



Saudi Geopolymer Experience Share

SIEFCO

سفكو

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CEO

Boring Fact Based Presentation Outline



Who we are

Stage 1:
What we did



Results

Stage 3:
Mechanical &
Environmental



Market

Stage 5:
Response From
Clients



Raw Materials

Stage 2:
Specifications



Costs

Stage 4:
Geopolymer V.
Traditional
Concrete



Stage 1: Who we are and what we did.

We are the largest precast concrete paver producer in Saudi Arabia.

**In 2023 we created 20 different geopolymer trials using natural Saudi pozzolan, along with either sodium, potassium, silicates and hydroxides, and phosphate, at different curing temperatures.
Binder was mixed in at end of process.**



Natural Pozzolana

From:	Saudi Ready Mix - Grinding Plant
To:	Customer - Siefco
Date:	30/10/2022

• Chemical analysis:

Item	ASTM C 618 class N	Results %
Silicon Oxide (SiO ₂)		43.8
Aluminum Oxide (Al ₂ O ₃)		16.2
Iron Oxide (Fe ₂ O ₃)		14.2
SUM (SiO ₂ +Al ₂ O ₃ +Fe ₂ O ₃)	79 Min.	74.2
Sulfur Trioxide (SO ₃)	4.0 Max.	0.083
Calcium Oxide (CaO)	Report only	9.15
Magnesium Oxide (MgO)		7.33
Moisture Content	3.0 Max	0.4
Loss in Ignition (LOI)	10.0 max	0.32

• Physical Test Results:

<u>Fineness:</u>		
Specific surface by Air Permeability, cm ² /g		5,400
Retained on 45 μ Sieve, %	> 34	7.6
Strength Activity Index		
7 Days	> 75	92
28 Days	> 75	105
Water Required (% of Control)	< 115	106

The above result comply to requirements of ASTM C618

Laboratory supervisor

Ammar Salat



Stage 2: Raw Material Specs.

Natural Saudi pozzolan: SiO₂ 43.8% / Al₂O₃ 16.2%
(SiO₂+Al₂O₃+Fe₂O₃ = 74.2%)

Na₂SiO₃: Na₂O 12.5% SiO₂ 27.5% (40% solid)
NaOH: 49%

K₂O3Si: k₂O 11.69% SiO₂ 26.11% M.R 3.1

KOH: 90% flake

Soloution: 25 kg silicate with 10kg KOH flake

Phosphoric Acid: 85%, 100L water to 200L H₃PO₄



Stage 3: Mechanical & EPD results

The only mix to meet the 55 MPa requirement was sodium based geopolymer cured at **80c**. GWP was halved.



TEST REPORT ON OVERCAST

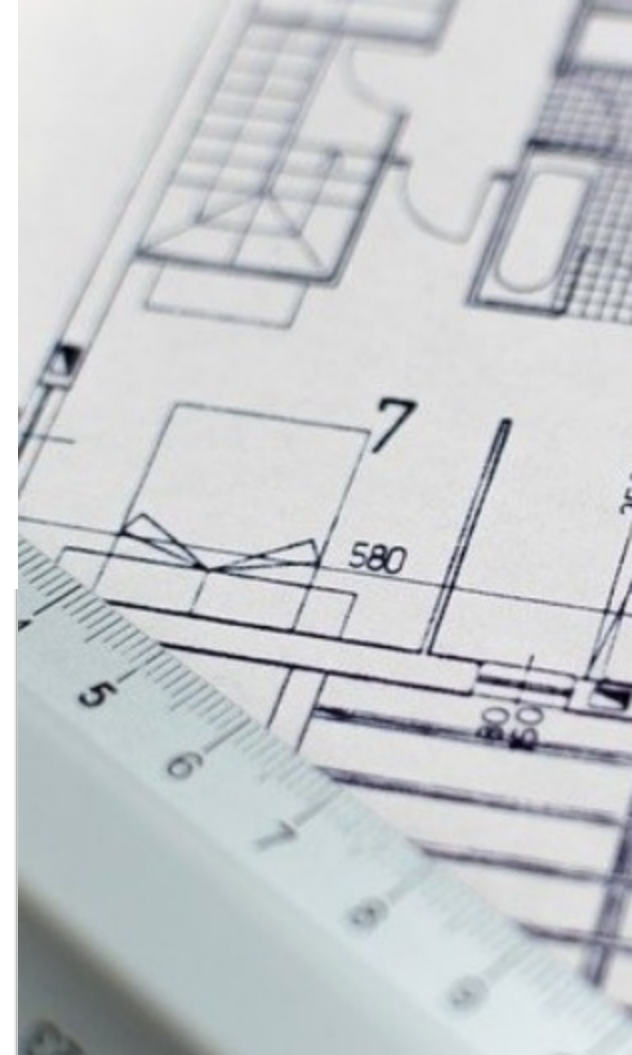
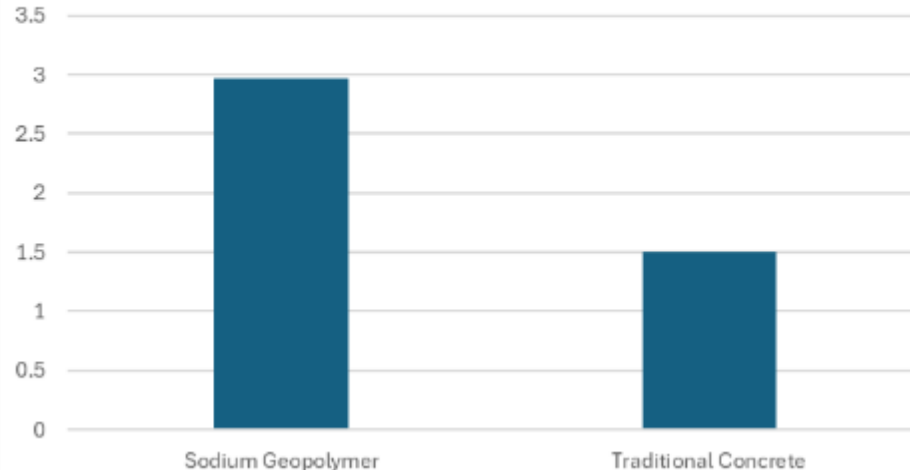
Project Data		Project No.	Project Name
Client	S&P Assets Ltd. (S&P Assets) - Dublin	Project No.	S&P Assets Ltd. (S&P Assets) - Dublin
Contract	S&P Assets Ltd. (S&P Assets) - Dublin	Project No.	S&P Assets Ltd. (S&P Assets) - Dublin
Project Name	Project Name	Project No.	Project Name
Sample Description			
Sample Description	Concrete (C15/20)	Sample No.	0101
Location	Site	Sample No.	0101-01
Sample Location	Site	Sample No.	0101-01
Test Method	ASTM C1064 (C1064)	Sample No.	0101-01
Test Date	2023/01/01	Sample No.	0101-01

Specimen No.	Concrete (C15/20)	Concrete (C15/20)	Concrete (C15/20)	Concrete (C15/20)	Concrete (C15/20)
Specimen No.	Concrete (C15/20)	Concrete (C15/20)	Concrete (C15/20)	Concrete (C15/20)	Concrete (C15/20)
1	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)
2	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)
3	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)
4	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)
5	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)	100% (C15/20)

Notes: - Test results are in accordance with the test method.



Global Warming Potential (kgCO₂e)





Stage 4: Costs

Mix 20				Normal mix			
	KG	SAR	SAR		KG	SAR	SAR
Sand	275	0.024	6.48	Sand	900	0.024	21.15
1/8	250	0.027	6.43	1/8	700	0.027	18.15
1/16	400	0.025	10.00	Powder 0/4	800	0.025	20.00
pezzolas	250	0.430	107.50	Cement	350	0.170	59.50
Sodium Silicate	20	1.25	25.20				
Sodium Hydroxide	20	1.25	25.20				
Total	1195		182.38	Total	2750		159.30
Packing cost				Packing cost			
	Quantity	SAR	SAR		KG	SAR	SAR
Wood Pallet / pc	0.049	15.000	0.74	Wood Pallet / pc	0.049	15.000	0.74
Plastic cover / kg	0.070	5.300	0.35	Plastic cover / kg	0.070	5.300	0.35
Put strap / m	1.540	0.071	0.11	Put strap / m	1.540	0.071	0.11
Total	1.659		1.23	Total	1.659		1.23
Interlock 6cm mix out		0.56	Sup	Interlock 6cm mix out		22.00	Sup
			125.00				125.00
Cost of Interlock 6cm Gray (mix 20) /SAR			20.81	Cost of Interlock 6cm Gray /SAR			6.65
Reference				Reference			
	Amount	Month Average	Shift average		Amount	Month Average	Shift average
Overhead	1-2021:4-2023	8,115,578	2,028,895	Shift Holland Production			
General Expenses	1-2021:4-2023	5,944,150	1,486,038				
Depreciation	Last month	571,302	571,302				
Total		4,086,984	22,762				
Total Cost of Interlock 6cm Gray (mix 20) /SAR			31.66	Total Cost of Interlock 6cm Gray /SAR			18.00
			26.20				26.20



Stage 5: Response from Clients

Clients approached with limited or no interest:
Red Sea Project, Aramco, Murabba, Neom, Sports
Boulevard, Roshn Development

Primary Concerns Raised: Costs and colour.

