SUPERIOR PRODUCTS
INTERNATIONAL II, INC.

OMEGA FIRE™ COATING

High Temperature Insulation

OMEGA FIRE™ COATING (formerly "SP2001F Fire Coating") is a unique blend of eight (8) different ceramic compounds chosen after ten (10) years of research investigating over 3000 compounds that combine and work together to form a heat block against extreme heat migration. Since the coating surface will come in direct contact with flame, a char enhancer was added to form a small char on the surface. When the char forms, it brings the ceramics up and into the char to allow the char to be tough and remain in place during actual fire conditions. OMEGA FIRE™ COATING is a ceramic hybrid that is unique to the industry. It is not fragile, it becomes surface hard; and because of the ceramics, it will continue to insulate against extreme heat migration during a direct or indirect fire. Whatever surface is covered with OMEGA FIRE™ COATING is able to offer extreme heat insulation through any substrate coated.

- OMEGA FIRE™ COATING has exceeded 3 hours in the ASTM E-119 structural steel fire test.
- Also, OMEGA FIRE™ COATING has exceeded 2 hours in the UL 1709 structural steel fire test.

SP2001F High Temperature Insulation/Fire Prevention and Protection Technology

Superior Products International II, Inc. has been experimenting with and developing the uses of "insulation and fire protection" ceramics for over 10 years. This category of ceramic functionality is new to the engineering field. Only in recent years has the idea of insulation been associated with this new breed of ceramics.

This is not an intumiscent coating, but instead, a pliable film that reacts to flame. In comparison, intumiscent coatings swell upon contact with fire and form a char that is extremely lightweight and fragile, leaving them susceptible to damage during a fire from strong winds, flying debris and sprinkler systems. Once the char is brushed off, the existence of fire protection is eliminated. Clean-up of all surface areas (direct and indirect exposure) is extensive from the swelled coating.

Cementious materials are very expensive to apply and have poor appearance. Some will emit toxic fumes during a fire.

Cellulose materials look like a shag rug on the surface and will be affected over time by condensation and humidity.

Unlike most fire barriers requiring 2-3 inches thickness (50-70mm), OMEGA FIRE™ COATING requires only 8 to 10 mm (350-400 mils) over wood and porous substrates, over metal 7 to 8 mm (300-350 mils) thickness to provide fire protection. The competing fire protection materials are either cementious and must be trowled on over wire mesh -

10835 W. 78th Street ● Shawnee, Kansas 66214 ● Phone: 913-962-4848; Fax: 913-962-6767

which is time-consuming in its application and inflexible in its finished state, or blown-on cellulose - which is somewhat fragile, subject to surface damage, and can absorb moisture. Intumiscent paints are applied thinly but when activated become fragile after expanding out to meet the flame. In other situations, two wallboard sheets (5/8 inch thick-14mm each) are nailed together to provide a one hour fire barrier or four wallboard sheets are required for a two hour fire barrier. This is labor-intensive, very heavy and expensive, and impractical in most major construction areas.

OMEGA FIRE™ COATING relies upon the dense combination of eight ceramic compounds to catch the heat of the flame. When flames contact the face of the coating, it begins a glazing or surface hardening that becomes tough while sealing off any pores to heat, smoke or gas passages. When the coating surface completely hardens, it forms a solid block against heat conduction. OMEGA FIRE™ COATING will set hard and hold constant for the duration of the fire.

In summary, OMEGA FIRE™ COATING is an extremely versatile, high-temperature insulation and fire-protection coating that can be used across all industrial, commercial and residential boundaries. OMEGA FIRE™ COATING can be sprayed into all angles, corners, columns, and tight areas providing a major advantage over all other materials to completely fire protect structures and facilities. The fact that OMEGA FIRE™ COATING is easy and inexpensive to apply, water-based, non-toxic, and remains flexible until used makes this coating a promising choice for those with high temperature, insulation, and fire-protection needs.

OMEGA FIRE™ COATING
Surpasses Expectations on Navy Tests

A Brief Note of Explanation:

- The test was conducted by the Navy testing groups.
- The left margin numbers show the temperature in degrees "C" - up to 1200 C.
- The line on top shows the temperature inside the furnace when the flame is turned on. As the temperature inside the furnace rises, this temperature line rises to show how hot it is inside the furnace. This heat is what is facing the coating surface.
- The numbers along the bottom of the chart shows the time (seconds) that the furnace is operating. For example, 2000 seconds divided by 60 seconds to a minute = 33 minutes. The Navy only wanted a 30 minute test run for their purposes.
- Figure 31 shows the heat coming through the coating and recording on the back of the aluminum plate that it was coated over. OMEGA FIRE™ COATING is 300 mils thick or 7.5mm dry thickness.
- Figure 32 shows the heat coming through the coating and recording on the back of the aluminum plate that it was coated over. OMEGA FIRE™ COATING is 250 mils thick or 6.2mm dry thickness.
- Figure 33 shows the heat coming through the coating and recording on the back of the aluminum plate that it was coated over. OMEGA FIRE™ COATING is 200 mils thick or 5mm dry thickness. As the thickness of OMEGA FIRE™ COATING was increased, it performed better in blocking the flame and extreme heat.

The main reason that the Navy likes OMEGA FIRE™ COATING is because it can protect aluminum from melting or bending during a fire. The Navy wants to use aluminum in ship construction because it is very much lighter in weight.

OMEGA FIRE™ COATING has performance characteristics that cannot be match by other fire protection coatings, including the following:

- OMEGA FIRE™ COATING can insulate against extreme heat before flame hits the coating. It is a insulation coating, then when fire hits it, it becomes a fire coating. Other coatings tested did not insulate until a flame hit the coating.
- After the fire, OMEGA FIRE™ COATING had half of its coating left to fight another fire or continue to insulate against extreme heat. All the other coatings charred (burned) during the fire and had nothing left to fight another fire and could not insulate against extreme heat after the initial fire was extinguished.

- OMEGA FIRE™ COATING was quickly and easily cleaned by brushing off the surface and could be quickly recoated to be back in service. The other coatings had to be completely cleaned off and reapplied from new.
- At the end of the test when the plates were laid down to show the surface of the coating, OMEGA FIRE™ COATING did not drop any of its char off the surface of the coating during the test which had air movements. The other coatings had dropped all of their char onto the floor and the metal surface that it had been covering was beginning to melt. The Navy was very pointed about the fact that they did not want to see any coating drop its protective char or body during the fire because the fire could reignite or another explosion could occur and the coating needed to be ready to take on additional duty to fight the fire. OMEGA FIRE™ COATING was the only coating capable of doing this additional duty.

The Need for Thermal Protection:

Figure 24 shows the steel specimen after this exposure for less than 8 minutes. It is clear that the specimen has undergone severe distortion and has, in turn, undergone permanent deformation via buckling. It should also be noted that although this specimen is full-scale in cross sectional dimensions and in thickness of the steel plate, it stands only 36" high and therefore is not subject to the large self-weight loads and stresses that the actual door is. The existence of the self-weight of the door will lead to even more pronounced distortions.

Figure 24.
An Unprotected Steel Specimen After 8 Minutes of Exposure.

The results show clearly that both the steel and aluminum doors require thermal protection. In fact, the results show that the steel door may well require a greater degree of protection than the aluminum door due, in part, to its thinner plate thickness. The results showed that the temperature limit of 200 degrees C is a reasonable criterion to impose form the standpoint of limiting the degradation of material properties and vis-à-vis the structural issues associated with thermal expansion.

Results Using the Superior Products, Inc. Omega Fire™ Coating:

OMEGA FIRE™ COATING was applied via a troweling process, akin to painting. Figure 29 shows a photograph of such a coating as applied and before testing. As can be seen, the coating possesses a smooth and aesthetic texture. This coating is highly adherent, tough, and impact resistant. The chars that form are adherent, dense, and possess a high degree of structural integrity. They were not observed to crack or disbond from the specimen.

In the case of the OMEGA FIRE™ COATING, various thicknesses were used, viz. 0.300", 0.250", and 0.200". The temperatures on the backside of the exposed faceplate were found to remain below 200 degrees C for the 30 minute duration of the test.

Figure 29.
Omega Fire™ Coating

Figure 30
Char Formed
Using Omega Fire™ Coating

Figure 30 shows an example of the char that formed with OMEGA FIRE™ COATING, and as noted above, the chars appear to possess a high degree of integrity. In all cases, again as noted above, the chars are dense to the touch and were never observed to flake off, or peel. On the other hand, we note that removal of the chars using a simple scraping process is readily accomplished – this is also important with respect to a re-application after a fire.

Furthermore, no special surface preparation is needed. The preparation used in the studies conducted herein consisted of simple cleaning with acetone following a light sanding using a fine abrasive paper.

The temperature vs. time histories recorded on the backside of the exposed faceplates for specimens with coatings of thicknesses of 0.300", 0.250", and 0.200" are shown in Figures 31 – 33, respectively.

As noted above, in this thickness range the peak temperatures after an exposure of 30 minutes were under 200 degrees C. From these results it appears that the minimum thickness required to ensure that the 200 degrees C limit is not exceeded is close to 0.200".

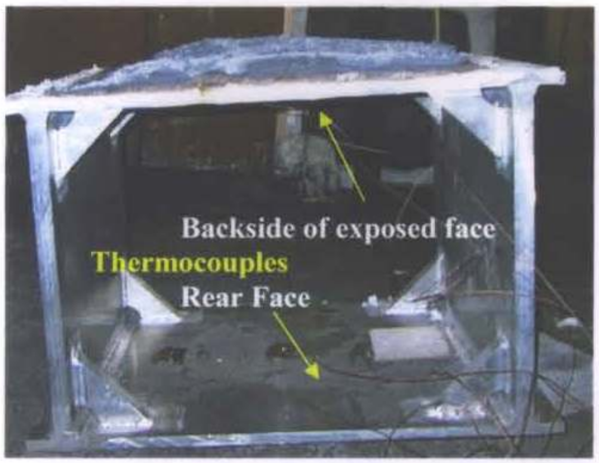


FIGURE 5. Aluminum Panel Undamaged with no warpage. Superior Products 2001F PFP Coating, Tested Using 2000°F Flame Temperature for 30 minutes. Note the lack of warpage.

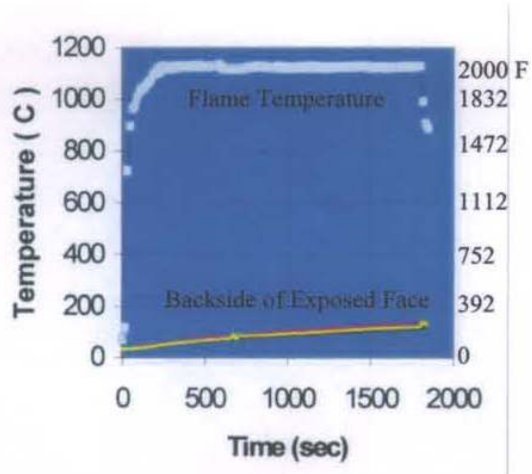


FIGURE 6. Temperature Profile for the Test Shown in Figure 5.

Coating thicknesses in the range of 0.150" to 0.200" are viable from the standpoints of both weight and long-term durability. Coatings much thicker than this range could suffer from several disadvantages including, inter alia, excess weight, a proneness to cracking or debonding, and from the formation of chars that are too thick and thus lack full structural integrity. If the temperature limit of 200 degrees C were relaxed, and the allowable peak temperature in fact increased to, say 230 degrees C, thicknesses in the range 0.100" to 0.150" would be possible.

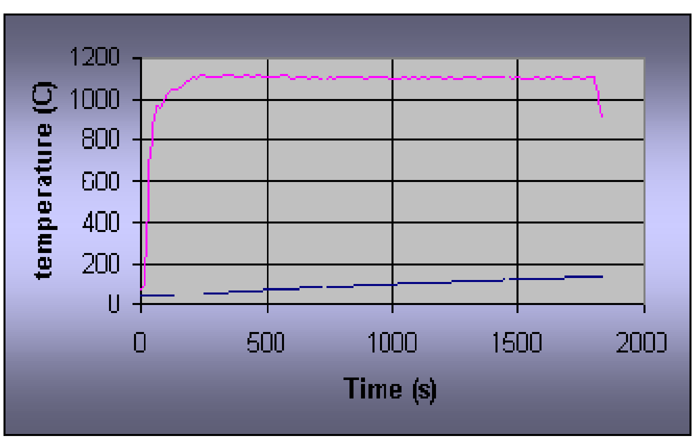


Figure 31 Temperature vs. Time for a Superior Products Coating of Thickness 0.300". Note that the upper curve is, as mentioned above, the plot of furnace temperature vs.time, illustrating the UL1709 temperature vs. time history.

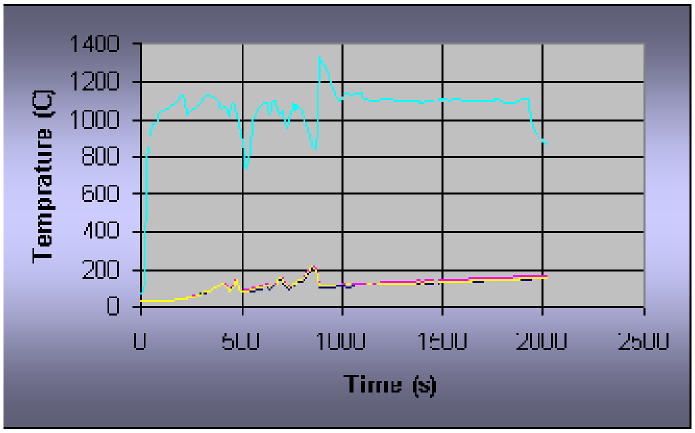


Figure 32 Temperature vs. time for a Superior Products Coating of Thickness 0.250”. The peak temperature on the backside of the exposed faceplate after a 30 minute (i.e. 1800s) exposure is still below 200 degrees C, and in fact is so up to times of 2000s.

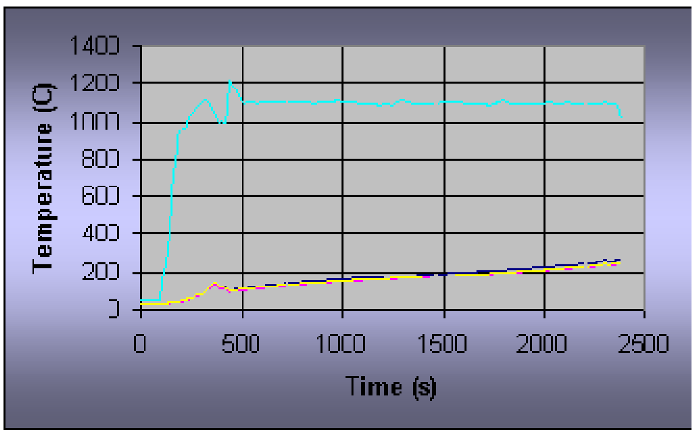
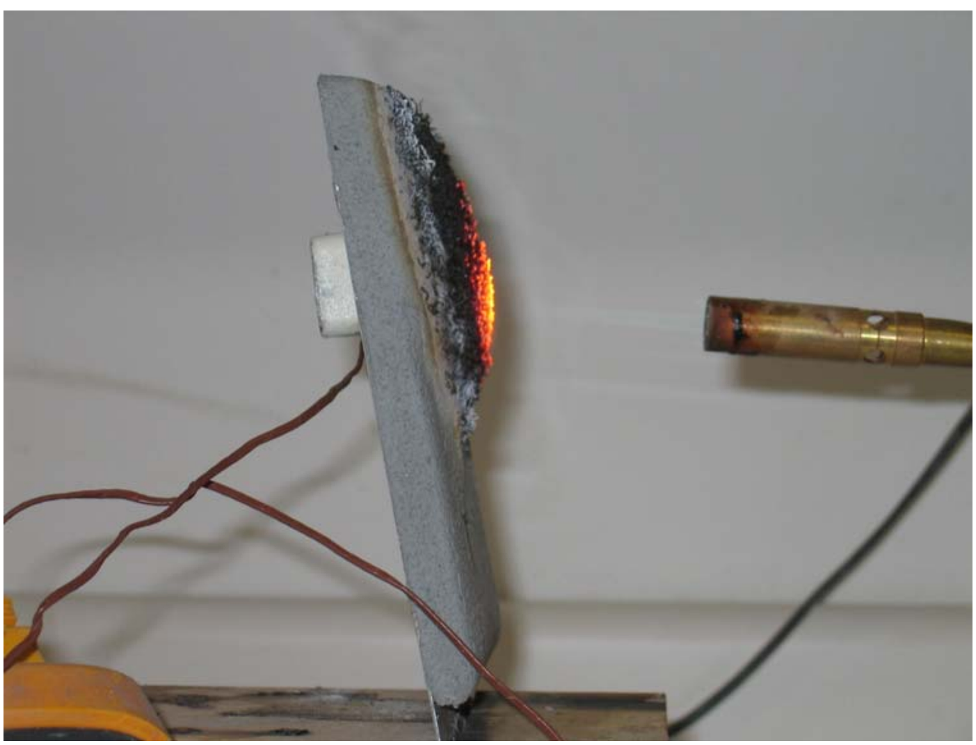


Figure 33 Temperature vs. Time for a Superior Products Coating of Thickness 0.200”. Note that after 1800s (i.e. 30 minutes) the peak temperature has risen just above 200 degrees C.

Pictures of Fire Testing of Omega Fire™ Coating




RadioShack
FLUKE
HOLD


RadioShack
START
STOP/RESET

ASTM E119 AND UL 1709 FIRE ENDURANCE SCREENING TESTING FOR SUPERIOR PRODUCTS INTERNATIONAL II, INC.
ON
SP 2001F (BATCH #121801)
AT 400, 500, AND 600 MILS
VTEC #500-124-5 THRU 10
TESTED: JANUARY 15, 2002

VTEC LABORATORIES INC.
212 Manida Street
Bronx, New York 10474
(718) 542-8248
FAX: (718) 542-8759

VTEC Laboratories Inc.

January 18, 2002

Client: Superior Products International II, Inc.
10835 W 78th Street
Shawnee, KS 66214

Attention: Mr. J.E. Pritchett

Subject: ASTM E119 and UL 1709 Fire Endurance Screening Testing of 14" x 14" x 1/4" Thick Coated Steel Plates.

SAMPLE DESCRIPTION:

The sample was identified as follows:

SP 2001F (Batch #121801) coated at 400, 500, and 600 mils on Steel Plate. Two plates at each thickness were coated, one used for ASTM E 119 testing and the other for UL 1709 testing.

The Coating was sent to VTEC Laboratories Inc. for ASTM E119 and UL 1709 Fire Endurance Screening Testing. VTEC personnel applied the coating to 14" x 14" x 1/4" thick steel plates. The coating was applied to the steel plate using a standard brush. One layer of SP 2001F was applied at 400, 500 and 600 mils and allowed to dry for three weeks under heat lamps.

212 Manida Street • Bronx, New York 10474 • (718) 542-8248 • Fax: (718) 542-8759 • www.vteclabs.com

PROCEDURE:

The furnace used for these tests measured 3ft x 3ft x 3ft. The outside construction is steel and the furnace is lined with a ceramic refractory insulation. The furnace dimensions inside the insulation are nominally 27" x 27" x 27". A single burner is centered vertically in the wall opposite the sample. This burner is rated for 1.5 million Btu/hr and is of the flat flame or non-impinging flame design. Furnace conditions are monitored by three Inconel-sheathed chromel-alumel thermocouples. These thermocouples are positioned 6" from the face of the sample. A transition piece was placed on the front of the furnace that had an opening of 12″ x 12″ were the sample was to be placed.

The sample was oriented vertically in the front opening of the furnace. The unexposed surface temperature of the sample was monitored by three, 20-gauge type K, fiberglass sheathed thermocouples. The first two tests, 500-124-5 and 500-124-6, were tested with a 1/2 inch thick layer of Kaowool over the thermocouples on the unexposed side. There were three 1" thick layers of Kaowool over the entire plate including the thermocouples on the unexposed side of the remaining samples.

The fire tests were run following the ASTM E119 and UL 1709 time-temperature curves.

The endpoint for the ASTM E119 and UL 1709 Steel Plate Test occurred when any individual thermocouple on the sample exceeded 1,000°F.

RESULTS:

Sample #500-124-5 (ASTM E 119) 400 mils

The test was conducted according to ASTM E119 specifications following the time-temperature curve. At 185 minutes the endpoint was not reached and the furnace was shut off and the test was voluntarily stopped. Post test observations showed that the coating was still intact, but separated from the steel substrate.

Sample #500-124-6 (UL 1709) 400 mils

The test was conducted according to UL 1709 specifications following the time-temperature curve. At 128 minutes 5 seconds one of the unexposed thermocouple exceeded 1,000°F meeting the endpoint of the test. At 132 minutes 45 seconds the average of the unexposed side exceeded 1,000°F.

Sample #500-124-7 (ASTM E 119) 500 mils

The test was conducted according to ASTM E119 specifications following the time-temperature curve. At 180 minutes 20 seconds one of the unexposed thermocouple exceeded 1,000°F, thus reaching the end point. At 184 minutes 5 seconds the average of the unexposed side exceeded 1,000°F. At 185 minutes the furnace was shut off and the test ended.

Sample #500-124-8 (UL 1709) 500 mils

The test was conducted according to UL 1709 specifications following the time-temperature curve. At 130 minutes 27 seconds one of the unexposed thermocouple exceeded 1,000°F meeting the endpoint of the test. At 134 minutes 52 seconds the average of the unexposed side exceeded 1,000°F. At 145 minutes the furnace was shut off and the test ended.

Sample #500-124-9 (ASTM E 119) 600 mils

The test was conducted according to ASTM E119 specifications following the time-temperature curve. At 185 minutes the furnace was shut off and the test ended without meeting the end point.

Sample #500-124-10 (UL 1709) 600 mils

The test was conducted according to UL 1709 specifications following the time-temperature curve. At 148 minutes 38 seconds one unexposed thermocouple exceeded 1,000°F meeting the endpoint of the test. At 151 minutes 15 seconds the average of the unexposed side exceeded 1,000°F. At 159 minutes the furnace was shut off and the test ended.

The time-temperature data are contained on the following pages.

Neil Schultz
Executive Director

Amirudin Rahim
Technical Director