

## MONOKOTE® Z-3306

### Thermal barrier

### Equipment and application recommendations

#### I. Site and Project Planning

- A. **Safety First:** Prior to application of Z-3306 it is important to read, understand and comply with the published MSDS and all OSHA and local regulations governing the use of Z-3306. Wear the recommended protective clothing, safety glasses and OSHA approved protective respirators.
- B. Arrange with the general contractor or owner's representative to meet and walk the site to establish the location of your pumping station.
  - a. Whenever possible, the pump station should be set up just outside the building. In warehouse applications, setting up in large doorways permits a high degree of ventilation and weather protection; bagged material should be placed close to the pump station within the building.
  - b. Establish a water source with adequate pressure available. In remote areas, a water truck may be necessary to meet material demands. In highly populated areas, local municipalities may require a settling tank before cleanout water may be dumped into public facilities.
- C. Arrange your schedule with the job superintendent and/or foam applicator. Sprayed foam must be completely cured and dimensionally stable prior to application of Z-3306 Thermal Barrier. Foam should cure a minimum of 48 hours before thermal barrier application is begun.
- D. Where the roof may be flexible all roof construction and finishing must be complete and there must be no roof traffic after Z-3306 Thermal Barrier application and until the coating has dried and full bond strength is attained. Drying time will vary according to relative humidity and temperature. With good ventilation and fan forced circulation, drying is usually complete in 7–10 days.
- E. Be firm on the necessity of having floors and wall areas uncluttered. Working around ducts, plumbing, and stacked materials such as old crates, boxes, wall-board, etc. can cut production rates in half.
- F. All surfaces to which Z-3306 is to be applied should be inspected for any foreign materials such as grease, oil, dirt, etc., which might impair adhesion. Any and all such materials must be completely removed to assure proper adhesion. Special surface preparation of new foam is usually unnecessary, but is required under the following conditions:
  - a. The application of Firebond® Concentrate bonding agent to all surfaces to receive Z-3306 is highly recommended. Firebond Concentrate bonding agent is required over all styrene foam plastic, over all horizontal urethane foam and all urethane foam where moisture may be present during the design life of the structure. Firebond can be applied with standard latex paint application equipment. Firebond Concentrate bonding agent should be applied at 500 ft<sup>2</sup>/gal and allowed to dry prior to application of the Z-3306.

- b. Foam which has been exposed to sunlight for even short periods of time is likely to have undergone destructive decomposition. The crisp decomposed layer must be scraped away and removed until a structurally sound foam substrate is exposed. After removal of all affected material Firebond Concentrate must be applied and allowed to dry prior to application of the Z-3306.
- G. Z-3306 applied with Firebond bonding agent has shown excellent adhesion to all foamed polystyrene and polyurethane foam plastic substrates tested to date. W. R. Grace & Co., however, has no control over field application or the many foam manufacturers formulas and when they might change. Whenever a previously untested or questionable foam substrate is encountered, sufficient bond tests should be run to determine if any special surface preparation is necessary. It is anticipated that this would be limited to the application of the recommended bonding agent but in some circumstances mesh and mechanical attachment may be required.
- H. Check to see if tarps will be necessary. When dry, Z-3306 is hard and bonds tenaciously to most surfaces. Aluminum should be carefully covered as it is particularly subject to staining from Portland cement based materials.
- I. Plan and provide for adequate heat and ventilation during the application, curing and drying period. Average temperatures should be kept above 50°F and should not dip below 40°F during application and until the thermal barrier is dry.
- J. Be sure to check code requirements and review the specifications to be sure that the general contractor, owner, insurance agents, etc. have the same interpretation as you, the applicator. Terms such as 15 minute finish rating, thermal barrier, fire barrier, and “approved” can be misused and should be clearly defined. Their specific definition may affect the required thermal barrier thickness.

- K. Be certain to check and plan to comply with all applicable job safety regulations. Recommendations in this manual do not supersede any regulations governing job safety.

## II. Pump, Mixer and General Application Equipment

### A. Pumps:

Many plastering pumps presently being used in applying cementitious gypsum or cement mixes, i.e., Monokote® MK-6® Fireproofing, are also capable of pumping Z-3306 Thermal Barrier. Delivery rates vary widely between pumps. Z-3306 can be pumped through small “squeeze” pumps rotor stator pumps with 2L3 through 2L6 rotor stator assemblies as well as several much larger piston pumps. The larger pumps have outputs of over 300 bags per day and can pump stiffer mixes over greater distances. Small pumps can have production rates of one-half or less of the large pumps and are restricted to shorter delivery systems. All pumps should be fitted with remote on/off controls at the nozzle. Prior to choosing a pump it is advisable to contact your local Grace Field Technical Services representative for a pump recommendation that meets your specific job needs. It is advisable to have: a full set of socket wrenches, screwdrivers, a grease gun, etc.; to handle service problems that develop during routine pump operation. Note that the Essick TM-30 (and similarly configured versions of this pump) is not suited for the application of Z-3306.

### B. Mixers

Most standard plaster mixers are capable of mixing Z-3306 Thermal Barrier. Both continuous and paddle style mixers can be used. When using a paddle mixer choose a mixer to match the production and hopper volume of your pump. Mixer volumes of 6, 9 and 12 ft<sup>3</sup> hold respectively 2 bag, 3 bag and 4 bag mixes. Mixing cycle time is 2–4 minutes per batch (see mixing instructions). A mixer’s speed should be

adjustable and the clutch should permit frequent start/stop operation. Mixer blades should scrape the sides clean. The mixer must be placed high enough above the pump hopper to empty completely when dumped. Previously mixed material must not be remixed in succeeding batches. Mixers with two sets of counter rotating blades can be used only with great caution. These systems tend to over-mix the material and cause excessively low densities. To prevent this, the mixer must be set at a low RPM (approximately 35 RPM) as to blend the material without whipping in excess air (see mixing instructions for more exact details). If a continuous mixer is to be used contact your Grace Field Technical Services representative for a recommendation and guidance specific to this equipment.

### **C. Water Measuring Devices**

The basic requirements are speed of delivery and the ability to repeatedly deliver a preset amount of water. Z-3306 requires approximately 6½ gallons of water/bag. (see Simplified Yield Chart below) To assure sufficient water pressure and volume, use a water main with reliable pressure and use a min 1 in. diameter hose (larger diameter for long distance or lower pressures). A small garden hose will not be sufficient to keep up with the demands of a moderate to high production job. The use of a water-metering device tends to increase average yield and pumping rate by providing a consistent mix at the maximum water ratio, which always hangs, and pumps satisfactorily. A wash-down hose, which permits cleaning and fine mix adjustments, should always be used in conjunction with the meter. Neptune in line water meters, timed sump pump systems, as well as quick fill flush tanks can all be used to accurately measure and dispense water for mixing Z-3306 fireproofing. Note that the old “5 gallon” bucket and water drum method is rarely used with success. As the day

goes on the operator tires and mix quality and consistency suffer. The area around the mixer soon becomes a mud hole due to spilled water; the drum overflows frequently when a forgotten hose continues to run, and water damage to surrounding material often occurs.

### **D. Conveying Equipment**

High production with minimal buildup of old material can only be assured in a clean, smooth walled, full flow system. Drag must be kept to a minimum by the elimination of all unnecessary restrictions and bends. Hose and fittings must be of a type that do not have ledges for buildup of material. All conveying equipment should be checked regularly for leaks, excess wear or deterioration. It is recommended that conveying equipment be installed in the following order: Pressure release valve on the pump manifold followed by ball valve, floor hose, tapered reducer, whip hose, shutoff ball valve, swivel, spray gun, orifice.

#### **1. Safety Release Valve**

The ball and seat should be checked and cleaned regularly. The release pressure should be adjusted according to manufacturer’s recommendations, and should be consistent with rated working pressures of other equipment in use.

#### **2. Ball Valve**

Should be a 2-inch, full flow brass or stainless ball valve permitting unrestricted flow of material from the pressure safety release, pump outlet into the floor hose fitting. This permits shutting down of the system to work on the pump without a lot of spillage, due to backflow.

#### **3. Bell Reducers**

Must be of the conical tapered type, and should have male external threads permitting sleeves and/or swivel fittings to be used. Galvanized steel is widely used without problems. Black iron plumbing fittings are unacceptable because severe material buildup often occurs and restricts material flow.

#### 4. Floor Hose

Standard plaster hoses with an appropriate pressure rating can be used to convey Z-3306. Floor hose should be the required lengths of reinforced 2 in., 1½ in., and/or 1¼ in. high-pressure plaster hose with suitable full flow fittings which present as little restriction as possible to material flow. 1¼ in. hose should not exceed 100 ft and total floor hose should not exceed 350 ft. Allowable hose length and minimum diameters will depend on the pump capacity and the desired pumping rate.

Pressure rated fittings should be compatible with rated hose pressure, and should be checked regularly for wear or damage. Use of a double female swivel, victaulic coupling or other device is recommended to aid in easily making and breaking hose junctions without twisting the entire hose. Kam-Loc Quick fits can be used when compatible with pumping pressures.

#### 5. Whip Hose

May be either 1 in. or ¾ in. diameter lightweight braided cord reinforced type. It should be well anchored to the edge of the scaffold, and fitted with double female swivels and scovil full flow fittings. Length of the whip hose should not exceed 20 feet.

#### 6. Gun & Nozzle (also refer to Simplified Yield Chart below)

Standard fireproofing and plaster spray nozzles should be used. The length of the gun may be adjusted by interchanging the aluminum pipe directly behind the nozzle. Extensions exceeding 5 feet are usually unworkable and not recommended. The nozzle should have a recessed seat in which the orifice remains centered. A 7/16 in. orifice is recommended for most applications. Orifice sizes from 7/16 in. to 9/16 in. can be used to meet specific application requirements.

An air control valve and movable air stem are absolutely essential. Air pressure should be sufficient to fan the material for an adequate pattern. Avoid extremely high air pressure (loud whistling sound), or extremely low air pressure (low buzz). For good yield, adjust the air pressure to meet the targeted densities detailed in the Simplified Yield Chart below. To achieve an even pattern, the air stem and orifice must be perfectly centered in the nozzle. The air stem is held in place with a thumb screw. It must be able to be easily adjusted during full spraying operation. The air stem should be as far back as possible, consistent with a good fanning action. Proper combination of air pressure and stem position will create a low frequency buzzing sound. A high frequency pitch indicates improper adjustment. Thorough daily cleaning and greasing is essential to keep the air stem free moving. When the system is shut off at breaks, lunch etc. material often backs down the stem causing a restricted uneven airflow. This also distorts the spray pattern. Running a wire down the stem two or three times a day prevents this buildup. The ear of the rubber cap may be connected to the head of the gun with a very loose wire; this prevents loss of the cap if blow-off occurs. Incorporation of a shut-off valve at the nozzle helps reduce waste and overspray. Nozzle clogging can also be greatly reduced or eliminated.

#### E. Scaffold

Rolling scaffold must be built in a manner that provides stability and safety to the applicator. All scaffolds must meet minimum OSHA and all applicable safety standards. It should be easy to clean and move. Tubular aluminum is ideal. Steel reduces cost and adds strength but is heavier than aluminum. As many of the following features as possible should be incorporated.

- Wheels should be 8 in.–12 in. diameter for smooth, easy movement so that spraying can continue without interruption.
- Scaffold floor should be of the open grate type; heavy-duty aluminum grating is ideal. Grating permits material to fall through the walking surface and prevents buildup of a slippery layer under foot. Plywood or planks are poor surfaces as they become slippery and inhibit smooth job operation.
- Minimum 3 in. toe guardrails should be placed around the edge of the scaffold floor to prevent the scaffold hose from slipping off the edge.
- Consistent with OSHA standards, guardrails should be placed waist high and firmly anchored. These act as a positive stop, and a sprayer doesn't have to watch the edge constantly while spraying.
- Putlogs, as long as 22-feet greatly extend the cantilevered scaffold length permitting access to large areas without moving the scaffold. Care should be taken to comply with OSHA safety practices regarding the construction and use of cantilevered scaffold.

#### **F. Communication**

Whenever the nozzle is out of sight of the pump or background noise is excessive, some type of communication is essential to coordinate pump and sprayer activity. Walkie-talkies, telephones or at least an on-off light at the pump station are valuable tools. Care should be taken if selecting a walkie-talkie because job equipment and steel construction severely interfere with some models. Variable speed controls are available on many pumps that allow the spray man to adjust pump speed from the nozzle while spraying.

### **III. Pump-Mixer Station Set-up**

The entire working and storage area should be covered and protected from weather wherever possible.

#### **A. Pump Placement**

The pump should be placed as close as possible to the building. This permits a shorter floor hose to be utilized. It is very important that the ground be high enough to permit wash water to drain away from the pump base. When weather permits, the pump set-up should be outside the building. This helps alleviate dust accumulation in the spray area.

#### **B. Mixer**

The mixer should be placed above the pump hopper. It should be high enough to permit full and complete dumping of slurry into the pump hopper.

#### **C. Working Platform**

A platform should be built directly behind the mixer so that the mixer man's waist is level with the edge of the mixer. It should be large enough to hold at least 20 bags of Z-3306 Thermal Barrier. Extending the platform around one side of the mixer permits the operator to more easily dump the mix and keep the hopper clean.

#### **D. Storage**

- 1) The storage area must be dry and completely protected from rain and/or construction water. It must be high enough to prevent any contact with water on the floor. Storage inside a building is recommended.
- 2) Pallets make excellent storage bases. When storing on unprotected ground, a layer of plastic should be placed under pallets and also over the stacked Z-3306 Thermal Barrier bags. This prevents ground moisture from damaging the lowest level of bags. The storage area should be immediately adjacent to the working platform.
- 3) Bags and/or materials exposed to water damage or containing set materials or lumps shall not be used.
- 4) Z-3306 as manufactured has a shelf life and bags are marked with an expiration date. All materials shall be used before their expiration date.

## IV. Mixing Procedure (Plaster Type Mixers Only)

It is essential to obtain a uniform mix of 38–43 pcf (650 grams per 1 liter cup) density in order to maintain a normal, full production mixing/pumping operation. The example below is for 3-bag mix. Quantities can be adjusted as required.

- 1) Set mixer speed at 30–40 RPM.
- 2) **Refer to Simplified Yield Chart below to set water.**
- 3) With blades turning, add water (approximately 6.5 U.S. gallons/bag).
- 4) Stop mixer and check to be sure mixer blades are clean.
- 5) With blades stopped, add two bags of Z-3306 Thermal Barrier.
- 6) Cut and place third bag on mixer grate.
- 7) Restart mixer and allow material in the mixer to begin to wet out.
- 8) Slowly add the third bag and mix for approximately one minute after the last bag is added (total mix time of about 1½ minutes). The mix will initially look dry and will gradually “cream out”. Continue to mix until the mix has a consistent “fat creamy” look with no remaining graininess. Do not under-mix.

- 9) Stop mixer and check the material density (target 650 grams/1 liter cup, range 610–690 grams) using a Grace Simplified Yield Kit. If not within this tolerance, restart mixer and adjust density by adding water, varying the mixing time and/or varying the speed of the blades (a longer mixing time or increased mixing speed will lower the density level). Once a mixing cycle and amount of water is determined, subsequent mixes will give similar results and this step need not be repeated.
- 10) When the pump hopper is nearly empty, restart mixer and let the mix turn for approximately 10 seconds to reblend before dumping. Dump entire batch. The mixer must empty completely when dumped to avoid leaving any old mix to be re-worked in the succeeding batch.

### Notes

1. Regularly scrape the inside walls of the pump hopper.
2. Wait until enough material has been pumped out of the hopper to allow sufficient room for the addition of an entire new batch from the mixer.
3. If the pump hopper will not take an entire batch, stop the mixer until the remaining material will fit. Restart the mixer for 2 to 3 seconds and dump the remaining material.
4. Do not let the pump suck air.
5. Simplified Yield Chart: WARNING: Do not exceed 26 bf per bag or dry density minimums may be violated!

**Target Mixer cup weight: 650 Grams per 1 liter cup**  
**Nozzle Yield Cups:**

Board feet per bag	6 gallons per bag	6.5 gallons per bag	7.0 gallons per bag
24	740	770	805
25	710	<b>740 Target</b>	770
26	680	710	740

## V. Start up and Shut Down

### A. Start Up

1. The whip hose should be detached from the floor hose at the tapered reducer and the gun detached from the whip.
2. About 2 gallons of water should be added to the mixer with the blades turning, and then dumped into the pump hopper.
3. The first Z-3306 Thermal Barrier mix should be prepared and the pump started (review and follow mixing instructions detailed in Section IV). The mix is dumped into the pump hopper when the last of the water leaves the pump hopper.
4. Pumping should continue until the water and about 3 gallons of Z-3306 has passed out of the end of the open floor hose. The whip hose may now be connected and the pump restarted. The pump is run until about 2 gallons of material have come through the other end of the whip hose. The pump is shut off and the valve on the whip quickly closed leaving a small amount of pressure in the system.
5. The nozzle is now mounted on the whip with the air stem pulled back and the air shut off at the nozzle. This leaves an unrestricted path through the orifice.
6. The valve on the whip is now opened and the “held” pressure pushes material through the orifice. If a blockage occurs at the orifice, the valve is re-closed and the rubber cap is removed and cleaned. When free flow is accomplished the pump is restarted, the air is turned on and the air stem is adjusted to give an acceptable pattern.
7. Air pressure should be adjusted to give a nozzle cup weight of approximately 740 grams.
8. Shutting the air off whenever there is a break in spraying will help prevent nozzle clogging during restarts.

### B. Shut Down Procedure

Thorough washing and flushing is necessary to prevent material from setting and accumulating in elbows and at unions.

1. After the last mix for the day has cleared the hopper, the pump should be slowed and large amounts of water pumped through the system. A sponge can also be pumped through the line.

2. At least 2 minutes of clear water should pass through the nozzle before the pump is shut off.
3. When clear water is attained at the nozzle the pump can be shut down and the hoses disconnected and drained. Note that when disconnecting the hoses at the pump the valve must be closed and the pressure relieved before disconnecting the hose. The valve can then be used to control the back flow of water to prevent whipping of the hose as water is drained from the open end of the hose.

## VI. General Application Guidelines

### A. Spraying (refer to Simplified Yield Chart above for proper material target weights)

#### 1. Hangability

After spraying has started, the amount of water should be adjusted so that the product will hang  $\frac{1}{2}$  in. to  $\frac{3}{4}$  in. in one pass. This will allow for the unevenness of the foam when the thermal barrier may be applied a little thick in some grooves and pockets. Hangability in excess of 1 in. indicates the product is too dry. This condition will result in elevated back pressures, high pump wear and low yield. If the product is too wet and some sliding occurs, do not try to patch with overspray until the surrounding material has begun to set (usually about 4 hours). Attempts at patching while the material is fresh usually results in further slides.

#### 2. Multiple pass application

Where multiple coats are required allow the first pass to fully set prior to application of subsequent passes. The first pass must not be allowed to dry out prior to application of the second pass. Where the first pass has dried it should be thoroughly rewet prior to application of the second pass. On horizontal surfaces such as the underside of floors or roof assemblies, where the first pass has dried prior to application of a second pass, it is recommended that Firebond Concentrate be applied at a rate of 500 ft<sup>2</sup>/gal and allowed to dry (followed by rewetting) prior to application of subsequent passes.

### 3. Natural Texture

The texture of the sprayed product can be varied by adjusting the air pressure and orifice size. High air pressure and small orifices ( $\frac{7}{16}$  in.) will atomize the product into a fine lightly textured surface. This will increase the product density and create a slightly harder surface. Larger orifices ( $\frac{1}{2}$  in.– $\frac{9}{16}$  in.) create a coarser texture and more uneven surface.

After the material is just begins to partially set, a paint roller can be used to knock down the texture creating a surface which is slightly smoother than the natural sprayed texture.

### 4. Troweling and Painting

When a troweled surface is desired, it is advisable to use a two-coat application. The material is mixed in the normal manner and then spray applied to the surface of the foamed plastic. A thin (min  $\frac{3}{8}$  in.) initial coat is sprayed and let set at least 5 hours. If left overnight, ventilation and heat must be controlled so that the coating does not dry out before being oversprayed. This set layer provides a key to prevent sliding when troweling the second finish coat. The second coat must be sprayed over the first in the usual manner. Troweling material directly from the mixer will result in a soft, more easily damaged surface and may violate minimum dry density requirements. After spraying, the surface texture may be knocked down and rough troweled with a large cement-finishing trowel or float.

- 1) After the material is completely dry the troweled surface may be spray painted with any Portland cement compatible paint. Latexes are ideal as they continue to breathe after they are in place. Painting greatly retards the drying rate and should be delayed until the product is completely dry—usually 10–14 days with good circulation, ventilation and relative humidity below 75%.

### 5. Bonding Agent

- 1) Grace recommends that Firebond Concentrate bonding agent be applied as a primer to all surfaces to which Z-3306 is to be applied. Firebond Concentrate bonding agent is recommended on all substrates but specifically required as a prime coat on all styrene foams and also on urethane surfaces in horizontal orientations (ceilings) or in high humidity conditions where surface condensation may occur. The bonding agent should be applied as a paint as to completely cover the surface of the foam at a nominal coverage rate of 500 ft<sup>2</sup>/gal.
- 2) The bonding agent should be allowed to dry prior to being oversprayed with the Z-3306 Thermal Barrier. Bonding agent is most effective when freshly dry and should not be left exposed for extended periods of time (days). Only the specific bonding agents recommended by W. R. Grace & Co. for use with Z-3306 Thermal Barrier may be used.

For more information, please contact your local Grace representative.

[www.graceconstruction.com](http://www.graceconstruction.com)

Assistance call toll free at 866-333-3SBM (3726)

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