

THE INGREDIENTS OF THERMO-SHIELD® COATINGS:

Why do the ingredients make THERMO-SHIELD® Coatings THE SUPERIOR product in the World's coatings market? What is so different about them compared to paints and other roof coatings? These are questions we are frequently being asked.

It took GENERAL INDUSTRIES CORP. of Colorado Springs, Colorado, 7 years of preparation, testing, and changes to develop their "PERFECT" roof coating, a product designed with the goal "TO CURE ALL ROOFING PROBLEMS".

GENERAL INDUSTRIES was not working alone:

- A. ROHM and HAAS, the resin supplier worked closely in developing and providing the very special resins needed to accomplish this task.**
- B. 3-M worked with GENERAL INDUSTRIES to determine what the ideal ceramic particles were to be most efficient for insulation of buildings and to best protect against solar radiant heat. These ceramics were an off-spin of the space shuttle technology. They are similar in that they are hollow ceramic micro-spheres having tremendous ability to reflect and dissipate (emittance) as well as act as nonconductors of solar heat. The ceramics we use differ because the needs of a building are different from the requirements of a space shuttle. On buildings we concentrate on solar heat, where the space shuttle is concerned mainly with heat from friction. Also, it is not practical to put ceramic tiles all over a building, so THERMO-SHIELD® was developed incorporating the bubbles in an easy to apply elastomeric coating. Different methods, but the same end result, a great insulative coating.**
- C. Much of the SPACE SHUTTLE technology was developed in the Colorado Springs Area. Some of their engineers were available for consultation to help determine how this space age information could be incorporated into building coatings to make homes and business more energy efficient.**

HOW DO THERMO-SHIELD® COATINGS DIFFER FROM COMMON PRODUCTS?

All of the ingredients are synthetic. Most other coatings use organic materials (Natural ingredients) that are broken down by nature: Thermal Shock, Extreme Heat or Cold, Chemicals, Ultra Violet Light, Ozone Decay, Blistering, Weather such as Wind, Rain, Snow, Hail, Sand Abrasion. Other coatings get hard, crack and peel, decay and turn chalky or simply decompose. THERMO-SHIELD®'S unique ingredients overcome all these

problems. The three basic components are **RESINS**, the “glue”, **FILLERS**, the “body”, and **PIGMENTS**, the “coloring”.

RESINS: We use Acrylic Elastomeric resins, which add these benefits:

- A. They remain elastic – move with any changes in the building, covering cracks and preventing new cracks from appearing. They stay elastic when very cold (Lab tests show the coatings will not crack at -37° C).**
- B. They cover the entire surface with a seamless membrane preventing water or air penetration. When applied at the recommended thickness, the roof coating will stand up to prolonged ponding of water, a property we have not seen in other elastomeric coatings.**
- C. They are very resistant to nature’s breakdown processes. Laboratory accelerated weathering tests indicate that after long exposure, our coatings actually get tougher and maintain their elasticity (Other coatings deteriorate in these tests).**
- D. When you stretch a THERMO-SHIELD® coating, it will draw back into its original shape. When a hailstone hits it, it will cause dents, but the coating will immediately spring back. The coatings are very resistant to hail, protecting the substrata from damage.**
- E. The resins are made up of very complex polymers that have the ability to hold onto huge amounts of solid particles and still have great adhesion (Normal resins lose much of their adhesion as solids are added). We add huge amounts of our ceramic micro-spheres, which want to float to the surface, but are held in suspension by the polymers. Some of our competitors claim to have similar ceramic benefits, but use solid ceramic beads instead of bubbles because they cannot keep the bubbles in suspension. The solid particles do not have the insulating benefit of the micro-spheres.**
- F. The resins give THERMO-SHIELD® its UV protection; they get tougher and more elastic with UV exposure, insuring long life.**
- G. The Roof Coat resin has a very special property that makes our roof coating unique from any other type of roofing product we have seen. It has “VARIABLE PERMEABILITY”. When conditions are wet, the polymers swell up becoming completely watertight. When conditions are dry the pores in the Roof Coat open up and trapped moisture can breathe out. This is of great importance. Other roofing products are watertight all the time. Moisture will work up through the substrata and become trapped under the waterproof material. When this heats up it turns water to vapor, expanding many times, causing blistering and destroying adhesion, or it freezes which also breaks down the adhesion, leading to roof failure.**

FILLERS: Most coatings use cheap fillers to keep the cost of their product down. Fillers like China Clay are common, organic products that, because they are developed by nature, are quite readily broken down by nature. **THERMO-SHIELD®** has ceramic micro-spheres; very similar to the ceramics used in the Space Shuttles, which are close to indestructible by the conditions faced each day by buildings.

- A. Ceramic micro-spheres are about 50% by volume in THERMO-SHIELD® coatings.**
- B. The micro-spheres help our coatings reflect about 85% of the Solar Light and dissipate (emittance) about 94% Of the infrared or “Hot” end of the light spectrum. They stop most radiant heat transfer before it ever becomes a problem.**
- C. Ceramic is one of the best non-conductors of heat; they reduce heat transfer by conduction. These micro-spheres are also hollow and vacuumed inside - the best insulator.**
- D. With ceramics you have to add a new term to your insulation vocabulary “DISSIPATION”. Other types of insulation just slow down the transfer of heat. Ceramics can “dissipate” (emittance) heat transferring it back into the atmosphere – the heat never gets into the building to become a problem (or in the case of THERMO-SHIELD® Interior coatings, the heat is not lost out of the building). A cube of ceramic material can be heated to over 1100° C and be safely picked up with bare fingers only seconds later while the cube is still glowing red-hot in the center. Ceramics make the heat dissipate quickly from the surface. Many people think a thin coat of THERMO-SHIELD® cannot provide insulation. THEY ARE VERY WRONG!**
- E. Because of the ceramics, our coatings are more resistant to dirt accumulation than other elastomerics. Dirt will wash off easily with a garden hose wash down.**
- F. The ceramic micro-spheres themselves are fireproof and can dissipate great amounts of heat. As a result, THERMO-SHIELD® coatings have a good fire resistance. In the Japanese flame tests, our coating had Zero flame retention.**

PIGMENT: **THERMO-SHIELD®** coatings make use of Titanium dioxide and Aluminum trihydrate as our white pigments. These are very stable substances that are very resistant to natural breakdown; they add to the reflectivity, to the long life and to the fire resistance of the coating. **THERMO-SHIELD®** is rated Fire Resistance Class A. Many competitive

coatings use cheap pigments that easily break down, resulting in chalkiness, short life and early fading.

In short there is no weak link in the THERMO-SHIELD® FORMULA. The ingredients combined form coatings that are:

- A. Environmentally safe – water based both liquid form and cured coatings are free of toxic materials. Lab tests show there are no harmful effects from their application.**
- B. Resistant to color fading – Japanese tests showed THERMO-SHIELD® had less fading than any other paint tested for the Japanese market.**
- C. Long life – applications more than 15 years old are still holding up well with no signs of cracking, hardening or peeling. Roofs are still watertight even where they have been exposed to long-term water ponding. What problems that have appeared have almost all been applicator errors and those have been repaired easily by additional coating on the problem area. The first Exterior wall jobs are still bright and fresh looking with no noticeable fading after 14 years.**
- D. THERMO-SHIELD® coatings are very resistant to chemicals. The Calcoast tests show the finished products were unharmed by some very harsh chemicals, including battery acid and salt-water solutions.**

These are the basic ingredients and the reasons that make THERMO-SHIELD® like no other protective coating available. Combined together with a few additives, such as thickeners, fungicides and others, they provide the end user with affordable, “PROBLEM SOLVING”, Space Age Protection.