

ALDOT-441

PRESTRESSING STRAND PULLOUT TEST

1. Scope

- 1.1. This procedure provides a method for measuring the bond strength of a specific lot of prestressing strand relative to the bond strength of other lots produced at various times or by various manufacturers. The intent is to measure the relative bond resistance of the prestressing strand when cast without prestress in a well consolidated standard concrete mixture.

2. General

- 2.1. For each type and size of prestressing strand used as primary reinforcement, one pullout testing block shall be cast and tested.
- 2.2. Two blocks are required for the SCC bridge project. One block with regular ½” strand and one block with ½” special strand.
- 2.3. Concrete used in the block is a standard concrete mix. The concrete mix is not intended to be representative of the actual concrete used for the girders.
- 2.4. Each pullout block shall contain ten strand samples. Each strand shall be pullout tested according to this procedure.
- 2.5. Auburn University Highway Research Center (HRC) personnel shall inspect the block fabrication as noted below and observe the pullout testing.

3. Strand Preparation:

- 3.1. Ten strand samples shall be taken from a roll of strand used for the project girders.
- 3.2. Samples shall be saw-cut to 34 in. lengths, any projections from the saw-cutting shall be removed, and a sample shall be straightened by hand if it is bowed more than 3/8 in. over the 34 in. length.
- 3.3. The strand samples shall be visually examined to verify that they are not rusted.
- 3.4. The strand samples shall be wiped with a clean paper towel to clean off any loose dirt or incidental rust. The samples shall not be cleaned with acid or any other solvent.

4. Pullout Block Fabrication:

- 4.1. Pullout block shall be fabricated as indicated in Figure 1.

- 4.2. Reinforcing cage shall be installed and securely positioned within the forms before any strand samples are tied in place.
- 4.3. After the forms and reinforcement have been inspected, the strand samples shall be tied securely in place in accordance with the block drawings.
- 4.4. Split plastic sheathing shall be installed to effectively debond the top 2 in. of embedded strand as indicated in the Figure 1.
- 4.5. Concrete placement shall proceed after strand installation has been inspected.
- 4.6. The concrete shall conform to the proportions given in Table 1. The normal-range water reducer may be selected within the range given to attain a slump of 2–4 in. Compressive strength shall range between 3800 and 5000 psi within 48 hours of casting. Six cylinders shall be cast from the same batch and cured with the test blocks; three of the cylinders shall be used to determine the concrete strength at the time of the strand pullout testing.
- 4.7. An internal vibrator shall be used to obtain good consolidation around the strand samples.
- 4.8. The top surface shall be smoothed using a one-pass trowel finish to attain flat concrete surfaces adjacent to the strand samples. No strand sample shall be disturbed after the vibration is complete.
- 4.9. Curing compound shall be sprayed on the top of each block to prevent shrinkage cracks from occurring in the top surface.
- 4.10. Each block shall be cured under a tarp; a support rack shall be placed over each test block to keep the curing cover from coming in contact with the tips of the strand samples.

5. Testing Procedure:

- 5.1. Determine and record the compressive strength of the concrete on the day after casting the test blocks. Once the concrete strength is within the 3800–5000 psi range, the prestress manufacturer shall begin pullout testing under the observation of HRC personnel.
- 5.2. The hydraulic jack shall be a pull-jack with a center-hole assembly at the end of the ram (such as normally used for single-strand stressing). It shall be tested and calibrated to permit loading to at least 50 kips, and shall have a travel of at least 12 in.
- 5.3. The bridging device shall be as shown in Figure 2.
- 5.4. The bridge shall be slipped over each strand to be tested and placed against the concrete surface. The strand chucks shall be slipped over the strand to the top of the bridge and light pressure shall be applied to the jack to seat the jaws of the chuck into the strand.

- 5.5. The jacking load shall be applied in a single increasing application of load at the rate of approximately 20 kips per minute until the maximum load is reached and the load gauge indicator can no longer sustain maximum load. Jacking shall not be halted until the strand can no longer sustain the maximum load.
- 5.6. The pullout capacity of the strand sample shall be recorded as the maximum load attained by the strand sample before the measured load decreases.

6. Documentation:

- 6.1. The following data shall be recorded for each strand sample:
 - 6.1.1. Maximum capacity (as defined above)
 - 6.1.2. Approximate load at first noticeable movement
 - 6.1.3. Approximate strand pullout distance at achievement of maximum load
 - 6.1.4. General description of failure

Table 1 Concrete mixture for pullout test blocks

Materials	Quantity per cubic yard
Cement (Type III)	660 lbs
Concrete Sand	1165 lbs (SSD)
#78 Crushed Limestone	2011 lbs (SSD)
Normal-range water reducer	10–20 oz
Air-entraining agent	None
High-range water reducer	None
Water	278 lbs

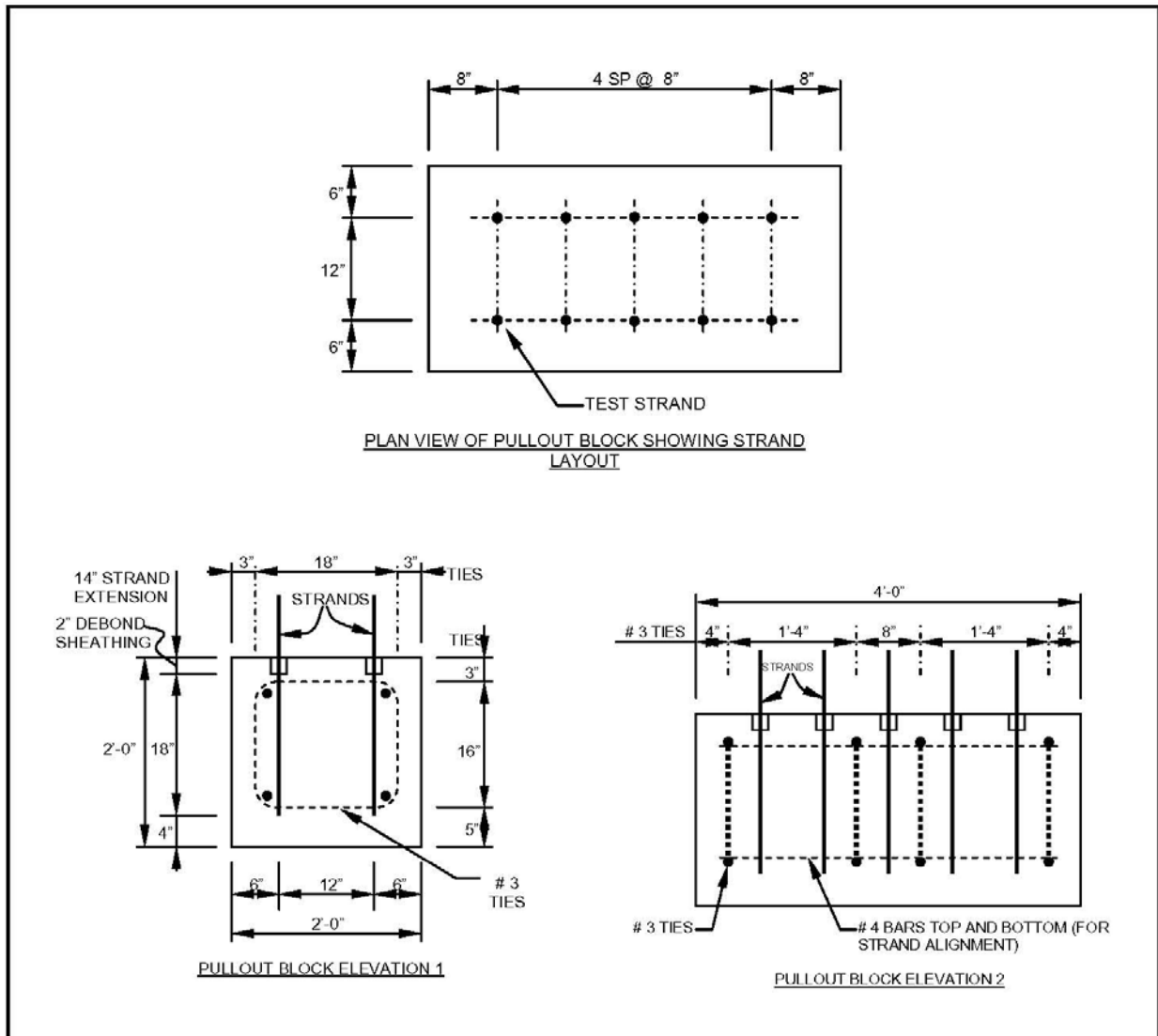


Figure 1: Pullout block specifications.

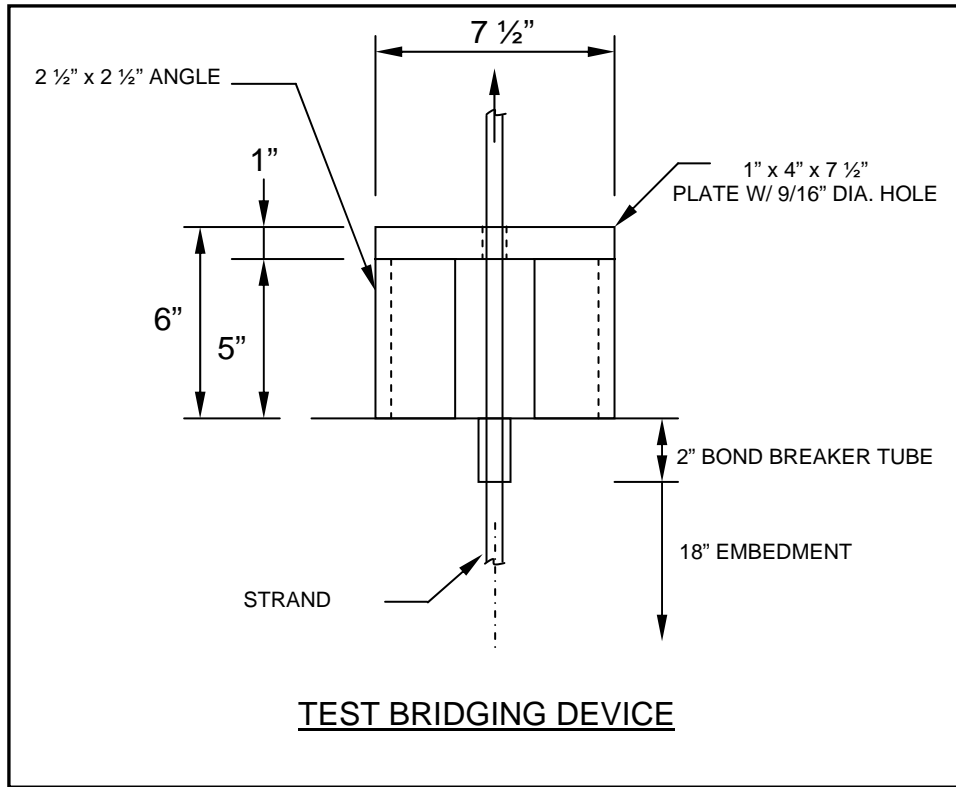


Figure 2: Bridging device specifications.