



Environment | **Carbon Emissions**

Utilities – WP17b1

CEMEX Vertua Classic Zero Concrete

Minimising carbon emissions through use of carbon-neutral concrete

The Challenge

A component of the HS2 works at the Victoria Road Crossover Box required pouring of a concrete slab (to enable installation of a UKPN substation), as well as fencing foundations (~35m³). Traditional concrete typically generates large quantities of carbon, due to release from initial manufacture, as well as during the chemical reaction when mixed with water and aggregates.

In keeping with HS2's commitment to reduce its construction carbon emissions, the CSjv utilities team investigated low-carbon alternatives for the slab. This was undertaken as part of a quarterly review of the work package Environment & Sustainability Matrix; facilitated by the Environment Manager. Undertaken as a workshop, the matrix ensures the identification and tracking of progress made in implementing environmental best practices onsite.

The team required a concrete solution that was both low carbon, as well as meeting necessary UKPN substation engineering specifications.

The Solution and Benefits

The team utilised Vertua Classic concrete, produced by CEMEX. The Vertua Classic product has a ~30-50% CO₂ reduction versus standard concrete (Portland cement, CEM I) mixes. This is achieved by specialised binders and a small percentage of Ground Granulated Blast-furnace Slag (GGBS). Specifically, the team used Vertua Classic Zero, which offset the remaining 50-70% of CO₂ emissions via a carbon neutrality specialist in accordance with the CarbonNeutral Protocol (the leading global framework for carbon neutrality).

Use of the product resulted in carbon savings of approximately 10.95 tCO₂e, when compared against a traditional CEM I Portland mix.

As an added benefit, all CEMEX cement products have achieved BES6001 'excellent' Responsible Sourcing Accreditation. In turn, contributing to HS2's goal of ensuring 100% of concrete products are sourced from a recognised responsible sourcing scheme.



	tonnes CO ₂ e produced for 35m ³ of concrete
CEM 1 (Standard Portland Mix)	10.95 t CO ₂ e
Virtua Classic Mix	7.60 t CO ₂ e
CO ₂ e saving (before approved offset applied)	(3.35 t CO ₂ e)
TOTAL CO₂e savings (with remaining emissions offset – Virtua Classic Zero)	10.95 tCO₂e



Cost – Vertua Classic Zero costs an additional £7/m³ versus CEM 1 mixes.



Further Information:

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Working on behalf of





CEMEX Vertua Classic Zero Concrete

Additional notes and assumptions used in calculations:

- 35 m³ of concrete poured for substation and fencing foundations.
- CEM 1 Standard Portland cement assumes a carbon emissions factor of 0.131 t CO₂e per tonne of concrete (primary material production), as taken from the DEFRA GHG Conversion Factors 2020 (available online).
- Vertua Classic cement has a carbon emissions factor of 0.0907 t CO₂e per tonne of concrete (as provided by CEMEX).
- Assumes a concrete density factor of 2.39 tonnes/m³ (as provided by CEMEX).
- Residual carbon emissions from the Vertua Classic cement were offset in accordance with the CarbonNeutral Protocol. Further detail on Vertua Classic Zero is available on the CEMEX website:
<https://www.cemex.co.uk/testpage#VertuaClassic>
- Vertua Classic Zero costs an additional £7/m³ versus traditional CEM I mixes.
- Curing times for Vertua Classic Zero were similar to traditional CEM I mixes. This would vary dependent on the temperature and the water/cement ratio used for different mixes.



Further Information:

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Ready Mix Carbon Footprint Calculation

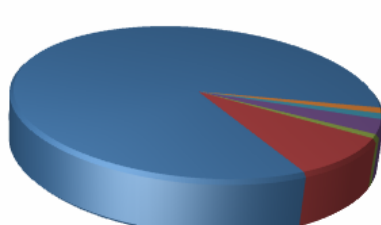
PRODUCT NAME AND ORIGIN					
Product	Facility	Country	Execution Date	Source Year	User Name
Vertua Classic Zero DC-1	Wembley Plant	UK	8/26/2020	2013	Sustainability

RAW MATERIALS				
Family	Origin	Raw Material	tCO2eq/m3 Raw Material	tCO2eq/m3 Transport
CEMENT	Rugby	OP Bulk (CEMI 52.5N)	0.178779	0.003588
ADDITIONS	Purfleet GGBS	GGBS	0.006916	0.000000
ADDITIVES	Cemex Admixtures	Superplasticiser CSP340	0.001977	0.000000
AGGREGATES	Angerstein Wharf	All In Aggregate	0.007112	0.004471
	Kingsmead Quarry	All In Aggregate	0.003432	0.005355
WATER	Network Water	Water	0.000049	0.000000
	Recycled Water	Water	0.000000	0.000000

ENERGY AND AUXILIARY MATERIALS		
Material	tCO2eq/m3	tCO2eq/m3 Transport
Electricity	0.002485	--
Gas Oil	0.000143	0
Returned Concrete	0	0
Waste	0.000004	0.000003
Water	0.000055	--

DELIVERY & TRANSPORT		
Distance	Transport	tCO2eq/m3 Transported
8 km	RMX Truck 8 m3	0.002640

CO2 FOOTPRINT RESULTS		
Name	tCO2 eq/m3	%
Cement	0.182367	84.0
Aggregates	0.020370	9.4
Aditives	0.001977	0.9
Aditions	0.006916	3.2
Energy & Others	0.002739	1.3
Transport	0.002640	1.2
TOTAL	0.217009	
Density (ton/m3):		2.391343
Total (tCO2 eq/ton):		0.090748



- Cement: 84 %
- Aggregates: 9 %
- Aditives: 1 %
- Aditions: 3 %
- Energy & Others: 1 %
- Transport: 1 %