HEIDELBERGCEMENT GROUP

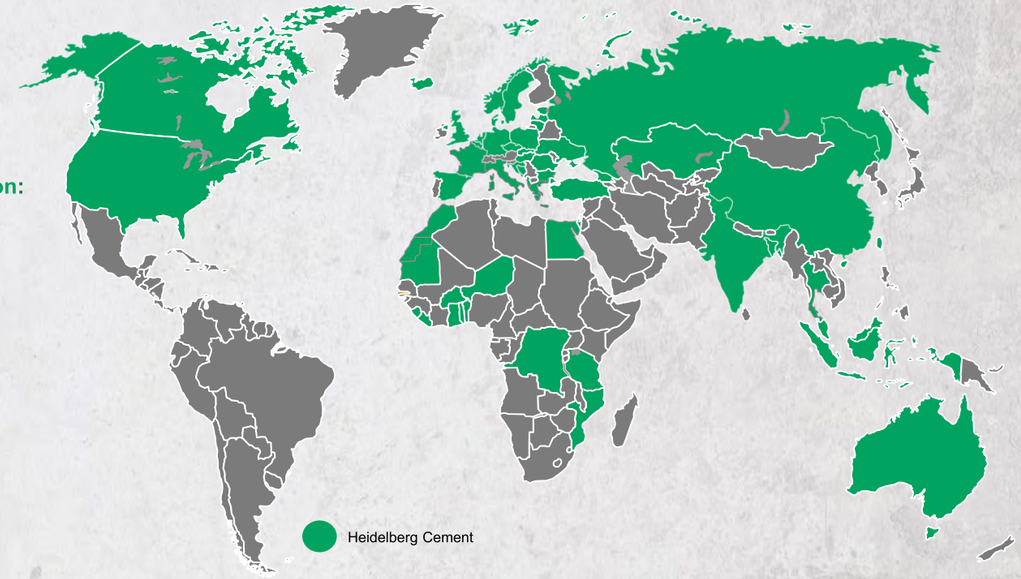
Worldwide

Market position:

01 Aggregates

02 Cement

02 Ready_mix Concrete



Heidelberg Materials, Germany with over 150 years of experience, manufactures over 184 million tonnes of cement annually and has presence in more than 50 countries across the globe with dedicated 51,000 employees in more than 3,000 locations, making sure that our slogan “Material to build our Future ” is brought to life day after day.

Heidelberg Materials is one of the world’s largest company in the building products segment. Deep concern for environment and emphasis on sustainability as its driving objectives, company has obligated itself to build on three pillars of ecology, economy and social responsibility. Producing reliable building materials that you can rely on, the company stands committed to building a better world for generations to come.

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HEIDELBERGCEMENT

for those who care for Environment

Portland Pozzolana Cement (PPC)

About Heidelberg Materials

What started off as a cement mill in 1873 in Heidelberg, Germany is today a global conglomerate in the cement industry. With sales of over 184 million tonnes, a presence in more than 50 countries, 3000 Production locations and more than 51,000 employees, HeidelbergCement delivers high quality products to its discerning customers.

About "mycem" cement

"mycem" is a fly ash based cement that complies with IS 1489 : 2015 (Part I). It is manufactured using high strength Portland Cement clinker blended with a selection of high quality fly ash (conforming to IS 3812) and gypsum.

The "mycem" advantage

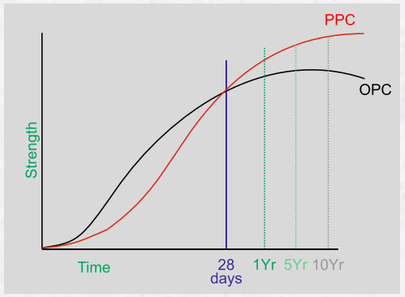
1. Improved Strength: Structures built with "mycem" display continued gain of strength even beyond 28 days. This superior characteristics remains unmatched by OPC.

When cement reacts with water, hydration takes place which forms binding material known as C-H-S gel(Silica Gel) along with highly reactive Calcium Hydroxide & heat of hydration.

Cement + Water → C-S-H (Gel Binder & Strength giving Compound) + $Ca(OH)_2$ (Hazardous Reactive Lime) + △ ↑ (Heat of Hydration)

Reactive Silica present in Mycem continues reacting with weak Calcium Hydroxide $CA(OH)_2$ & keeps converting it to Strong C-S-H Gel which keeps adding to the strength of concrete even beyond 28 days.

Cement + Water → C-S-H + $Ca(OH)_2$ + △ ↑
+ Fly Ash
↓
C-S-H



2. Improved Workability: The small spherical size and glassy texture of fly ash in "mycem" reduces the water requirement to achieve desired consistency. This leads to improved workability and finish with superior slump retention characteristics that improves place-ability and reduces segregation and honeycombing.

3. Reduced Permeability & Improved Durability : The pozzolanic reaction involving high grade reactive silica in fly ash and calcium hydroxide causes pore refinement which narrows the gel pores thus reducing permeability of concrete and gives longer life to concrete Structures.

The embedded reinforcements therefore remain relatively better protected from ingress of water and salts. This makes the structure more durable.

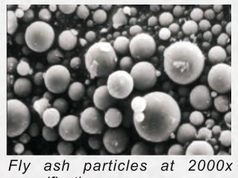
4. Lower Heat of Hydration causes reduction in Cracks: The heat of hydration creates thermal stresses in concrete or mortar which ultimately results in cracks. Mycem cement is specially designed to reduce 30-35% heat of hydration in comparison to OPC which achieved through calibrated bending with high grade reactive silica (Fly Ash) in close circuit mills. Lower Heat Hydration in Mycem reduces expansion and thermal stresses & thereby, shrinkage cracks in concrete or plaster are reduced.

5. Improved Resistance against Chemical Attacks: Calcium Hydroxide produced during hydration process, is highly reactive to acidic water, sulphates and chlorides present in atmosphere or underground. Use of high quality fly ash in "mycem" improves the resistance of concrete against such hostile substances in the environment.

reactive silica present in fly ash, reacts with hazardous calcium hydroxide and converts it to advantageous C-S-H gel (silica gel). The calcium hydroxide that get consumed leaves capillaries that are filled by C-S-H gel and this makes the concrete impermeable.

6. Lower Life Cycle Cost: Uniform particle size distribution, spherical particles and lower heat of hydration of "Mycem" makes the concrete denser and impermeable resulting in smooth and better surface finish. This lends durability to structure and saving on surface preparation, pre painting expenses and frequent repairs.

7. Environment Friendly Alternative: Every tonne of clinker produced releases one tonne of carbon dioxide in the atmosphere. By replacing 30-35 % of clinker with fly ash, it not only reduces C02 emissions but also helps in conserving energy and scarce lime stone reserves.

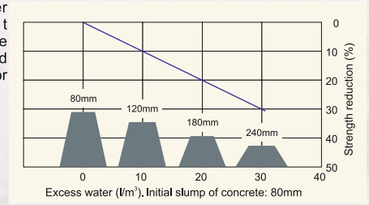


Fly ash particles at 2000x magnification.

Effect of Excess Water

Water cement ratio is the most critical factor that decides the ultimate quality and strength of concrete. Increase in water cement ratio results in decrease of compressive strength of concrete.(Refer chart)

It is recommended that a competent engineer's advice be sought on water cement ratio. Water should be just adequate to make the mix workable and not a loose paste or slurry.



Influence of excess water on strength of concrete

Getting Started

Globally PPC has proved its technical superiority over OPC. Blended cements have become the preferred choice of the engineering fraternity. "mycem" therefore becomes a versatile eco friendly alternative to address every construction need.

Curing Time

Curing assists in continuing the hydration process and controlling surface temperature of concrete and plaster. This aids in segmentation of capillaries. Proper curing minimizes shrinkage cracks, imparts greater abrasion resistance to surface, reduces permeability and improves carbonation resistance.
A minimum period of seven days or longer is recommended depending on the exposure condition at site. Curing should begin at the earliest possible but not later than 24 hours after placement of concrete. Wet or moist curing is recommended. Use of curing compounds may also be considered .

Importance of Correct Design Mix

Dense, fully compacted concrete is a must for achieving maximum strength and durability.
IS 456 : 2000 - Indian Standard Code of Practice for Plain and Reinforced Concrete (forth revision) should be referred while deciding the minimum grade of concrete and cement content and type depending on the nature of the project and exposure conditions at the site.
IS 383 : 2016 - Indian Standard Code for Specification for coarse and fine aggregates for concrete (second revision) is to be referred for careful selection of aggregates.
IS 10262:2019 - Indian Standard Code for Concrete Mix Proportioning - Guidelines (second revision) is recommended for concrete mix design.

As per IS 456 (Fourth Revision) : Environmental Exposure conditions, Cement type recommendation for Sulphate exposure and Minimum Cement content for RCC

Environment	Table 3: Exposue Conditions (Clauses 8.2.2.1 and 35.3.2)	Table 4: Cement recommendation against Sulphate exposure (Clauses 8.2.2.4 and 9.1.2)	Min. cement content Kg/m3	Max. free water Cement Ratio	Min. Grade of Concrete
Mild	Concrete surfaces protected against whether or aggressive conditions, except those situated in coastal area	PPC,PSC, OPC	300	0.55	M20
Moderate	Concrete surface sshetered from severe rain or freezing whilst wet b)Concrete exposed to condensation and rain concrete continuously under water c)concrete is contact or buried under non aggressive soil/ground water d)Concrete surfaces sheltered from saturated salt air in coastal area	PPC,PSC, OPC	300	0.5	M25
Severe	Concrete surfaces exposed to severe rain alternate wetting and drying or occasional freezing whist wet or severe condensation concrete completely immersed in sea water, Concrete exposed to coastal environment	PPC,PSC, OPC, SRPC	320	0.45	M30

Storage

"Shelf life" of every cement is dependent on its storage conditions. Contact with humid air will cause deterioration in its performance. Cement storage / Godowns must be fully covered and sealed to prevent ingress of moist air. The cement is to be stored on raised wooden platform covered with waterproof tarpaulin from bottom and top. The cement bags should be staked up to 10 bags height in header and stature form. First In, First Out (FIFO) system is to be adopted while consuming the bags. Bags stored for more than 3 months should be tested before use.

Typical Physical Properties

Physical Characteristics	Units	Requirements of IS: 1489 (Part I)	"mycem"
Fineness of Cement Sp. Surface blaine	m^2/kg	300 minimum	380 ±10
Soundness			
Le-Chatelier Expansion	mm	10 maximum	<2.0
Autoclave Expansion	%	0.8 maximum	<0.1
Setting Time			
Initial setting time	Minutes	Not less than 30	180 ±20
Final setting time	Minutes	Not more than 600	250 ±20
Compressive Strength			
At 3 days	Mpa	16 minimum	27 ±2
At 7 days	Mpa	22 minimum	35 ±2
At 28 days	Mpa	33 minimum	51 ±2

Chemical Characteristics (Units % by mass)	Requirement of IS 1489 (Part I)		"mycem"
Magnesia (MgO)	6.0	maximum	<3.00
Insoluble Residue $X + \frac{4x(100-X)}{100}$ Where X is the declared % of fly ash in the PPC sample		maximum	<32.00
Sulphuric Anhydride (SO_3)	3.0	maximum	2.4 ±0.1
Loss on Ignition	5.0	maximum	<3.5
Total Chloride (Cl)	0.1	maximum	<0.006

Applications

Mycem is a superior quality Portland Pozzolana Cement for use in all types of RCC Structures, Plastering and Masonry work :

- All type of multi-storey residential, commercial and Industrial structures.
- Mass concrete structures such as Dams & Bridges.
- Large Foundations and Retaining Walls even in aggressive soil.
- Marine Structures in aggressive environment.
- Pre-cast Concrete products like Concrete bricks, Poles & Pipes.
- Canal lining, Concrete Roads and all other civil work

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