J Civil Environ Eng 2018, Volume 8
DOI: 10.4172/2165-784X-C1-015

Feasibility assessment of alternate transom using composite fibre pultruded sections for Sydney Harbour Bridge

Olivia Mirza[1], **Jason Johnston**[2], **Michael Kemp**[3] and **Tony Gates**
[1]Western Sydney University, New South Wales Australia
[2]Arup Australia, New South Wales Australia
[3]Wagners Australia, New South Wales Australia

Over 2.5 billion timber transoms have been installed in railway tracks around the world. These transoms are subject to frequent maintenance and replacement due to the degradation of timber. In order to reduce the maintenance issue associated with timber transoms, this paper will assess the behavior of a virtually maintenance free material under static loading. This would provide financial and practical benefits to the maintenance of the Sydney Harbour Bridge's railway network by reducing the need for replacement and frequency of maintenance. Conventional alternative materials including steel and concrete have been extensively researched but are not viable for use in the Sydney Harbour Bridge railway system due to maintenance and weight issues. Composite steel-concrete panels utilize the best attributes of both materials to provide a solution that is lighter lightweight, reduces the depth and will reduce installation time. While precast steel-concrete composite panels reduce the weight of concrete transoms, they are still quite heavy. The composite fibre material is a constantly developing material that is promising for use in transoms. The material possesses strong mechanical properties while reducing the weight and installation time relative to concrete solutions. There is limited research regarding the feasibility of composite fibre material for use in transoms due to the relatively recent development of the material. This paper presents a theoretical panel design solution using Wagners Composite Fibre Technology (CFT) pultruded hollow sections to cater for applied rail loads. Two composite fibre panels were fabricated and assembled using AJAX ONESIDE blind bolts and LINDAPTER blind bolts, and experimentally tested to investigate the panel's response to static railway design loads. The two blind bolts and the static experimental methodology were chosen to replicate previous experiments investigating composite steel-concrete panels for use as transoms. The composite fibre panel design successfully resisted a maximum load of 900kN and deflected less than the serviceability deflection limit. The panels were also numerically modeled under static, serviceability railway loading to determine the stress distribution within the panel. The stress distribution within the panels was within the stress limits of Wagners CFT's pultruded hollow sections. The results from experimental and finite element analysis proved the composite panel design is a feasible solution to replace the existing timber transoms of the Sydney Harbour Bridge railway network in regards to deflection and stress distribution under static, serviceability loading.

O.Mirza@westernsydney.edu.au