

GEOPOLYMER CONCRETE TECHNOLOGY

Technical data sheet:

Compressive strength [MPa] Cube 40×40×40 mm	1d	87
	7d	118
	28d	144
Flexural strength [MPa] (without fiber) Prism 160×40×40 mm	1d	8.5
	7d	13
	28d	14.5
Density [kg/m ³] Saturated surface dry condition	28d	2297
Flow diameter [mm] Mini-cone test	total	275
Young Modulus* [GPa]	28d	38
Total porosity* [Vol.%]	28d	6
Resistance to sulphate attack Loss in mass* [%]	Until 28d no loss in mass	
Fire resistance*	Retains strength up to 900 C°	

*Parameters can vary and are approximate.

(Compressive Strength up to 200 Mpa is possible)

Geopolymer benefits vs. conventional cementitious materials:

- High compressive strength
- No water curing
- High abrasion resistance
- Rapid setting and quick hardening
- Fire resistance (up to 1000°C)
- Less emission of toxic fumes under heating
- High resistance to different acids and salt solutions attacks
- Less deleterious alkali-aggregate reactions
- Low shrinkage and thermal expansion (About 1/4 of Conventional Cement Concrete)
- Low creep (About 1/4 of Conventional Cement Concrete)
- High surface resistance.

Some applications of Geopolymer:

Construction industry:

Geopolymer concrete can be design to achieve a wide range of compressive strengths, from standard to ultra-high strengths, with varying consistencies from zero slump to self-levelling. It can also be formulated to withstand different environmental conditions such as freeze-thaw cycles, corrosive environments, and high temperatures or fire exposure. Applications include:

- Pre-fabricated panels
- Road repair in heavy traffic areas
- Airports – fast setting areas
- 3D printing
- Sound insulation panels
- Pervious alternative concrete formulation
- Backfill as an aggregate material
- Inorganic resin for Asphalt/flexible road

Building materials:

Geopolymer can be used in a wide range of concrete replacement products such as pipes, manholes, bridge decks, paver bricks, etc. Geopolymer can be customized to provide high thermal, corrosive resistance, and environmentally friendly concrete products. Applications include:

- Fire-resistant coatings
- Inorganic geopolymer resin for lumber/wood/plywood industries
- Pre-fabricated products
- Roofing tiles
- Geopolymer bricks

Sewer Rehabilitation / Repair Industry:

Using sprayed reinforced geopolymer as an alternative for repairing critical infrastructure presents significant advantages. Compared to conventional concrete, sprayed geopolymer concrete exhibits enhanced adhesive properties, particularly in terms of resistance to abrasion and chemicals. Its innovative formulation ensures better adhesion to existing concrete surfaces, surpassing the effectiveness of repairs using traditional Ordinary Portland Cement. Applications include:

- Reinforcement Sprayed Coatings

Coastal environmental protection:

Geopolymer alternatives offer both non-porous and permeable materials, providing solutions for controlling coastal erosion and addressing environmental challenges where traditional concrete struggles to maintain long-term performance. Applications include:

- Seashores
- Offshore windfarms
- Coastal erosion

Chemical plants:

Geopolymer demonstrates exceptional resistance against common industrial acids like sulfuric and nitric acids. It serves as a highly cost-effective alternative to organic polymers. Applications include:

- Refractory materials
- Alternative fertilizer

Oil and gas industry:

Geopolymer presents exciting alternative solutions for multiple applications compared to traditional concrete in proppants and well cementing. Its superior properties, such as being less abrasive and highly resistant to heat and chemicals, result in performance products that are both effective and less disruptive to drilling equipment expenses. Applications include:

- Proppants
- Well cementing
- Retaining wall
- Precast beams
- Precast bridge decks
- Pavements