

Olmsted Dam Major Equipment Strand Jack Heavy Lift Equipment

Operational functions and details

Both the super gantry crane and catamaran barge will utilize strand jacks to raise and lower their loads. Loads can vary from the lighter lifts of the individual lifting frames (up to 900 tons) to complete precast concrete shell and their associated lifting frames mounted on top (up to 4900 tons). These strand jacks mount on the strand jack platforms of each piece of equipment, and operate by raising and lowering strands that connect to the load.

Strand jacks are hydraulically operated lifting devices, capable of lifting extremely heavy loads. They operate by incrementally raising several wire rope strands by wedging the strands in place in the top anchor, raising the jack's cylinder, and then wedging the strands in the bottom, opening the top anchor and lowering the cylinder. Once the cylinder is retracted, the top anchor wedges the strands again and the cycle is repeated until the load is lifted to the desired height. The gantry crane will utilize ten strand jacks, each with a working capacity of 1100+ tons. Each jack will contain between 40 and 66 strands (depending on the load on a particular jack) that will attach to the top of the lifting frame legs. The catamaran barge will have similar jacks.

A completely integrated system will be installed on both pieces of equipment incorporating the diesel powered hydraulic power units, PLC controls, strand jacks, high carbon steel strands, and lifting attachments. The complete jacking system must have the capability to equalize forces at multiple lift points between all the jacks as a group.



Olmsted Hydraulic Strand Jack

Facts & Figures

- **Cost:** The strand jacks were purchased from Dorman Long Technology for \$238,232 per jack (includes all necessary components).
- **Major Components:** Twenty four (plus spares) 1100+ ton strand jacks, hydraulic power units, high carbon strands, controls, lifting attachments.
- **Power Source:** Diesel hydraulic power unit, each capable of powering multiple strand jacks. These units will be mounted on top of the super gantry or cat barge.
- **Lifting Capacity:** Equal to rated capacity of cat barge or super gantry
- **Lifting Speed:** The twelve each, 1100+ ton strand jacks are capable of lifting at a rate of 20' per hour.
- **Stroke Distance:** Each strand jack will have a stroke distance of 18 1/8".
- **Strands:** 18 millimeter (11/16") diameter high carbon steel strands.

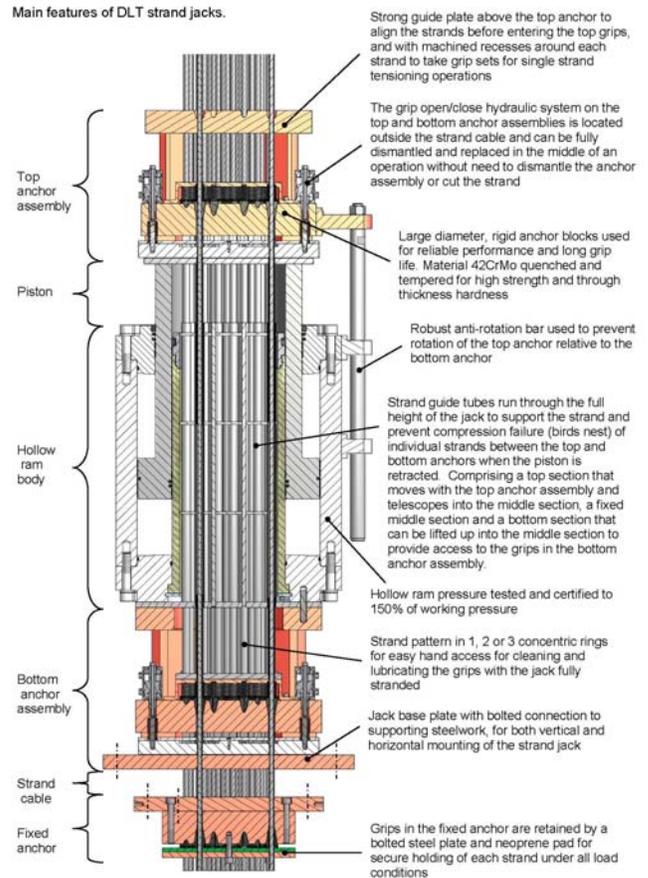
Operational Specifics

The 18mm strands are installed by feeding them through the bottom and top anchors. The upper anchor head closes and grips the strands. After opening the lower head, the piston of the jack extends and raises the closed upper anchor head including the strands. In top position, the lower anchor head closes, the upper anchor head opens, and the piston returns to the starting position.

When lowering, the procedure is reversed. The upper anchor head will be closed and hold the load, while the bottom anchor head will be opened. Closing and opening of the anchor heads is done by the lower and upper wedge release cylinders. Safety valves are integrated into the strand lifting unit to stop the cylinder movement if a hose breaks. During the whole cycle, the stroke, the hydraulic pressure, and the position of the wedges are monitored constantly by the computer and displayed by indicators throughout the entire system.

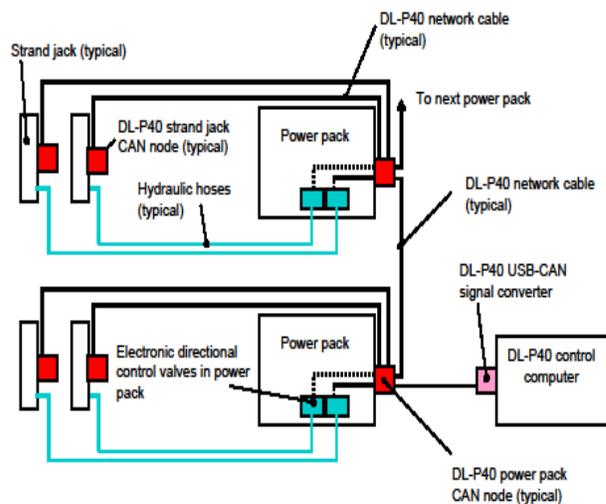
The manifold box is the interface between the strand lift unit, the hydraulic power pack, and the control computer. The communication card receives information from the strand lift unit, sends it to the control computer, and receives commands from the control computer to operate the hydraulic valves to direct the oil flow.

The control computer is a standard computer equipped with the cylinder control-system specially developed to control the hydraulic lifting equipment. Every cylinder is connected by a serial connection to the central computer. The computer instructs and receives information for each cylinder. As a result, the control of the hydraulic valves and the reading of the sensors are locally organized, while a total picture is built in the central computer. Consequently, the central computer is able to coordinate the movements of all connected cylinders at once at a rate of 15000 times per second.



Schematic of Typical Strand Jack

The schematic layout of the DL-P40 system hardware is as follows :

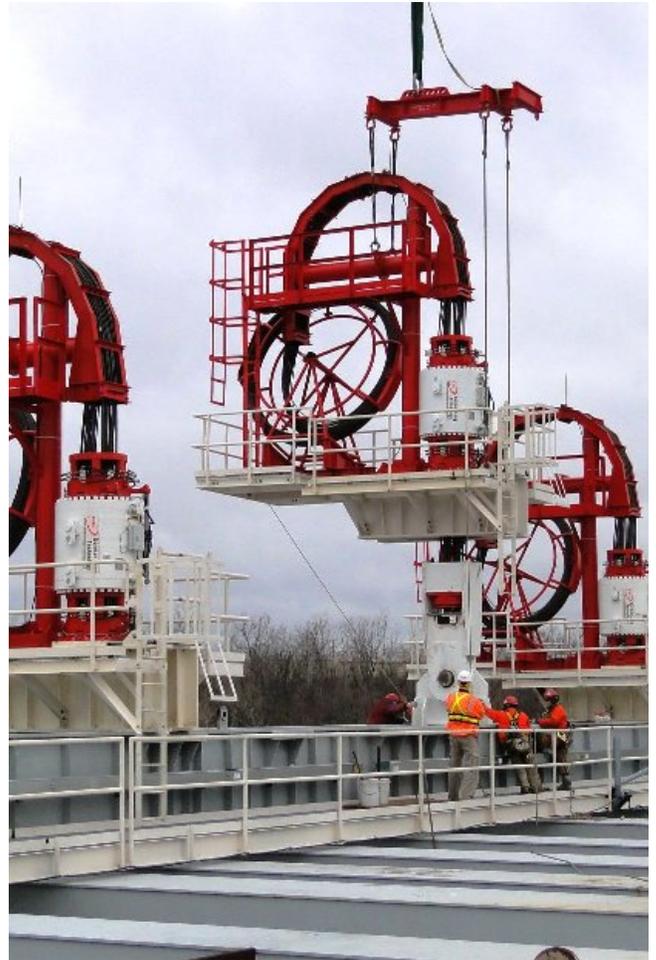


Cable Management System

The strand jacks employ a strand management system consisting of a strand guide and re-coiler. Other strand jack systems usually have the strands hanging free from the jack instead of being coiled (as shown). Olmsted's system keeps the strands coiled and only allows the length needed for each lift to be deployed. This system helps to protect the strands from environmental and other damage and makes storage much easier.



Strand Jack and Cable Management System



Installation of Strand Jack and Cable Management System on Catamaran Barge

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