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by the
Epoxy Resin Formulators Division

PREFACE

Epoxy resins are probably the most versatile of the modern plastics. They have unique properties including high mechanical strength, outstanding adhesive characteristics, excellent electrical insulating properties and superior chemical resistance. As a result, they are widely used to fabricate tools and structures, make high strength adhesives, apply high grade electrical/electronic insulation and in the manufacture of protective coatings.

A number of different basic epoxy resins can be combined with an even greater number of curing agents, flexibilizers, fillers and other chemicals to produce several hundred different end products with various combinations of the unique properties listed above. This versatility, which makes the epoxies so useful, also contributes to handling problems for the user (and, indeed, the manufacturers) of epoxy products. On the one hand, most epoxy formulations are nearly totally nontoxic while on the other hand, there are a few formulations which are extremely hazardous . . . and in between are compounds with varying degrees of hazard.

The SPI Epoxy Resin Formulators Division, cognizant of its responsibility to the formulating industry and particularly to the end-user relative to the safe use of these versatile products, has produced this Guide.

PURPOSE AND SCOPE

Recognizing the problems that a range of formulations could present to the user, the Epoxy Resin Formulators (ERF) Division of The Society of the Plastics Industry (SPI) launched a program in 1965 to develop guides for classifying and labeling epoxy materials. These guides are the result of the work of the ERF Division of the SPI. They set forth criteria for classifying and labeling epoxy products so that the industrial user and those in the health professions, are alerted to any potential hazards associated with a specific epoxy product. With this knowledge, the user is able to safely handle such products.

These guides do not apply to such products intended or suitable for household use since the Federal Hazardous Substances Labeling Act already applies.

Table 1
GUIDE FOR CLASSIFYING EPOXY PRODUCTS ACCORDING TO THEIR SKIN IRRITATING, SENSITIZING AND CARCINOGENIC POTENTIALITIES

Hazard Category (Class)	Description	Definition
Class 1 (Practically Non-Irritating)	The product is non-irritating or produces only transient mild skin irritation following prolonged or repeated contact.	The undiluted product produces NO irritation when applied to the skin of rabbits for 24 hours *and* it produces no irritation (or very slight irritation) when applied to rabbits for 8 hours per day for 5 consecutive days.
Class 2 (Mildly Irritating)	The product will produce only irritation of the skin following prolonged or frequent contact.	The undiluted product fails to produce severe edema* or severe erythema** when applied to the skin of rabbits for 24 hours.
Class 3 (Moderately Irritating)	The product may produce injury with some persons when in contact with the skin for a prolonged period of time or following a relatively few short-term contacts.	The undiluted product fails to produce severe edema or severe erythema in 4 hours but does so when applied to skin of rabbits for 24 hours.
Class 4 (Strong Sensitizer)	The product is a strong sensitizer.	A strong sensitizer is a substance that produces an allergic sensiti-

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it.

Class 5 (Extremely Irritating)	The product is capable of producing substantial injury when in contact with the skin for a relatively short period of time.	The undiluted product produces severe edema* or severe erythema** when applied to the skin of rabbits for 4 hours or the undiluted product produces injury in depth (destruction or irreversible change in structure of tissue) when applied to the skin of rabbits for 24 hours.
Class 6 (Suspected Carcinogen in Animals)	The product is or contains a substance known to cause a carcinogenic response when applied topically to or inhaled by experimental animals.	The product is or contains a material which: (a) Causes tumors or cancers in a statistically significant number of mice in a lifetime of skin painting by standard test procedures; *or*, (b) By animal studies, causes depression of blood-forming organs.

* Severe edema—is swelling 1 mm or more (Draisze score of 4)
** Severe erythema—is bright or beet redness (Draisze score of 4)

Table 2

GUIDE FOR LABELING EPOXY PRODUCTS ACCORDING TO THEIR SKIN IRRITATING, SENSITIZING AND CARCINOGENIC (IN ANIMALS) POTENTIALITIES

Hazard Category (Class)	Label Requirements*	Warning Labels*
Class 1 (Practically Non-Irritating)	Specific	For Industrial Use Only!
	Precautionary Statement	Avoid gross contamination of skin.
	Specific	SPI Classification 1
Class 2 (Mildly Irritating)	Specific Signal Word	For Industrial Use Only! Caution!
	Statement of Hazard	May Cause Skin Irritation
	Precautionary Statement	Avoid skin contact. If contact occurs, wash with soap and water at the first opportunity.
	Specific	SPI Classification 2

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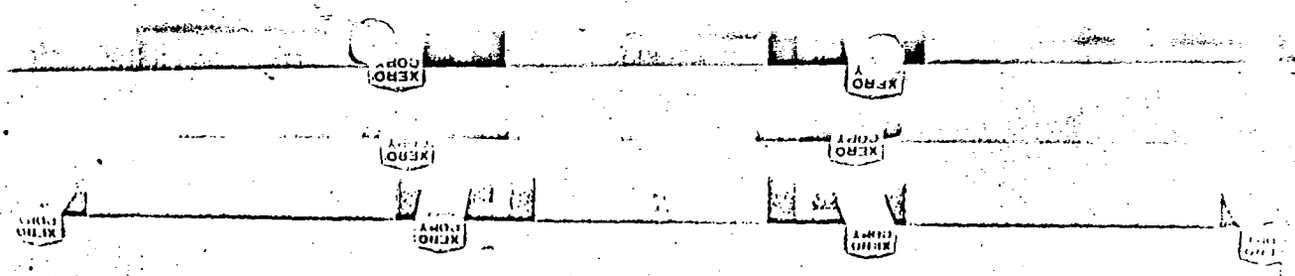

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Class 3 (Moderately Irritating)	Specific Signal Word	For Industrial Use Only! Warning!
	Statement of Hazard	May Cause Injury to Skin Following Prolonged or Repeated Contact
	Precautionary Statement	Prevent prolonged or frequent skin contact. If contact occurs, wash at the first opportunity with soap and water.
	Specific	SPI Classification 3
Class 4 (Strong Sensitizer)	Specific Signal Word	For Industrial Use Only! Warning!
	Statement of Hazard	May Cause Skin Sensitization or Other Allergic Responses
	Precautionary Statement	Avoid inhalation of vapor. Use good ventilation particularly if heated or sprayed. Prevent all contact with the skin. If contact occurs, wash immediately with soap and water.
	Specific	SPI Classification 4
Class 5 (Extremely Irritating)	Specific Signal Word	For Industrial Use Only! Danger!
	Statement of Hazard	Causes Serious Skin Burns
	Precautionary Statement	Do not get on skin or clothing. In case of contact, immediately flush skin with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before reuse.
	Specific	SPI Classification 5
Class 6 (Suspected Carcinogen)	Specific Signal Word	For Industrial Use Only! Danger!
	Statement of Hazard	Prolonged or Repeated Contact of Liquid or Breathing of Vapors or Mists May Cause Delayed and Serious Injury
	Precautionary Statement	Do not handle or use until the manufacturer's safety precautions have been read and understood.
	Specific	SPI Classification 6

* In addition to designation of the SPI Classification and the statement "For Industrial Use Only," the name and address of the producer or distributor is required on the labels of all epoxy products.

IMPORTANT NOTE

Epoxy products which are both irritants and sensitizers (as defined in Table 1) should bear the signal word reflecting the higher degree of hazard and should otherwise be labeled in accordance with both hazards. Epoxy products which present any of the additional hazards defined in Tables 3 and 5 should also be labeled to reflect these hazards and the illustrative labels shown above (in Table 2) must be modified to do so. The complete label should then be used in addition to or in combination with any label required by law.

Table 3

GUIDE FOR CLASSIFYING EPOXY PRODUCTS ACCORDING TO THEIR TOXIC POTENTIALITIES AND THEIR LOCAL EFFECTS ON THE EYES

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Hazard Category (Class)	Definition
Highly Toxic	A product which has a median lethal dose (LD_{50} value) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 grams and 300 grams each.
Toxic by Ingestion	A product which has a median lethal dose (LD_{50} value) of more than 50 milligrams but not more than 1000 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 grams and 300 grams each.
Highly Toxic by Inhalation	A product which has a median lethal concentration (LC_{50}) of 200 parts per million or less of vapor (1) or 2 milligrams per liter or less of mist (2) or dust (3) when administered by continuous inhalation for one hour or less to albino rats weighing between 200 grams and 300 grams each.
Toxic by Inhalation	A product which has a median lethal concentration (LC_{50}) of more than 200 parts per million but not more than 2000 parts per million by volume of vapor or more than 2 milligrams per liter but not more than 200 milligrams per liter of mist or dust when administered by continuous inhalation for one hour or less to albino rats weighing between 200 grams and 300 grams each.
Highly Toxic by Percutaneous Absorption	A product which has a median lethal dose (LD_{50}) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours or less with the bare skin of albino rabbits weighing between 2 kilograms and 3 kilograms each.
Toxic by Percutaneous Absorption	A product which has a median lethal dose (LD_{50}) or more than 200 milligrams per kilogram but not more than 2000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours or less with the bare skin of albino rabbits weighing between 2 kilograms and 3 kilograms each.
Corrosive – Eyes	A product which causes destruction or irreversible alteration of living tissue of the eye at the site of contact. A product would be considered corrosive if in undiluted form it produces blindness or destruction or irreversible change in the structure of the cornea or conjunctiva when applied to the eyes of rabbits for 24 hours.
Irritant – Eyes	A product is an irritant to the eyes if available data on human experience indicate that it is irritant to the eyes, or if a positive test result is obtained when the product is tested by the method described in Appendix A (Section 191.12 of the Code of Federal Regulations).

(1) Vapor: A gaseous form of a substance which is normally in the solid or liquid state. A vapor diffuses.
(2) Mist: Suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a disbursed state such as by splashing, foaming or atomizing.
(3) Dust: Solid particles generated by handling, crushing, grinding, rapid impact, detonation or decrepitation. Dusts do not diffuse in air but settle under the influence of gravity.

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Table 4
GUIDE FOR LABELING EPOXY PRODUCTS ACCORDING TO THEIR TOXIC POTENTIALITIES AND THEIR LOCAL EFFECTS ON THE EYES

Hazard Category (Class)	Signal Word	Statements of Hazards	Precautionary Statements
*Highly Toxic by Ingestion	Danger!	Poisonous if Swallowed	Do not take internally. Wash thoroughly after handling.
Toxic by Ingestion	Warning!	Harmful if Swallowed	None.
*Highly Toxic by Inhalation	Danger!	Poisonous if Inhaled	Do not breathe (vapor-dust-mist). Use with adequate ventilation.
Toxic by Inhalation	Warning!	Harmful if Inhaled	Avoid breathing (vapor-dust-mist). Use with adequate ventilation.
*Highly Toxic by Percutaneous Absorption	Danger!	Poisonous if Absorbed Through Skin	Do not get in eyes, on skin, on clothing. Remove contaminated clothing immediately. Wash thoroughly after handling.
Toxic by Percutaneous Absorption	Warning!	Harmful if Absorbed Through Skin	Avoid contact with eyes, skin, clothing; wash thoroughly after handling.
Corrosive — Eyes	Danger!	Causes Severe Eye Burns	Do not get in eyes. First Aid Instructions In case of contact, immediately flush eyes with plenty of water for at least 15 minutes; get medical attention.
Irritant — Eyes	Warning!	Causes Eye Irritation	Avoid contact with eyes. First Aid Instructions In case of contact, immediately flush eyes with plenty of water.

* Labels also require the word "Poison," the skull and crossbones symbol and the statement "First Aid Instructions." Labels must also contain one or more of the following first-aid instructions.
(a) "If swallowed, induce vomiting by inserting finger down throat, or by giving a teaspoon of salt in a glass of warm water; repeat until vomit fluid is clear; call a physician; or, Do Not induce vomiting—in the case of petroleum distillates."
(b) "If inhaled, remove to fresh air. If not breathing, give artificial respiration. Call a physician."
(c) "In case of contact, immediately flush skin with plenty of water. Wash contaminated clothing before reuse."

Table 5
GUIDE FOR CLASSIFYING EPOXY PRODUCTS ACCORDING TO THEIR FLAMMABLE AND PRESSURE GENERATING PROPERTIES

Hazard Category (Class)	Definition
Extremely Flammable Liquid	A product which has a flash point at or below 20°F. as determined by the method described in Appendix A (Section 191.13 of the Code of Federal Regulations).
Extremely Flammable	A product which ignites and burns at an ambient temperature of 80°F. or less when subjected to friction, porcussion or to an elec-

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Solid	tric shock.
Flammable — Solid	A product which ignites and burns with a self-sustained flame at a rate greater than 1/10 of an inch per second along its major axis when tested by a method described in Appendix C (Section 191.14 of the Code of Federal Regulations).
Flammable — Liquid	A product which has a flash point of above 20°F. to and including 80°F. as determined by the method described in Appendix B (Section 191.13 of the Code of Federal Regulations).
Pressure Generating Substances	A product falling within any of the following categories: 1. It explodes when subjected to an electric spark, or to the flame of a burning paraffin candle for 5 seconds or less; or 2. It expels the closure of its container when held at or below 130°F. for 2 days or less; or 3. It erupts from its open container at a temperature of 130°F. or less after having been held in the closed container at 130°F. for 2 days. 4. It decomposes to release gas in its containers.

Table 6

GUIDE FOR LABELING EPOXY PRODUCTS ACCORDING TO THEIR FLAMMABLE AND PRESSURE GENERATING PROPERTIES

Hazard Category (Class)	Signal Word	Statements of Hazards	Precautionary Statements
Extremely Flammable Liquid	Danger!	Extremely Flammable	Keep away from heat, sparks, and open flame. Use with adequate ventilation.
Extremely Flammable Solid	Danger!	Extremely Flammable	Keep away from heat, sparks, and open flame. Do not grind or subject to friction.
Flammable Liquid	Warning!	Flammable	(Same as for Extremely Flammable Liquid).
Flammable Solids	Warning!	Flammable	Keep away from heat, sparks and open flame.
Pressure Generating Substances	Warning!	May Contain Gas Under Pressure	Keep away from heat. Store in a cool place. Loosen closure cautiously.

—PART V—

Appendix A (Eye Irritants); Appendix B (Flash Point); Appendix C (Flammable and Extremely Flammable Solids)

See Amendment published in Federal Register, September 17, 1964; 29 F. R. 13009*

* Copies of these documents will be reproduced in the final printing of the Guide.

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