9600202 POST-TENSIONING COMPONENTS
INTERNAL/INDUSTRY REVIEW COMMENTS

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Zuming Xia
817-829-7352
zxia@structuraltec.com

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1. 960-2.2.1.2 Smooth Plastic Duct: This was not listed in the current revision: For Internal system injected with flexible filler – Suggest to make the following changes: External PT systems with duct injected with flexible filler shall use smooth plastic duct. Internal PT systems with duct injected with flexible filler can use corrugated plastic duct. Our concerns are really on minimum bending radius needed for internal PT system together with bonding issues.
Response: During flexible filler testing at the FDOT Structures Research Center, smooth plastic duct has been successfully bent to radii typically used for internal tendons. At locations where very tight radii are used, steel pipe is allowed to be used in lieu of smooth plastic duct. All tendons with flexible filler are required to be designed as unbonded tendons.

2. General comments on implementing fib Bulletin 75 for Internal Bonded Post-tensioning: While fib Bulletin 75 is report has merit presenting extensive information about material components, fabrication process, on-site installation and testing and approval processes for the ducts, their associated accessories and PT systems. ETAG themselves have not put the time table for PT suppliers to conduct the new tests or set up a deadline before their approved system being taken off from the approval list. Our question is: What is the grace period for conducting additional tests? Some test definitely make sense, such as the one already in the current version of July 2016 which combines wear test and minimum bending tests on the same sample and keep the clamping force for a duration of 14 days. Other tests such as elevated temperature: Is it necessary? What is Florida DOT's experience with this? How was duct performing from the demolishing of the existing bridge. The challenge here is to find a lab or build oven big enough to put the testing frame and testing equipment in the oven. As far as we know, none of our European PT suppliers have conducted the duct tests under elevated temperatures yet.
Response: For FDOT projects, specification requirements are tied to the date of the construction contract but PT system approvals are tied to their time of use. Thus there is still time available to conduct the required tests and get PT systems approved prior to when they will be used on a project. PT systems that were previously approved by FDOT using older versions of our specifications have already been removed from the Approved PT Systems List for projects let after December 2015. Testing of PT system components at the specified 114°F temperature somewhat addresses actual construction conditions in Florida, e.g. heat from hydrating concrete and field conditions during mid-summer. If anything, the 114°F might be a little on the low side for Florida. The temperature of the smooth plastic duct used for testing at the FDOT Structures Research Center was measured as high as 150°F during the day.

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Tommaso Ciccone
3-902-430-0161
t.ciccone@tensainternational.com

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We would like to highlight the main changes that, as a PT contractor, we will face on our PT system moving from Fib Bulletin 7 to Fib Bulletin 75. In details (table 3.2.1-1): Test per Appendix B.1 (“Leak tightness of anchorage-duct assembly”): such test aims to demonstrate the tightness of the connection anchorage duct as the former Fib Bulletin 7 “Leak tightness test” (paragraph 4.2.2) was trying to assess. Of course now it is required a pressure five times higher (0.5 bar instead of 0.1) and sincerely technically we do not understand such increase of pressure.
Response: System requirements of fib Bulletin 75, Annex B.1, are consistent with component requirements of fib Bulletin 75, Annex A.6 (which is the same as fib Bulletin 7, Annex A.6). A given component that has already passed the component testing specified in fib Bulletin 75 Annex A.6 should also pass the system testing specified in fib Bulletin 75 Annex B.5, especially given the much larger volume of compressed air to draw from within the 30 meter long duct assembly.

Test per Appendix B.4 (“Full scale duct system assembly”): it is nearly the same as “Stage 1 test: Full Scale System Assembly” (Fib Bulletin 7, paragraph 4.2.1) but it is requested to thread steel strands inside ducts and to expose tendons to outside environment for 14 days. Such supplementary requirements, by facts, completely forces to make new tests again.
Response: The assembly test per fib Bulletin 75, Annex B.4, is checking effects of temperature daily cycles on geometry and connections of the assembled and fully installed tendon (i.e. with strand). Hence, the 14 days duration.

Test per Appendix B.5 (“Leak tightness of assembled duct system”): such test substitutes “Stage 2 test: Leak tightness test” (Fib bulletin 7, paragraph 4.2.2) but asking for steel strands to be threaded, a five times higher pressure (0.5 bar instead of 0.1) and a 1 hour conditioning (not requested before). Previous tests as per Fib Bulletin 7 become of course no longer valid. We have not been able, even talking to Fib group members who wrote Bulletin 75, to understand reasons for this change.
Response: The 0.5 bar pressure requirement is consistent with component testing and anchorage assembly testing. The 1 hour conditioning time is specified to reduce / cancel effects of initial creep of polymer components under permanent pressure which would increase pressure loss. Hence, this conditioning is considered to be favorable for passing the test.

Regarding paragraph 960 – 3.2.3 “External PT Systems Pressure Tests”: We see that now it is required to have full external tendon, from anchorage to anchorage, conditioned to 150 psi, an extremely high value. Previous FDOT Spec was calling for a 1.5 psi pressure for the connection anchorage to duct/pipe assembly, which is definitely the weakest point. We believe that 150 psi it is a very difficult target to achieve, even in case that all mock up tests are carried out within massive concrete blocks.
Response: For system acceptance, the required test pressure has been reduced to 100 psi with an acceptable pressure loss of 10 psi after five minutes to be more consistent with the maximum allowable wax injection pressure of 75 psi per Specification 462-7.4.2.1.5.3.

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Said I. Nour
630-972-40258

said.nour@dsiamerica.com

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1. 960-3.2.1 Table 3.2.1-1 Appendix B.5 (Leak tightness of assembled duct system) The understanding of this test was to check the airtightness of the system. Previously, 1.5psi held for 1min with a loss of 0.15psi was used in fib 7. That was sufficient to know if there is any loose connection or missed heatshrink before pouring concrete. It appears that, so far, the 1.5 psi has worked for fulfilling that objective. Now, fib 75 requires a pressure of 7.25 psi held for 5 minutes. Is there a real benefit for this increase? Some connections of the currently available industry systems may not pass this requirement unless significant changes and re-design are made across the board with added costs.
Response: The 7.25 psi (0.5 bar) pressure requirement is consistent with component testing and anchorage assembly testing specified in fib Bulletin Annex A.6. A given component that has already passed the component testing specified in fib Bulletin 75 Annex A.6 should also pass the system testing specified in fib Bulletin 75 Annex B.5, especially given the much larger volume of compressed air to draw from within the 30 meter long duct assembly.

2. 960-3.2.1 Table 3.2.1-1 Appendix B.4 (Full Scale duct system assembly) The FIB 75 procedure B.4.3.4 includes the installation of rebar cage. Since no concrete pour is involved in this test, what is the purpose of the rebars? Would it make sense to keep the fib 7 test in this case?
Response: The rebar cage is considered a “tool” for fixing the tendon and tendon supports but NOT an essential component of the test. What is essential is that the tendon supports used in the test are built up the same way or equivalent to what is typically used on site.

3. 960-3.2.1 Table 3.2.1-1 Appendix A.2 (Stiffness of duct) This test is intended to determine the effective stiffness of the corrugated duct to be used in the calculation of maximum duct support spacing according to the equation in Fib 75 Section 6.2. Since the smooth duct has no corrugations, it is relatively straight forward to compute the stiffness….and therefore the maximum support spacing. Perhaps, it would be preferable that the maximum duct support spacing for each size be computed and provided in a table in the new specs for constancy.
Response: Agree. Table 3.2.1-1 has been revised to show that the test is not required for smooth plastic duct. Maximum duct support spacings are already called out in Specification 462-7.2.1.

4. 960-3.2.1 Table 3.2.1-1 Appendix A.1 (Dimensional requirement) For flexible filler, duct is smooth HDPE with max. DR of 17 according to ASTM D3035 and F714 per section 960-2.2.1.2(3). These ASTM specs govern the manufacturing of HDPE pipes in the United States. Therefore OD, ID and thickness tolerances should be according to the ASTM specs and not FIB bulletin 75. The OD and ID tolerance of ASTM specs are stricter than Fib 75. We believe no dimensional requirement test is needed as long as the smooth HDPE is manufactured according to ASTM specs.
Response: Agree. Table 3.2.1-1 has been revised to show that the test is not required for smooth plastic duct.

5. 960-3.2.1 Table 3.2.1-1 On a general comment, do the performance test requirements of fib 75 make sense for the smooth HDPE Pipe?...As the DR 17 HDPE pipes are thicker and stronger than the current corrugated duct, some of the performance load and acceptance criteria may seem

trivial. For example, for the 125 psi rated DR 17 HDPE pipe, the 11 psi negative pressure or 4 psi positive pressure to test for concrete pressure on duct sounds insignificant.
Response: Agree. Table 3.2.1-1 has been revised to show that the test is not required for smooth plastic duct.

6. 960-2.1(5) Fatigue test per ETAG-013 Section 6.1.2-I specifies the use of a machine apparatus and not concrete block for anchorages other than bond anchorage. The last reference of 6500 psi concrete strength seems to apply for the bond anchorage test.
Response: Agree. Section 960-2.1.5 has been revised as follows:
5. Test anchorages in accordance with AASHTO LRFD Bridge Construction Specifications, or the Guideline for European Technical Approval of Post-Tensioning Kits for Prestressing of Structures (ETAG-013, June 2002 edition) with the exception that the design concrete strength used in the testing will be 6,500 psi. For anchorages that will be used for tendons with flexible filler, test anchorages in accordance with ETAG-013 Section 6.1.2-I~~, with the exception that the design concrete strength used in the testing will be 6,500 psi~~.

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