



Mechanical Properties of Concrete Obtained from Existing Buildings

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Summary

The mechanical properties of concrete obtained from existing reinforced concrete buildings constructed many years ago were investigated. Concrete strength is used in seismic evaluations in Japan, however the concrete strengths obtained from the compressive tests were sometimes much lower than the specified concrete strength in the structural draft. It is investigated whether those properties of concrete were affected by deteriorations over long time periods, uncertainty of construction, or by other similar means. An improved method to estimate modulus of elasticity was also proposed and verified.

Keywords: Existing building; Compressive strength of concrete; Modulus of elasticity; Tensile strength; Completion year.

1. Introduction

When conducting seismic evaluations it is necessary to clarify the differences in the mechanical properties of concrete obtained from existing buildings and concrete manufactured in the laboratory. The maximum strength and modulus of elasticity of concrete are directly related to the seismic performance of existing buildings. For example, the maximum strength of the concrete is concerned with the shear strength of the columns, and modulus of elasticity is related to the bearing strength of the post-installed anchor bolts used in the retrofitting process. In this paper, the mechanical properties of concrete obtained from existing buildings constructed many years ago are discussed, with the stress strain curves obtained from compressive tests being the main point of discussion. Modulus of elasticity, tensile strength and strain at the maximum strength are discussed in comparison with the estimated values by using the present equations.

2. Outline of investigations

2.1 Existing buildings and concrete cylinders

In seismic evaluations, concrete cylinders used for the compressive tests are usually obtained from the non-structural members, for example, the wing wall or spandrel wall. This is because the work process of core boring from those members is relatively easy. However, it is reported that the concrete strength of those members is estimated to be lower than the concrete strength from the

structural members; girders, columns and shear walls. Therefore, the concrete cylinders in this paper were obtained from structural members of the existing RC buildings. A summary of concrete cylinders used in this paper is shown in Table 1. The total number of investigated existing buildings and concrete cylinders were 111 and 722

Table 1: Summary of concrete cylinders

Existing buildings	111
Concrete cylinders	722
Construction year	1951~1981
Specified strength of concrete (N/mm ²)	13.5~20.6