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Concrete Embodied Carbon Study

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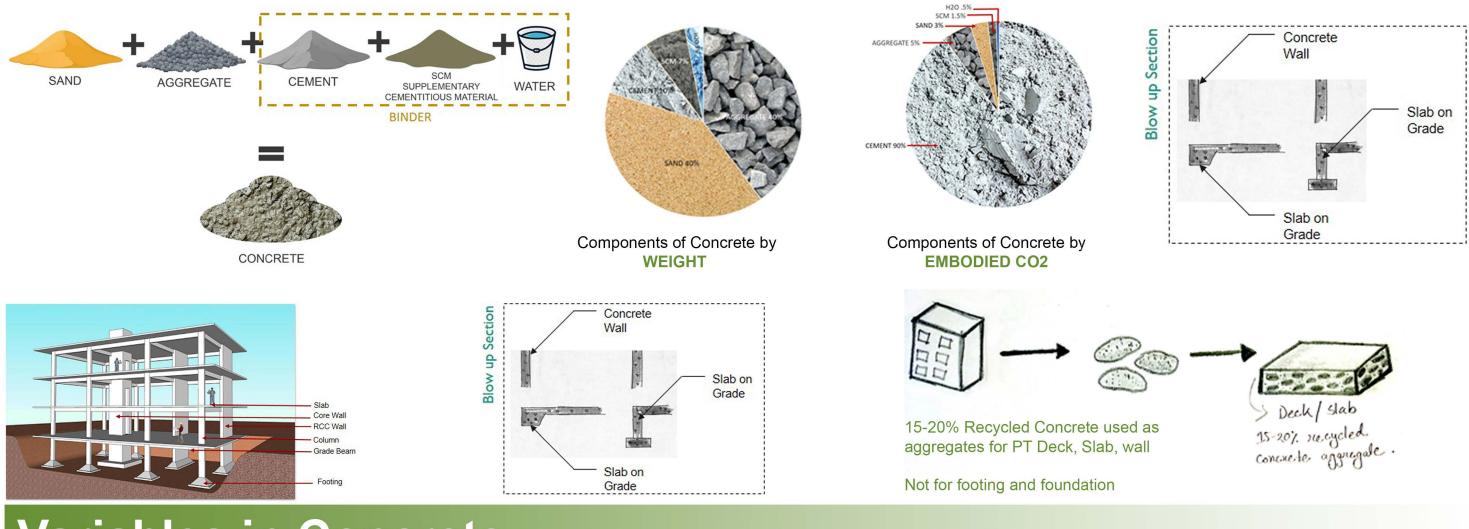
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Portland State **CONCRETE EMBODIED CARBON STUDY**

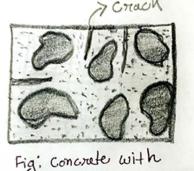
Abstract

Generally, in concrete, cement contains a significant amount of embodied carbon. For this reason, designers are looking for different mixtures and .sources for the replacement of cement in concrete. Which can provide the optimum strength by using a minimum amount of cement



Variables in Concrete

Aggregates

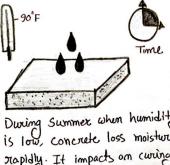


large Aggregates

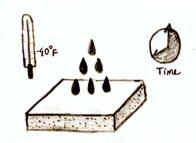
Large Aggregates

Less strength, Prone to cracking Not suitable for smooth finishes, or curved structures. Requires less amound of water

Seasons / Humidity

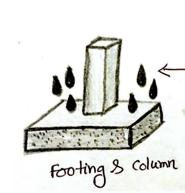


rapidly. It impacts on curring



During Winter when humidit

is high, concrete loss moisture

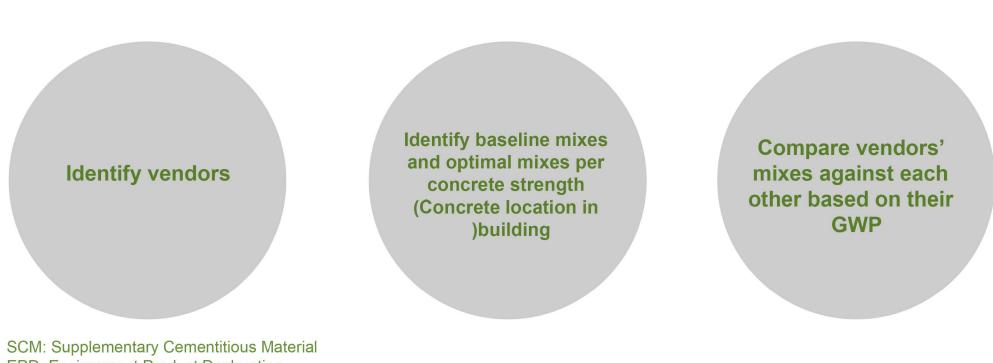


Concrete with Smaller Aggregates

Small Aggregates

Stronger in comparison to the larger aggregates in the same amount of concrete. Suitable for smooth finishes, curved structures Requires more water

Methodology



EPD: Environment Product Declaration GHG: Green House Gas GWP: Global Warming Potential (KgCO2 per Cubic Yard) LCA: Life Cycle Assessment ASTM: The American Society for Testing and Materials ACA: American Concrete Association

Freshwater used in the concrete

that are harmful to concrete.

mixture for construction. Recycled

water does not use in the concrete

mixture because it contains minerals

Recycled water used for the cooling

process of the structure during

summer time.

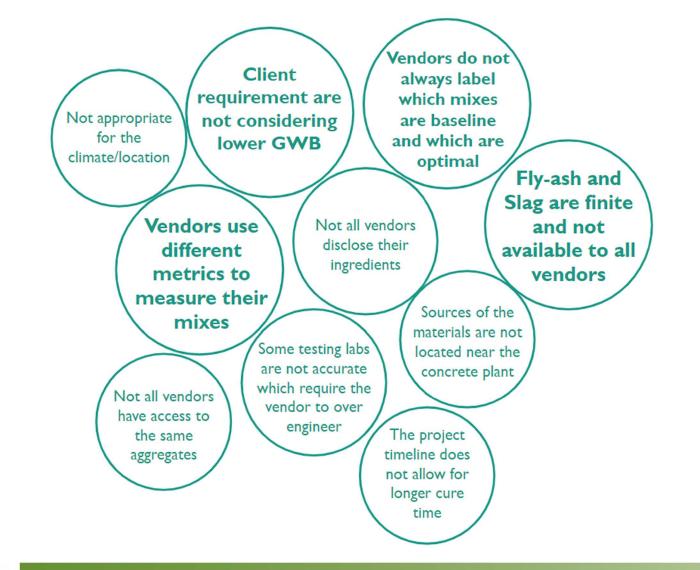
Results

Vendor A									
Concrete		GWP (Kg CO2/Yard3)				Cure Days	% GWP to Baseline		
PSI	Concrete Location	Basline	Mixture ID	Optimal	Mixture ID	Standard			
4000	Foundation	303		234.99		28	77.55		
4000	Tower Crane Footing	435.57		355.75		28	81.67		
6000	Cores	429.1		355.75		28	82.91		
4000	Misc. Walls	347.2		234.99		28	67.68		
4000	Columns					28			
5000	SOG					28			
4000	Elevated Desk/Topping Slabs	338.37				28			
6000	PT. Deck					28			

			Vendor E	3			
Concrete		GWP (Kg CO2/Yard3)				Cure Days	% GWP to Baseline
PSI	Concrete Location	Basline	Mixture ID	Optimal	Mixture ID	Standard	
4000	Foundation	334.09	Mix 40SC820A	311.16	Mix 06FF522N	28	93.14
4000	Tower Crane Footing	334.09	Mix 40SC820A	311.16	Mix 06FF522N	28	93.14
6000	Cores	521.4	Mix 6500DS02			28	
4000	Misc. Walls	334.09	Mix 40SC820A	311.16	Mix 06FF522N	28	93.14
4000	Columns	334.09	Mix 40SC820A	311.16	Mix 06FF522N	28	93.14
5000	SOG	383.79	Mix 45WM329N	349.38	Mix 45JD422A	28	91.03
4000	Elevated Desk/Topping Slabs	334.09	Mix 40SC820A	311.16	Mix 06FF522N	28	93.14
6000	PT. Deck	521.4	Mix 6500DS02			28	

	Concrete		Vendor GWP (Kg CO2/Yard3)			Cure Days	% GWP to Baseline
PSI	Concrete Location	Basline	Mixture ID	Optimal	Mixture ID	Standard	No diff to buschine
4000	Foundation	281.25	2440N17200	249.27	2440N17F00	28	88.63
4000	Tower Crane Footing	281.25	2440N17200	249.27	2440N17F00	28	88.63
6000	Cores	371.26	2460N3R2PV	471.86	2460GARCS0	28	127.10
4000	Misc. Walls	281.25	2440N17200	249.27	2440N17F00	28	88.63
4000	Columns	281.25	2440N17200	249.27	2440N17F00	28	88.63
5000	SOG	369.66	2450N3V2S9	277.4	2450N15F00	28	75.04
4000	Elevated Desk/Topping Slabs	281.25	2440N17200	249.27	2440N17F00	28	88.63
6000	PT. Deck	371.26	2460N3R2PV	471.86	2460GARCS0	28	127.10

Challenges and Recommendations



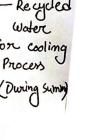
Client

Washington State University-Vancouver Life Sciences Building

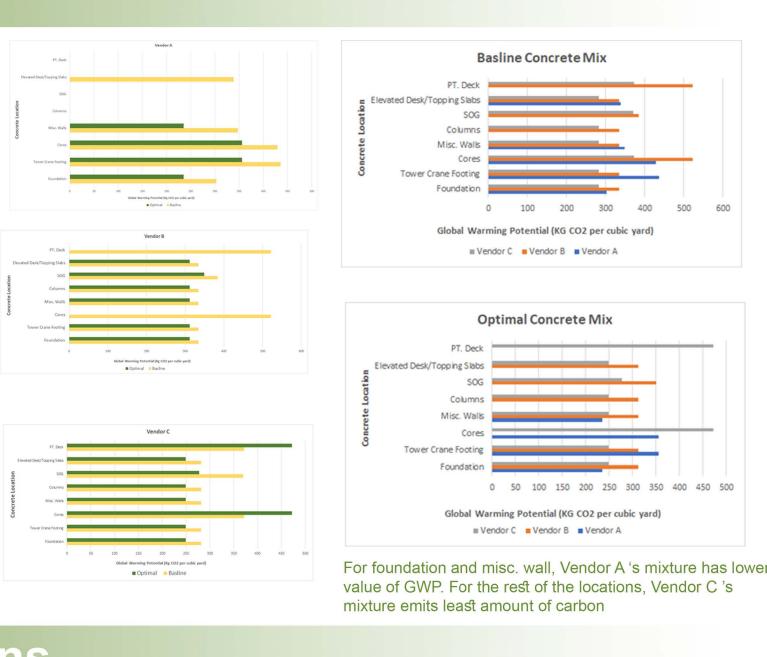


The project is a 60,000 sf new construction academic research building for Washington State University Vancouver. The building is currently in the programming phase and will include labs, offices, classrooms and other support spaces

The project will meet a minimum LEED Gold level of certification as set by WSU. In addition, SRG Partnership with Andersen Construction will be focusing on reducing embodied carbon on the project wherever possible, with a specific focus in the earliest stages on the selection and design of the structural system through quantifying the relative reduction in GWP



Push industry towards more transparency





Location of Vendores near construction site, Vancouver, Wa

