IPA SYSTEMS, INC.
QUALITY PRODUCTS FOR THE CONCRETE/MASONRY INDUSTRY

IPANEX

FOR HIGH PERFORMANCE CONCRETE

A Liquid Admixture for Concrete

IPANEX – Product Data Sheet

An Admixture to Reduce the Permeability of Concrete

Description:

IPANEX is a complex alkaline earth silicate admixture that chemically reacts with portland cement to improve the physical and chemical properties of concrete in all stages of development – fresh, curing and finished concrete.

IPANEX is used to reduce the permeability of concrete in above and below grade applications, to provide concrete with greater durability in structures that are historically subject to accelerated deterioration and to provide resistance to reinforcing steel corrosion.

Typical applications include parking structures, below grade walls and floors, water and wastewater treatment plants, underground vaults, tanks and pits, swimming pools, pressure mats, water storage tanks, tunnels, bridge structures (precast and cast-in-place), curbs and gutters, sidewalks, manholes, catch basins, highways, waterparks, monuments, runways and dams.

The effects of **IPANEX** concrete admixture include:

- Permeability Reduction
  The most water soluble constituents, calcium hydroxide and calcium aluminum hydroxide (referred to as free lime) are converted into the insoluble minerals, tricalcium silicate and tricalcium-aluminum silicate. These insoluble minerals precipitate into the capillaries as very fine micro-crystals. Combined with the micro-pore structure, this results in a concrete mass which can withstand the penetration of water, even under extreme pressures.

- Increased Durability
  Large numbers of the macro-pores (found in conventional concrete) are reduced in size to micro-pores in **IPANEX** concrete. Approximately 3.8% of the cured mass of **IPANEX** concrete is occupied by these micro-pores. The micro-pores are hydrophobic and even though the system "breathes", condensation cannot form. This factor, combined with other physical properties of **IPANEX** concrete, results in a matrix that is extremely durable under the most severe conditions.

- Corrosion Resistance
  Independent field evaluations and laboratory testing show that **IPANEX** concrete protects reinforcing steel from corroding.

IPA SYSTEMS, INC.
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Advantages:

In the Fresh Concrete State –

- Contains no calcium chloride (or other chlorides)
- Lower slump concrete is more easily mixed, placed and consolidated
- 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 drying shrinkage
- Lower controlled heat of hydration

In the Hardened State –

- Higher compressive strength (slump for slump and equal air content)
- Positive effect on all physical properties
- Watertight under hydrostatic pressures up to 7 atmospheres – more than 100 psi (689.5 kPa). Forms a completely watertight mass
- Hard durable surfaces are resistant to dusting and spalling
- Surfaces are also highly resistant to cavitation and abrasion
- Eliminates formation of condensation in the pore matrix, resulting in excellent freeze-thaw resistance
- Inorganic material providing anti-bacterial and anti-fungal properties
- **IPANEX** reduces efflorescence and exhibits increased resistance to chloride ion penetration
- Cannot wear off like a coating

Packaging: 275 gallon (1041 L) tote tanks, 55 gallon (208.2 L) drums, 5 gallon (18.9 L) pails, pints (.47 L)

Shelf Life: 3 Years; Protect from freezing

Dosage: 13 oz (0.38 L) per sack of cement; 13.8 oz (0.40 L) per 100 lbs. (45.4 kg) of cement

TECHNICAL DATA

The following is a partial summary of tests made on **IPANEX** concrete:

- Permeability of conventional concrete as compared to concrete containing **IPANEX** admixture, F'c = 4,000 psi (27.6 MPa). Based on modified CRD C 48-55 test procedure. Depth of penetration by water was reduced by 84%. Volume of penetration by water reduced 98%.
- Compressive Strength, psi, ASTM C 39 – Minimum 110% of control – 3, 7, 28 day strengths all greater than control (equal air and equal slump)
- Flexural Strength, psi, ASTM C 78 – 3, 7, 28 day strengths all greater than control (equal air and equal slump)
- Length Change, ASTM C 157 – **IPANEX** concrete exhibits approximately 25 percent less shrinkage than control concrete (equal air and equal slump)
- Bond developed with reinforcing steel, psi, ASTM C 234 – minimum 105% of control, 28 day tests
- Heat of Hydration, cal./g., ASTM C 186 – **IPANEX** concrete exhibits 13% less heat of hydration
- Capillary Water Intake, % - IPANEX concrete exhibits 48% of control at ½" (12.7 mm) submersion and 44% of control at 5½" (139.7 mm) submersion
- Freeze -Thaw Durability, AASHTO T 161, 300 cycles – 101.2% of control
- Resistance of Concrete to Chloride Ion Penetration, AASHTO T 259-78/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 (37.8°C) drying of **IPANEX** modified concrete, the corrosion currents, half cell potentials, and chloride ion contents were all below established corrosion thresholds. After 48 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 Ipanex On The Durability Of Pennsylvania Turnpike Bridges*, December 1998, Paul J. Tikalsky, PHD, P.E., Barry Scheetz, PHD., John Garvey, M.S. Candidate.
- *Durability of Concrete Bridges An Investigation Into The Performance of a Permeability Reducing Admixture*, July 1999, John Garvey, MSCE, Paul J. Tikalsky, PHD., P.E., Barry Scheetz, PHD.
- "Influence of Alkaline Earth Silicate Admixture on Durability of Pennsylvania Turnpike Bridges," John J. Garvey, et al, Transportation Research Record 1668, Paper No. 99-0939

Installation:

IPANEX admixture is added to the concrete at the job site, batch plant, or pre-caster's facility.

- Check design mix to specification to confirm proper dosage of **IPANEX**
- Premix **IPANEX**. Continue mixing until a uniform consistency is achieved.
- Dispense **IPANEX** into the concrete truck or batch plant mixer at proper dosage.
- Mix **IPANEX** in the truck by spinning the barrel at maximum mixing speed for 5 minutes
- Mix **IPANEX** at batch plant in accordance with plant procedures.
- **Insure that convenience water is not added. Over addition of water will negate beneficial effects of IPANEX .**

IPANEX Specification:

Concrete shall contain **IPANEX** manufactured by IPA Systems, Incorporated, 2745 North Amber Street, Philadelphia, PA – 215-425-6607. **IPANEX** shall be added to the concrete at the job site, batch plant or pre-caster's facility at the rate of 13 fluid ounces (0.38 liter) per sack of cement in the concrete. If **IPANEX** is added into the concrete truck, it shall be mixed into the concrete by rotating the barrel for 5 minutes at maximum mixing speed. Concrete shall be designed, placed and cured in accordance with the latest American Concrete Institute Manual of Concrete Practice. The contractor shall submit **IPANEX** literature and job-site dispensing procedure to the engineer prior to commencement of work. **IPANEX** shall be stored and installed in accordance with manufacturer's recommendations.

Note: Normal concrete procedures, as outlined in the ACI Manual of Concrete Practice (latest edition), must also be followed.

Availability and Cost:

IPANEX is manufactured by IPA Systems Incorporated in Philadelphia, PA. For distributors in your area please contact IPA Systems, Inc.

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CAUTION – FOR INDUSTRIAL USE ONLY:
In accordance with federal regulations, do not use this product unless Material Safety Data Sheet (MSDS) is available on-site. Consult MSDS before using this product. Always use rubber gloves when using this product. Wear eye and skin protection according to MSDS instructions.

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