

CHALLENGE FOR NEXT GENERATION OF CONCRETE BRIDGES, NON-METALLIC BRIDGE WITH ZERO CEMENT CONCRETE

A. Kasuga

Sumitomo Mitsui Construction, Tokyo, Japan.

e-mail: akasuga@smcon.co.jp

SUMMARY

Concrete engineers and researchers have been developed durable reinforce concrete technologies for long time. However, we have not reached the goal which gives us a perfect technology against deterioration of reinforced concrete. Basically concrete itself is high durable material. And we recognize this fact when we see Roman concrete structures are still working now. The technologies described in this paper are the challenge to derive the solution against deterioration of reinforced concrete. This research and development has been taking for about 30 years. Then a non-metallic highway bridge is under design and will be built in 2020 with the key technologies of aramid fiber tendons, fiber reinforced concrete and butterfly web.

Keywords: *Non-metallic concrete bridge, Zero cement concrete, Aramid fibre, Fibre reinforced concrete.*

1. INTRODUCTION

Concrete is innately an extremely durable construction material. This is clearly evident to anyone looking at the Pantheon in Rome (Fig. 1), which was built 2000 years ago but is still structurally sound today. However, the Pantheon and other long-lasting concrete structures were made of plain unreinforced concrete. This limited their forms to arches and domes, which are not subject to tensile forces. That changed in 1867, when the French landscape gardener Joseph Monier came up with the idea of strengthening plant pots with wires (Fig. 2), marking the beginning of the history of reinforced concrete. Through the lens of concrete's long history, a development that occurred merely 150 years ago is still recent. Until that point, concrete had been limited to arches and domes, but the invention of reinforced concrete gave concrete forms as much design freedom as steel. However, by incorporating steel, reinforced concrete inherently admitted a factor for deterioration: corrosion (Fig. 3). To this day, we are still battling against this deterioration factor. We do not have the technology to completely stop steel deterioration.



Fig. 1. Pantheon in Rome.