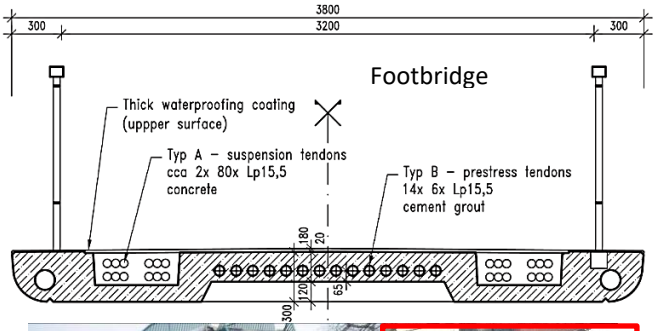
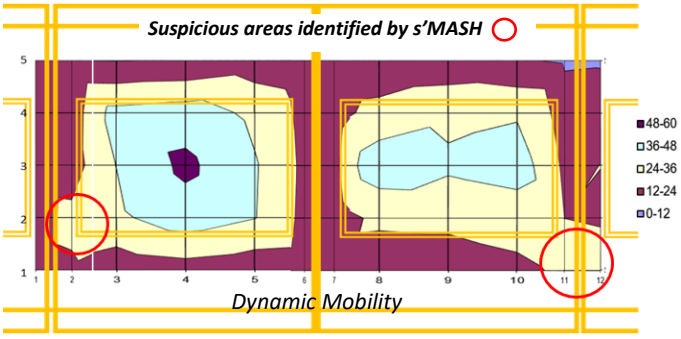
NDTitans in action

Case 10.5 Non-destructive evaluation of a Stress Ribbon Bridge, Czech Republic





After the collapse of the Troja stressed ribbon concrete footbridge in Prague, Czech Republic, due to corrosion of the prestress steel strands, **NDTitans Claus Petersen, Malcolm Lim and Hugo Orozco** were invited to demonstrate the feasibility of utilizing different nondestructive testing techniques to evaluate the current condition of similar stress ribbon bridges located in the country.

A visit to the salvage yard where several damaged pieces of the 34-year old Troja bridge could be inspected, allowed to identify the possible causes that lead to deterioration of the tendons. It was noticed that some of the ducts for the Type B tendons were only partially grouted and that there were signs of water leaking through the joints between the precast segments. Also, it was evident the bad quality of the concrete used to cast the gutters where the Type A tendons were embedded without ducts. There was honeycombing in several locations and also, excessive shrinkage of this concrete produced cracking, especially along the perimeter in contact with the concrete of the precast elements, allowing the water leaking from the joints to easily flow and come into contact with the tendons.

With this experience, the ND testing was then carried out over the three-span, 200 m long, Nymburk bridge, located on the Elbe River at about 45 km east of Prague. The structure, construction process and age of this bridge are similar to the Trojan bridge.

A preliminary visual inspection found moisture stains on the underside of the bridge caused by the water leaking through the joints as well as a few spots with minor spalls and reinforcing bar corrosion. Additionally, it was found that a thin repair overlay cast over the deck of the bridge had debonded in many areas which made it impossible to use the NDT systems without removing it. Thus, it was decided to perform the testing from the underside of the bridge.

The **MIRA** Ultrasound-Echo tomographer and the **DOCter** Impact-Echo system were used to try to find poorly grouted ducts for the type B tendons. However, the MIRA signal could not penetrate and reach the ducts because of the heavy layer of reinforcing bars below the ducts. With an adequate selection of the impactor, the DOCter could apparently do the job by identifying some suspicious points where the ducts could have voids (dropping of the solid resonance frequency).

For the case of the Type A tendons, the purpose was to identify the defective (cracked, voided) concrete in the gutters by using the **s'MASH** system based on the Impulse-Response method. With this quick method, it was expected to find higher mobility values in cracked or voided concrete than in sound concrete. The mobility contour plot shows the areas of potentially defective concrete where the tendons might have started an active corrosion process.

The findings were recommended to be confirmed by drilling of some cores or by using endoscopy.

Report by **NDTitan Claus Germann Petersen**