



Saudi Geopolymer Experience Share

SIEFCO

سفكو

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:	Saudreadymix - Grinding Plant
To:	Customer -Safco
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:

Fineness:		
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	Expectation > 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

Solution: 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.

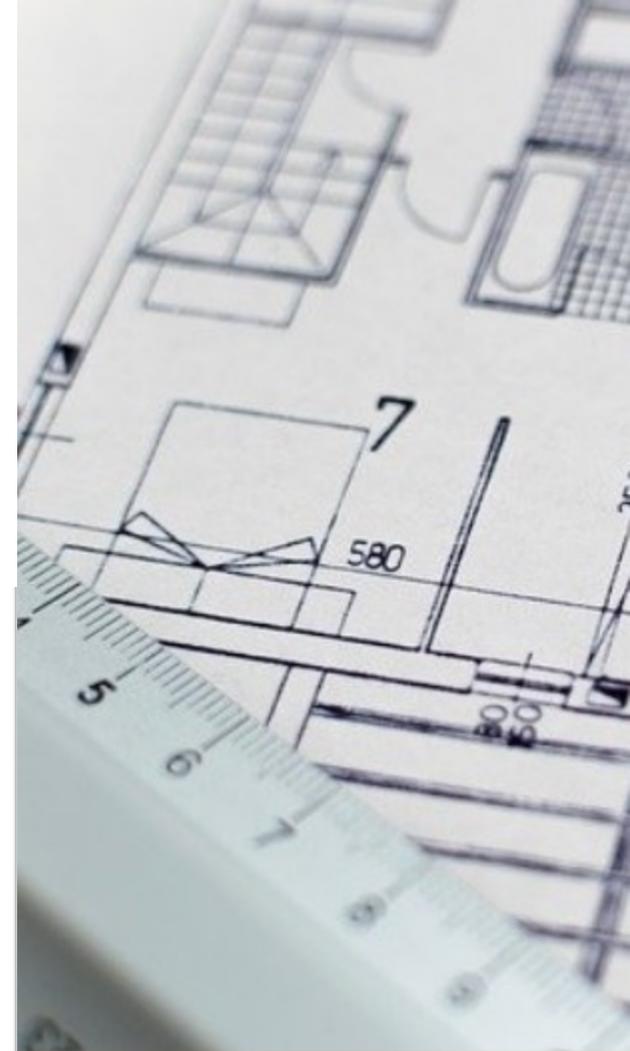
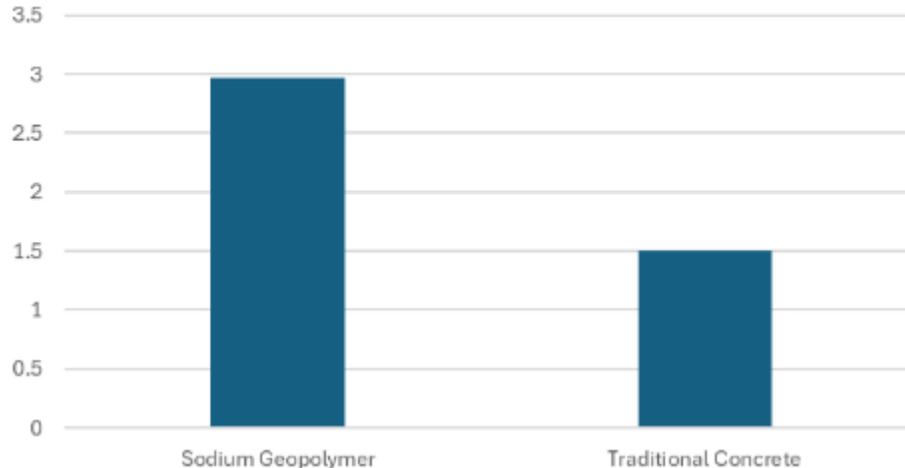


TEST REPORT (EN 12601)

Item	Value	Unit	Standard
Client	S&S Concrete Ltd. (S&S) - Dublin		EN 12601:2012 (EN 12601)
Project	S&S Concrete Ltd. (S&S) - Dublin		EN 12601:2012 (EN 12601)
Project Name	Project		
Sample Description	Concrete (EPD) - 55 MPa	Sample No.	12601
Specimen	50x50x50	Sample No.	12601
Sample Condition	28d	Sample No.	12601
Test Method	ASTM C109	Sample No.	12601
Product	ACES	Sample No.	12601

Specimen No.	Compressive Strength (MPa)	Compressive Strength (N/mm ²)	Modulus of Elasticity (GPa)	Modulus of Elasticity (N/mm ²)	Compressive Strength (MPa)
1	55.0	55.0	28.0	28.0	55.0
2	55.0	55.0	28.0	28.0	55.0
3	55.0	55.0	28.0	28.0	55.0
4	55.0	55.0	28.0	28.0	55.0
5	55.0	55.0	28.0	28.0	55.0

Global Warming Potential (kgCO₂e)





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.

