

LIFT-OFF TEST PROCEDURES FOR UNBONDED MONOSTRAND POST-TENSIONING TENDONS

INTRODUCTION:

The purpose of a lift-off is to verify the force of a tendon after it has been stressed.

A lift-off test may be required when the recorded elongation of recently stressed tendons is out of code-recommended tolerance, typically +/- 7%.

Project specification may call for a selected force verification using the lift-off method.

The lift-off test is preferable and most easily done before the stressing tails of the tendons have been cut off. The following procedure is based upon the length of the stressing tail being of sufficient length that standard stressing equipment may be utilized.

Where the stressing tail is too short to use standard stressing equipment, specialized multi-use splice chucks and stressing tubes shall be required. This is NOT covered in the following procedure.

The following procedure assumes standard SURE-LOCK or SURE-LOCK II anchorages, or similar. Where antiquated anchorages like ATLAS, PRESCON, or barrel-and-chuck anchorages have been used, special equipment may be required.

All stressing operations shall be carried out by experienced and competent persons.

PROCEDURE:

1. Visually check the stressing jack grippers for cracks, excessive wear, and presence of deleterious materials. Install new grippers, if required.
2. Visually check the general condition of the exterior anchorage zone concrete (top and bottom surfaces) to the tendon where the lift-off test shall be conducted. If there are cracks, rock pockets, delamination's or spalls consult with the EOR prior to conducting the lift-off testing.
3. Visually check inside the stressing pocket for presence of voids, rock pockets, or other defects, including rotated, inclined, non-aligned, or fractured anchors.
4. Visually check the condition of the exterior face of the anchor wedges and if any anomalies exist report them to the EOR prior to commencing the lift-off test.
5. Visually check the strand stressing tail, and inspect each of the outer wires for fracture, nicks, cuts, or excessive damage.

6. Wipe clean strand stressing tail of all deleterious material, including cement paste.
7. Place stressing jack on strand, and extend the ram approximately 4", assuming a standard 8" stroke jack is used, and that adequate stressing tail is available.
8. Visually check that the stressing jack nose is correctly seated on the anchorage.
9. Engage the jack grippers.
10. Ensure that all safety procedures for stressing are maintained. Install plywood barricades behind the stressing jack, as deemed necessary.
11. Only personnel required for stressing operations shall be in proximity to the test area.
12. Commence stressing tendon until lift-off is achieved. NOTE: the hydraulic pump will VERY quickly build up pressure. This is normal, as the tendon is already stressed, and little or no ram displacement will be achieved as the pressure is increased. The operation of stressing is best undertaken with a remote momentary switch, rather than the pump on/off toggle switch.
13. The operator shall visually monitor the pressure gauge during the application of stressing. At lift-off the gauge pressure will spike, then suddenly drop several hundred psi, at the moment the wedges 'pop', or release from the anchorage wedge-cavity. An audible sound will be heard. If the operator has his/her hand on the pump at the time of lift-off, the release of the wedges shall be felt by the operator through the pump housing. This is NORMAL. The drop in gauge pressure after wedge release is due to overcoming the mechanical-friction force of the previously seated wedges.
14. Record the value of the gauge pressure immediately after it drops from the spike value at wedge release.
15. From the current calibration graph for the stressing equipment (pump, gauge and jack) interpolate the value of gauge pressure (psi) to force (lbf or kips) and report to the EOR.
16. The lift-off test magnitude determines the residual force in the tendon at the anchorage where the stressing jack was installed. Determination of the force level in the tendon at other locations requires consideration of friction and wedge-seating effects.
17. Release the stressing force from the hydraulic jack and pump and visually check that the wedges have correctly seated into the anchorage.

REFERENCE: CONCRETE CONSTRUCTION, Chapter 12 Unbonded Post-Tensioning System Technology in Building Construction by Florian G. Barth, P.E.