ABSTRAK

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Judul : Analisis Kuat Tekan dan Transmisi Cahaya pada Beton Transparan Menggunakan Serat Optik dan Pasir Silika sebagai Agregat Halus

Di era perkembangan konstruksi modern, kebutuhan material bangunan yang menggabungkan kekuatan struktural, estetika, dan ramah lingkungan semakin meningkat. Beton transparan adalah material yang hadir sebagai solusi, yaitu material komposit yang memungkinkan cahaya menembus melalui serat optik. Material ini menjadi solusi alternatif yang mendukung konsep *green building*). Penelitian ini bertujuan menganalisis pengaruh penggunaan serat optik plastik (POF) berdiameter 2mm dengan variasi volume 0%, 3.14%, 4,04%, dan 5,05%. Selain itu, digunakan juga 50% pasir silika sebagai agregat halus untuk meningkatkan kualitas permukaan beton. Campuran beton dibuat tanpa agregat kasar, dengan rasio semen:pasir:air sebesar 1:2,5:0,45, dan diuji setelah masa curing selama 28 hari.
Hasil penelitian menunjukkan penambahan serat optik meningkatkan rasio transmisi cahaya, dengan variasi (0%) sebesar 0%, (3,14%) sebesar 3,12%, (4,04%) sebesar 5,25%, dan (5,04%) sebesar 8,31%. Nilai transmisi cahaya maksimum sebesar 731 lux pada benda uji variasi 5,04%. Sebaliknya, Pengujian kuat tekan menurun, dengan nilai tertinggi 15,36 MPa pada variasi 0%, diikuti 11,88 MPa (3,14%), 11,90 MPa (4,04%), dan terendah 11,41 MPa (5,04%). Variasi 4,04% serat optik memberikan keseimbangan optimal dengan kuat tekan 11,90 MPa dan transmisi cahaya 5,25%, Beton transparan dengan komposisi ini dinilai sesuai untuk aplikasi non-struktural seperti panel dekoratif atau fasad bangunan. Pasir silika juga terbukti menghasilkan permukaan lebih halus, mendukung estetika sekaligus efisiensi pencahayaan alami.

Kata kunci: Beton Transparan, Serat Optik, Pasir Silika, Kuat Tekan, Transmisi Cahaya

ABSTRACT

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Title : Analysis of Compressive Strength and Light Transmission of Transparent Concrete Using Optical Fibers and Silica Sand as Fine Aggregate

In the era of modern construction, the demand for building materials that combine structural strength, aesthetics, and environmental sustainability continues to increase. Transparent concrete has emerged as an innovative solution, functioning as a composite material that allows light to pass through optical fibers and supporting the concept of green building. This study investigates the effect of incorporating plastic optical fibers (POF) with a diameter of 2 mm at variations of 0%, 3.14%, 4.04%, and 5.05%. Additionally, 50% silica sand was used as fine aggregate to enhance the surface quality of the concrete. The concrete mixture was designed without coarse aggregate, using a cement:sand:water ratio of 1:2.5:0.45, and tested after a curing period of 28 days.
The results showed that the addition of optical fibers improved light transmission, reaching 0% at the control mix, 3.12% at 3.14%, 5.25% at 4.04%, and 8.31% at 5.04%, with the maximum light intensity recorded at 731 lux for the 5.04% variation. However, compressive strength decreased, with the highest value of 15.36 MPa at 0%, followed by 11.88 MPa (3.14%), 11.90 MPa (4.04%), and the lowest at 11.41 MPa (5.04%). The 4.04% variation provided the most balanced performance, achieving 11.90 MPa in compressive strength and 5.25% in light transmission. Transparent concrete with this composition is therefore considered suitable for non-structural applications such as decorative panels and building façades, while silica sand was shown to produce a smoother surface that enhances both aesthetics and natural lighting efficiency.

Keywords: Transparent Concrete, Optical Fiber, Silica Sand, Compressive Strength, Light Transmission