

# PROJECT PROFILE

## COMPRESSIVE STRENGTH OF PLAEX PRISMS

### PROJECT BACKGROUND

PLAEX Building Systems Inc., a company based in New Brunswick, is working towards producing plug-and-play concrete-like building blocks using recycled aggregate and recycled plastic as the binder. In a previous article "PLAEX BUILDING PRODUCTS", the products were introduced and the mechanical properties were examined in different temperatures. In this article the results of compressive strength tests of prisms made of PLAEX blocks are presented.

### METHODOLOGY

PLAEX building block prototype measured as 200x100x400 mm<sup>3</sup>, being half-height units. Test prisms were built with five unit height, in a running bond pattern, alternating courses of whole units and two half units, starting with a whole unit. Half units were cut from whole units with a masonry saw and the two ends of the cut unit got attached to create a whole unit. Then prism samples were tested under compression in a self-reacting test setup created in the structural lab.



### RESULTS

The failed specimens showed extensive bulging and a ductile failure mode. The average compressive load capacity of the specimen was 1016 kN. The equivalent average strength was 12.6 MPa. To calculate the strengths, the effective net area,  $A_e$ , of the prism surface was calculated.  $A_e$  is the total area minus the area of the two core and the adjacent areas that were not loaded. However, the area of the six voids were not reduced as it is not required to reduce the areas of the voids that are distributed across the cross-section and do not exceed 25% of that area, according to Clause 7.3 of the CSA- S304

standard. In addition, since the height-to-thickness ratio of the prism samples is 2.5, a correction factor of 0.875 was required to be applied to the compressive strength resulting in an average strength of 11.0 MPa.



Sample No.	Compressive Load (kN)	Compressive Strength (MPa)	Reduced Compressive Strength (MPa)
1	913.96	11.34	9.92
2	1047.40	13.00	11.37
3	1085.45	13.47	11.79
Average	1015.60	12.60	11.03

### RECOMMENDATIONS

Production of PLAEX units is still in the trial phases and is going through further refinement. The provided units were not the same; therefore, the two ends of the units cut in half and joined together did not necessarily create an even surface for the top unit. The resulting gaps caused an uneven loading of the samples.

In design of masonry structures, the specified compressive strength,  $f'_m$ , is used. Statistically, the actual compressive strength of a sample with the same material meets the minimum  $f'_m$  value 95% of the time. The calculated  $f'_m$  for PLAEX prisms was 9.7 MPa, which is similar to the un-grouted concrete block prism strength of 8 and 10 MPa for unit strengths of 15 and 20 MPa according to Table 4 in the CSA-S304 standard.