

# Returned Concrete Recycling with MasterSuna RCT 323 - Case Study

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**Abstract:** Since MasterSuna RCT323 was launched in Australia in November 2021, many trials have been conducted nationwide to show how the product performs in treating returned concrete. Since trials have commenced, we have focused on the reuse of treated concrete back into a concrete mix as a sustainable option to the industry to prevent waste to landfill. In May 2022, with one of our valued customers in Western Australia, we decided to conduct a full-scale trial from start to finish of treating returned concrete and introducing it back into a concrete mix as a partial coarse and fine aggregate replacement. Through this process we will show how the treated material was reintroduced, the cost savings associated with purchasing aggregates, haulage, dumping and reduction in CO<sub>2</sub>.

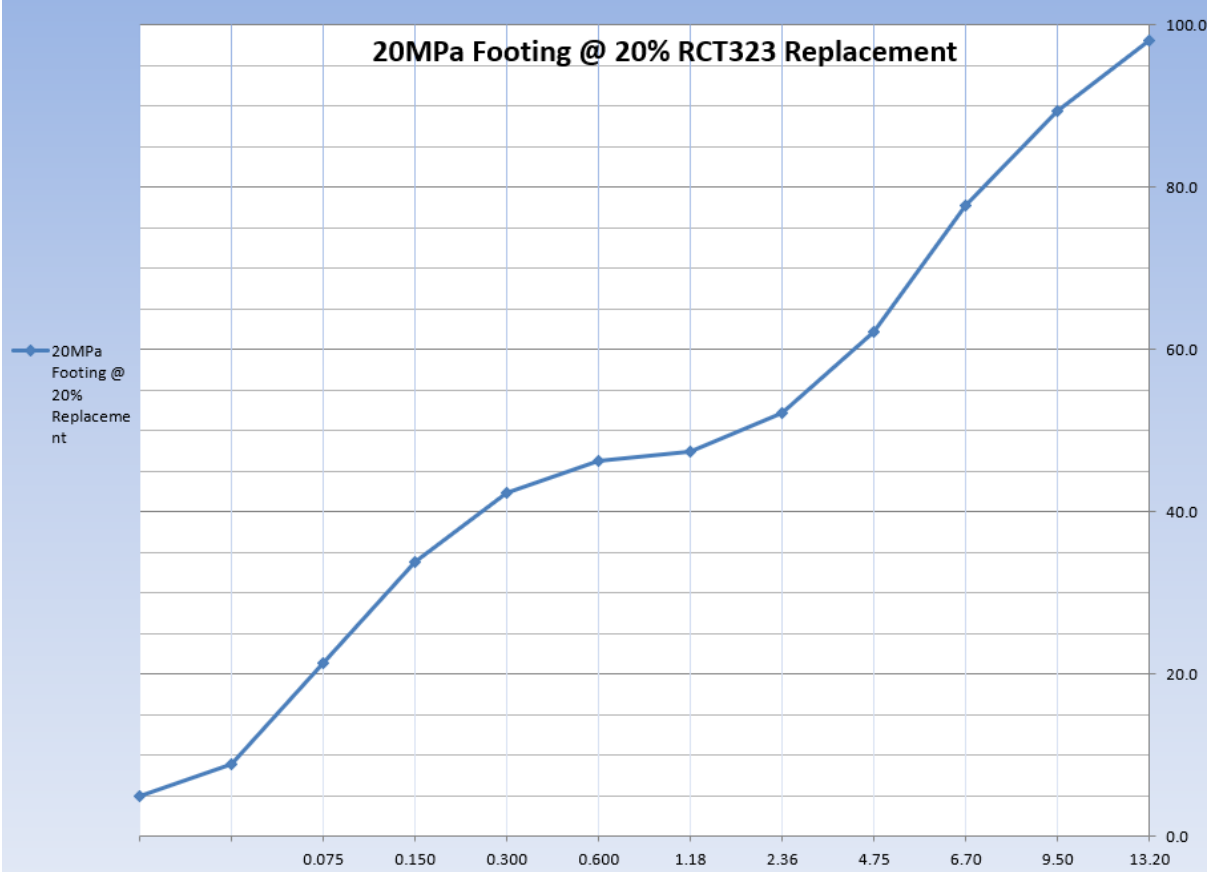
**Keywords:** Concrete, Innovation, Recycling, Waste, Reuse

## ***Treating Returned Concrete***

On May 3<sup>rd</sup> 2022 at 2pm, we treated material returned from a concrete pour of approx. 2.4m<sup>3</sup>. 3 bags were used to complete the treatment which took approx. 3minutes of mixing from initial addition of RCT323. Once the material has granulated, it is time to discharge the material from the agitator onto a suitable pad to avoid contamination with other aggregates and for sufficient space to remix the material with a front end loader. After discharge was complete, the piles of treated material were back bladed to approx. 150mm to left dry out overnight to remix and break up the material the following morning. The Agi bowl was later inspected at the slump stand to see if any material had remained in the bowl and it determined that the agitator would not have to be washed out after the material treatment which leads to a quicker turn around time for reloading agi's and minimizes risk due to additional water in the bowl after wash out. At 7am the next morning, the material was re-mixed with the front loader in order to free up the material and prevent balling. If balling occurs, utilized the loader bucket to flatten the balls and back blade. Use the wheels and roll-over if necessary to break. Once this has been completed, the material can be stock piled and should remain free from binding together creating any balling as the hydration process has completed and will not re-hydrate.

**Lab Trials – Gathering Data**

Prior to any full scale trials being carried out, initial lab trials should have been conducted to provide initial data to create a mix design replicable to the control mix. Always carry out PSD, Particle Density and Water Absorption testing on the treated materials. This will provide data in order to create a suitable mix design to optimize the aggregate replacement, to calculate the theoretical yield and Free water cement ratio.



	Slump	Air Content	7Day (MPa)	28Day (MPa)
<b>Control</b>	100	3.5	18.0	23.0
<b>20% RCT323</b>	100	3.8	15.5	20.0
<b>30% RCT323</b>	100	3.8	17.0	22.0
<b>50% RCT323</b>	120	3.6	15.5	20.0

**Field Trials**

On the 4<sup>th</sup> May 2022, full scale plant trials were conducted to incorporate 15% of treated material back into the concrete mix. Prior to dosing the material, we carried out moisture tests to ensure we captured any water in the material and took this into consideration prior to batching. Re-mix the material to ensure its completely free flowing and free of any significant lumps. A 20MPa footing mix was chosen for the trial. We replaced both fine and coarse aggregate based on past PSD information gathered. Due to the cementitious material present, this contributed to an increase in fines passing the 75mic sieve which allowed for the reduction of fine aggregate. The poured consisted of 25m<sup>3</sup> for a residential footing. This enabled us to sample an initial 5m<sup>3</sup> from the control mix for comparative data. Mid way through the pour we batch 5m<sup>3</sup> of the RCT323 mix, visually on the slump stand there was no noticeable difference in terms of workability. A sample was taken at the plant to carry out initial type testing for slump, air content and compressive strength and 7 & 28Days. Slumps both left site at 130mm slump due to the long transit. The Control and RCT mix both looked identical in terms of workability, finishability and the rheology was improved with the RCT due the to the addition of cementitious particles in the matrix. The pour was

located 45mins away from the plant which was a good test for slump retention. No water was added on site and no negative feedback was recorded from contractors (no difference was noticed between mixes)

	<b>Slump</b>	<b>Air Content</b>	<b>7Day (MPa)</b>	<b>28Day (MPa)</b>
<b>Control</b>	130	3.2	17.5	26.5 & 27.0
<b>15% Replacement</b>	140	3.6%	16.0	27.0 & 26.5



Figure 1 Control Mix



Figure 2 15% Replacement

### **Commercial Benefits**

- Reduction in aggregate purchases from external suppliers (treated concrete has been paid for and being re-used)
- Trucks not diverted to landfill or quarries to have returned concrete dumped – saving in fuel and truck turnaround. Treated in the concrete yard and re-used as an aggregate.
- Saving in water usage due to washout not required after treatment. Also contributes to less build up of waste in washout pits which ends up in landfill.
- Front End loader is fully utilized for concrete production and not tied up reloading pit waste into tippers.
- Saving on maintenance of machinery
- Tippers carting aggregates and utilised for other sales over carting waste which usually means tippers bodies to be washed after causing loss in sales for tippers.
- Quarries becoming full of concrete waste creating downtime for crushers crushing waste over virgin aggregates.

**Cost of Dumping Returned Concrete V's Treating with RCT323**

	<b>Cost/m3</b>	<b>RCT323/m3</b>
<b>Coarse Aggregate</b>	\$31.50	\$30.00
<b>Fine Aggregate</b>	\$13.50	
<b>Landfill</b>	\$10.00	
<b>Tipper</b>	\$5.00	
<b>Agi Wash-out</b>	\$1.00	
<b>Front End Loader</b>	\$2.00	\$2.00
<b>Maintenance</b>	\$2.00	\$2.00
<b>Total Cost</b>	\$65.00	\$34.00
<b>Potential Saving/m3</b>	\$31.00	

*\*Note: each state and individual company data will have varying cost. Study was carried out with a company in Western Australia*