Repairing a Post-Tension Anchor

By Stephen A. Johanson

Because there was no such thing as an ICRI Guideline when the concrete repair industry was born, contractors developed their own methods of repairing structures. Not every contractor may approach a repair in the same way, and different original materials require different repairs. For instance, there are different methodologies to repair a post-tension anchor when dealing with different types of post-tensioning. The following describes one method to repair an unbonded post-tension anchor.

Unbonded tendons have become the most common type of post-tensioning reinforcement in today's post-tensioned structures. Typically, they consist of seven strands with a nominal diameter of 0.5 inches. The woven strands are covered with a corrosion inhibiting grease and encapsulated in a plastic sheath. Typical strand properties are as follows:

Specification	ASTM A416 Low Relaxation, Grade 270	
Nominal diameter	0.5 in	12.7 mm
Nominal area	0.153 in^2	98.7 mm^2
Nominal weight/mass	0.52 lbs/ft	0.78 kg/m
Yield strength	37.2 kips	165.3 kN
Min. breaking load	41.3 kips	183.7 kN
Young's modulus (approx.)	28,500 ksi	195 GPa
Relaxation	max. 2.5%	max. 2.5%

Tendon anchorages are normally located at the ends of a concrete slab or expansion joint. Tendon anchorages are either in the form of a dead-end or stressing end. Should the protective sheathing be damaged or water enter the sheath due to improper greasing, the strand will begin to rust. With the addition of chloride salt, stress corrosion of the strands will proceed.

Additional deterioration will occur at the anchors if the perimeter concrete is not properly protected from moisture intrusion and salt contamination. Stressing strand stubs, which extend beyond the anchor that do not have adequate concrete cover, will create a hostile environment, causing tendon corrosion (see Figure 1).

The repair of end anchors due to concrete deterioration and the replacement of the existing strand due to corrosion or some other related issue, such as new construction modifying an existing slab that will affect the strand, require the relaxing of the strand in order to remove the stressing end anchorage. To remove the stressed end anchor, a specific approach to the procedure is recommended.

The approximate location of the strand needs to be identified prior to cutting open an access point in the slab to expose the strand. Methods available to locate embedded strands are pachometers, ground surface radar, x-ray, and radar rebar locators.

The access hole that exposes the tendon should be at least 30 inches away from the anchor requiring de-stressing. A full depth opening of 8 inches square is sufficient for this purpose. In the access hole, a post-tension lock-off device is required to retain the stressing strength in the remaining tendon while the end anchor is repaired.

At the tendon's up side, the end farthest from the post-tension anchor, a steel bearing plate and leveling grout must be installed around the tendon. It is necessary to remove the plastic sheeting prior to installing the bearing plate. The plate should be A-36 steel, 3/8 inch thick, and have a 5/8 inch oblong hole cut into one side. The plate will be placed around the tendon and leveled in the horizontal and vertical plane. An epoxy grout with compressive strength of at least 6,000 psi can be used to grout the rear of the plate. After the epoxy grout has achieved full strength, the lock-off device can be installed (see Figure 2).

Lock-off devices have a section of the steel ring that slides out and allows installation over the post-tension cable. A set screw secures this section in location. Split wedges are placed over the cable and recessed into a conical hole from which the existing tendon protrudes. A hydraulic jack and shim plates are installed over the tendon. Sufficient space between the back of the jack and the down side end of the concrete opening are necessary to

set the split wedges. The hydraulic jack should stretch the tendon until the load on the jack reaches approximately 2,800 to 3,200 pounds. After the split wedges are sealed into the lock-off device, the jack and shims are removed. Visual observation that the split wedges are seated properly is necessary.

At this point, if it is not necessary to repair the post-tension anchor, the lock-off device may be left in place, protected with an anti-corrosion system and cast into the slab. Otherwise, after the tendon has been locked off, repair to the anchor may proceed. Deteriorated concrete is removed, structural steel and panic bar reinforcement surfaces are properly prepared, and additional reinforcement may be added, if necessary.

Corrosion inhibitors should be installed on all exposed structural steel. Good quality portland cement concrete or high strength repair mortars with aggregate need to be installed. After the repaired end has cured and gained sufficient strength, a splicing chuck will be attached to the existing tendon, and a pigtail length of post-tension cable will extend from the chuck, through the slab and post-tension anchor. The existing anchor may be reused or substituted with a new epoxy-coated anchor.

The jacking assembly will be installed over the tendon at the repaired stressing tendon. The tendon will be stressed until the wedges in the lock-off device become loose. Remove the wedges and lock-off device. The wedges will be reseated in the end anchorage. The jacking assembly is then removed. The exposed tendon in the access hole needs to be covered with grease and a protective covering. A protective plastic cap is installed with grease over the anchor end where the seated wedges rest. A good quality mortar plug is then installed to encapsulate the plastic cap. The encapsulation of the anchorage will protect it against aggressive materials, thus preventing the formation of corrosion cells (see Figure 3).

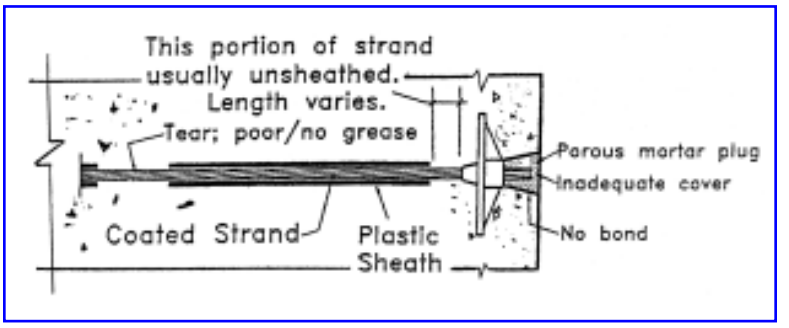

Fig. 1

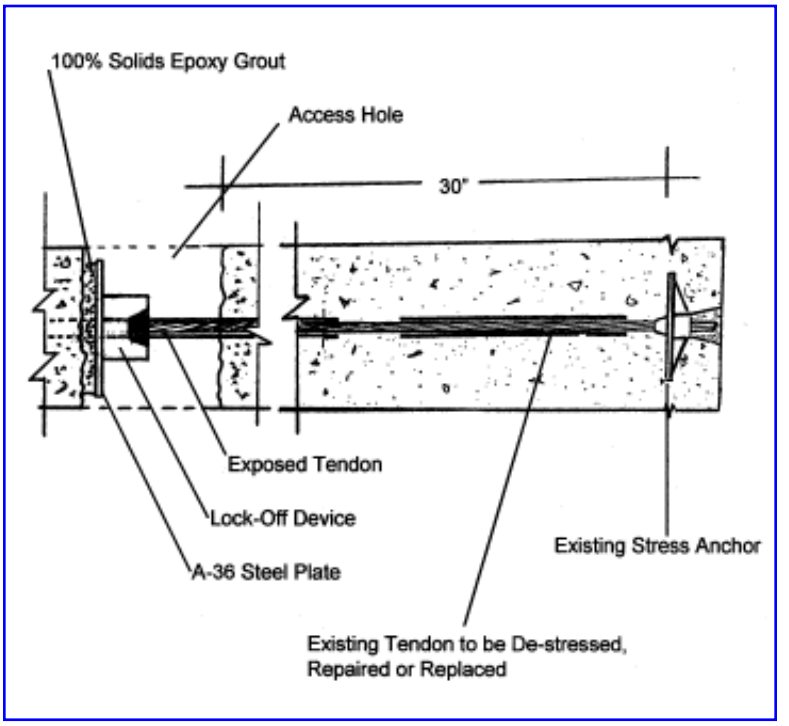

Fig. 2

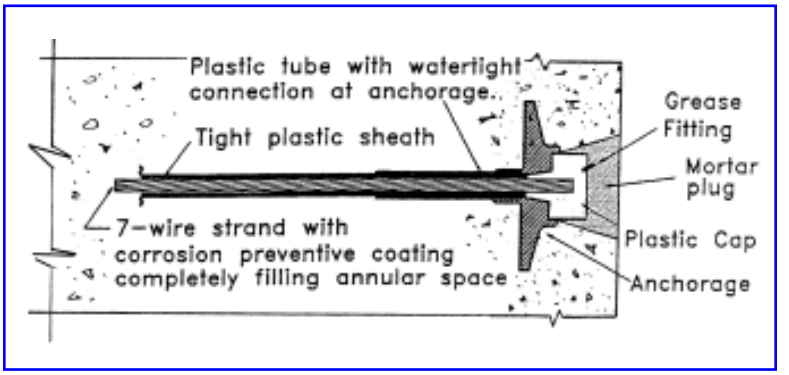

Fig. 3

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