

## ABSTRAK

Kebutuhan rumah tinggal di Indonesia pada tahun 2018 mencapai sekitar satu juta rumah. Hal ini menjadi alasan kebutuhan bahan bangunan juga semakin meningkat. Panel dinding pracetak dapat dijadikan sebagai alternatif bahan bangunan yang memiliki keunggulan mudah dan cepat dalam pemasangannya. Penggunaan panel dinding pracetak juga akan lebih menghemat biaya tenaga kerja. Dinding panel beton ringan merupakan salah satu pengembangan beton yang memiliki nilai guna lebih dibanding beton normal biasa. Pada penelitian ini, panel dinding akan disatukan membentuk panel komposit dengan papan kalsium silikat sebagai *skin* dan beton *expanded polystyrene* sebagai *core*. Selanjutnya, kesatuan bahan ini disebut *sandwich panel*. Tujuan dari penelitian ini adalah untuk mengetahui sifat fisik dan mekanik panel dinding beton ringan *expanded polystyrene* dengan lapis luar papan GRC kuat tekan vertikal, kuat lentur horizontal dan ketahanan pukul/ *impact*.

Dalam penelitian sifat fisik dan mekanik panel dinding beton ringan *expanded polystyrene*, digunakan 27 benda uji panel yang berukuran 1800x610x75 mm. Untuk 18 benda uji diberi lapis luar berupa papan GRC, 9 diantaranya akan dihubungkan dengan *connector* baut berdiameter 10 mm, sedangkan 9 benda uji lainnya tanpa diberi perkuatan. Ketebalan papan GRC yang digunakan yaitu sebesar 4 mm. Pengujian panel dinding beton ringan *expanded polystyrene* dilakukan berdasarkan SNI 03-3122-1992 (Panel Beton Ringan Berserat). Pengujian yang dilakukan yaitu uji kuat tekan vertikal, kuat lentur horizontal dan ketahanan pukul/ *impact*. Sebelumnya, dilakukan pengujian pendahuluan terhadap beton *expanded polystyrene* (kuat tekan, berat jenis, modulus elastisitas, dan serapan air), kuat lentur papan GRC, dan kuat tarik baut.

Hasil pengujian terhadap kubus beton *expanded polystyrene* diperoleh berat jenis rata-rata sebesar 612,57 kg/m<sup>3</sup>; daya serap air rata-rata sebesar 12,11%; kuat tekan rata-rata sebesar 2,52 MPa; dan modulus elastisitas rata-rata sebesar 943,93 MPa. Hasil pengujian kuat tekan vertikal panel dinding PP-T, PGP-T, PGB-T berturut-turut sebesar 0,72 MPa, 0,84 MPa, dan 1,43 MPa. Pengujian kuat lentur horizontal panel dinding PP-L, PGP-L, dan PGB-L berturut-turut sebesar 0,83 MPa, 1,36 MPa, dan 1,12 MPa. Hasil pengujian ketahanan pukul/ *impact* panel dinding PP-I dan PGP-I mengalami keruntuhan total pada pukulan pertama, sedangkan pada panel dinding PGB-I terdapat satu panel dinding yang mampu bertahan lebih lama. Panel dinding PGB-I3 mengalami retak pada pukulan pertama dan keruntuhan total pada pukulan ketiga. Dari pengujian ini diketahui bahwa penambahan lapis luar GRC dan *connector* baut dapat meningkatkan nilai kuat tekan sampai 200% dan kuat lentur sebesar 36% sampai 66%. Akan tetapi penambahan lapis luar papan GRC tidak memberi pengaruh yang signifikan terhadap *impact resistance*. Berdasarkan hasil pengujian, hanya panel dinding PGP-L yang memenuhi syarat SNI 03-3122-1992 (Panel Beton Ringan Berserat), mutu B.

Kata kunci : *sandwich panel*, *expanded polystyrene*, kalsium silikat

## ABSTRACT

*The need for housing in Indonesia reaches around 1 million houses in 2018. This is the reason behind an increasing demand for building materials. Prefabricated wall panels can be used as alternative building materials that have easy and fast advantages in installation. The use of precast wall panels will also save labor costs. Lightweight concrete panel walls are one of the concrete developments that have more use value than normal normal concrete. In this study, the wall panel were a composite with calcium silicate boards as a skin and expanded polystyrene concrete as the core. Furthermore, the unity of this material is called a sandwich panel. The purpose of this study was to determine the physical and mechanical properties of lightweight polycyrene lightweight concrete wall panels with GRC boards outer layer vertical compressive strength, horizontal bending strength and impact resistance.*

*In the study of the physical and mechanical properties of lightweight polymers expanded polystyrene wall panels, 27 panel test specimens measuring 1800x610x75 mm were used. For 18 specimens given an outer layer in the form of a GRC board, 9 of them will be connected with a bolt connector with a diameter of 10 mm, while 9 other test objects without reinforcement. The thickness of the GRC board used is 4 mm. The testing of expanded polystyrene lightweight concrete wall panels is carried out based on SNI 03-3122-1992 (Fibrous Lightweight Concrete Panels). Tests carried out are vertical compressive strength test, horizontal bending strength and impact resistance. Previously, preliminary tests were conducted on expanded polystyrene concrete (compressive strength, specific gravity, elasticity modulus, and water uptake), the flexural strength of the GRC board, and the tensile strength of the bolt.*

*The results of testing for expanded polystyrene concrete cubes obtained an average density of 612.57 kg / m<sup>3</sup>; average water absorption capacity of 12.11%; average compressive strength of 2.52 MPa; and the average modulus of elasticity is 943.93 MPa. The test results of the vertical compressive strength of PP-T, PGP-T, PGB-T wall panels were 0.72 MPa, 0.84 MPa and 1.43 MPa, respectively. The horizontal flexural strength tests of PP-L, PGP-L, and PGB-L wall panels were 0.83 MPa, 1.36 MPa and 1.12 MPa, respectively. The PP-I and PGP-I wall impact resistance test results experienced total collapse in the first blow, whereas in the PGB-I wall panel there was one wall panel that could last longer. The PGB-I3 wall panel was fractured in the first blow and total collapse in the third blow. From this test it is known that the addition of the outer layer of GRC and bolt connector can increase the compressive strength to 200% and flexural strength by 36% to 66%. However, the addition of the outer layer of the GRC board does not have a significant effect on impact resistance. Based on the test results, only PGP-L wall panels that meet the requirements of SNI 03-3122-1992 (Fibrous Lightweight Concrete Panels), quality B.*

*Keywords: sandwich panel, expanded polystyrene, calcium silicate*