



Amendments to the CARES Post Tensioning Certification Scheme

1 Background

Following on from its certification scheme for post tensioning in bridges, CARES introduced a scheme for flat slabs in 1999, recognising that this construction method was on the increase and that controls via certification requirements were non-existent. Since its introduction, CARES has received industry feedback relating to particular elements of the post tensioning operation. This has resulted in a revision of its scheme requirements in key areas, as described below.

The recent amendments to the scheme addressed areas of the construction process recognised as those requiring improvement. For example, feedback from the industry sector indicated that grouting was an area that required a more stringent approach, including the training and qualification of grouting operatives. It has been reported to CARES that a percentage of ducts, approaching 1% on average, have been either partially or completely ungrouted, thereby potentially affecting the integrity of a number of buildings in the long term. This is an average figure, and recognising that risks may result from inadequate grouting procedures or from the use of a poorly trained or inadequately supervised grouting team, it is possible that this figure will be exceeded in certain structures.

The amended CARES certification scheme requirements were implemented in February of 2008.

2 Revision to the CARES Scheme

The CARES PT scheme is monitored by an “across industry” CARES Post-tensioning Technical Committee which meets on a regular basis to review scheme requirements in the light of feedback from industry sectors and also CARES’ own auditing experience. The CARES scheme for flat slabs (PT2) is now at issue 4; amended in November 2007 and implemented in February 2008. The main changes, at this recent revision, are:

- Post Tensioning Anchorages must either comply with BS EN 13391 or have a European Technical Approval to ETAG013.
- Stressing equipment must comply with the Post Tensioning kit producer’s recommendation.
- The Post Tensioning kit must now only be supplied by the Post Tensioning contractor. This reduces the possibility of the unqualified Post Tensioning kits being installed.
- Prestressing Strand and high tensile steel bar must be CARES approved.
- All Post Tensioning operatives must now have a photo-identification card issued by CARES in accordance with the CARES scheme requirements (CARES Appendix PT9). This reduces the possibility of inexperienced personnel being used to undertake specialist Post Tensioning work.
- All Post Tensioning operations are to be carried out under the control of a nominated supervisor.
- Post Tensioning specifications produced by the Post Tensioning contractor must comply with the minimum recommended requirements of the CARES’ Model Specification.
- Grout must now comply with the new BS EN 447: 2007.
- Grout must now be pre-bagged, reducing the variability due to site batching and the inherently variable properties of bagged cement.
- Grouting operations must only be undertaken within the temperature range specified by the grout manufacturer.
- Grouting records must be recorded and provide confirmation that each duct has been fully grouted.
- The Post Tensioning contractor must inform CARES of all contracts to be undertaken and CARES will audit 10% of these contracts as a minimum.

Additional related CARES documents

- The CARES Model Specification for Bonded and Unbonded Post-tensioned Floors.



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3 Risks to incorrectly post-tensioned buildings

Recognising the importance of using a post tensioning contractor with sound grouting procedures and properly trained operatives and supervision, and considering any risks and their consequences of not doing so, building owners might wish to perform project specific reviews on existing post tensioned buildings.

The risks for a building will depend on a number of factors including:

- the level of confidence in the installation,
- the exposure of the structure to the environment,
- the sensitivity of the structure should tendon loss occur,
- the use of the building.

With specific reference to grouting, the consequences of ungrouted or poorly grouted tendons may include:

- for exposed structures, risk of spalling of concrete adjacent to ducts primarily due to the presence of trapped water in ungrouted ducts, which would freeze at sub-zero temperatures.
- for enclosed structures, latent spalling from construction phase,
- failure of an ungrouted tendon due to corrosion,
- reduced contribution to shear and ULS flexure capacity due to unbonded behaviour,
- unpredictable response during demolition or modification.

Should such a review raise concerns, in some cases a selective programme of intrusive or non-destructive testing may be considered appropriate in addition to the normal cycle of visual structural inspections. Currently, research in NDT methods is ongoing and the selection of any method requires detailed consideration, including assessment of the methods' reliability. Useful guidance is given in *fib* Bulletin 33, Chapters 3 and Appendix A.

4 Recommendations for new buildings

It is with these risks in mind that the CARES Post Tensioning Scheme has been designed, and it is highly recommended that new buildings should be constructed by a specialist contractor certified under the CARES post-tensioning scheme. Bearing in mind however that, unless the client specifies that CARES is present on a specific project, the CARES scheme will include audits of only a sample of the projects of the specialist post tensioning contractor. With this in mind, project specific start up reviews are recommended to ensure that the issues above have been addressed and the roles and responsibilities for quality control are clear and understood.

Should the client wish, CARES may be called to apply its certification scheme on any particular structure via, if necessary, the contract specification.

Why Take the Risk. Specify CARES.



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