



## Smart Strengthening of Existing RC Piers with SD490 and PCM

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### Summary

A smart seismic strengthening method of existing RC piers is being developed. In this method, longitudinal high strength re-bars (SD490) for strengthening are touched an existing column surface and mounted to base concrete, and special polymer cement mortar (PCM) is sprayed directly over the re-bars by a dry spray system. This method has two special features; one is that anchored longitudinal re-bars have a T-nut at the anchored end for decreasing the anchor length, and the other is that the direction of coring for anchoring re-bars is slanted for touching anchored re-bars to a surface of an existing column. A reversed cyclic loading test and an analysis were carried out to investigate the effect of the seismic strengthening by this method. From the results, it is cleared that the verification of the seismic performances of the bridge pier strengthened with SD490 and the polymer cement mortar may be carried out according to Specifications for Highway Bridges.

**Keywords:** SD490; strengthening; retrofit; polymer cement mortar; dry spray system.

### 1. Introduction

Maintenance; repair, strengthening, of infrastructures is being very important issue in Japan. Especially, seismic strengthening of existing structures is being extremely important issue after the South Hyogo prefecture Earthquake in 1995.

A smart seismic strengthening method of existing RC piers is being developed. In this method, longitudinal high strength re-bars (SD490) for strengthening are touched an existing column surface and mounted to base concrete, and special polymer cement mortar (PCM) is sprayed directly over the re-bars by a dry spray system. This method has two special features; one is that anchored longitudinal re-bars have a T-nut at the anchored end for decreasing the anchor length, and the other is that the direction of coring for anchoring re-bars is slanted for touching anchored re-bars to a surface of an existing column.

What points are smart?

First, high workability; a construction period will be shortened because of high workability by both using a dry spray system of polymer cement mortar and a short coring depth for anchoring re-bars because of a T-nut anchorage (see Photo. 1), therefore, construction costs will be cut down significantly.

Next, high durability performance; durability of the structure strengthened by this method will be enhanced by using polymer cement mortar, therefore, especially this performance will contribute to strengthening in water environment; river or offshore.

Finally, smart in shape; the jacketing thickness will be reduced to less than about 100 mm. Therefore, an impediment ratio of a strengthened pier will be decreased less than about 5% in the case of the new method compared with the case of a conventional RC jacketing method in which the ratio will usually exceed the regulated limit of 5%. Also, this advantage will be able to reduce an amount of materials necessary to strengthening dramatically.

A reversed cyclic loading test and an analysis were carried out to investigate the effect of the seismic strengthening by the new method.