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# HYDROCEM

'Highly Reactive Metakaolin pozzolanic Admixture for Cement / Concrete'

**Hydrocem** is a scientifically processed reactive allumino silicate pozzolana formed by calcining purified clay in an externally fired rotary kiln. A thermally structured ultrafine pozzolana replaces industrial by product such as Silica Fume - Micro Silica, one of the widely used mineral admixtures, without compromising the end result. Microsilica is an ultrafine, highly reactive pozzolana. Pozzolana has been used for centuries; The Classical Greeks and Romans used cements made from volcanic ash that had pozzolanic properties.

**Hydrocem** is a highly reactive Metakaolin mineral additive in powder form to make durable concrete with higher compressive strength and low permeability having better finish. It is manufactured from pure raw materials to a strict quality standards and it is not a by-product. Its particle size is smaller than cement particles. IS: 456:2000 recommends the use of Metakaolin as mineral admixture & the same is governed under ASTM 618 C-Class N-Pozzolana. The particle size of Hydrocem is significantly smaller than cement & blending leads to enhance the property of Portland cement:

**Hydrocem** improves the durability of concrete in a wide variety of aggressive environments. The beneficial effects are seen at an early stage because Hydrocem reacts with calcium hydroxide almost as fast as it is formed in the cement during hydration. The overall effect of removing calcium hydroxide, refining the pore structure and densifying the interfacial zone, is to reduce: Re-bar corrosion, Sulphate attack, Acid attack, freeze-thaw damage, Alkali Silica Reaction, Efflorescence etc.

## Physical Properties:

Average particle size, $\mu m$	: 1.5	Brightness	: 80 +- 2
Bulk Density (Gm/Ltr)	: 300 +_30	BET surface area m <sup>2</sup> /gm:	15
Physical form.	: Off-white powder	Pozzolan reactivity	: 1050 mg
Specific Gravity	: 2.5		Ca(OH) <sub>2</sub> /gm

## Chemical Composition – Wt.

SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub> + Fe <sub>2</sub> O <sub>3</sub>	: 96.88%	Na <sub>2</sub> O	: 0.56%
CaO	: 0.39%	K <sub>2</sub> O	: 0.06%
MgO	: 0.08%	Li <sub>2</sub> O	: Nil.
TiO <sub>2</sub>	: 1.35%	L.O.I	: 0.68%

## Mix proportion For M40 and M60 grade of Concrete:

Mix proportion, kg/m <sup>3</sup>	M 40				M 60			
	Control	7.5%	10%	12.5%	Control	7.5%	10%	12.5%
Cement.	405	374.6	364.5	354.4	450	416	405	394
Hydrocem-Microsilica.	-	30.4	40.5	50.6	-	33.75	45	56.25
Water	174	174	174	174	153	153	153	153
W/Cementitious Ratio.	0.43	0.43	0.43	0.43	0.33	0.33	0.33	0.33
Coarse Aggregate								
20-10mm 60%	670	665	665	664	674	672	671	670
<10mm 40%	447	444	443	443	449	448	447	447
Fine Aggregate.	679	672	671	670	681	678	677	677
Dose of admixture in % by wt. of cementitious material.	0.70	0.9	1.1	1.2	0.60	1.00	1.15	1.30





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#### Test Result For M 40 & M 60 Grades Concrete:

Mix proportion	M 40				M 60			
Kg/m <sup>3</sup>	Control	7.5%	10%	12.5%	Control	7.5%	10%	12.5%
Air contents	2.0	2.6	2.8	3.0	2.6	2.7	2.8	3.0
Slump obtained mm.	75	85	80	80	55	60	60	55
Compressive strength N/mm <sup>2</sup>								
1st day	15.2	15.7	16.3	17.4	23.6	28.8	27.2	29.5
3rd day	32.4	35.1	36.0	43.6	40.0	44.2	41.3	42.5
7th day	39.6	45.3	45.6	48.4	52.0	54.2	52.9	53.3
28th day	45.5	51.4	53.8	50.2	60.6	64.5	68.9	66.2
Flexural strength N/mm <sup>2</sup> (28 days)	5.2	5.5	6.4	6.2	7.3	8.6	9.2	8.7
Modulus of Elasticity N/mm <sup>2</sup> (28 days)	37700	42500	44400	44100	42700	46700	54900	52800
Chloride ion permeability -Coulombs (28 days)	3162	906	351	468	1802	384	317	267

Commercial use of Metakaolin based Hydrocem has already begun in several countries worldwide. Blending with Portland cement Hydrocem improves the properties of Concrete and Cement products considerably by:

1. Increasing Compressive & Flexural strength.
2. Providing resistance to chemical attack.
3. Reducing permeability substantially.
4. Preventing Alkali-Silica Reaction.
5. Reducing efflorescence & shrinkage.
6. Protecting corrosion.

#### APPLICATION:

**Hydrocem** is used in preparing High Performance, High Strength and Lightweight concrete, Industrial-Commercial floor, Marine concrete, Precast Concrete, Shotcreting, Fiber cement & Ferro cement products, Glass Fiber Reinforced Concrete, Mortars, stuccos, Repair Material, Pool Plasters etc.

#### DOSAGE:

**Hydrocem** is used @ 5% to 12.5% by weight of cement depending upon the requirement of strength.