WATERPROOFING SYSTEM



PERMATECH

The Waterproofing Company

Over **50 Years** of Experience in Chemical Construction

Best Quality **German** Engineering

IPA BAUCHEMISCHE PRODUKTE GMBH

Bauchemie mit persönlicher Note

IPANEX ADMIX

Liquid Crystalline Waterproofing Concrete Admix

IPANEX - Intergral Watertight Concrete

IPANEX is a chloride free, water based inorganic complex alkaline earth silicate. It reacts chemically with portland cement to densify the paste content of portland cement concrete, reducing the permeability and ingress of chlorides from deicing chemicals, sea water and salt spray as determined by test methods AASHTO T 259 and T 260. The addition of this admixture enhances workability, physical properties, watertightness (CRD C 48) and has little effect on set time (ASTM C 403).

This admixture has been used in combination with other admixtures (ASTM C 494), fly ash (ASTM C 618), silica fume (ASTM C 1240), ground granulated blast-furnace slag (ASTM C 989), Type K Cement (ASTM C 878), and air-entraining admixtures (ASTM C 260). Dosage of 0.9 Ltrs per 100 kg of cement (ASTM C 150) are normally specified. Ipanex can be added at the batch plant or jobsite.

From the scientific point of view :

IPANEX is a chloride-free water-based inorganic complex alkaline earth silicate that reacts chemically with portland cement to densify the matrix of portland cement concrete. This leads to a considerable lowering of the permeability of concrete, and the penetration of chloride ions into concrete is greatly reduced. This, in turn, reduces the chloride-induced corrosion of steel reinforcement in concrete structures.

The practical point of view:

Basic Uses: IPANEX is used to waterproof concrete in above- and below-grade applications, to provide concrete with greater durability in structures that are historically subject to accelerated deterioration, to provide resistance to reinforcing steel corrosion, and to replace membranes when used in conjunction with peripheral waterproofing.

How does IPANEX ADMIX work ?

When the two principal components of Portland cement - tri-calcium silicate and di-calcium silicate - react with water, they form a complex calcium silicate hydrate compound called C-S-H. This compound is effectively the "glue" in Portland cement. As C-S-H forms and grows in hydrating concrete, a network of pores forms among the hydrating cement particles - even with the C-S-H itself. Large pores and uncomplicated network channels allow water to easily enter and leave the concrete, often penetrating deep into the structure to cause corrosion.If the interconnected pores are smaller and have a very sinuous path-way, however, water can only penetrate a short distance into the structure. This property is referred to as tortuosity.

IPANEX controls the way hydrating concrete forms - uniformly redistributing the C-S-H already being formed within the concrete to produce a more homogeneous, fine-grained microstructure. The nucleation process that occurs when Ipanex is added to Portland cement concrete not only reduces the size of the pores, it also makes the path that water has to follow more difficult. This increased tortuosity minimizes water's ability to penetrate to the interior of concrete structures.

Other concrete admixtures contain organic chemicals or mineral by-products that change the chemical and physical properties of the concrete without altering the chemical composition. The only thing Ipanex adds is more C-S-H, identical to the hydration products already in Portland cement.

Packing : 20 Ltrs / 200 Ltrs / 1000 Ltrs Tote Tanks

Shelf Life : 2 Years

Dosage : 0.9 Ltrs per 100 kg Cement (1% by weight of cement)

IPANEX - ADVANTAGES

IPANEX® Modified High Performance Concrete

IPANEX® modified high performance concrete can be specified with confidence in the following applications:

> Below grade foundation walls and slabs, water parks, water storage tanks, swimming pools, reservoirs or other locations where impermeability of water under high hydrostatic pressure is critical.

> Parking garages, bridges and other structures where electrochemical corrosion of reinforcing steel and freeze thaw cycles are anticipated.

> Industrial, chemical and treatment plants – to provide optimum concrete substrate conditions for areas known to be in direct contact with aggressive chemicals -those areas where corrosion resistant coatings must be specified.

In Fresh Concrete State:

- Contains no calcium chloride (or other chlorides)
- Lower slump concrete is more easily mixed, placed, and consolidated
- Lower water/cement ratio
- Highly cohesive, eliminating voids and honeycombs
- Bleed-water is reduced, providing for earlier finishing
- Excellent workability when floating or troweling
- Easily pumped

Minimizes segregation In the Curing State

- Significantly reduces shrinkage
- Lower controlled heat of hydration

In the Hardened State:

- Higher compressive strength (slump for slump and equal air content)
- Meets the requirements of ASTM C 494, Chemical Admixtures for Concrete, Type A
- Positive effect on all physical properties
- Watertight under hydrostatic pressures up to 7 atmospheres-more than 100 psi (0.7 MPa). Forms a completely watertight mass.
- Hard durable surfaces are resistant to dusting or spalling
- Surfaces are also highly resistant to cavitation and abrasion
- Eliminates formation of condensation in the pore matrix, resulting in excellent freeze thaw resistance
- Is inorganic, thus providing anti-bacterial, fungicidal properties
- IPANEX reduces efflorescence and exhibits increased resistance to chloride ion penetration— it cannot wearoff like a coating (AASHTO T259-78)

Physical Properties (Typical)

- Compressive Strength 108% of control (ASTM C 39)
- Freeze Thaw Durability 101% of control at 300 cycles Durability factor 98 (AASHTOT161)
- Flexural Strength 102% of control (ASTM C 78)
- Length Change 26% less than control (ASTM C 157)
- Heat of Hydration 13% less than control (ASTM C 186)
- Expansion due to Alkali Silica Reaction 47% less than control (ASTM C441)
- Bond Strength Comparison 105% of control (ASTM C 234)

BENEFITS

> Track record since 1965
> Creates watertight mass
> Eliminates membrane
> Reduces alkali silica reaction
> Excellent freeze/thaw resistance
> Reduces efflorescence
> Inorganic
> Characteristics unchanged over time
> Increased resistance to chloride ion penetration
> Cannot wear off like a coating
> Cost effective
> Improved durability
> Protects reinforcing steel
> Contractor friendly

APPLICATIONS

> Parking structures
> Below-grade walls and floors
> Water and sewage treatment plants
> Underground vaults
> Tanks and pits
> Swimming pools
> Pressure mats
> Water storage tanks
> Tunnels
> Bridge structures
> Curbs and gutters
> Sidewalks
> Manholes
> Catch basins
> Highways
> Waterparks
> Monuments
> Runways and dams

Summary of Test made on IPANEX Concrete

Permeability and Chloride Ion

Penetration of IPANEX® Concrete

1. AASHTO Designation: T259-78 resistance of concrete to chloride ion penetration; AASHTO designation: T 260-78 sampling and testing for total chloride ion in concrete. These tests involve the ponding of a 3% sodium chloride solution 14 mm deep for 90 days. Samples are then taken from depths of 1.6 to 14 mm and 14 mm to 28 mm. The average concentration of chloride ion is then determined. Concentrations at these two levels are compared from slabs with and without IPANEX®.
When IPANEX® was added to concrete, chloride ion penetration was reduced by 23% at the 1.6 to 14 mm depth and 75% at 14 mm to 28mm depth for 90 days. Samples are then taken from depths of 1.6 to 14 mm depth. This test was developed to measure resistance to penetration by saltwater into concrete.

2. CRD Designation: CRD-C 48-55 (Modified) Method of Test for Water Permeability of Concrete. The test was conducted to compare the permeability of IPANEX Concrete to control concrete. 152mm diameter cylinders were cast using a six sack 28N/mm2 mix design. The tops of the concrete cylinders were exposed to a point source of blue dyed water at a pressure of 7bar for a period of 72 hours. The cylinders were then split down the middle and inspected. The procedure was repeated. The following results were obtained.

Penetration

Test No.	Control	Ipanex	Reduction
1	(50.8mm)	(12.7mm)	75%
2	(44.4mm)	(3.2mm)	93%

Average 84%

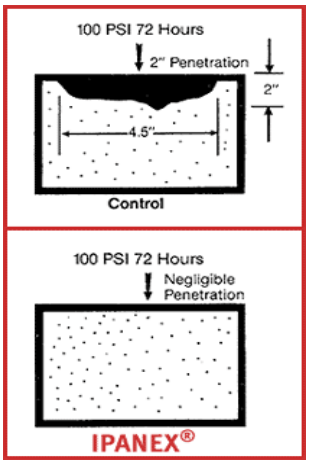
When IPANEX was added to concrete the depth of penetration by water was reduced by 84%. However, the volume of concrete penetrated by the dyed water was reduced by more than 98%.

Macrocell Corrosion Test

Ipanex Concrete compared to Microsilica Concrete

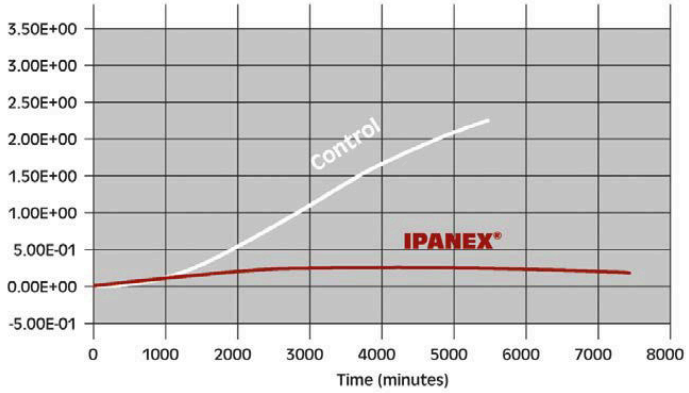
Concrete specimens with identical mix designs, using the same aggregates,cement and water are fabricated under controlled conditions. The specimens are 305mm x 305mm x 178mm thick reinforced concrete slabs. The NaCl solution is ponded on the slabs continuously for four days. After four days, the solution is vacuumed off and the slabs are rinsed and maintained at a constant temperature of 100°F for three days. This repeating cycle of ponding with salt water and air drying.

When IPANEX and microsilica concretes were compared for forty eight weeks. Neither concrete mix showed test data that exceeded established corrosion thresholds. This was supported by demolition and inspection at the end of the test. No corrosion could be determined by visual inspection.



WATER PERMEABILITY

CONTROL VS. IPANEX®



MACROCELL CORROSION TEST (SCAT)

Half Cell Potentials (Volts) ASTM C 876

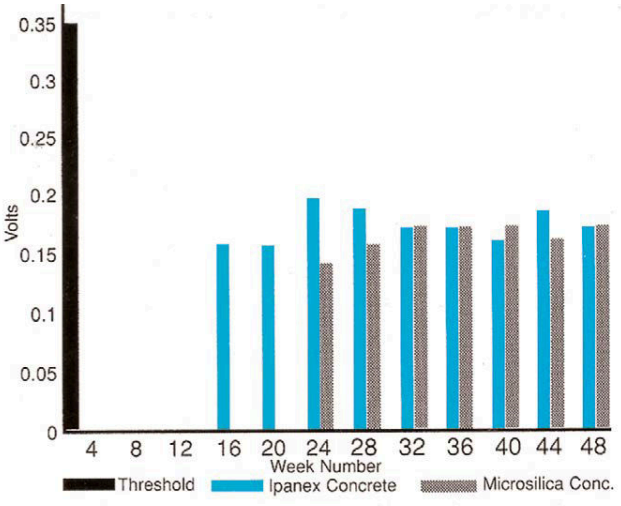


FIGURE 2

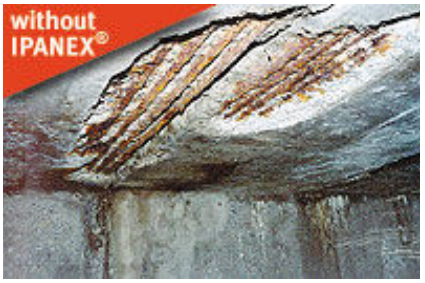
Summary of Test made on IPANEX Concrete

Permeability of plain concrete as compared to concrete containing IPANEX Admixture F'c = 4000 psi. Based on modified CRD-C 48-55 test procedure	Depth of penetration by water reduced 84%. Volume of penetration by water reduced 98%
Compressive Strength, psi, ASTM C 39	110% of control – 3, 7, 28 day tests
Flexural Strength, psi, ASTM C 78 – 3, 7, 28 day	strengths all greater than control
Length Change, ASTM C 157 –	IPANEX concrete exhibits approximately 25% less shrinkage
Bond developed with reinforcing steel, psi, ASTM C 234 –	minimum 105% of control – 28 day
Heat of Hydration, cal./g., ASTM C 186	IPANEX concrete exhibits 13% less heat of hydration
Capillary Water Intake, % –	IPANEX exhibits 48% of control at 15mm" submersion and 44% of control at 165mm" submersion
Freeze-Thaw Durability, AASHTO T161, 300 cycles –	101.2% of control
Resistance of Concrete to Chloride Ion Penetration, AASHTO T259-78/T260-78	75% greater than control
Reduction in expansion from alkali silica reaction, %, ASTM C 441 –	47% less expansion
Macrocell corrosion test (SCAT)	After 48 weeks of alternate cycles of 4 days of 15% NaCl ponding and 3 days at 100°F drying of IPANEX modified concrete, the corrosion currents, half cell potentials, and chloride ion contents were all below established corrosion thresholds. After forty-eight weeks the slabs were demolished and no corrosion of reinforcing steel was evident.
Turnpike Bridge Evaluation – Wiss, Janney, Elstner Associates, Inc., February 1991	Evaluation of Bridge Deck Slabs Incorporating IPANEX Concrete (Patpk)“





The pictures show IPANEX and Control Concrete specimen after several years of exposure to oil well brine. The control shows heavy damage, the IPANEX is still in good condition.



Pa Turnpike Bridge at Milemarker 135,2

without IPANEX -1994



Pa Turnpike Bridge at milemarker 133,4

IPANEX was used for the decks - 1994

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