

**PENGARUH PEMANFAATAN LIMBAH BETON MINI PILE
SEBAGAI SUBSTITUSI AGREGAT KASAR DENGAN
VARIASI PERSENTASE 60% - 100% TERHADAP KUAT
TEKAN BETON MUTU $f_c' = 20$ Mpa**

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ABSTRAK

Pembangunan infrastruktur di Politeknik Negeri Bengkalis menghasilkan limbah potongan beton *mini pile* bermutu tinggi (K-500) yang belum dimanfaatkan secara optimal. Penelitian eksperimental ini bertujuan menganalisis pengaruh substitusi limbah *mini pile* sebagai *Recycled Concrete Aggregate* (RCA) dengan variasi 0%, 60%, 70%, 80%, 90%, dan 100% terhadap nilai *slump*, berat volume, dan kuat tekan beton mutu rencana $f_c' = 20$ MPa berdasarkan standar SNI 7656:2012 dan SNI 2847:2019. Pengujian dilakukan terhadap 54 sampel silinder (15 cm × 30 cm) pada umur 7, 14, dan 28 hari. Hasil penelitian menunjukkan bahwa peningkatan rasio substitusi limbah *mini pile* menyebabkan penurunan nilai *slump* dan *workability* akibat tingginya daya serap air mortar lama, serta menurunkan berat volume beton. Pada umur 28 hari, kuat tekan beton dengan substitusi limbah *mini pile* hingga persentase tertentu masih mampu memenuhi target mutu rencana $f_c' = 20$ MPa. Dengan demikian, pemanfaatan limbah beton *mini pile* terbukti layak dijadikan alternatif agregat kasar ramah lingkungan untuk beton struktural sedang dengan proporsi campuran yang optimal.

Kata Kunci: Limbah Mini Pile, Agregat Kasar, Kuat Tekan Beton, Mutu $f_c' = 20$ MPa, Uji Slump, Berat Volume

***THE EFFECT OF USING MINI-PILE CONCRETE WASTE AS A
COARSE AGGREGATE SUBSTITUTE (AT 60%–100%
REPLACEMENT LEVELS) ON THE COMPRESSIVE
STRENGTH OF CONCRETE WITH A SPECIFIED STRENGTH
OF $f_c' = 20 \text{ MPa}$***

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ABSTRACT

infrastructure development at Politeknik Negeri Bengkalis produces high-strength concrete mini pile waste (K-500) that has not been optimally utilized. This experimental study aims to analyze the effect of substituting mini pile waste as Recycled Concrete Aggregate (RCA) with variations of 0%, 60%, 70%, 80%, 90%, and 100% on the slump value, unit weight, and compressive strength of concrete with a design target strength of $f_c' = 20 \text{ MPa}$ based on SNI 7656:2012 and SNI 2847:2019 standards. Testing was conducted on 54 cylindrical specimens (15 cm × 30 cm) at 7, 14, and 28 days of curing. The results showed that increasing the mini pile waste substitution ratio led to a decrease in slump value and workability due to the high water absorption of the adhered old mortar, as well as a reduction in concrete unit weight. At 28 days, the compressive strength of concrete with mini pile waste substitution up to a certain percentage still met the target design strength of $f_c' = 20 \text{ MPa}$. Thus, the utilization of concrete mini pile waste is proven viable as an eco-friendly coarse aggregate alternative for medium structural concrete with an optimal mix proportion.

Keywords: *Mini Pile Waste, Coarse Aggregate, Concrete Compressive Strength, Grade $f_c' = 20 \text{ MPa}$, Slump Test, Unit Weight*