









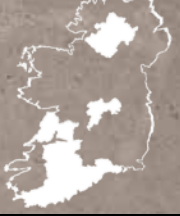















LOCAL AGGREGATES LOCAL EXPRESSION

	<div>STANDARD</div> 		<div>STRENGTH TEST 1: 30.73 MPA STRENGTH TEST 2: 23.65 MPA</div> <div>THERMAL RESISTANCE: 0.968</div>
	<div>LIMESTONE</div> 		<div>STRENGTH TEST 1: 39.81 MPA STRENGTH TEST 2: 28.21 MPA</div> <div>THERMAL RESISTANCE: 1.038</div>
	<div>SHINGLE</div> 		<div>STRENGTH TEST 1: 20.31 MPA STRENGTH TEST 2: 22.54 MPA</div> <div>THERMAL RESISTANCE: 1.312</div>
	<div>SANDSTONE</div> 		<div>STRENGTH TEST 1: 39.90 MPA STRENGTH TEST 2: 22.62 MPA</div> <div>THERMAL RESISTANCE: 1.369</div>
	<div>SLATE</div> 		<div>STRENGTH TEST 1: 25.64 MPA STRENGTH TEST 2: 25.82 MPA</div> <div>THERMAL RESISTANCE: 1.255</div>
	<div>GRANITE</div> 		<div>STRENGTH TEST 1: 30.56 MPA STRENGTH TEST 2: 34.12 MPA</div> <div>THERMAL RESISTANCE: 1.445</div>
	<div>QUARTZITE</div> 		<div>STRENGTH TEST 1: 36.52 MPA STRENGTH TEST 2: 33.17 MPA</div> <div>THERMAL RESISTANCE: 1.894</div>
	<div>HI-CON</div> 		<div>STRENGTH TEST 1: 129.28 MPA STRENGTH TEST 2: 141.26 MPA</div> <div>THERMAL RESISTANCE: NOT TESTED</div>

BACKGROUND

THE CONCRETE INDUSTRY HAS SOME ISSUES WITH CO2 EMISSIONS AND EMBODIED ENERGY IN ITS PRODUCTS. THE MAIN SINNER IS THE PRODUCTION OF CEMENT, BUT PARTS ARE ALSO DUE TO RAW MATERIAL EXTRACTION, TRANSPORTATION OF MATERIALS AND MANUFACTURING AT THE FACTORY. THE EMBODIED ENERGY OF AGGREGATE ITSELF IS LOW BECAUSE VERY LITTLE PROCESSING ENERGY IS INVOLVED. THE STONE IS QUARRIED AND CUT AT THE FACTORY. HOWEVER, SINCE IT IS A HEAVY MATERIAL, THE ENERGY EMBODIED IN THE TRANSPORTATION OF STONE IS HIGH.

HYPOTHESIS

OUR HYPOTHESIS WAS THAT USING LOCALLY SOURCED STONE INSTEAD OF IMPORTED AGGREGATES FOR CONCRETE MIXES WILL GIVE EVERY REGION ITS OWN DISTINCT MATERIAL EXPRESSION. BY REPLACING SAND WITH FINELY CRUSHED AMOUNTS OF EACH STONE, WE HOPED THAT EACH AGGREGATE WOULD HAVE ITS OWN DISTINCT COLOUR. BECAUSE OF THE VARIATIONS IN AGGREGATE USED, WE THINK THAT ALL OF THE RESULTANT CONCRETE MIXES WILL HAVE VARYING PROPERTIES WITH REGARDS TO STRENGTH AND THERMAL PERFORMANCE, AS WELL AS APPEARANCE. OUR HYPOTHESIS WAS THAT THE MIXES WILL HAVE SUFFICIENT STRENGTH TO COMPETE WITH STANDARD PORTLAND CEMENT. OUR STUDY IS IN THE SCOPE OF IRELAND AND IRISH MATERIALS, BUT AS A STUDY IT COULD BE APPLIED ANYWHERE.

STUDY

WE HAVE DONE A PERFORMANCE STUDY OF EIGHT DIFFERENT CONCRETE MIXES. SIX OF THEM HAVE USING VARIOUS LOCAL IRISH AGGREGATES, WHICH WE HAVE THEN COMPARED WITH A STANDARD PORTLAND CEMENT MIX AND ONE MIX OF ULTRA-HIGH PERFORMANCE CONCRETE. ALL MIXES HAVE THE SAME SAME DESIGN (WITH THE EXCEPTION OF THE ULTRA-HIGH PERFORMANCE CONCRETE), WITH THE STONE TYPES GROUND INTO LARGE AGGREGATE AT APPROXIMATELY Ø10 MM, AS WELL AS BEING MORE FINELY GROUND AS A REPLACEMENT FOR FINE AGGREGATE AND SAND. THE RESULT IS THAT THE CONCRETE MIXES ARE PURELY MADE OF THE LOCAL STONE TYPE, WITH THE EXCEPTION OF THE CEMENT WHICH IS A CEMIII MIXTURE OF CEMENT AND GGBS.

WE CAST ONE SLAB OF 300X300X100 FOR TESTING THERMAL RESISTANCE, APPEARANCE AND VARIOUS FINISHES LIKE GROUNDED, BRUSHED AND WET GROUNDED. WE ALSO CAST TWO 100X100X100 CUBES OF EACH MIX IN ORDER TO TEST ITS STRENGTH. BECAUSE OF TIME LIMITS, THE CUBES DIDN'T SIT FOR MORE THAN 14 DAYS, AND THE RESULTS MUST BE READ AS SUCH.

FINDINGS

THERE WERE LARGE VARIATIONS IN STRENGTH, NOT JUST BETWEEN MIXES BUT ALSO IN EACH MIX. WE THINK THIS COMES DOWN TO VARIATIONS IN AGGREGATE SIZE, AND ALSO THE FACT THAT THE CUBES ONLY HAD 14 DAYS TO SET. OUR HYPOTHESIS WAS THAT REPLACING THE FINE AGGREGATES WITH FINELY GROUND STONE WOULD AFFECT THE COLOUR OF THE CONCRETE. THIS WAS ONLY THE CASE FOR THE SLATE AND THE LIMESTONE, AND WE BELIEVE THIS IS DOWN TO THE FINES BEING DARKER THAN THE CEMENT MIX ITSELF. IN THE CASE OF THE SANDSTONE AND THE QUARTZITE, WE CAN SEE THAT THE CEMENT OVERPLAYS THE FINE AGGREGATE, MAINTAINING ITS GREY CONCRETE COLOUR.

