



Grouting of a PT Tendon

Question:

What are the guidelines to perform a proper grouting of a tendon?

Answer:

- Follow a well-designed grouting plan. Be prepared for the unexpected.
- Check the availability of grouting materials (water, cement, admixtures) in appropriate quantities.
- Always store grouting materials in a shadowed and well-ventilated area. As per PTI M55.1-19 (specification for grouting of PT structures), §5.3-Preparation for grouting operations, 5.3.1-Materials & equipment, temperature of cement, dry packaged materials, and/or prepacked grout > 32°C will accelerate the rate of stiffening and water demand of the grout.
- Water quantity should be sufficient not only for the grouting but for the cleaning of the grouting machine/tools after completion of works.
- Check temperature of water. Must be in an appropriate temperature as per grouting mix design. Use ice cubes if necessary. As per PTI M55.1-19 (specification for grouting of PT structures), §5.7-Temperature considerations, 5.7.1-Hot climates, the temperature of the grout shall not exceed 32°C. To produce and keep it cool, a thermal insulation or cooling circulation system may be installed, or the grout may be batched using cold water. If it is unavoidable that the temperature of the grout exceeds 32°C, then special precautions, such as the use of suitable admixtures, shall be taken to control flash set.
- Perform an operation check of grouting machine (hoses, gauges, electric power etc.).
- Have always a back-up plan in case of black-out or machine failure.
- Check the integrity of all inlets and outlets. If damaged repair as appropriate.
- Perform an air test by blowing air inside the tendon. Observe if dry air without any signs of water/humidity is coming out from the outlets. Do not fill ducts with water.
- Prior of grout process always perform a fluidity cone test to verify the fluidity of the grout.
- Check grouting machine pressure during grouting process. As specified in PTI M55.1-19 (specification for grouting of PT structures), §5.6-Mixing and injecting of grouts, 5.6.3-Grouting Operations, the pumping pressure at the pump and inlet shall not exceed 1MPa (10 bar/145 psi). Unless otherwise specified by the Engineer, grout injection shall be at a rate of between 5 and 15m of duct per minute (16.4 and 49.2 ft of duct per minute). The grouting rate shall be slow enough to avoid air entrapment and segregation of the grout and ensure complete filling of the duct.
- Grout shall be injected from the tendon lowest point or the lowest end of the tendon in an uphill direction as per PTI M55.1-19 (specification for grouting of PT structures), §5.6-Mixing and injecting of grouts, 5.6.3-Grouting Operations. The grout shall be used within 30 minutes of the first addition of water to ensure the flowability of the grout.



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- Do not add more water to improve the fluidity. Water shall not exceed the max. ratio of 0.45 (45%) as per PTI M55.1-19 (specification for grouting of PT structures), §3-Design, Table 3.1-Range of material quantities.
 - It is recommended to use a pre-bagged, tested, and approved grout. Grouts where the constituent materials are measured and batched on site do not always have uniform properties. This arises from variations in materials especially in water, day to day mixing differences, weather conditions, and so forth. In a pre-bagged grout, all the constituent materials have been thoroughly mixed and blended at the factory in a dry condition. This ensures that nothing other than water needs to be added while mixing on site.
 - Tendons where the grout has filled the outlet pipes just above grouted PT element are considered as fully grouted. However, if there is still doubt, as per PTI M55.1-19 (specification for grouting of PT structures), §5.6-Mixing and injecting of grouts, 5.6.6-Measures to be taken after grouting, drilling into the grout port with a short drill bit can confirm the solidly grouted cavity. If a void is found, the section can be inspected with a borescope to observe the extent of the void. The void may be regouted with an approved method with approved materials.