MIXKOTE INTERNAL MEMBRANE (MIM)

CRYSTALLIZATION WATERPROOFING ADMIXTURE

DESCRIPTION

MIXKOTE MIM provides a simple and effective solution for the waterproofing of new concrete construction. **MIXKOTE MIM** is a cementitious-based crystallization chemical powder compound used for the treatment of concrete and other materials containing Portland cement. **MIXKOTE MIM** is specially blended for use as an admixture at concrete batching plants. Its' introduction into concrete premix reduces water permeability of the final poured concrete by formation of chemical crystals throughout the concrete mass when the chemicals contained in **MIXKOTE MIM** interact with concrete. **MIXKOTE MIM** provides protection against moisture, water pressure, certain aggressive chemicals and serves as a hardening as well as curing agent. **MIXKOTE MIM** also offers protection against the corrosion of reinforcing steel, concrete shrinkage cracks and frost damage.

ADVANTAGES

- Cost effective
- Maximizes waterproofness of concrete
- Reduces water demand for a given slump
- Inhibits cracking and shrinkage of concrete
- Protects concrete against aggressive chemicals
- Increases compressive strength of concrete
- Non-toxic
- Protects against chloride attack on reinforcing steel
- Seals hairline cracks up to 0.5 mm
- Cannot be damaged as it becomes an integral part of the concrete

USES

- Basement slabs and walls
- Dams
- Sewerage and water treatment plants
- Tunnels and subway systems
- Underground vaults
- Pre-cast concrete/structures
- Roof Decks
- R.C. Water tanks
- All foundations

PHYSICAL PROPERTIES – MIXKOTE MIM as a Waterproofing Admixture

TABLE 1

(Properties of Hardened Concrete Mixtures)

Hardened Property	Tested to **ASTM**	Tested to **CAN / CSA**	Plain Concrete **Mix 1 ***	Plain Concrete **Mix 2 ****
Compressive Strenght, MPa	**C39**	**A23.2-9C**		
1 day (24 hour)			**8.4**	**8.0**
3 days			**20.6**	**23.7**
7 days			**28.1**	**33.4**
28 days			**35.7**	**41.0**
56 days			**41.6**	**46.7**

TABLE 2

Hardened Property	Tested to **ASTM**	Tested to **CAN / CSA**	Plain Concrete **Mix 1 ***	Plain Concrete **Mix 2 ****
Boiled Absorption (% at 7 days)	**C642**		**5.3**	**4.7**
Permeable Voids (% at 7 days)	**C642**		**11.7**	**10.7**
Hardened Air Voids Parameters	**C457**			
Air Content (%)			**5.6**	**6.5**
Specific Surface Area (mm^2/mm^2)			**30.9**	**22.8**
Spacing Factor (μm)***			**150.0**	**180.0**

NOTES:

* *Denotes that AEA has been added into mix.*

** *Denotes 1% of MIXKOTE MIM added by mass of content.*

*** *Test result meet CAN / CSA A23. 1-M90, Clause 14.3 : Requirements for Spacing Factor, not exceeding 230 μm.*

TYPE

WATER PROOFING

ADVANTAGES

WATER RESISTANT

COMPONENT

1 PART

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PHYSICAL PROPERTIES – MIXKOTE MIM as a Waterproofing Admixture — **TABLE 3**

(Properties of Fresh Concrete Mixtures)

Hardened Property		Tested to **ASTM**	Tested to **CAN / CSA**	Plain Concrete **Mix 1 ***	Plain Concrete **Mix 2 ****
Water Demand	Kg/m^3			**153**	**143**
Slump	mm	**C143**	**A23.2-5C**	**75**	**80**
Air Content	%	**C231**	**A23.2-4C**	**6.6**	**6.2**
Plastic Density	Kg/m^3	**C138**	**A23.2-6C**	**2312**	**2328**
Initial Set	Hr;Min	**C203**	**A23.2-26C**	**5;00**	**12;30**
Final Set	Hr;Min	**C203**	**A23.2-26C**	**7;55**	**15;30**
Total Bleeding	Kg/m^2	**C232**		**0.21**	**0.48**
Bleeding Rate	$Kg/m^3/Hr$	**C232**		**0.06**	**0.044**
Ambient Temperature	°C			**14.0**	**15.0**
Mix Temperature	°C			**13.5**	**15.5**

NOTES: *Rate of Slump Loss shown was conducted at 14 + 1°C*
** Denotes that AEA has been added into the mix.*
*** Denotes 1% of MIXKOTE MIM added by mass of cement (no AEA added)*

COMPRESSIVE STRENGTH

ASTM C39 'Compressive Strength of Cylindrical Concrete Specimens'

Three **MIXKOTE MIM** treated samples and untreated concrete cubes but with addition of air-entrancing agent were tested (Refer Table 1). Compressive strength test result after 28 days indicated a significant strength increase in the samples incorporated with **MIXKOTE MIM**. The compressive strength increase is about 15% over that of the feature sample.

TYPICAL TEST RESULTS

Maximum Depth of Penetration under Water Pressure of 500 ± 50 kPa for 72 ± 2 hours (BS EN 12390-Part 8: 2009)	Untreated (without MIXKOTE MIM): 144.37 mm Treated (with MIXKOTE MIM): 131.55 mm *Note: The samples show no leakage during test*
Water Absoprtion % (BS 1881-Part 22:1983)	< 2% (G45 Concrete)
Water Vapor Transmission (ASTM E96)	12.28 $g/h.m^2$

PERMEABILITY

US Army Corps of Engineers CRD C48-73 'Permeability of Concrete' Setsco Services Pte. Ltd. Singapore

Six **MIXKOTE MIM** admix-treated and six untreated concrete samples were tested for water permeability. Pressure was gradually increased over five days and then maintained at 7 bars (224 ft water head) for 10 days. While the six untreated samples showed water leakage beginning on the fifth day and increasing throughout the test period, the **MIXKOTE MIM** samples showed no water leakage at any time during the test.

Similarly, six each of treated and untreated concrete tubes were tested for void content according to ASTM C642. The **MIXKOTE MIM** treated samples are proven to be having less vapor and water permeable voids by about 13% and 9% respectively (Refer to Table 2). However, both samples have passed the Spacing Factor for not exceeding 230 µm according to ASTM C457. Even though the treated samples have more air content and higher Spacing Factor; thus less Surface Area, they are less permeable to vapor and water molecules which is solely due to the formation of **MIXKOTE MIM** crystals along the capillaries in the concrete.

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MIXKOTE MIM must be added to the concrete at the time of batching. The sequence of procedures for addition will vary according to the type of batch plant operation and equipment.

1. Prior to concrete being batched, add **MIXKOTE MIM** to the drum of the ready-mix truck. After batching, mix the materials for 2-3 minutes to ensure the admixture is distributed evenly throughout the batch. A minimum of 10 minutes must elapse before discharging the concrete. A further 1 minute of mixing at high speed prior to discharging is recommended.
   Mix **MIXKOTE MIM** with water to form a very thin slurry (eg: 7kg of powder mixed with 13 litres of water).
2. Pour the required amount of materials into the drum of the ready-mix truck. The aggregate, cement and water should be batched and mixed in the plant in accordance with standard practices (taking into account the quantity of water that has already been placed in the ready-mix truck).
   Pour the concrete into the truck and mix for at least 5 minutes to ensure even distribution of the **MIXKOTE MIM** throughout the concrete.
   For further information regarding the proper use of **MIXKOTE MIM**, please consult with a CHEMIND Technical Representative.

TRIAL MIXES
The concrete producer with CHEMIND presence shall test a trial mix of concrete(s) containing **MIXKOTE MIM**, to satisfy the Engineer that the enhanced concrete conforms to strength, water : cement ratio, slump and other performance requirements (when specified). After satisfactory completion and approval of the trial mixes, compliance of the concrete with the mix description, slump and other requirements shall be responsibility of the Main Contractor.

The Engineer reserves the right to require the concrete as placed and cured in the actual structure, to conform with the 28 Days requirement for the concrete to achieve full compressive strength. If additional tests such as water absorption, water penetration, etc. is required, the Contractor shall provide costings for absorption testing by an approved Laboratory.

SETTING TIME AND STRENGTH
The setting time of concrete is affected by the chemical and physical composition of ingredients, temperature of the concrete and climatic condition. Extension of set time may occur when using **MIXKOTE MIM** (Refer to Table 3).
The amount of extended set will depend upon the concrete mix design and dosage rate of the admixture.
Concrete containing **MIXKOTE MIM** may develop higher ultimate strengths than plain concrete.
Trial mixes should be carried out under project condition to determine the setting time and strength of the concrete (Refer to Table 1).

LIMITATIONS
When incorporation of **MIXKOTE MIM** is added, the temperature of the concrete mix shall not be placed with air temperature below 4°C or above 35°C without the approval of the Engineer and suitable modification of admixture dosage according to CHEMIND recommendations.

DOSAGE
Concrete mix designs depend on local requirements and/or local standards for watertight concrete systems. Premix concrete suppliers must be able to ensure continuity supply to avoid cold joints, etc.

MIXKOTE MIM is normally added at 1% by mass of cement or maximum of 5kg/m^3 of concrete. Consult with the Technical Department of CHEMIND in determining the appropriate dosage. Site trial mixes are always recommended to evaluate and confirm actual water reduction and consistence class.

PACKAGING
MIXKOTE MIM is available in either 25kg bags or 25kg pails. Customizable packaging is available for large projects.

STORAGE
MIXKOTE MIM must be stored at dry and cool place with a minimum temperature of 10°C.
Shelf-life is one year when stored under proper conditions.

SCOPE OF REGISTRATION AND STANDARDS
Manufacture of Waterproofing materials. Compliance with ASTM technical standards and AS 3740 - 2004 Australia Standard. SIRIM certification is available for selected products upon request, subject to applicable testing and certification requirements.

Made In Malaysia

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