Tips on Handling and Tensioning Strand

Presents some helpful suggestions on proper handling and tensioning of stress-relieved strand for precast prestressed concrete production.

An efficient materials handling system and a safe tensioning strand procedure are of utmost importance in any precast prestressed plant operation.

The following suggestions are offered on proper handling and tensioning of stress-relieved strand. Figures 1 through 14 further illustrate these points by showing good and poor practices.

- Strand coils should not be dropped. Doing so could lead to wires being damaged or the coil shifting, thus causing problems such as entanglement and kinking in the package. This would then present problems in dispensing and tensioning the strand.
- When using a wire rope or chain sling, it is wise to wrap them with a covering such as a rubber hose to prevent tearing of the package or nicking of the wires.
- A sharp knife is suggested for removing the outer paper wrapping of the strand package. However, care must be taken not to nick or abrade the strand.
- Once the strand package is placed in the dispenser, the bands can be cut. Use a band cutter or shears. A cutting wheel can damage the strand by nicking it; a torch can not only reduce the strength of the strand, but has even ignited the wrapping paper.
- To easily identify the strand, attach the metal identification tag to the dispenser until all the strand on the reel has been used.
- Use of a center bar in the dispenser is suggested. This helps guide the strand out and prevents loops from flipping on the inside creating entanglement and kinking problems.

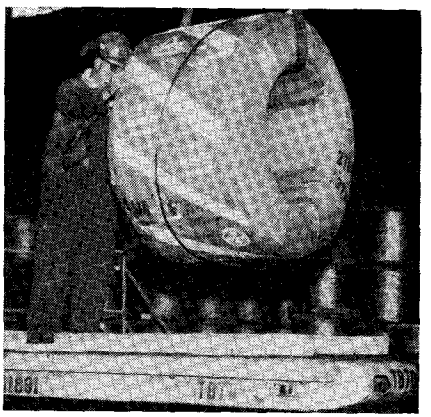

Fig. 1. The strand package must be properly handled to prevent damage to the strand and insure safety for the plant personnel. A fork lift can be used, or as shown here, a sling from an overhead crane is being incorporated. It is important not to drop the package from a truck to prevent shifting or crushing, which could lead to problems such as entanglement in the package.

The strand should be allowed to freely rotate as it is pulled from the center and should be pulled so it feeds out in a counter-clockwise direction.

- When stringing the bed, care must be taken not to kink the strand or contaminate it with the bond breaker used on the forms. Again, take necessary precautions at this stage to avoid nicking or abrading the strand.
- Pay particular attention to the gripping chuck as it is the only attachment holding the strand at a force of nearly 190,000 psi. Use only properly maintained and closely inspected chucks. Special attention should be given to the wear on the serrations of the insert. Clean and inspect after each use.
- Double check the chuck size. Give

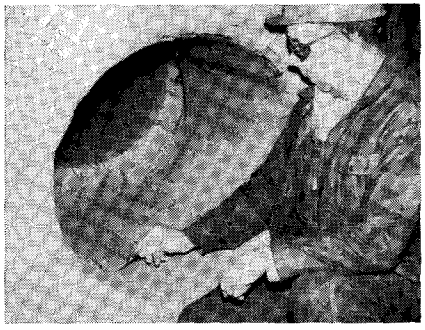

Fig. 2. A sharp knife can be used to easily remove the outer wrappings on the package. It is important, however, not to nick or abrade the strand.

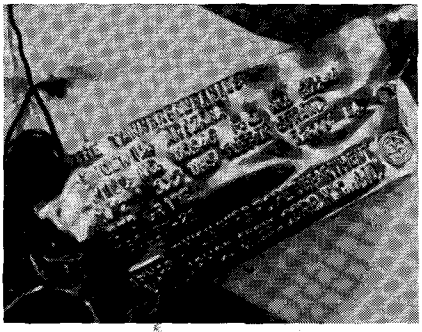

Fig. 4. A useful idea is to attach the metal tag to the dispenser until all the strand in the strand package has been used. State highway inspectors and especially the quality control department find this a reliable method of identifying the strand.

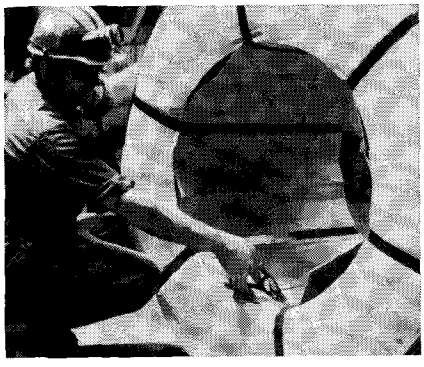

Fig. 3. Once the strand package is placed in the dispenser the bands can be cut. This should be accomplished by using a band cutter or shears. The dispenser in this photograph has been removed to show the proper way the band cutters should be used. A cutting wheel may damage the strand by nicking it; and a torch only reduces the strength of the strand but can ignite the wrapping paper, resulting in a costly fire.

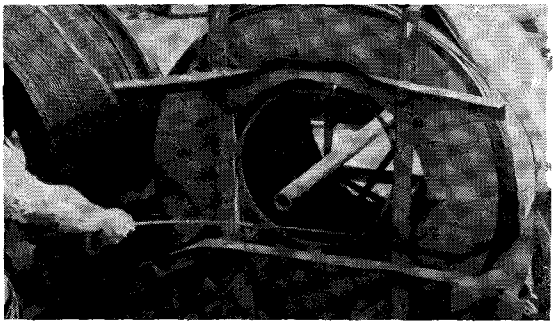

Fig. 5. Use of a center bar in the dispenser is suggested. The objective of this is to guide the strand out of the package and prevent loops from flipping on the inside, thus creating an entanglement problem. The strand must be allowed to freely rotate as it is pulled from the center and should be pulled so it feeds out in a counter-clockwise direction, as previously mentioned.

careful attention to the placement of the chuck to insure that its axis coincides with the axis of the strand. Incorrect alignment can lead to notching and shearing of the strand wires which can result in wire or strand failures during tensioning.

- The strand and chuck must then be properly seated in the ram to insure that the tension is evenly placed on both.
- During tensioning of the strand, make sure all personnel have been moved from the area. Be certain no one is standing on or immediately adjacent to the bed. If it is necessary to stand by the end of the bed, a protective shield should be provided in the event of a failure in the chuck, strand or tensioning system.
- If the strand is to be pulled while in a depressed position, tensioning should be performed at both ends to

Fig. 6. When stringing the bed, care must be taken not to kink the strand or contaminate it with the bond breaker. Also, precautions are necessary not to nick or severely abrade the strand. Here the strand is being laid in the bed after the bond breaker has been allowed to dry.

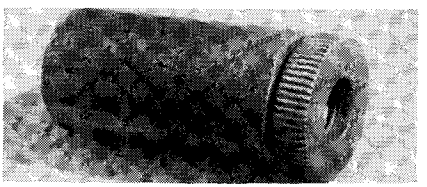

Fig. 7. The gripping chuck should be of primary concern since it is the only attachment holding the strand at a force of nearly 190,000 psi.

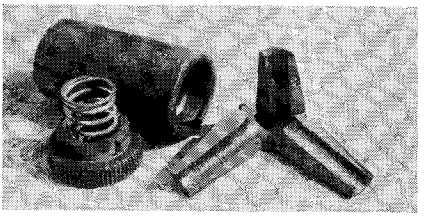

Fig. 8. Only well maintained and closely inspected chucks should be used. This includes proper cleaning after each use with checks being made on the barrel, cap, spring and inserts. Special attention should be given to the wear on the serrations of the insert.

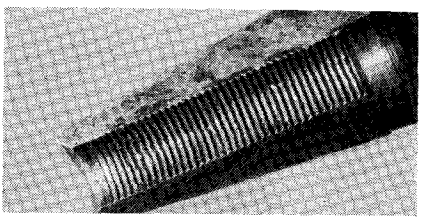

Fig. 9. At first glance, this insert may appear to be in good condition. Closer inspection, however, shows crushed and worn serrations which could lead to slippage of the strand or possible strand failure at the chuck during tensioning.

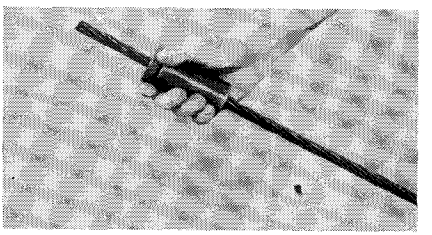

Fig. 10. The chuck size should be double checked, and careful attention must be given to placement of the chuck to insure that its axis coincides with the axis of the strand. Incorrect alignment can lead to notching and shearing of the strand wires, thus causing a strand failure.

counteract the friction at the hold-down points. Care must also be taken to insure rollers at depression points are free to rotate.

- When strand is depressed after tensioning, a roller system is the best method. If this is unavailable, the largest diameter and smoothest surface depressors should be used. Be careful not to damage the strand due to the notch sensitivity of the high strength wire.

Implementation of these ideas should provide an efficient materials handling system for your prestressing operations and safer working conditions.

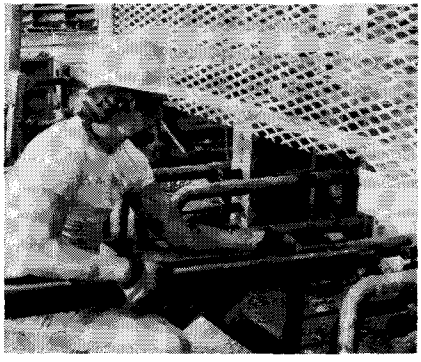

Fig. 11. The strand and chuck must then be properly seated in the ram to insure that the tension is evenly placed on the chuck head and no slippage will occur.

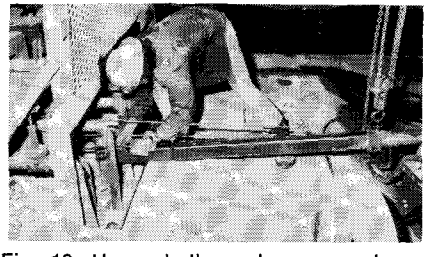

Fig. 12. Here chalk marks are made on the ram to check elongation. When initially tensioning the strand, "release slippage" must be accounted for at the live end. This is the distance the strand slips back into the chuck until the inserts fully hold the strand in position. During final tensioning, chuck slippage at both the dead and live ends must be considered when cross-checking strand tension with elongation.

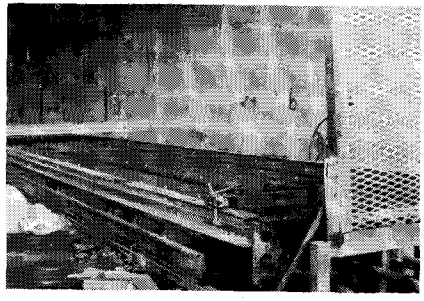

Fig. 13. During tensioning of the strand, make sure all personnel are removed from the immediate area. Especially important is that no one is standing on or immediately adjacent to the bed. If it is necessary to stand by the end of the bed, a protective shield should be provided in the event of a failure in the chuck, strand or tensioning system.

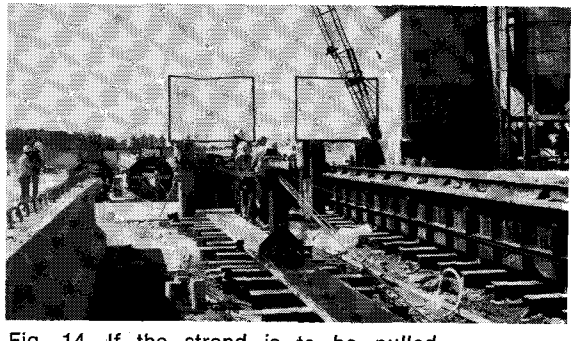

Fig. 14. If the strand is to be pulled while in a depressed position, tensioning should be performed at both ends to counteract the friction at the hold-down points. Care must also be taken to insure rollers at depression points are free to rotate.

Acknowledgment

This article is based on information supplied by Armco Steel Corporation, Middletown, Ohio.