



## Comparison of Compressive and Tensile Strengths of Dry-Cast Concrete with Ordinary Portland and Portland Pozzolana Cements

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### Abstract

Concrete is the most widely used construction material in the world. Along with the increasing economic needs in the development of construction, precast technology has become a primary solution that leads to the industrialization. The use of precast concrete system offers several advantages, such as rapid erection, higher product quality, lower project cost, better sustainability, and improved occupational health and safety. In general, there are two casting methods used in concrete placement, namely wet- and dry-castings. The dry-cast concrete has also been used for its advantages particularly in precast concrete industries, e.g. its rapid hardening time for fast mold removal (it significantly increases the plant productivity). The use of Portland Pozzolana Cement (PPC) as a replacement to Ordinary Portland Cement (OPC) has become increasingly popular for the past decade. Hence, its application in dry-cast method needs to be further investigated for its mechanical properties such as its compressive and splitting tensile strengths. An experimental work was carried out to examine the properties of dry-cast concrete using both types of cements (PPC and OPC). The development of its compressive strength was also monitored at 1, 7, 14, 21, 28, and 56 days of age. The splitting test was conducted to describe the tensile strength of dry-cast concrete. The observation of crack and failure behaviour of all concrete specimens were also carried out.

**Keywords:** Compressive Strength; Dry-Cast Concrete; OPC; PPC; Precast Concrete; Splitting Test; Tensile Strength; Wet-Cast Concrete.

### 1. Introduction

Indonesia is one of the fast developing countries in the world. One of which is the development in construction sector. Nowadays, concrete is still the most popular material used in constructing various types of structures, such as buildings, infrastructures, and many others [1-19]. Thus, it encourages the use of various cements for concrete structures. Recently, the government provides better fiscal allowance to support the rapid development of infrastructures in Indonesia. In 2015, the approval of the Revised Draft of Government Income and Budget (2015 RAPBN-P) enables the government to concentrate on realizing the infrastructure development programs, including the road and port facilities. In the subsequent years, they will eventually increase the national cement consumption, either directly from the project activities or the impact of the speedy economic growth. One type of cement that is Type-I cement or also known as the Ordinary Portland Cement (OPC) is the most widely used cement in construction. The relatively rapid development in compressive strength at the early age and high sustainable compressive strength in the long term has made it become the main option for structural needs. Another type of cement that is popularly used for recent structural needs in construction for the past two decades is the Portland Pozzolana Cement (PPC). The PPC is a mixture of Portland cement and pozzolanic ingredients such as siliceous in class-F fly ash, burnt clay, pumicite, and other by-product of power plant.

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