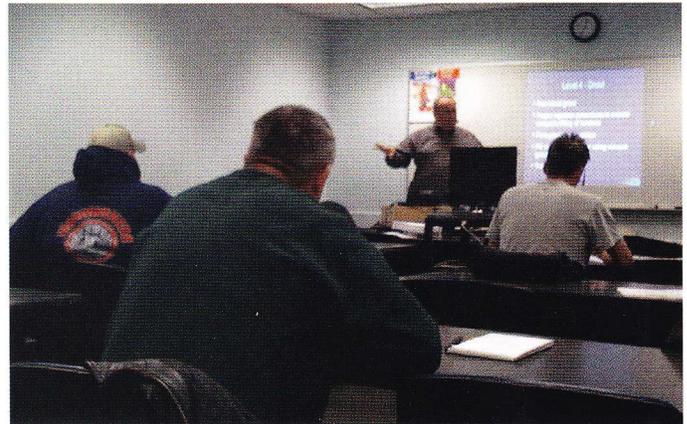


CERTIFICATION: ASSURING QUALITY IN POST-TENSIONED CONCRETE CONSTRUCTION

by Ken Bondy

The development of competent specifications for the fabrication and installation of post-tensioning tendons has greatly improved the quality and durability of post-tensioned concrete structures.¹ Comprehensive, consensus-based specifications for fabrication and installation of post-tensioning materials are available from PTI² and the American Concrete Institute (ACI).³⁻⁵ These specifications can be incorporated into projects simply by referencing them in contract documents. But specifications are just part of the quality control process. The other critical part is certification. Certification by established, recognized programs is the best guarantee available to specifiers and/or licensed design professionals that the materials they specify conform to their specifications, and the installation and inspection of those materials are done by individuals who know what they are doing. Certification in construction is analogous to licensing of design professionals—demonstrable, tangible evidence of knowledge and capability in a specialized process or endeavor.

Outstanding certification programs have been developed by construction-related associations such as ACI, PTI, the Precast/Prestressed Concrete Institute (PCI), and by private, for-profit organizations. PTI has developed an extensive program of training, education, and certification designed to improve the quality of post-tensioned concrete structures. PTI's programs include certification of field personnel, inspectors, tendon fabricating plants, and plants producing prestressing steel strand. Some of these PTI programs have been in place for more than 20 years, and they have certified thousands of individual installers and many fabricating and strand producing plants. Individuals certified by PTI have undergone intense "hands-on" training in workshops taught by experienced and knowledgeable faculty, and have passed comprehensive examinations covering all relevant aspects of post-tensioning installation and inspection work. PTI's program for certification of plants producing unbonded single-strand tendons started in 1989 and currently certifies



58 plants, representing approximately 95% of all unbonded tendon production. The recently launched PTI certification program for prestressed concrete strand plants now certifies international plants in Asia and the Middle East, with additional plants likely to follow.

Design professionals may not realize that unbonded tendon plant certification is actually required by the ACI Building Code and model codes into which it is incorporated, such as the International Building Code (IBC)⁶. ACI 318-11,⁷ Section 3.8.4, incorporates ACI 423.7-07, "Specification for Unbonded Single-Strand Tendon Materials and Commentary," in its entirety. Section 1.6.1 of ACI 423.7-07 requires that unbonded single-strand tendons be fabricated in a plant "...certified by an externally audited quality assurance program..."⁸ Commentary Section R1.6.1 states that plants certified by PTI satisfy this requirement. While the mandatory portion of ACI 318-11 does not directly address certification of field personnel, it does strongly recommend it in its introduction, as follows:

"It is recommended to have testing and certification programs for the individual parties involved with the execution of work performed in accordance with this Code. Available for this purpose are the plant certification



programs of the Precast/Prestressed Concrete Institute, the Post-Tensioning Institute, and the National Ready Mixed Concrete Association; the personnel certification programs of the American Concrete Institute and the Post-Tensioning Institute; and the Concrete Reinforcing Steel Institute's Voluntary Certification Program for Fusion-Bonded Epoxy Coating Applicator Plants."

Although my specialty has been the *design* of post-tensioned concrete building structures, I have been employed by and have owned companies that fabricated and installed post-tensioning tendons. I can personally testify to the vast improvement in materials, installation, and inspection that results when tendons are fabricated in certified plants, installed by certified ironworkers, and inspected by certified deputy inspectors.

As an example of the importance of certification, consider the issue of tendon corrosion. I have cited tendon corrosion as the single largest problem ever faced by the U.S. post-tensioning industry.¹ Early unbonded tendon sheathings and coatings were inadequate to protect tendons from corrosion in the most aggressive environments, particularly in parking structures where deicing salts were applied. The development by PTI of new specifications for improved tendon materials and installation, and the execution of and conformance to those specifications by PTI-certified individuals and plants, has substantially resolved those early corrosion problems. Incidents of tendon corrosion in unbonded post-tensioned structures are now rare, and have been reduced to a level equivalent to or less than that experienced in any other type of construction. I believe this dramatic improvement

in the quality of post-tensioned concrete construction is directly attributable to the enforcement of specifications by certified individuals and fabricating facilities.

So how can design professionals take advantage of these effective, proven certification programs? Simply by requiring them in their contract documents. Design professionals should always require that tendon materials used in their projects be produced by certified plants, that tendon materials are installed by certified field personnel, and that the work be inspected by certified deputy inspectors. IBC 2006, Section 106.1.1, requires that construction documents must "...show in detail that [the work proposed] will conform to the provisions of this code..." Contractually requiring certification by established and recognized certification programs not only satisfies the code, but it is also the design professional's best guarantee that his/her projects will contain properly installed post-tensioning materials of the highest quality.

Learn more about PTI certification programs at: http://www.post-tensioning.org/certification_program.php.

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