

# ARCOR® International

a Division of AEC Corp.

## **General Application Specification For Epoxy Coating**

### **Contents**

Section I	Scope
Section II	General Information
Section III	Surface Preparation
Section IV	Application
Section V	N/A
Section VI	Inspection
Section VII	Repairing Imperfections
Section VIII	Cure

## SECTION I

### •SCOPE

1.1 ARCOR® / VICOR® coatings are high performance polymers designed for surface protection in severe corrosive/erosive environments. They have outstanding high temperature immersion properties, good thermal shock and aging characteristics. When applied to a metallic or nonmetallic surface, they act as a complete barrier against corrosive chemical attack, fluid particulate flow, low and high pH fluctuations and temperature extremes.

1.2 A schedule for preparation and application should be devised to insure the surface is prepared to the correct standards, then the appropriate ARCOR® / VICOR® system applied before contamination or rust bloom occurs.

1.3 Appropriate personnel protective equipment should be utilized during blasting of substrate containing potentially hazardous material such as lead.

1.4 Although ARCOR® / VICOR® coatings do not contain solvent, adequate ventilation should be provided for the work area. NIOSH respirator is recommended as a precaution.

1.5 Application personnel should wear protective clothing - eye shields, gloves and head garments to protect them for accidental spillage and excessive skin contact.

1.6 Facilities should be provided to allow application personnel to wash with warm soap and water to remove material BEFORE it cures.

1.7 Adequate lighting devices should be installed for all stages of preparation, application and inspection.

1.8 If any staging or other structures are erected to facilitate application, they should be inspected for safety prior to and during their use.

1.9 Contractors/applicators should be familiar with the methods of surface preparation and quality control recommended herein, and/or be familiar with comparable information provided in SSPC, NACE or ASTM reference material.

1.10 Prior to mixing and/or applying material, the contractor/applicator should have read and understood this Specification for Application and the appropriate ARCOR® / VICOR® technical data sheets, application sheets and material safety data sheets.

## SECTION II

### • GENERAL INFORMATION

2.1 Instruction sheets briefly outlining the use of this product are provided in every case/unit of material.

### 2.2 HANDLING AND STORAGE

2.2.1 Always keep material in original sealed containers until just prior to use.

2.2.2 Store away from direct sunlight or flames. Although this material is NOT flammable, it IS combustible. Storage temperatures should be maintained between 55°F (13°C) and 95°F (35°C). Storage temperatures should be monitored and recorded.

2.2.3 Always keep material in a dry, clean environment. To prevent accidental contamination by spent abrasive or debris; this product should be kept away from the work area until a clean up has been accomplished after surface preparation. If accidental settling occurs, remove dust and debris from lids prior to opening.

2.3 Thinning and Additives - never thin with solvents or use additives in this product. The addition of these ingredients could dramatically alter the cure and performance of this product.

### 2.4 EFFECTS OF TEMPERATURE

2.4.1 This product is temperature dependent. Cold temperatures (less than 55°F) will cause a significant increase in viscosity (resistance to flow). Therefore, the material should be warmed by placing the sealed canisters in a shallow pan of hot water, or gradually warmed by placing near a heat outlet until the material temperature is between 65-78°F (18-25°C). A microwave oven can be used to heat the base component material. A 1-kg base unit can be heated on high for 45 seconds. Increase or decrease time as conditions warrant. Do not use a microwave to heat the activator component.

2.4.2 If the surface is cold, less than 65°F (18°C), this material will become stiff when applied, making it difficult to evenly spread the material. Warm the surface with a portable heater. Never use kerosene, gasoline, oil or propane heaters, as they will leave a residue on the substrate, which will hinder adhesion. When heating the substrate, pay close attention to dew point calculations.

2.4.3 Hot temperatures (80°F+) will lower the viscosity. The higher the temperature the more difficult it will be to apply normal thickness (15-30 mils) on vertical and overhead areas. In such situations, a second or even third coat may be required to obtain desired film thickness.

2.4.4 Ideal temperature conditions for the ARCOR®/VICOR® product, metal surface and ambient environment are 65°-78°F (18°-25°C).

2.4.5 Cure of the product is also effected by temperature. Lower temperature will increase the time required to cure. Higher temperature will decrease the cure time. This characteristic also effects pot-life or working time. Consult material data sheets for pot life and cure schedules.

\* Dispensing this material into shallow pans immediately after mixing can extend Pot-life or working time.

## SECTION III

### • SURFACE PREPARATION

**NOTE:** The importance of proper surface preparation should never be understated. If applied over an inadequately prepared surface, the optimum performance properties of this ARCOR material will not be achieved. Laboratory studies convincingly illustrate that adhesion, heat resistance, thermal shock, impact resistance and film integrity are all reduced in direct correlation to the inferiority of the surface preparation.

3.1 Remove grease, lubricants and oils. Use a non-polar solvent, Acetone or MEK, which will not leave a film (Isopropyl alcohol can be used in areas with solvent use restrictions. Be aware that larger volumes will be required and greater effort applied.). Scrub with wire wheel or brush. If solvents are used to degrease the surface, rinse generously with additional solvent after scrubbing.

**QC HOLD POINT:** Document surface cleanliness on ARCOR® QC Inspection Report

3.2 Remove sharp edges and imperfections on the surface (e.g. weld splatter). Grind sharp edges to a minimum radius of 1/8" (approx.). Remove or grind down weld splatter until no sharp or abrupt edges exist. Holes and pits should be filled with a VICOR® rebuilding compound before coating the surface.

3.3 The air used for grit blasting must be free from contaminants, such as oil and water. The air supply should be equipped with oil and water filters. Test purity of air by passing the air through a clean white cloth for one minute at the beginning of each work period.

**QC HOLD POINT:** Document blast air cleanliness on ARCOR® QC Inspection Report

3.4 Grit used for blasting and/or abrading must also be free from contaminants especially chlorides. Verify cleanliness by placing a one pound representative sample in a 5-gallon bucket of CLEAN water. No oil slick or other form of contamination, except for grit dust, should be visible on the water surface. Chloride level can be tested with a Surface Contamination Analysis Test Kit (SCAT). Copper slag, Coal Slag (Black Beauty) or Aluminum Oxide abrasives may be used to attain the desired level of cleanliness and surface profile, subject to specific project requirements and limitations. It may be acceptable to recycle the blast abrasive, taking care to replenish with new material every two cycles. Use a fine mesh screen to filter out debris. For best results, limit recycles based on type of material used.

**QC HOLD POINT:** Document abrasive cleanliness on ARCOR® QC Inspection Report

3.5 Nozzle pressure should be 100-psi  $\pm$  5 psi. Therefore, a typical system would be:

- \* Compressor size - 375 cfm or greater
- \* Compressor to pot hose size - 2-3" ID
- \* Pot to nozzle size - 1 1/2-2" ID
- \* Nozzle size - #5 or #6

3.6 Surface temperature must be maintained at a minimum of 5°F (3°C) above dew point during surface preparation and application of ARCOR®/VICOR® materials.

**QC HOLD POINT:** Document surface temperature on ARCOR® QC Inspection Report

**QC HOLD POINT:** Document dew point on ARCOR® QC Inspection Report

3.7 Employ a dehumidification system during the blasting and application stages. In general, epoxies perform more predictably, and better overall results are achieved, when the relative humidity is less than 60%. The possibility of rust blooms is also reduced when relative humidity is less than 60%. Use of a minimum 1,500-CFM desiccant-type dehumidifier should maintain relative humidities at 40% or less.

**QC HOLD POINT:** Document relative humidity on ARCOR® QC Inspection Report

3.8 Abrasive blast the entire surface to attain a scale free, oxide free, metal finish with a minimum anchor profile of 3-5 mils and SSPC rating in accordance with the Product Data Sheet. Surface profile should be taken with Testex 'X Course' Press-O-Film tape. Measurement of Tape profile is done with Testex Dial Thickness Gage.

**QC HOLD POINT:** Document surface profile on ARCOR® QC Inspection Report

3.9 Surface chloride contamination can drastically reduce the life of a coating. Therefore, it is necessary to test freshly blasted surfaces for chlorides and ferrous ions (Fe) using a SCAT kit (see 3.5). Chloride levels should be less than 50 PPM and Fe should be less than 10 PPM. If higher levels are found wet the entire contaminated substrate with deionized or demineralized water to leach out the contaminants. Allow a minimum of 12 hours leach time. Re-blast the area and test again. If after two washes the desired contamination levels are not attained, contact an ARCOR®/VICOR® technical representative.

**QC HOLD POINT** Document SCAT results on ARCOR® QC Inspection Report

## SECTION IV

### • IV.a. Weld Stripe/Rebuilding & Primer Application

4.1 The ARCOR®/VICOR® material should be applied as soon as possible after the surface has been prepared. Continuous use of Dehumidification to maintain less than 40% RH will minimize potential oxidation of the substrate and should allow adequate time (approximately 12 hours) for application of the prime coat. If 12 hours is exceeded or if Dehumidification is not maintained at less than 40% RH for the entire period or if oxidation is visible as exhibited by a change in color of the substrate, the entire surface should be re-blasted to clean off the oxidation layer. This cleaning blast will be less aggressive than the original blast since profile has already been attained.

**QC HOLD POINT** Document relative humidity on ARCOR® QC Inspection Report

4.2 If the surface becomes contaminated with oil, grease or lubricant after blasting, wash thoroughly with non-polar solvent. (See Section 3.1)

4.3 Be sure area is completely free from dust and spent abrasive. After removing spent abrasive, allow particles to settle, then blow down the surface with high pressure, clean and dry air. Next vacuum the entire surface using a brush attachment to insure all surface dust is removed. The surface may then be solvent washed with a non-polar solvent (MEK, Acetone) and allowed too completely dry. Solvent wash is not required.

**QC HOLD POINT:** Document surface cleanliness on ARCOR® QC Inspection Report

4.4 ARCOR® recommends the application of ARCOR® S-30 Prime as the first or prime coat. This product is specially formulated to flow into the pores of the blast cleaned metal to effectively seal the metal from the service environment and provide a good chemical bond to the chosen ARCOR®/VICOR® topcoat. For ferrous substrates, the addition of zinc phosphate allows the S-30 Primer to resist corrosion undercutting when the coating integrity has been breached.

**QC HOLD POINT** Document material batch # on ARCOR® QC Inspection Report

4.5 The ARCOR®/VICOR® coatings are two-component epoxies. They are packaged in two canisters (Part A & Part B) containing the proper mix ratio. Add the entire contents of Part B canister into the entire contents of Part A canister. Consult the appropriate data sheets for mix ratios by volume and weight. For plural component spray application, insure that ratio settings directly correspond to the volume ratio of the material being applied.

4.6 Ambient and surface temperature should be at least 55°F. Although the ARCOR®/VICOR® products will cure down to 36°F, application will be extremely

difficult below 55°F and curing will be very slow (See Section 2.4.2). Surface temperature must be maintained at a minimum of 5°F (3°C) above dew point during surface preparation and application of ARCOR®/VICOR® materials.

**QC HOLD POINT** Document surface temperature on ARCOR® QC Inspection Report

**QC HOLD POINT** Document dew point on ARCOR® QC Inspection Report

4.7 MIX COMPLETELY! Scrape side and bottom of mixing canister with wooden mixing stick provided with each system. Streaks indicate the material is not thoroughly blended and further mixing is required. Mixing time is normally five minutes. A portable pneumatic or electric hand-held mixer may also be used. A “Jiffy-Mix” blade is recommended. Avoid hitting sides and bottom of canister with blade. This may introduce chips from the container into the coating. After mixing in original container material should be ‘boxed’ into a clean container and mixed again for at least one minute.

**QC HOLD POINT** Document mix results on ARCOR® QC Inspection Report

4.8 Consult Product Data Sheets for pot-life or working-time. Dispense into smaller containers or paint trays to extend working life. Higher temperatures will shorten the pot-life; lower temperatures will extend pot-life (See Section 2.5).

**QC HOLD POINT** Document material applied within pot-life on ARCOR® QC Inspection Report.

4.9 As appropriate, apply S-30 Prime to all weld areas, edges, seams, joints and structural changes in the surface, by brush or roller. Allow to set until dry to touch. Stripe over the S-30 Prime with EE-92 using plastic squeegee applicator. Smooth material into surrounding substrate leaving no elevated edges or uneven spots. Do not apply beyond area coated with S-30 Prime. Insure no skips, pinholes or voids occur in the coating.

4.10 Allow stripe coat to cure until dry to touch. Apply S-30 Prime over entire surface with brush roller or sprayer. Wet mil thickness should be a minimum of 20 mils. Monitor film thickness with a wet-film thickness gauge. Check every 10 square feet on open areas and every 5 square feet near seams and structural changes in the surface. All ARCOR®/VICOR® coatings are “solvent free.” This means wet film thickness will be the same as cured film thickness. Consult ARCOR® ‘Procedures For Spray Coating Application.

**QC HOLD POINT** Document wet-film on ARCOR® QC Inspection Report

## • IV.b. OVERCOATING

4.11 Apply second coat before first coat is fully cured. Since temperature and humidity effect cure rate, the amount of time required between coats will vary. A sound bond will be accomplished between coats if the guidelines in the Product Data Sheets are met. The ‘fingernail’ test is commonly used to determine whether the material is still within the overcoat window. Press your fingernail into the coating. If an imprint is easily made then the material is still within the overcoat window. If an imprint cannot be made, or can be made only with more than moderate effort, it can be assumed the overcoat window has passed and the material must be brush-blasted.

### **QC HOLD POINT** Document overcoat window on ARCOR® QC Inspection Report

4.12 Should it be required to overcoat past the specified time guidelines, the first coat must be brush-blasted to provide a good bonding surface. It is not necessary to allow additional cure before brush blasting can begin. A brush-blast should remove all material gloss and provide a profile of 3-5 mils. If the recommended overcoat time is exceeded by no more than 2 hours at 78°F, brush blasting may not be required. Although not generally recommended, the coating may be wiped down with MEK (or similar Ketone solvent) to remove the high gloss and provide good intercoat adhesion (Follow cleanliness standards outlined in Sections 4.2 and 4.3). The solvent wash method should not be used unless recommended by an ARCOR™ representative for a specific circumstance.

For ARCOR® S-30 Prime, S-30, EE-95, ARCTHANE the recommended overcoat schedule is as follows;

- 55°F 10-12 hours @ <60% RH;
- 65°F 8-12 hours @ <60% RH;
- 75°F 6-10 hours @ <60% RH;
- 85°F 4-10 hours @ <60% RH;
- 95°F 2-10 hours @ <60% RH.

4.13 Intercoat bonding is accomplished by a chemical reaction between adjacent layers of coating which results in a monolithic coating. Maximum adhesion is attained when the LEAST amount of time passes between coats. Hence, adhesion decreases as more time elapses between coats.

4.14 In general, overcoating should be accomplished as soon as the previous coat ‘tacks up’, when it is no longer ‘wet’ to touch. Normally between 78°F and 88°F the product will tack up in 2 to 4 hours. The next layer should be installed as soon as possible, but within 10 hours, at these higher temperatures, for best performance. The level of ‘tack-up’ depends on the application method being used. By roller, squeegee or brush ‘tack-up’ must be firmer than if spray application is used. For roller or squeegee a horizontal shear is applied which could disturb the prior coat if it is not sufficiently tacked-up. Use the thumb twist to determine if roller or squeegee can be safely applied. Put thumbprint onto coated surface and push and twist thumb with modest

pressure into coating. If coating is compressed wait one hour and try again. When no compression is observed, coating may proceed.

**QC HOLD POINT** Document ‘tack-up’ on ARCOR® QC Inspection Report

4.15 Cure time increases sharply as temperature decreases. It is important to remember that it is the temperature of the substrate that will determine the coating temperature, hence cure rate. At cooler temperatures it may be necessary to add heat to accelerate the cure to comply with scheduling requirements. Between coats do not use kerosene, gasoline or any other petroleum based heat source as they may deposit a film of residue on the substrate or coating which will hinder adhesion or intercoat bonding. Electric heat sources are recommended. Once all coating layers are applied it is acceptable to use a petroleum based heat source (e.g. a torpedo heater) to accelerate the full cure of the coating system. When using added heat be very cautious of dew point, humidity and overcoat windows.

**QC HOLD POINT** Document cure time & recoat window on ARCOR® QC Inspection Report.

4.16 Spray apply additional coats of S-30 in accordance with section 4.5-5.15 until final film thickness is attained. Consult ARCOR® ‘Procedures For Spray Coating Application.’

**QC HOLD POINT** Document wet-film thickness on ARCOR® QC Inspection Report

## SECTION VI

### •INSPECTION

6.1 Coating continuity must meet NACE Condition A, 100% pinhole free coating system.

6.2 UV-QC (if applicable). After application of S-30 Prime-UV, while still wet, the coated surface is inspected using an ultraviolet light system. All flaws and imperfections will show as a dark spot. All spots are touched-up with a brush or squeegee using fresh material.

After application of a coat of S-30, while still wet, the coated surface is again inspected using an ultraviolet light system. All flaws and imperfections will show as a light, luminescent spot. All spots are touched-up with a brush or squeegee using fresh material.

**QC HOLD POINT** Document coating continuity on ARCOR® QC Inspection Report

6.3 The final coating should be allowed to cure a minimum of 12 hours prior to DFT (dry-film thickness) measurements.

6.4 Coating thickness should be verified with a dry-film thickness gauge. Measurements should be made every 10 square feet on open areas and every 5 square feet around structural changes in the surface. If readings less than the specified mil thickness are observed, three additional readings over the 10 (or 5) square foot area should be taken. If three of the four readings are less than the minimum specified mil thickness, the area should be identified with a chalk or marker for repair. If less than three measurements fall below the acceptance level, an average is taken. If the average is below the acceptance level the area is to be identified with a chalk or marker for repair.

**QC HOLD POINT** Document dry-film thickness on ARCOR® QC Inspection Report

6.5 The final coating should be allowed to cure a minimum of 24 hours prior to high-voltage spark testing.

6.6 Visually inspect coating for skips, pinholes and other film imperfections. Identify flawed areas with chalk or marker. It is preferred and recommended that holiday/pinhole detection be performed with the aid of an electronic, high voltage holiday detector using a minimum of 100 volts per mil of coating. NACE currently recommends a voltage equal to 1000V times the  $\sqrt{\text{mil}}$  thickness. Spark testing can only be done on flat surfaces at least 2" away from uncoated tube ends.

**QC HOLD POINT** Document spark test on ARCOR® QC Inspection Report

## SECTION VII

### • REPAIRING IMPERFECTIONS AND FLAWS

7.1 If an imperfection has been detected within allowable overcoating time (See Section 4.11), wipe the area with a solvent, allow to dry and simply reapply a layer of ARCOR®/VICOR® product. Be sure to press the material firmly into the surface and feather edges.

7.2 If the material has cured, the area around the imperfection must be roughened by grinding or grit blasting and solvent washed. If the surface has begun to show signs of oxidation or rust bloom, the surface must be thoroughly abraded back to clean oxide free metal. It is not necessary to wait until material has fully cured to begin abrading the material. As with the substrate, a 3 to 5 mil profile is recommended.

7.3 Should the measurements taken with the dry-film inspection gauge prove to be below film thickness specifications, all these areas should be brush-blasted (or solvent washed depending on overcoat time).

7.4 After blasting or abrading, remove dust and spent abrasive from the surface with a vacuum with brush attachment.

7.5 It is advisable, but not imperative, to wipe the abraded area with solvent, allow to dry.

7.6 Apply according to Section IV.b. Apply S-30 coating over abraded area with brush or squeegee. Feather coating into existing areas making sure not to apply coating over unabraded areas.

7.6 Inspect according to Section VI.

## SECTION VIII

### • CURE

Epoxy coatings cure by a chemical reaction, which produces its own heat (exotherm), causing the polymer to change from a liquid or paste-like state into a hard, durable surfacing material. Full cure or complete polymerization is generally accomplished in 3 days at 72°F (22°C).

8.1 Cure time, as stated in Section II, is dependent upon ambient temperature and humidity. However, the following guideline will assist in determining the extent to which the polymer has cured for exposure to certain conditions at 75°F.

<u>Condition</u>	<u>Time elapsed after application</u>
Light movement or stress	12 hours
Shipping	36 hours
Immersion or high loading	72 hours

8.2 Force curing or “baking” the polymer dramatically reduces the amount of time required before the polymer can be stressed or put into service. Between coats do not use kerosene, gasoline or any other petroleum based heat source as they may deposit a film of residue on the substrate or coating which will hinder adhesion or intercoat bonding. Electric heat sources are recommended. Once all coating layers are applied it is acceptable to use a petroleum based heat source (e.g. a torpedo heater) to accelerate the full cure of the coating system. When using added heat be very cautious of dew point, humidity and overcoat windows.

8.3 Usually heat can be applied to the polymer before it has become firm. However, care must be exercised since applying heat to the polymer before it has become firm may cause it to decrease in viscosity and slump down the surface.

8.4 The addition of heat or force curing also enhances the chemical, heat resistance and physical properties of the polymer.

8.5 For ARCOR® S-30 Prime, S-30, EE-95, ARCTHANE the recommended force-cure schedule is as follows;

- 90°F (32°C)            45 hours
- 95°F (35°C)            36 hours
- 100°F (38°C)           27 hours
- 105°F (41°C)           24 hours
- 110°F (43°C)           20 hours
- 115°F (46°C)           16 hours
- 120°F (49°C)           12 hours

8.6 After force curing, always allow the coating to cool to ambient conditions before subjecting it to high loading or service.

**-END-**