

REINFORCED PLASTICS, SAFE STORAGE AND HANDLING OF MATERIALS

MATERIALS OF CONSTRUCTION STANDARD ENGINEERING SPECIFICATION

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Page 1 of 4

1. SCOPE

This specification includes safety requirements for storage and handling of liquid polyester, vinyl ester, and epoxy resins or putties and their auxiliary materials. These are being used in increasing volume on many plants as patching compounds, for assembly of fabricated reinforced plastic equipment, for linings, etc. These materials are new to many persons and introduce new safety problems. **This is an informative specification for internal Company use and is not to be used for procurement purposes.**

2. GENERAL

2.1 Principal hazards to health are fire and explosion. Proper storage and handling, as described in this specification, will minimize these hazards. Prior to use, safety data sheets must be obtained from material manufacturers and thoroughly understood and followed for each specific material used.

2.1.1 With epoxy resins, dermatitis is encountered by about one person in four using the amine hardeners. Once a person is sensitized, amine fumes alone can reactivate and aggravate the irritation. Persons known to have amine allergic skin reactions should not be allowed to work with these materials. Extreme care in housekeeping and personal cleanliness is required with epoxy resin systems. Fire is a minor problem.

2.2 In view of the hazardous nature of some of these materials and their instability at elevated temperatures, special procedures should be established at each plant and construction site to expedite their removal from receiving areas to proper storage locations (see section 4).

2.3 CO₂ or dry powder extinguishers should be in the areas where these materials are stored and used.

2.4 Only persons fully instructed in the safety requirements of this specification shall be permitted to work with these materials. Local plant and area safety rules and regulations also shall be followed. See S2T for threshold limit values for airborne contaminants.

3. MATERIALS

3.1 General. Many resin systems are used in the reinforced plastics industry, depending upon the fabricating or molding procedure, curing temperature, and end use.

Vendors and merchandise designations are given to describe materials and may not include all acceptable products. Substitutions by suppliers are to be made only on approval of the local authority initiating the use of this specification

Only those systems commonly used on Du Pont plants are covered in this specification. They consist of polyester, vinyl ester, and epoxy resins to which catalysts or hardeners are added to cause the resin system to cure (harden) at ambient temperature. Accelerators or promoters are employed to activate the catalyst. These resin systems vary from low-viscosity fluids to stiff putties made from filled resins.

3.2 Polyester, Vinyl Ester Resin Systems

3.2.1 Polyester resins, as received, are solutions of granular resin in styrene or vinyl toluene and should be treated as low flash-point solvents. Typical trade names are: Atlac 382, Amcon 460, Brutem 130, Ceilcrete, and Homalite 445. Vinyl ester trade names are Dakakune 411, Hetron 922, and Altec 580. Other materials and properties are listed in SW43S. These resins may contain added accelerator (see 3.2.3). The catalysts are packaged separately.

3.2.2 Catalysts for polyesters are organic peroxides, such as methyl ethyl ketone peroxide (MEK peroxide), supplied as a 60 percent solution in dimethyl phthalate liquid; or benzoyl peroxide (BPO), 50 percent by weight in tricresyl phosphate paste. The peroxides are highly flammable and can burn violently even in the absence of atmospheric oxygen. Under certain conditions they will decompose with explosive violence (see 5.3.1). **Caution: Never use dry BPO powder. Dry BPO powder is sensitive to shock, heat, and ultraviolet light, and readily explodes with violent force.**

3.2.3 Accelerators, also called promoters, for polyester systems usually are cobalt naphthenate (6 percent metal), or dimethylaniline. Both of these are stable compounds and should be stored in sealed containers. The cobalt naphthenate solution is not considered to be toxic or corrosive. Dimethylaniline is extremely toxic and is absorbed readily through the skin. Protective gloves made of butyl rubber should be worn when handling this material. It should be used only in a well-ventilated area and never exposed to temperatures over 150°F. Dimethylaniline is used in quantities less than 1 cm³ and, therefore, vapor exposure is minimal. Spills must be avoided, however, since the threshold limit value of this material is 5 ppm in air.

3.3 Epoxy Resin Systems

3.3.1 Epoxy resins, as received, are liquid polymers. Volatility is low, and the fire hazard is slight. The

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resins are not considered to be irritants prior to addition of hardener. Typical trade names are: Homalite 345, Devcon, Brute 30, and Coroline. Many formulations of epoxy resins are available which contain diluents, solvents, or other materials which can be more hazardous than the "pure" epoxy resin alone. A product safety data sheet from the manufacturer shall be thoroughly studied so that proper precautions are exercised.

3.3.2 Epoxy hardeners or curing agents (sometimes erroneously called catalysts) generally are liquid aliphatic amines, such as diethylenetriamine (DETA) or triethylenetetramine (TETA). These materials are severe skin irritants capable of causing burns and dermatitis. Breathing of vapors may cause asthmatic-type responses. Severe irritation and damage can occur upon contact with the eyes. See 5.3.9 and 5.3.10 for recommendations in the event of eye or skin contact.

3.4 Reinforcements and Fillers

3.4.1 Glass-fiber materials may cause temporary skin irritations. With most workers, the irritation disappears in a few days, and no further discomfort is experienced even with continued exposure.

3.4.2 Fillers employed with some systems, and in all putties, may be silica flour, talc, clays, etc. They should be handled to avoid dust problems.

3.5 Solvents

3.5.1 For polyester systems, acetone is the recommended solvent for cleanup of equipment. **This is a flammable solvent and must be used with care to preclude the possibility of fire.** For most operations, disposable equipment and work area covers, e.g., paper sheeting should be used to minimize the necessity for solvent use.

3.5.2 For epoxy systems, dilute acetic acid (3 to 5 percent) or vinegar is recommended for cleanup. Hot soapy water can also be used in cleaning.

4. STORAGE

4.1 Resins

4.1.1 Store resins in sealed containers in a cool place (40 to 80°F), preferably under refrigerated conditions. Low-temperature storage will greatly extend the shelf life of the resins. Treat similar to low flash-point solvents.

4.1.2 Where large quantities of resin (over 15 gal) are stored or mixed, a separate room should be provided and equipped for this purpose.

4.2 Catalysts

4.2.1 Peroxide catalysts should be stored in a noncombustible storage area separate from all other materials.

4.2.2 Do not leave packages for any length of time at receiving locations. Packages should be moved to refrigerated storage as soon as received.

4.2.3 All catalysts in bulk storage must be sealed in the original containers under refrigerated conditions (less than 60°F). Refrigerators used for catalyst storage should be fitted with doors that open under internal pressure, and any operable electrical facilities within the storage compartment must be Class I, Group D, construction.

4.2.4 With paste peroxides, avoid temperature fluctuation in storage. Alternate heating and cooling may cause melting and recrystallization of the peroxide, thus forming large crystals that make accurate dispensing impossible, and increase the explosion hazard. If recrystallization should occur, dispose of the material (see 5.3.8.2).

4.2.5 Stored catalyst must be protected from exposure to the sun and ultraviolet light.

4.2.6 Use nonsparking tools to open shipping crates.

4.2.7 Once removed, catalyst must not be returned to the original storage container.

4.2.8 Spills must be cleaned up immediately, see instructions concerning spills (see 5.3.8).

4.3 Accelerators or Promoters. Store in sealed containers well removed from catalysts.

4.4 Epoxy Hardeners. Store in sealed and labeled containers. Refrigeration is not required.

4.5 Glass Fibers. There is no recognized hazard in the storage of this material. To attain the highest quality of laminate, it is essential that the glass materials be kept dry. If exposed to excessive moisture, the glass materials should be oven dried at about 220°F prior to use.

4.6 Fillers. Dry powder fillers should be packaged and handled to eliminate dust problems. These materials should be stored in a dry place.

5. HANDLING

5.1 Personal safety equipment must be worn when handling the uncured resin and additives. Safety glasses with side shields are minimum requirements and other items such as gloves, etc, may be required depending upon local conditions and work being performed.

5.2 Resins

5.2.1 Personal cleanliness rules should be practiced. Avoid unnecessary contact, wash hands frequently, wear clean clothing, and use protective equipment.



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5.2.2 The resins must be kept away from open flames and, except for short periods of use, should be handled in closed containers.

5.2.3 Due to the flammability and toxicity of some of these materials, such as styrene and dimethylaniline, it is necessary that these materials be used only in areas having good ventilation. Standard S2T gives the maximum allowable concentrations of these materials and it shall be used to determine ventilating requirements for specific cases.

5.2.4 Avoid excessive skin contact with solvents. Gloves and hands should be washed with warm water and mild soap (Boraxo is good) immediately after using resins. A cream such as Pro-Tek® can be used before handling resin. Hospital Lotion manufactured by A. S. Aloe Co (or similar hand cream) can be applied before using resins and after washings to reduce chapping.

5.3 Peroxide Catalysts

5.3.1 Do not mix catalysts with any materials other than resin. Violent decomposition may result if mixed with accelerators, promoters, organic or inorganic acids, alkalis, alcohols, amines, ethers, petroleum oils, and many other chemicals.

Note: Never add catalyst directly to accelerator or promoter.

5.3.2 The catalysts must be handled at the job site in small quantities (no more than 2 oz). A clean polyethylene bottle may be used to transport and dispense these catalysts. All containers must be clearly and properly marked to identify the contents.

5.3.3 Catalysts must be kept away from all sources of heat such as radiators, steam pipes, fire, etc. Minimize exposure to the sun and ultraviolet light.

5.3.4 Small quantities of catalysts may be stored for 8 hours at temperatures up to about 80°F.

5.3.5 Do not add peroxide catalysts to hot resins. It is important to stir each ingredient completely into the resin mixture before adding the next one.

5.3.6 If an amount of catalyst greatly in excess of that specified is used in the resin mix, enough heat may be generated to start a fire.

5.3.7 Do not return excess peroxide catalyst to the container; destroy as in 5.3.8.2.

5.3.8 Clean up spills immediately to avoid fire.

5.3.8.1 For liquid catalyst spills, immediately soak up spilled liquid with vermiculite or perlite.* Remove the contaminated material by carefully sweeping it onto a nonsparking shovel. Then destroy the catalyst by adding slowly to a 10 percent solution of sodium hydroxide with continuous agitation. Destruction is complete when foaming and bubbling have ceased (or in 24 hours).

5.3.8.2 Sweep up spilled paste peroxide and submerge the sweepings in a pail of water. Dilute by stirring and then add slowly to a 10 percent sodium hydroxide solution using continuous agitation to prevent settling or lump formation. If the solution thickens, add water. After bubbling ceases, discard the waste material by flushing into a drain with copious quantities of water. Wash broom in sodium hydroxide solution.

5.3.9 The catalysts are severe eye irritants. If they get into the eyes, flush the eyes immediately with large quantities of water and report for medical attention.

5.3.10 The catalysts also are mild skin irritants. If skin contact is made, wash immediately with cold water. If discoloration or discomfort persists, report for medical attention.

5.4 Epoxy Hardeners and Activated Resins

5.4.1 Avoidance of contact with the skin takes priority over all other precautionary measures. Complete and repeated instructions should be given to all employees concerning precautions necessary for safe handling (see 3.3.2).

5.4.2 Workmen handling these materials must adhere to strict cleanliness of their person and their work area.

5.4.3 Polyethylene, neoprene, or butyl rubber gloves must be worn at all times when handling these materials.

5.4.4 Work clothing should be changed immediately after being contaminated by hardeners or activated resin.

5.4.5 Rubber-soled industrial safety shoes or rubber overshoes should be worn by all personnel to avoid permeation of spilled resins and hardeners to the skin.

5.4.6 Clean disposable paper should be used where work is being done on tables or work benches.

*A 20-gallon or larger container of vermiculite or perlite should be kept in the work area where liquid peroxides are used repetitively.



5.4.8 All work areas should be provided with adequate ventilation to remove amine vapors at the point of liberation. See 5.2.3.

5.5 Glass Fibers

5.5.1 Small fibers of glass are mechanical irritants and, in some cases, sensitizers. Cover exposed skin areas as well as possible with long sleeves and coveralls. With most workers irritation is noticeable only for a few days.

5.5.2 Where a fiberglass laminate is machined, exhaust ventilation shall be provided. Where sanding is required, proper ventilation shall be installed in shop

areas and respiratory equipment approved by the Bureau of Mines shall be used for field work.

5.5.3 Accumulation of plastic dust must be avoided for it presents a potential explosion hazard.

5.6 Asbestos Fibers

5.6.1 Asbestos fibers may cause serious bodily harm. When repairing plastics containing asbestos, the safety and monitoring provisions included in S4T shall be followed.

5.6.2 Wet grinding and specially designed ventilating equipment sometimes suffice, but each situation must be checked against the requirements in S4T.



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