

Round robin test for testing stress corrosion cracking of prestressing steels

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Summary

Within the scope of this round robin test ribbed prestressing bars of the type St 950/1050, diameter 26,5 mm, were tested for their resistance against stress corrosion cracking according to DIN EN ISO 15630-3 (February 2011) at three testing laboratories.

The results have shown that at two testing laboratories none of the tested bars reached the required time to failure while the specimens at the third testing laboratory all have passed the test. At one of the testing laboratories former investigations using specimens from the same rolled bar yielded results which do not agree with the recent tests. Basically it is apparent that the time to failure for each of the testing laboratories and for testing laboratory 1 for each testing campaign are relatively equal indicating that the different results are probably due to a systematic effect.

The recommendations mentioned in DIN EN ISO 15630-3 how the testing cells have to be designed and which testing conditions should be maintained have been recorded for the performed investigations and obvious deviations registered. Partly small deviations were observed, but a systematic of these deviations with respect to the different behavior of the prestressing bars could not be derived from that.

The large scattering found in the round robin test has shown that the reliability of the test in the present form has to be questioned. Results of a round robin test carried out a few years ago by ADZB also exhibited significant scattering. Obviously, even for specimens obtained from the same rolled bar slight differences exist which under certain conditions can lead to crack initiation with subsequent crack growth. Surface analysis yield mill scale residues due to the manufacturing process covering unevenly and incompletely the surface and thus leading to micro crevices. Hence, the corrosion attack as a result of the testing solution does at no time take place under comparable surface condition which possibly could explain the different time to failure.

In order receive more reliable results from the stress corrosion cracking tests further investigations should be conducted. Improvements with respect to a better reproducibility could possibly be obtained by a surface treatment before the test or by potentiostatic test conditions with an externally applied constant potential during the tests.