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Ball Consulting Ltd.

Memo

To: Rob Paterson
From: Hiram Ball
CC:
Date: 4/7/2008
Re: Use of VF-774 in GFRC and Cast Stone

Follows is Appendix L from the PCI "Recommended Practice for GFRC Architectural Panels". Also, a technical data sheet on the product showing its composition is faxed.

Forton VF-774 has been used in the GFRC and Cast Stone industry since 1981 as either an integral material to insure thorough curing for GFRC or a topical sealer in the case of Cast Stone to hold the water of hydration in the casting to insure maximum cured strengths.

It has never been tested to ASTM 494 because of the extensive research done to prove its use in GFRC and the comparative testing is not applicable.

Ball

Consulting
Ltd

Forton VF-774

Technical Data

May 8, 2007

Description

- Water based, all acrylic co-polymer emulsion formulated to comply with PCI MNL 130, Quality Control Manual, Appendix L for curing admixtures used in GFRC.
- VF-774 also has long term natural ageing data to verify that its use in GFRC composites improves aged flexural properties.
- VF-774 can be used in precast concrete to reduce absorption, maintain color uniformity, and reduce or eliminate crazing and efflorescence.
- It is also used in concrete repair products and bonding agents due to its superior adhesive properties.

Physical Data (also MNL 130 specification)

- | | |
|---|------------------------|
| ○ Solids by weight | 51% ($\pm 1\%$) |
| ○ Viscosity 23°C (Brookfield, Spindle 2/50 rpm) | 100 — 300 cps |
| ○ pH | 8 - 10 |
| ○ Density at 20°C | 1055 kg/m ³ |
| ○ T _g | 11°C |
| ○ Particle Size | .1300 - .2500 |
| ○ Grit | 0 - 50ppm |

Storage

- Forton VF-774 should be stored in a closed container, in a dry environment at storage temperatures between 5°C and :30°C.
- Storage should be enclosed, out of direct sun light and away from direct sources of heat.

Shelf Life

- With proper storage conditions the normal shelf life will typically be 9 months.

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APPENDIX L — Specification for Polymer Curing Admixture

1. Property Requirements

- 1.1 Type compound
aqueous thermoplastic copolymer dispersion
- 1.2 Type polymer
acrylic based
- 1.3 % Solids
45 to 55% by weight
- 1.4 Free monomer content
maximum 0.2% by weight in dispersion
- 1.5 Appearance
milky white, creamy, free from lumps
- 1.6 Odor
must meet OSHA and EPA requirements
- 1.7 pH
8 to 10
- 1.8 Minimum film forming temperature 45
to 54°F (7 to 12°C)
- 1.9 Average polymer particle size 150-
200 nm (Malvern autosizer)
- 1.10 Molecular weight
400,000-500,000
- 1.11 Ultraviolet resistance
good (weatherometer 500 hrs.)
- 1.12 Alkali resistance
good
Example: Test saponification of polymer film- 4
weeks in 1 mole NaOH. 11K011
hydrolysis (less than 5% at 50°C)
- 1.13 Viscosity
100-300 cps
[Brookfield, spindle 2, 100 RPM, 70°F (21°C)]
- 1.14 Freeze-thaw stability
No gelation in a minimum of 5 cycles

2. Performance Requirements

To ensure GFRC product quality, curing compounds shall be tested by an independent laboratory to demonstrate that...

...the recommended quantity of polymer curing admixture in GFRC mix with no moist curing equals flexural properties of GFRC cured 7 days moist when both are tested at 28 days.

...the long term durability of the dry cured polymer admixture modified composite, verified by aging tests, is equal to or greater than the durability of GFRC cured 7 days moist.

...unit weight of mix design incorporating polymer curing admixture is greater than 120 pcf (1930 g/m³).

...the polymer exhibits durability, ultraviolet stability and oxidation resistance and stability in a high alkaline environment.

**Taken From
Glass Fiber Reinforced Concrete Panels
PCI Fourth Edition Book.**



Engineered Polymer Solutions
5501 East Station Ave.
Los Angeles, CA 90040
Telephone: (323) 726-7272

Certificate of Analysis

Ship To: BALL CONSULTING WHSE
626 CENTRE PARK DR
DESOTO, TX 75115

Ship Date: Thursday, March 22, 2007
EPS Sales Order Number: 1530276
Customer PO Number:
Customer Product Code: VF-774

Lot Number 7250018603

EPS 2774

| Specification | Result | Minimum | Maximum |
|-----------------------|--------|---------|---------|
| % NVM (Solids) | 52.00 | 50.0 | 52.0 |
| pH | 9.18 | 8.00 | 10.00 |
| Weight per Gallon | 8.80 | 8.70 | 8.90 |
| Particle Size | 0.258 | 0.130 | 0.260 |
| Brookfield Visc (cps) | 100 | 100.0 | 300.0 |
| Grit (ppm): | 50 | | 50 |

EPS products are made with high quality raw materials by doop4 dedicated to doing it right the first time and to excellent services. This product is certified to meet all of our stringent specifications:

This product has been evaluated for clarity and cleanliness after packaging and thereby certified to meet all our quality standards:

Quality Assurance

Shipping Department

EPS/CCA

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Material Identification

| | |
|---------------------------|-------------------------|
| Product ID: | 2774 |
| Product Name ¹ | EPS 2774 |
| Product Use: | Resin product. |
| Print date | 071Dec12006 |
| Revision Date | 14/Jul/200 ¹ |

Company Identification

| | |
|-----------------------|----------------|
| EPS/CCA | |
| 1400 N. State Street | |
| Marengo, IL 60152 | |
| Manufacturer's Phone: | 1-800-601-8111 |

| | |
|---------------------------|----------------|
| 24-Hour Medical Emergency | 1-888-345-5732 |
|---------------------------|----------------|

Phone:

2. COMPOSITION / INFORMATION ON HAZARDOUS INGREDIENTS

If this section is blank there are no hazardous components per OSHA guidelines.

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure:

Inhalation
Ingestion
Skin absorption

Emergency Overview:

This section not in use

This product contains ingredients that may contribute to the following potential acute health effects:

Inhalation Effects:

None known.

Eye Contact:

None known.

Skin Contact:

None known

Acute Ingestion:

None known

Other Effects:

None known

This product contains Ingredients that may contribute to the following potential chronic health effects;

See Section 11 for toxicological information about Mutagens, Teratogens and Carcinogens.

If this section is blank, no information is available.

4. FIRST AID MEASURES

Inhalation:

If affected by inhalation, move victim to fresh air. If symptoms persist, seek medical attention.

Eye Contact:

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Contact:

In case of contact, Immediately flush skin-with plenty of soap and water for at least 15 minutes. If irritation persists get medical attention,

Ingestion:

If swallowed, contact medical personnel immediately to determine best course of action.

Medical conditions aggravated by exposure: Any respiratory or skin condition.

5. FIRE FIGHTING MEASURES

Flash point (Fahrenheit):

201° F (94° C) TCC/PM

Lower explosive limit:

Not available. %

Upper explosive limit:

Not available. %

Autoignition temperature;

Not available. ° F (° C)

Sensitivity to impact:

No.

Sensitivity to static discharge:

Sensitivity to static discharge is not expected.

Hazardous combustion

See Section 10.

products:

Unusual fire and explosion hazards: None known.

Extinguishing media:

Carbon dioxide, dry chemical, foam and/or water 'fog.

Fire fighting procedures:

Use water spray to cool nearby containers and structures exposed to fire. Firefighters should be equipped with self contained breathing apparatus and turn out gear.

6. ACCIDENTAL RELEASE MEASURES

Action to be taken if material is released or Spilled:

Ventilate area. Remove spills with inert absorbent. Avoid contact with eyes,

7. HANDLING AND STORAGE

Precautions to be taken in handling and storage:

Keep container closed when not in use. Keep from freezing. Since emptied containers may contain product residue, follow all label warnings, even after container is emptied. Do not cut, drill, grind, or weld on or near this container.

8. PERSONAL PROTECTIVE EQUIPMENT AND EXPOSURE CONTROLS

Personal Protective Equipment

Eye and face protection:

Wear safety glasses or goggles to protect against exposure.

Product ID: 2774

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Skin protection:

Usual hand protection for handling resin products. Usual clothing for handling resin products.

Respiratory protection:

If exposure cannot be controlled below applicable limits, use the appropriate NIOSH approved respirator such as an air purifying respirator with organic vapor cartridge and dust/mist filter. Consult the respirator manufacturer's literature to ensure that the respirator will provide adequate protection. Read and follow all respirator manufacturer's instructions,

Ventilation

Required for handling or applying in a confined area.

Exposure Guidelines**OSHA Permissible Exposure Limits**

(PEL's) ACGIH Threshold Limit Value

(TLV's)

If this section is blank, no information is available.

9. PHYSICAL PROPERTIES**Odor:**

Physical State:

pH:

Vapor pressure:

Vapor density (air = 1.0):

Boiling point:

Solubility in water:

Coefficient of water/oil distribution;

Density (lbs per US gallon):

Specific Gravity

Evaporation rate (butyl acetate = 1.0);

Normal for this product type.

Liquid Not determined,

24 mmHG @ 68° F (20° C)

.6

212° F(100°C)

Soluble

Not determined.

8.8

1.05

.4

10. STABILITY AND REACTIVITY**Stability**

Conditions to Avoid:

Incompatibility;

Hazardous Polymerization:

Hazardous Decomposition Products;

Stable

None known.

Avoid water-reactive materials, heat or contact with peroxides or other catalysts.

None anticipated.

Carbon monoxide and carbon dioxide.

Sensitivity to static discharge:

Sensitivity to static discharge is not expected.

11. TOXICOLOGICAL INFORMATION

Mutagens:

Teratogens:

Carcinogens:

If this section is blank, no information is available.

12. ECOLOGICAL DATA

Not available at this time.

13. DISPOSAL CONSIDERATIONS

Disposal should be made in accordance with federal, state and local regulations.

14. TRANSPORTATION INFORMATION

U.S. Department of Transportation
Proper Shipping Name, RESIN, NOT REGULATED

49 CFR Hazardous Material Regulations Parts 100,180

The supplier will apply the combustible liquid exception in 49 CFR 173.150(1), limited quantity or "does not sustain combustion" exceptions and consumer commodity rules, when authorized. Please check 49 CFR Parts 100-180 to determine if the use of these exceptions applies to your shipments when re-shipping our products.

International Air Transport Association:

Proper Shipping Name: RESIN SOLUTION

International Maritime Organization:

Proper Shipping Name: RESIN SOLUTION

15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

SARA 311/312 Hazard Class:

| | |
|------------------|----|
| Acute: | No |
| Chronic: | No |
| Flammability: | No |
| Reactivity: | No |
| Sudden Pressure: | No |

U.S. STATE REGULATIONS:

Pennsylvania Right To Know:

Additional Non-Hazardous Materials

WATER, DEIONIZED
PROPRIETARY RESIN

7732-18-5
Trade Secret

Rule 66 status of product

Not photochemically reactive.

INTERNATIONAL REGULATIONS - Chemical Inventories

TSCA Inventory:

All components of this product are in compliance with U.S. TSCA Chemical Substance Inventory Requirements.

Canaria Domestic Substances List:

All components of this product are listed on the Domestic Substances List.

16. OTHER INFORMATION

HMS Codes

| | |
|---------------|---|
| Health: | 1 |
| Flammability: | 1 |

16. OTHER INFORMATION

Reactivity: 0

PPE: X - See Section 8 for Personal Protective Equipment (PPE).

Abbreviations:

OSHA - Occupational Safety and Health Administration, IARC - International Agency for Research on Cancer, NIOSH - National Institute of Occupational Safety and Health, NTP - National Toxicology Program, ACGIH - American Conference of Governmental Industrial Hygienists, SCAQMD - South Coast Air Quality Management District, TSCA - Toxic Substances Control Act, IATA - International Air Transport Association, IMO - International Maritime Organization, DOT - Department of Transportation, NA - Not applicable, NOT ESTAB - Not established, N.A.V. - Not available, RQ - Reportable quantity, WT - Weight, MG/CU M - Milligrams per cubic meter, G/L - Grams per liter, MM - Millimeters, MPPCF - Millions of particles per cubic foot, PF M - parts per million, PPT - parts per thousand, TCC/PM - Tag closed cup / Pensky-Martens, PB - Lead, Pa - Permissible exposure level, TWA - Time Weighted Average, STEL - Short term exposure limit, C - Celsius, F Fahrenheit.

Disclaimer:

The data on this sheet represent typical values. Since application variables are a major factor in product performance, this information should serve only as a general guide. EPS/CCA assumes no obligation or liability for use of this information. NOTICE: EPS/CCA MAKES NO WARRANTIES WITH RESPECT TO THIS PRODUCT, EXPRESS OR IMPLIED. EPS/CCA DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR FREEDOM FROM PATENT INFRINGEMENT. EPS/CCA WILL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES. Your only remedy for any defect in this product is the replacement of the defective product, or a refund of its purchase price, at our option. This MSDS contains additional information required by the state of Pennsylvania.