

Durability Of Rock And Soil Anchor Kits Using Prestressing Steel Strands

Xiaomeng Wang, Behzad Manshadi

BBR VT International, Zurich, Switzerland

Contact: xwang@bbrnetwork.com

Abstract

Prestressing strand ground anchors used in bridge foundations are in contact directly with the aggressive environment. The anchorage components are exposed to climate and the tendon is surrounded by soil or rock which is highly humid or immersed in underground water containing chemical agents. This working condition can lead to severe corrosion of prestressing steel, therefore risking the durability and safety of the structure. In this paper, various origins of corrosion of strand anchors during installation and service life were thoroughly analysed. Anchor components which are critical in terms of corrosion protection were identified, and their durability performances were defined according to the requirements from the newly published European Assessment Document (EAD) 160071-00-0102[1] for strand ground anchors. A group of tests was carried out on a commercialized strand anchor system to verify its durability performance, including sealing capacity of key protection components under various conditions and inner cement grout crack width assessment etc.. Testing results proved that the tested strand anchor system is fulfilling all the requirements from the EAD and fits for applications with long-term utilization.

Keywords: Strand ground anchors; corrosion; durability.

1 Introduction

1.1 Background

Strand ground anchors are prestressed structural elements installed in pre-drilled holes in the soil or rock, using 7-wires prestressing steel strands as the tensile element and grout (usually cement grout) to transfer tensile load to the ground. Strand ground anchors are often used in bridge foundations to balance lifting force, slope stabilization during bridge abutment constructions and for seismic protection [2][3]. **Chyba! Nenalezen zdroj odkazů.** shows a typical ground anchor system for long term utilization, composed by load transfer elements, corrosion protection element and other auxiliary elements [1].

Corrosion protection of a ground anchor is crucial to achieving the desired performance, as the strand

ground anchors are installed in ground conditions which vary in terms of density, porosity, water level and environmental aggressivity – and direct surveillance of the tensile element is impossible as the installed anchor effectively becomes invisible. The corrosion protection performance of a strand ground anchor system is therefore dominating the durability and even safety of the structure. Corrosion of strand anchors and failures due to the corrosion were reported from time to time. Littlejohn et al. [4] has analysed 35 anchor failures worldwide due to corrosion. John [5] reported strand slippage and loss of load of anchor due to early corrosion of strand related to poor installation practice and as a consequence a water ingress. Failure of permanent anchorages adjacent to a tidal surge barrier has been investigated by Barley et al. [6]. A recent disaster in