Section 7: PRESTRESSING JACKS

Jacks used in typical post-tensioning systems are generally the center-hole variety (see Figure 7-1 for an example). Prestressing jacks have more wearing surface, longer jack stroke and packing than conventional jacks of the same capacity. This increases the potential of variations in the accuracy of the applied force. Other conditions which may affect accuracy and efficiency of hydraulic units are: use of unfiltered oil, exposure of the system to dust or grit, eccentric loading, type of packing, ram position, oil temperature, hydraulic valves, ram and packing maintenance, and readout equipment. Care and effort must be exercised to maintain accuracy in the jacking equipment.

One condition that must be considered when using hydraulic jacks is hysteresis. Hysteresis is an energy loss due to a hydraulic pressure change inside the jack, causing inaccurate load values when the ram pressure is static or decreasing. An increase of hydraulic pressure also causes an energy loss, but this loss is taken care of by calibrating the jack and pressure gage with a load cell during this increase of pressure.

Improper gage readings occur when the ram is fully extended and the hydraulic pressure is dissipated against the jack case. This condition can cause harm only if it damages the jack or gage and if the gage reading is mistaken for actual tendon stress.

The Contractor should monitor the stroke of the jack. Typically, jacks have a 12-inch (300 mm) stroke and if the ram is extended beyond this limit the jack will be damaged.

Fittings and valves are a common source of problems. The fittings are equipped with spring-loaded, self-closing ball valves that occasionally will not open when joined together. If this occurs anywhere except in the gage line, the system will not work and a high gage reading will show immediately. If the stuck valve is in the gage line, everything will work except the gage. Valves and fittings that leak, or will not hold the load, should be replaced. When fittings are replaced, it is imperative that high-pressure-type fittings are used (e.g. Schedule 80). If there are any questions concerning high-pressure fittings, contact METS immediately.

In general, jacks are about 95% efficient, but actual efficiency will vary depending on the age and condition of the jack. Be cautious of any calibration chart that shows jacking forces much greater than 95% of pressure multiplied by the piston area. Load cells and pressure gages are available to check any questionable equipment.

The *Standard Specifications*[23] requires that the jacks used to stress tendons that are permanently anchored at 25% or more of the specified minimum ultimate tensile strength of the prestressing steel, such as box girder tendons, be calibrated by METS within one year prior to use and after each repair. Jacks used to stress tendons that are permanently anchored at less than 25% of the specified minimum ultimate tensile strength of the prestressing steel, such as footing tie-downs,

[23] 2010 SS, Section 50-1.01D(3), *Equipment and Calibration.*

must be calibrated by a private laboratory authorized by METS within six months prior to use and after each repair. The Structure Construction web site, listed under *Field Resources*, has current information for jacks used with all State authorized stressing systems.

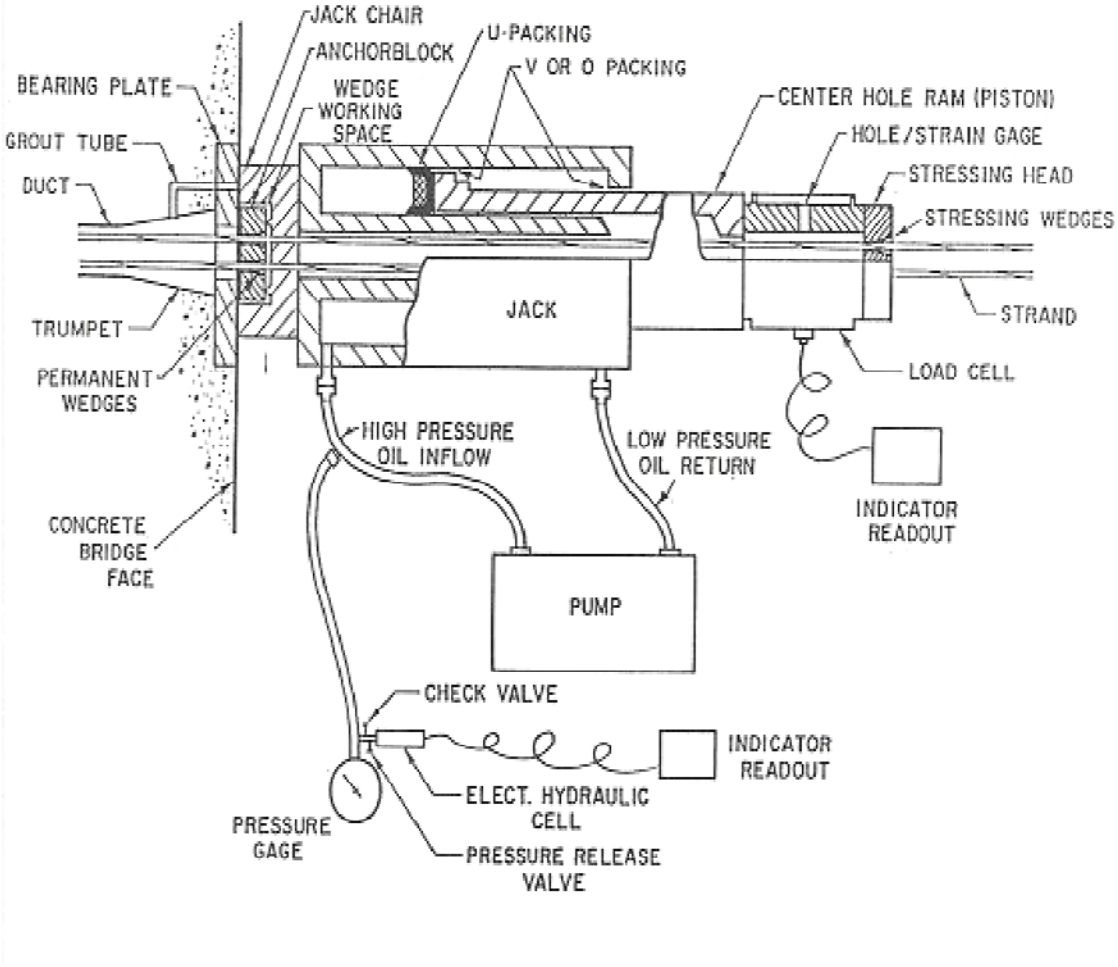

Figure 7-1 – Schematic of A Typical Post-Tensioning System.

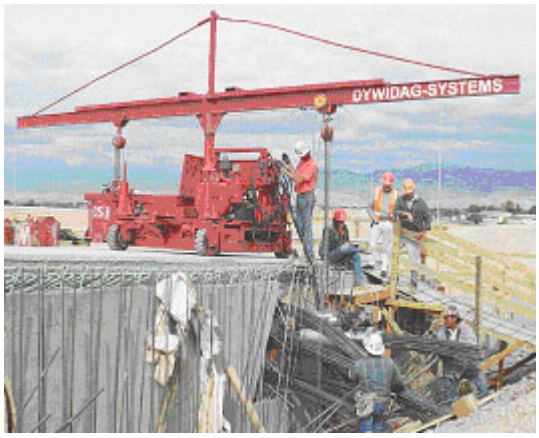

Photo 7-1 – DSI Post-Tensioning Operation.

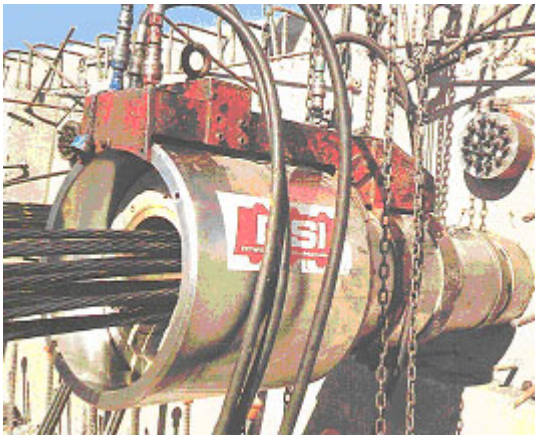

Photo 7-2 – High Capacity Prestressing Jack.

Photo 7-3 – High Strength Bar Stressing Operation.