

Sustainable High Performing Concrete



INSEE HI-CRETE PORTLAND COMPOSITE CEMENT is the result of years of research and development, engineered with INSEE's trademarked newly introduced SmartAct™ Complex Organo-Mineral Technology. It is a unique superior blended cement with up to 35% clinker replaced with a composition of more than one cementitious mineral addition under the newly established Sri Lanka Standard SLS 1697:2021 Specification for Portland-Composite Cement (PCC). INSEE HI-CRETE PORTLAND COMPOSITE CEMENT is produced as two variants; a ternary composition Combining of either fly ash or slag with high-grade calcium carbonate.

Producing compressive strength equivalent to that of OPC among other characteristics, INSEE HI-CRETE PORTLAND COMPOSITE CEMENT comes strongly recommended for projects that require strength development at all ages. The dense microstructure and low porosity of INSEE HI-CRETE PORTLAND COMPOSITE CEMENT guarantees high resistance suitable for all concrete exposure conditions across Sri Lanka, especially coastal regions. Its low heat of hydration is ideal for mass concreting, piling and foundations, while its resistance to alkali aggregate reaction (AAR) is well suited for strategic infrastructure such as dams, bridges and power plants. Optimum particle size distribution and high packing density of INSEE HI-CRETE PORTLAND COMPOSITE CEMENT ensures the consumption of less mixing water, while its reduced clinker percentage results in the reduction of the carbon footprint of the cement product, making INSEE HI-CRETE PORTLAND COMPOSITE CEMENT more environmentally friendly than OPC.

INSEE HI-CRETE PORTLAND COMPOSITE CEMENT



FACT FILE

Name:	INSEE HI-CRETE CEMENT
Type:	Portland-Composite Cement
Sri Lankan Standard:	SLS 1697:2021
Strength Class:	42.5N/R
British Standard:	BS EN 197 CEM II-B/M

PROPERTIES

Property	SLS 1697:2021 Requirement	INSEE HI-CRETE CEMENT Average
PHYSICAL PROPERTIES		
Compressive Strength (2 days)	≥ 10 N/mm ²	≥ 20 N/mm ²
Compressive Strength (28 days)	42.5 - 62.5 N/mm ²	> 52 N/mm ²
Initial Setting Time	≥ 60 minutes	130 - 150 minutes
Fineness	Not Specified in Standard	400 - 420 m ² /kg
Soundness	< 10 mm	< 1 mm
Relative Density	Not Specified in Standard	2.96
CHEMICAL PROPERTIES		
SO ₃	≤ 3.0 %	< 2.8 %
Chloride	≤ 0.1 %	< 0.05 %
LOI	Not Specified in Standard	< 3.0 %

COMPATIBILITY

INSEE HI-CRETE is compatible with:

- Chemical Admixtures complying with BS EN 934-1:2008 and ASTM C494
- Fly Ash complying with BS EN 450
- Ground Granulated Blast Furnace Slag (GGBFS) complying with BS EN 15167-1:2006
- Silica Fume complying with BS EN 13263-1:2005+A1:2009
- Manufactured Sand (M-Sand) complying with BS EN 12620:2013
- Natural Sand, Quarry Sand and Offshore Sand complying with BS EN 12620:2013

APPLICATIONS

INSEE HI-CRETE is used for:

- Sustainable and high performing structural concrete for buildings, commercial and infrastructure projects
- Sustainable and durable concrete structure from foundation to roof
- High durable road construction
- Ideal solution for concrete elements in contact with marine environment and aggressive soil or underground water such as sulphate, chloride and acids
- Easy pumpable concrete with fast casting and demolding
- Large-scale infrastructure development projects with bulk cement requirements
- High-rises and large-scale housing and commercial projects with the requirement for sustainable high performing concrete
- Concrete with low carbon footprint

FEATURES & BENEFITS

Sustainable High Performing Cement

While OPC undergoes one reaction to form calcium-silicate hydrate gel (C-S-H) – the glue that holds concrete together – INSEE PCC CEMENT undergoes THREE reactions with INSEE's trademarked SmartAct™ Technology, promoting refinement of the pore structure of matured concrete. INSEE PCC CEMENT first undergoes the hydration reaction similar to OPC forming calcium silicate hydrate (C-S-H) as well as portlandite $[Ca(OH)_2]$. This is followed by the pozzolanic reaction like in Blended Hydraulic Cements (BHC), where the presence of cementitious additions such as fly ash or slag in the ternary composition react with the portlandite created from the first reaction to form additional C-S-H, further decreasing porosity, capillary pores and void spaces in the concrete, thus greatly reducing permeability and increasing strength and durability in the structure. A third nucleation reaction unique to INSEE PCC CEMENT further accelerates the hydration and formation of additional carbonate aluminate hydrate (C-A-H) growing between the capillarity pores, resulting in a denser microstructure as well as higher strength and durability at each level of maturity.

Higher Sulphate and Chloride Resistance

The very dense microstructure and low porosity makes INSEE PCC CEMENT the ideal product to be used in constructions in aggressive environments that contain sulphate in ground water or soils, salts and acids or any other exposure conditions found across Sri Lanka that harm and/or accelerate the decaying process of concrete structures.

Alkali Aggregate Reaction (AAR) Resistance

Fly ash and slag as cementitious constituents used in INSEE PCC CEMENT reduces the alkali aggregate reaction (AAR) by bonding chemically the soluble alkalis in the cement, thus preventing the possibility of forming expansive alkali gels with potential reactive aggregates in the concrete microstructure, resulting in cracks formation and concrete deterioration.

Mass Pouring

For larger areas of concreting, high internal temperatures can cause adverse reactions such as internal cracking resulting from thermal contractions and delayed ettringite formation (DEF). Featuring low heat of hydration development at early age, INSEE PCC CEMENT is highly recommended for mass concrete works, and the preferred solutions in hot weather conditions especially in tropical countries.

Environmentally Friendly

Unlike traditional OPC which consists of more than 95% clinker - the main cement constituents that emits CO_2 during its production, the new INSEE PCC contains up to 35% less clinker in its composition. INSEE PCC CEMENT also has an optimum particle size distribution with a high packing density which results in superior fresh and hardened concrete properties with high water retention, thus reducing the required mixing water to achieve the desirable workability with potential mix design and cost optimisation.

Superior Workability

The finely engineered particles of high-grade calcium carbonate ($CaCO_3$), finely blended slag, and spherical fly ash particles all act as lubricant, reducing water demand for the mixture while also increasing the fluidity and workability of the cement. Now, with proven superior workability above all other cement products in the market, INSEE PCC CEMENT enables masons to achieve a much smoother and highly aesthetic finish for masonry work. This property also results in increasing the pumpability of concrete.

Water Protect

Rainwater enters concrete through open pores and capillary voids. The new INSEE PCC CEMENT formulation results in a very dense and impermeable concrete microstructure with very less voids and connected capillary pores. The optimal particle size distribution also means maximum packing density of the concrete, offering complete protection against water penetration and infiltration. This leads to stronger, more water resistant and high standard living homes, with INSEE PCC CEMENT addressing the key challenges of rainwater penetration and ingress in concrete structures that are of significant concern for homeowners.