

**PENGARUH ADMIXTURE SUPERPLASTICIZER, ACCELERATOR,
SILICA FUME DAN SERAT MICRO MONOFILAMENT
POLYPROPYLENE TERHADAP KUAT TEKAN BETON
HIGH EARLY STRENGTH**

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ABSTRAK

Penelitian ini mengevaluasi pengaruh kombinasi bahan tambah terhadap kuat tekan awal dan *workability* beton *High Early Strength* (HES) dengan target kuat tekan 40 MPa dalam waktu kurang dari 24 jam. Menggunakan semen PCC tipe I, split (1-2 cm) dan pasir (zona 2), serta variasi dosis *superplasticizer* (1,7%; 2,3%; 2,6%), *accelerator* (1,5%; 2,5%; 3,5%), *silica fume* 5%, dan serat *micro monofilament polypropylene* 0,025%. Hasil menunjukkan bahwa kombinasi *accelerator* 3,5% dengan *superplasticizer* 1,7%, 2,3%, dan 2,6% mencapai kuat tekan tertinggi pada umur 22 jam (44,52; 45,08; 46,03 MPa), melebihi kuat tekan rencana. Pada umur 28 hari, semua variasi melebihi target 52 MPa (40 MPa + deviasi), dengan nilai tertinggi 69,17 MPa (*accelerator* 3,5% + *superplasticizer* 1,7%). *Workability* terbaik diperoleh pada kombinasi *accelerator* 1,5% + *superplasticizer* 2,6% (*slump flow* 61 cm), sedangkan *accelerator* 3,5% + *superplasticizer* 1,7% menghasilkan *slump flow* terendah (52,5 cm). Kombinasi optimal yang memenuhi kriteria kuat tekan awal tinggi dan *workability* adalah *accelerator* 3,5% + *superplasticizer* 2,3% (45,46 MPa pada 22 jam, *slump flow* 55 cm), dengan penggunaan dosis *superplasticizer* menghemat penggunaan air hingga 45% dengan kuat tekan yang tercapai, serta pemakaian *silica fume* dan serat *micro monofilament polypropylene* yang membantu mengurangi penyusutan dan retak halus. Penelitian ini menunjukkan efektivitas kombinasi *admixture* dalam mencapai kekuatan awal tinggi sekaligus menjaga *workability* beton, sehingga cocok untuk aplikasi konstruksi percepatan seperti perbaikan jalan *rigid* atau struktur jembatan.

Kata kunci: Beton HES, *superplasticizer*, *accelerator*, *silica fume*, serat *micro monofilament polypropylene*, kuat tekan, *workability*.

**THE EFFECT OF SUPERPLASTICIZER, ACCELERATOR,
SILICA FUME AND MICRO MONOFILAMENT POLYPROPYLENE FIBRE
ON THE COMPRESSIVE STRENGTH OF HIGH EARLY
STRENGTH CONCRETE**

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ABSTRACT

This study evaluates the effect of additive combinations on the early compressive strength and workability of High Early Strength (HES) concrete with a target compressive strength of 40 MPa in less than 24 hours. Using PCC Type I cement, crushed stone (1-2 cm), and sand (Zone 2), along with variations in superplasticizer dosage (1.7%; 2.3%; 2.6%), accelerator dosage (1.5%; 2.5%; 3.5%), 5% silica fume, and 0.025% polypropylene micro monofilament fibers. The results showed that the combination of 3.5% accelerator with 1.7%, 2.3%, and 2.6% superplasticizer achieved the highest compressive strength at 22 hours (44.52; 45.08; 46.03 MPa), exceeding the planned compressive strength. At 28 days, all variations exceeded the target of 52 MPa (40 MPa + deviation), with the highest value being 69.17 MPa (3.5% accelerator + 1.7% superplasticizer). The best workability was achieved with the combination of 1.5% accelerator + 2.6% superplasticizer (slump flow 61 cm), while 3.5% accelerator + 1.7% superplasticizer resulted in the lowest slump flow (52.5 cm). The optimal combination meeting the criteria for high early compressive strength and workability is accelerator 3.5% + superplasticizer 2.3% (45.46 MPa at 22 hours, slump flow 55 cm), with the use of superplasticizer reducing water consumption by up to 45% while achieving the desired compressive strength, as well as the use of silica fume and micro monofilament polypropylene fibers, which help reduce shrinkage and fine cracking. This study demonstrates the effectiveness of the admixture combination in achieving high early strength while maintaining concrete workability, making it suitable for accelerated construction applications such as rigid road repairs or bridge structures.

Keywords: *HES concrete, superplasticizer, accelerator, silica fume, polypropylene monofilament microfiber, compressive strength, workability.*