

An old bridge transformed into a new one: possible, recommendable?

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1 Abstract

There is an extensive network of reinforced concrete bridges that give service to roads, highways and railways. These structures were constructed with quality standards of the past, and they suffer of severe problems. Now we consider the idea of substituting them with structural elements with much longer service life. However, there is an important question to be addressed in this area: what to do with the existing infrastructure that would be demolished. Even more if we consider environmental issues.

One good example of this recurrent problem could be found in the case of the Gullspång bridge (Sweden). It was constructed in 1935 and it was severely damaged with corrosion. The administration decided in the 2016 that no further repair would be done and that the bridge would be demolished and a new erected in substitution. A fraction of the concrete from the old bridge was crushed and processed to produce new aggregate. With this aggregate, using the coarse fraction, it was analyzed the structural effect of replacing natural aggregates with these recycled aggregates. The performance of the new structural elements was positive, and it seems that a high percentage of the natural aggregates could be replaced with recycled ones.

Keywords: recycled aggregates, recycling, beam, reinforced concrete, concrete.

2 Introduction

The use of recycled aggregates for concrete production has been a growing trend since year 2000 [1]. There are multiple benefits of using recycled materials: 1) to slow down resource depletion at input, 2) to lower pollution at output and 3) to provide a sound growth of worldwide employment. The recycling of construction and demolition waste (CDW) can be an effective method to achieve these benefits. Currently, recycling and re-use of CDW is supported by the European Commission particularly through the Waste Framework Directive [2]

In the case of recycled concrete, it solves mainly two problems. First, the processing of the demolition or

construction wastes from the public works. And second, it does not use natural resources. There are different qualities for the recycled aggregates. The higher the quantity of concrete that is present in the original waste, the better the resulting aggregates are. On the contrary, if a batch of waste comes with an elevated percentage of impurities such as brick, plaster or asphalt, the aggregate quality is significantly lower. In this work we used recycled aggregates originating from recycled concrete from fragments of beams from a bridge that was constructed in 1935.

There are several recommendations about the maximum quantity of this type of recycled aggregate that can be used in concrete. The majority of regulations define a limit that varies