

The studies conducted below show a compare and contrast between rounded and jagged concrete aggregate recycled back into a batch. The research conducted shows that if concrete were broken down into jagged pieces and thrown back into a mix – replacing the coarse aggregate ratio, the mix design would still hold an operable compressive strength and could ultimately be re-poured on a construction site. However, the same statement does not stand true for rounded pieces thrown back into a mix. The theory behind the results conducted is that the more jagged pieces allow the rest of the “mud” to bind to something when under compression. Whereas the more rounded pieces have no rigidity for the “mud” to bind or hold against which ultimately forces the concrete to break a lot easier when under compression.

Fine (lb.)	Coarse (Recycled) (lb.)	Cement (lb.)	Water (lb.)
70	90	40	20
PSI			
Round (7 Day)	2428.4	6"	NOTES
Round (14 Day)	2517.1	6"	Added 6lb Water
Round (21 Day)	2830.1	6"	^
Round (28 Day)	3112.4	6"	^
SLUMP			
Jagged (7 Day)	3129.3	4.5"	Added 6lb Water
Jagged (14 Day)	3393.5	4.5"	^
Jagged (21 Day)	3400.6	4.5"	^
Jagged (28 Day)	3452.6	4.5"	^
Control G			
Control G (7 Day)	3202.3	5"	Added 6lb Water
Control G (14 Day)	3294.2	5"	^
Control G (21 Day)	3634.7	5"	^
Control G (28 Day)	4143.7	5"	^

Table 1. Shows the mixes and their correlating results.

Shape Deformities in Recycled Concrete as a Substitute Aggregate in Concrete

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Abstract

Concrete is a universal material that is used widely across the construction industry. Whether this be for walls, floors, footings, countertops, fillings, etc. they all share a very similar make-up in their physical qualities. Within a standard concrete mix, a fine aggregate and a coarse aggregate are added to the mix design to help with solidity and compressive strength in the mixture. Mix designs and the aggregate ratio within a mix is dependent on what the specified job calls for. Recycling, reusing, and innovative material is the next generation in construction and quite frankly figuring out what recyclable materials can be re-batched into a concrete mix to hold the same compressive strength is on rapid incline. The best part about concrete is the compressive strength can be manipulated based on what you add, what you take away, and even adjusting the ratio as a whole. This study directly reflects the results of the differences between shapes in recycled concrete used as a coarse aggregate substitute in concrete mixes. The results shed light on not only the compressive strength differences in rounded versus jagged pieces, but also educates the industry on how applicable recycled concrete could be.

The results from the compressive test shows that jagged concrete pieces can in fact be re-batched into a new concrete mix in replacement of the standard coarse aggregate and still hold a desirable compressive strength. Although this one test may not be enough evidence to convince a rubble yard to start selling their jagged pieces of broken concrete to batch plants for re-use, it is a step in the right direction. If that's one day the case, the first step towards implementing this in the real world would be to start on smaller projects. Sidewalks, benches, curbs, small walls, etc. would be a perfect starting point because none of these items will need to hold an unattainable compressive strength. After a few years of this implementation, the real-world feedback and tests will be a true testament to see if it is in fact worth taking the next step and trying to replace all coarse aggregate with jagged pieces of recycled concrete. More extensive research by industry professionals would need to be conducted with this type of mix prior to building tilt-ups, bridges, and other large concrete/masonry buildings that require a much higher compressive strength.

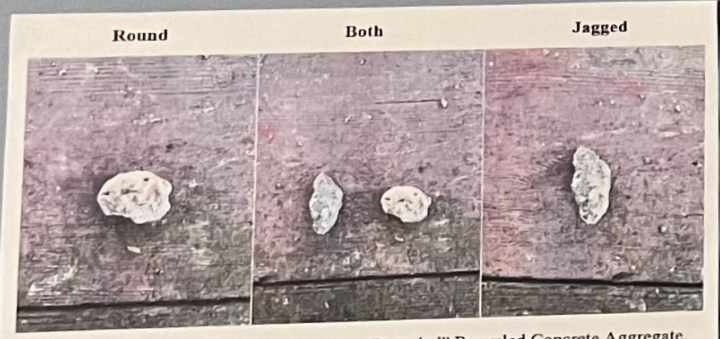
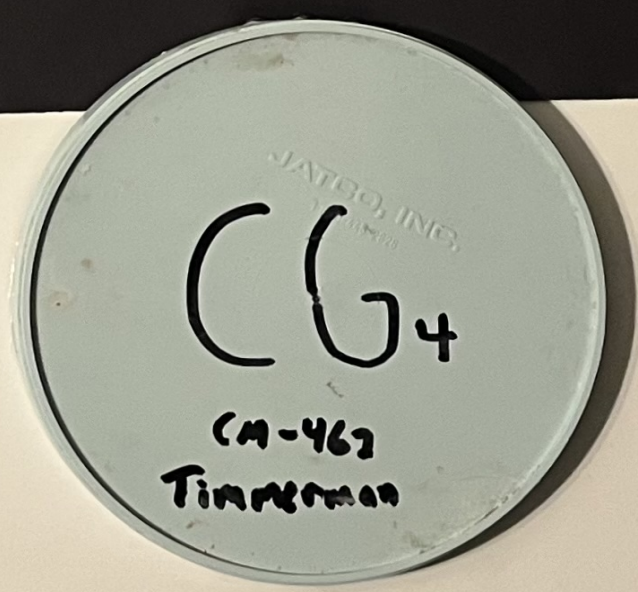
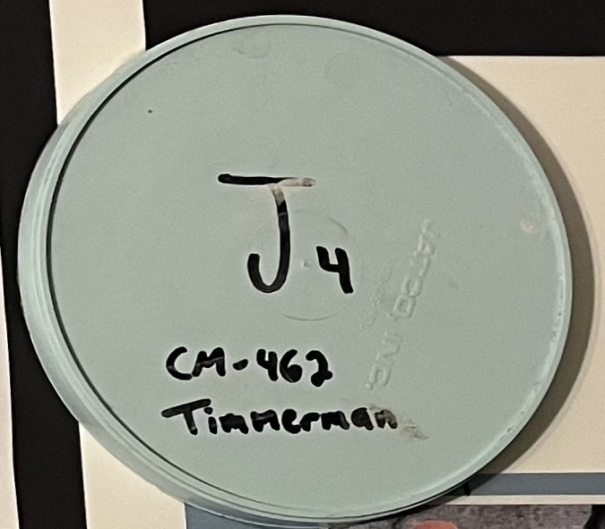
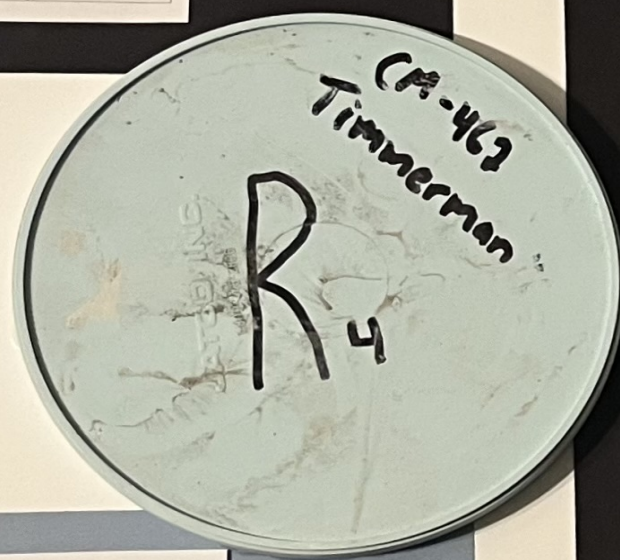


Image 1. Discrepancies of "Jagged" versus "Rounded" Recycled Concrete Aggregate.

Prior to the 28-day process there was a lot of planning, coordinating, and physical work that went into the preparation of being able to successfully mix and batch all three different types of concrete. The three types of concrete that needed to be mixed was a standard mix with the jagged pieces replacing the standard coarse aggregate, a mix with the rounded pieces replacing the coarse aggregate, and a control group with the standard coarse aggregate. All weights and ratios for each group can be seen in Table 1 listed above.

