

The Viability of Biochar in the Built Environment

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This research aimed to test the viability of substituting biochar in building materials in place of cement, or in addition to concrete recipes. This research looked specifically into the potential for biochar as brick-like building blocks by testing its ability to be molded, as well as its compressive, and three-point bending strength. Through this research, it was hoped to uncover whether local biochar can become a viable alternative to other regularly used building and design materials, such as concrete blocks or bricks, that have much greater embodied carbon footprints. Nine concrete recipes varying in the amount of biochar substituted for either the sand or cement content were tested for their maximum compressive strength and three-point bending load capacities on both their horizontal and vertical spans, as well as quantitatively observed during mixing and curing. Through this testing, at 13 days post mix, it was found that the concrete formula C20, or where 20% of the cement in the recipe was substituted with biochar, held the highest maximum loads for horizontal three-point bending capacities when compared to other recipe counterparts and our control formula. Meanwhile, C10, or where 10% of the cement was substituted with biochar, held the highest max loads in the vertical three-point bending.

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Image 1. One round of bricks immediately after pouring.



Image 2. Side-by-side of all the finished bricks.

Bricks were cured for about 13 days before testing

	Cement (g)	Sand (g)	Water (oz)	Biochar (g)
0	700	1750	350	0
S10	700	1575	350	175
S20	700	1400	350	350
S30	700	1225	350	525
S40	700	1050	375	700
C10	630	1750	315	70
C20	560	1750	300	140
C30	490	1750	345	210
C40	420	1750	365	280

Image 3. Chart for recipes used.



Image 4. Curing comparison over the first week of the curing process.

Three-Point Bending Maximum Loads

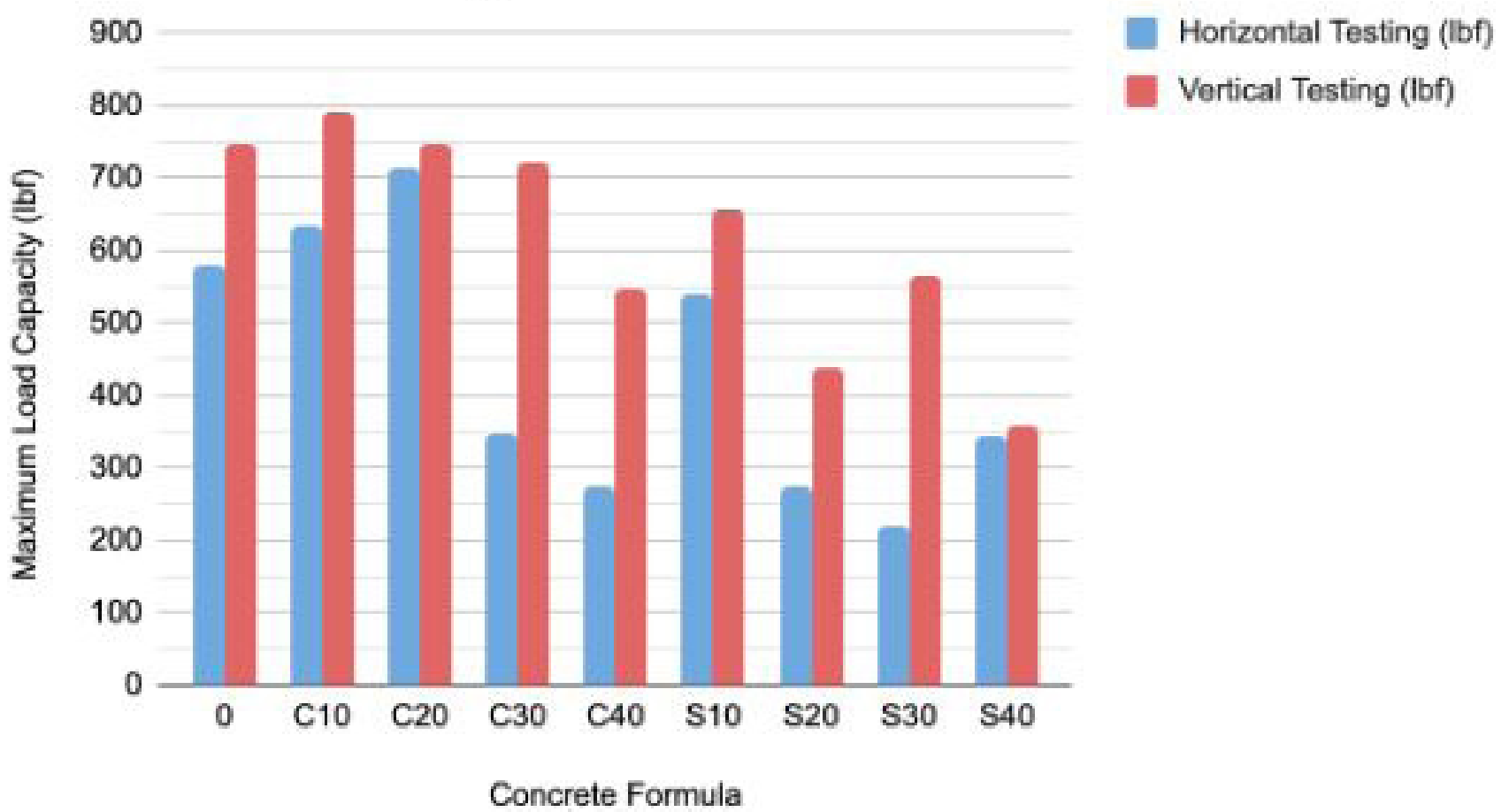


Image 5. Graph showing 3-point bending test results.

Formula Compression Maximum Loads

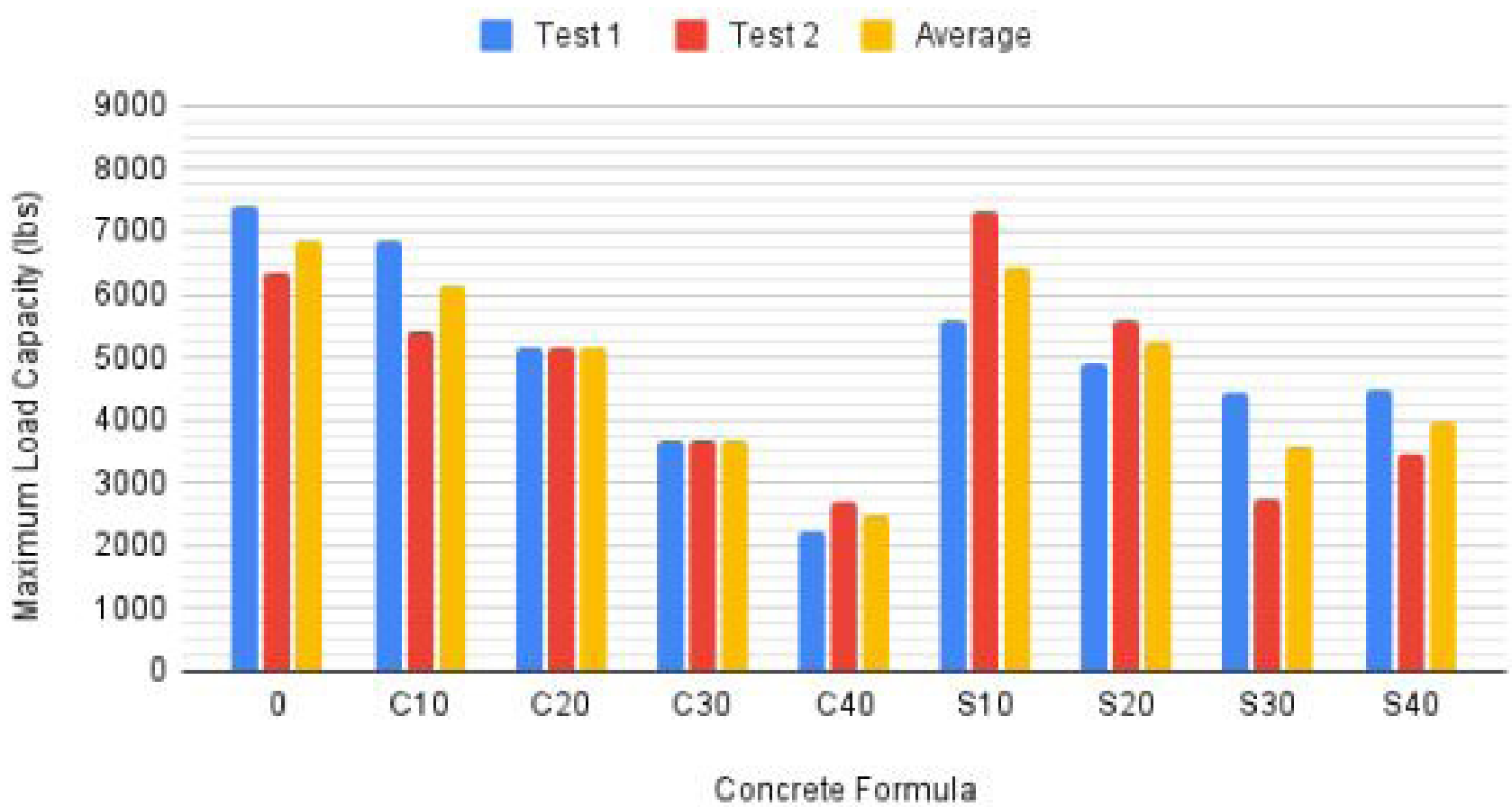


Image 6. Graph showing the compression test results.