

TECHNICAL REPORT
of the
JANE DOE INCIDENT

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INVESTIGATION of the JANE DOE INCIDENT

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A. INTRODUCTION

Jane Doe was an employee of ABC from June, 1998 until November, 11, 1998. She worked with various epoxy compounds in the course of building aircraft components. XYZ manufactured and supplied some epoxy compounds to ABC. Her exposure to the epoxy materials caused severe skin irritation and sensitization.

The purpose of my investigation was to determine if:

1. The safety information provided by XYZ was defective in a manner that contributed to the incident;
2. Dermal exposure to epoxy potting compounds in the composite manufacturing department at the ABC facility created a specific unsafe working condition that created a high risk of serious injury to employees such as Doe;
3. The specific, unsafe condition violated
 - (a) any state or federal safety statute, rule, or regulation, or
 - (b) if it violated any commonly-accepted and well-known safety standard in the composite manufacturing industry.

B. INFORMATION AVAILABLE

1. Complaint (11/9/00).
2. Plaintiff Response to XYZ Discovery Requests (10/25/01).
3. Plaintiff Response to ABC Discovery (8/22/01).
4. Plaintiff Rule 26(a)(1) Disclosures (12/14/01).
5. XYZ Response to Plaintiff First Discovery (12/14/01).
6. XYZ Supplemental Response to Plaintiff First Discovery (12/28/01).
7. ABC Response to Plaintiff First discovery (9/21/01).
8. ABC Supplemental Response to Plaintiff First Discovery (10/3/01).
9. ABC Response to Plaintiff Second Discovery (11/26/01).
10. ABC Second Supplemental Response to Plaintiff First Discovery (12/13/01).
11. Responses of Defendant XYZ to Plaintiff's Second Interrogatories and Requests for Production (1/14/02).
12. Attached responses with Bates stamp CIB000372 to CIB000398.

13. Items referenced in Response #2, ABC Response to Plaintiff's Second Discovery (11/26/01)
 - a. Conform Premium Natural Rubber Latex Exam Gloves
 - b. Laboratory Handies Super Heavyweight Vinyl Gloves
 - c. Disposable Powder Free Vinyl gloves
 - d. Ambidex Disposable Vinyl Gloves
 - e. Mapa Staziol gloves
 - f. Green nitrile gloves
 - g. White nylon gloves
 - h. White cotton gloves
14. Chart: Ms. Doe's inspection of gloves.
15. Defendant ABC Corporation's Second Supplemental Responses to Plaintiff's First Request for Production of documents to Defendant ABC.
16. Epoxy safe handling guide from the Task Group of the QRS Society.
17. Protective Order.
18. XYZ's Responses to Plaintiff's Third Set of Interrogatories and Requests for Production.
19. XYZ's Responses to Plaintiff's Fourth Set of Interrogatories and Requests for Production.
20. XYZ's Responses to Plaintiff's Fifth Set of Interrogatories and Requests for Production.
21. ABC's Responses to Plaintiff's Fourth Set of Interrogatories and Requests for Production.
22. ABC's Responses to Plaintiff's Fifth Set of Interrogatories and Requests for Production.
23. Deposition of DEF taken May 21, 2002.
24. Deposition of GHI taken May 20, 2002.
25. Deposition of JKL taken May 20, 2002.

C. BACKGROUND AND DESCRIPTION OF THE INCIDENT

ABC took over the manufacture of aircraft parts using two-part epoxy resin systems from its sister plant. The epoxy systems involved one part (-A) that is the epoxy resin. The epoxy resin system may contain solvents, accelerators, fillers, and reactive diluents. The second part (-B) is the curing or hardening agent.

Epoxy resins may be liquid, solid, or modified liquid. The properties of each ingredient in each resin system determine its potential for toxic exposure. Many of these systems are potent skin irritants in the uncured state, and may even cause sensitization in some individuals.

The process began by bonding pre-preg material to a honeycomb material with epoxy. In the honeycomb area, employees mixed the two epoxy components in a cup, and applied the mixture using tongue depressors, spatulas, putty knives, or other means, into the honeycomb structures of aircraft components. After the epoxy cured and hardened, additional processing

was required to fill remaining voids. This work was performed in the final finishing area, also known as the “dirty room”, because of the routers used to sand or grind the cured surfaces.

The manufacturing process, raw materials, Material Safety Data Sheets (MSDS), and personal protective equipment were sent from the sister facility to Doe’s facility. ABC provided latex and vinyl gloves for employees to use with the two-part epoxy resin systems because those gloves had also been used at the sister facility allegedly without incident (JKL; p. 25) . JKL and the plant nurse approved the use of latex and vinyl gloves for use at Doe’s facility (JKL; p. 24) and provided orientation training that included personal protective equipment issues. Green nitrile gloves were also available at Doe’s facility, but they were designated for use with “chemicals”. The latex and vinyl gloves used in the honeycomb area frequently tore due to abrasion, and due to the sharp edges of the honeycomb material. Testimony exists that the vinyl and latex gloves also dissolved from contact with the epoxy materials. Employees were exposed to the epoxy materials because the gloves dissolved. Heavier lay-up gloves were tried, but they were not considered suitable by ABC because they left a residue on the parts.

Doe worked with XYZ’s two-part epoxy resin systems. Doe also worked with Methyl Ethyl Ketone (MEK) and release agents. ABC relied on the MSDS and product label information provided by XYZ for their epoxy resin systems. Every MSDS and product label that I reviewed for the XYZ materials that Doe used stated only that “impervious” gloves should be worn. Specific glove recommendations were absent from the MSDS and product labels. XYZ was a member of a trade organization, QRS, from the 1980’s until May, 1999. Thereafter, XYZ continued to participate as a non-dues-paying member with representation on the QRS Task Force. XYZ also had a participating role since 1992 in a Working subgroup of the Task Force. It has also participated since the early 1980’s, and continues to participate, in the TUV’s Division of QRS. XYZ is also a 25-year member of a well-known chemical trade association.

The Task Force published a safe handling guide. The guide contained information for safe handling of epoxy resin systems in processing. Although the “Note to Users” indicates that the information contains “general guidelines” and is “not exhaustive”, it does provide glove selection criteria for users of epoxy resin systems. The guide was not restricted in its distribution since it was not a controlled document. There is no indication that XYZ ever provided a copy of the guide to ABC, or that XYZ ever routinely sent the guide to its customers with product shipments. The guide was provided only after a customer inquired to XYZ, and when circumstances indicated a need for the document.

D. ANALYSIS

1. Working with Chemicals, and Especially Epoxy Materials, Without Proper Personal Protective Equipment, Is A Dangerous Condition.

A. Epoxy Resins

The literature on uncured epoxy resin systems clearly illustrates the hazards of these materials.

1.4.3 Irritation of Surface Tissues and Sensitization

Irritation of the skin and respiratory tract are the most commonly encountered toxic manifestations of contact with epoxy compounds. The degree of irritancy depends on the molar fraction of epoxy groups, the volatility, the solubility in both fats and water, and the viscosity of the material.ⁱ

Sensitization of Surface Tissues. Sensitization reactions in man caused by repeated exposure to epoxy compounds may be manifested by skin reactions or by asthma-like reactions to the respiratory tract.

Full-blown sensitization reactions can be elicited from much less agent than is required for an irritative response. Because this condition is difficult to treat, sensitized individuals may require transfer to other working areas. In this regard, it is now believed that on occasion vapors not present in sufficient concentration to cause irritation cause sensitivity.ⁱⁱ

Sensitization dermatitis. This type results from an allergic reaction to a given substance. The sensitivity becomes established during the induction period, which may be a few days to a few months. After the sensitivity is established, exposure to even a small amount of the sensitizing material is likely to produce a severe reaction. Some substances can produce both primary irritation dermatitis and sensitization dermatitis. Among them are organic solvents, chromic acid, and epoxy resin systems.ⁱⁱⁱ

XYZ

MSDS and product labels published by XYZ indicate the sensitization potential of their products. XYZ used the nonspecific term “impervious” to describe what gloves to wear, despite the fact that they had knowledge of specific glove materials that provided suitable protection.

XYZ failed to provide their customers with specific glove material recommendations that would have effectively protected users from sensitization.

ABC

ABC possessed MSDS that specifically indicated that dermal exposure to epoxy materials would create unsafe working conditions. JKL, as Doe's facility environmental, health, and safety representative/coordinator, stated that she reviewed the MSDS. ABC failed to properly act on this information.

B. Hazard Communication, and The Use of Personal Protective Equipment

XYZ

XYZ was a chemical manufacturer and subject to the provisions of regulations promulgated by the Occupational Safety and Health Administration (OSHA), specifically 29 CFR 1910.1200. The purpose of this regulation is:

§1910.1200 Hazard communication.

(a) Purpose. (1) The purpose of this section is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to employers and employees. This transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, material safety data sheets and employee training.

Hazard communication ("HAZCOM") was promulgated in 1985. Since 1985, guidelines have been developed for the structure and content contained in MSDS and product labels. The most important document regarding MSDS preparation is ANSI Z400.1 and its revisions.^{iv} The ANSI Standard is a commonly accepted and well-known safety standard in industry for the development of MSDS. This ANSI Standard provides guidance "for developing MSDS [that] reflects the best practices of many different companies represented on the working group as well as significant input from outside parties and consultants".^v The Health and Safety Committee of the QRS sponsored and directed the development of the 1993 standard.^{vi}

A Material Safety Data Sheet describes the hazards of a material and provides information on how the material can be safely handled, used, and stored. It is a summary of material safety information. For completeness and clarity, it should

contain information on chemical product and supplier identification, chemical or hazardous components, hazards identification, first aid, fire-fighting measures, accidental release measures, handling and storage, exposure controls, personal protection, physical and chemical properties, and reactivity. It may also include toxicological, ecological, disposal, transport, regulatory, and other useful information. MSDSs cannot include information on every unique application of the material, although they should consider the hazardous exposures resulting from customary and reasonably foreseeable occupational use, misuse, handling, and storage. The MSDS is only one source of information on a material; as such, it is best used along with technical bulletins, labels, training, and other communications.^{vii}

Specifically concerning skin protection, the ANSI standard states the following:

8.2.2 Skin protection

Recommend when known, the best barrier material (such as butyl rubber or neoprene) for PPE. Where other factors, such as thickness of the material (heavy duty vs. light) or durability are important, they should be included in the guidance. Base the recommendation on laboratory permeation data, or appropriate field experience.^{viii}

MSDS were never intended to serve as a primary literature surrogate for assessing and treating occupational exposures to hazardous substances. For this reason, they should not be held to the level of detail existing in the scientific literature. However, the material presented in the MSDSs should be correct and provide adequate information on the product so that individuals will be aware of the hazards and know what precautions to take.^{ix}

Every MSDS (and their revisions), and every product label for the XYZ epoxy products that Doe used, and that I reviewed, consistently used the phrase “impervious gloves” in the portion of the MSDS that addressed personal protection information. The use of the word “impervious” does not refer to the specific, best barrier material based on laboratory permeation data or appropriate field experience.

XYZ had specific knowledge of the best barrier material for these compounds, as expressed in the guide. Table 3 on page 8 of the guide summarizes generalizations about chemical resistance of glove materials. Even a cursory glance at the table shows that although vinyl gloves are rated

“excellent” for liquid or solid epoxy resins, they are rated “poor” for modified epoxy resins, hardeners/curing agents, and solvents. Since the XYZ epoxy systems required the use of the latter group of materials, it is clear that vinyl gloves are inappropriate for use with the full range of epoxy resins systems and components. Neoprene or nitrile (which ABC had available at their facility) are the minimum acceptable glove materials.

XYZ did not distribute the guide to their customers, except in direct response to requests for it, or in response to specific requests for dermal protection recommendations. Document number 11 in Section B of this report states on page 3 that *“Customers are further advised that latex gloves are usually not suitable and that butyl rubber or nitrile gloves could be suitable depending on the circumstances. Customers are also told to have their employees wear clothing to cover their skin and to avoid direct skin contact with these Epocast products.”*

ABC

§1910.1200(d) requires chemical manufacturers and importers to evaluate chemicals produced by them to determine if they are hazardous. Epoxy materials have known specific hazards that pose a high risk of injury. Information on those hazards was published in available, peer reviewed literature, and in the MSDS in ABC’s possession.

ABC did not perform competent HAZCOM training for their employees that used epoxy materials, per 1910.1200(h)(2)(iii) of HAZCOM which states that training shall include:

- (iii) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used;

The training advocated the use of the “approved” latex or vinyl gloves for epoxy work, and the use of the green nitrile gloves for use with “chemicals”. Epoxies are chemicals. However, the HAZCOM training specifically did not require the use of nitrile gloves for use with epoxies. Vinyl and latex gloves were known to not protect workers from epoxy materials. Therefore, the training provided incorrect information causing Doe to be unnecessarily and repeatedly exposed to the hazards of epoxy materials.

ABC's training and their use of latex and vinyl gloves that tore, dissolved, and exposed Doe to direct dermal contact with the known specific hazards of epoxy materials violated the OSHA HAZCOM standard.

OSHA's 29 CFR 1910.132 also applies to ABC. Its requirements are:

Subpart I – Personal Protective Equipment

§1910.132 (d) *Hazard assessment and equipment selection.* (1) The employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE). If such hazards are present, or are likely to be present, the employer shall:

- (i) Select, and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment;
- (ii) Communicate selection decisions to each affected employee; and,
- (iii) Select PPE that properly fits each affected employee.

JKL stated (P. 46) that ABC did not train each worker on how to properly don and doff the gloves until approximately one month after workers started experiencing problems. Proper procedures for donning and doffing personal protective equipment are important especially if, as in this type of operation, the external surfaces of the personal protective equipment are contaminated with the hazardous material that the personal protective equipment is supposed to protect against. Improper doffing can cause exposure to the contaminants. All employees should have received this important training and instruction whether or not they were experiencing problems.

ABC supplied and advocated the use of latex and vinyl gloves that tore, dissolved, and exposed Doe to the epoxy materials and the known specific hazards of allergic skin reactions and sensitization. ABC did so despite the fact that it possessed MSDS that recommended only impervious gloves be used with epoxy materials. Properly selected gloves, and proper employee training in their use, would not have exposed Doe to those hazards. ABC violated OSHA regulations regarding personal protective equipment.

2. This Dangerous Procedure Was Likely To Cause Serious Injury.

The basic measures for preventing accidental injury, in order of effectiveness and preference, are:

1. Eliminate the known hazards from the machines, methods, materials, and plant structure.
2. Control the hazard by enclosing or guarding it at its source.

3. Train personnel to be aware of the hazard and to follow safe job procedures to avoid it.
4. Prescribe personal protective equipment for personnel to shield them against the known hazard.^x

XYZ

Accepted industry standards existed for communicating competent personal protection information. However, XYZ failed to provide clear and precise glove selection information in their MSDS and product labels for the epoxy products that Doe used. XYZ also failed to provide this information although they knew the proper glove materials. XYZ knew or should have known this information based on their own manufacturing experience, their participation on the Task Force, and the contents of the guide to which XYZ's representatives contributed. XYZ's failure to provide clear and competent personal protection guidance on their MSDS and their product labels, and by their failure to freely distribute the guide, deprived users of valuable information that would have protected them from the hazards of the epoxy materials.

ABC

ABC possessed and reviewed MSDS that stated the hazards of epoxy materials, and the need to use impervious gloves. ABC failed to provide gloves that positively protected Doe from contact with the epoxy materials. The known hazards are inherent in the epoxy materials. Substitute materials were not available because the use of these epoxy materials was determined by customer specifications. Prescribing proper personal protective equipment was the only way ABC could protect Doe from the known specific hazard of allergic reactions and sensitization. ABC failed to provide proper skin protection.

3. Incorrect Instructions and Improper Safety Equipment That Doe Was Given for Her Work With Epoxy Resins Caused Her Injuries.

To a reasonable degree of professional certainty, and subject to modification if additional information becomes available, it is my professional opinion that Doe was injured due to the lack of proper personal protective equipment for her exposure to epoxy materials at the ABC facility.

XYZ

XYZ, as the chemical manufacturer of the products that Doe used, possessed critical safety information necessary to the safe use and handling of epoxy materials. XYZ failed to communicate this information in their MSDS as required by OSHA and ANSI standards, and by withholding the guide from free and routine distribution to customers. This could have been accomplished, for example, by having the guide and MSDS accompany shipments of epoxy products to customers, or by mailing them to the ship-to address. The existence of the guide could have also been mentioned in XYZ's MSDS with reference to an Internet site where users could access and download the information.

ABC

The unsafe condition created by Doe's dermal exposure to epoxies from degraded gloves was the direct and proximate cause of Doe's injuries.

E. FINDINGS

To a reasonable degree of professional certainty, and subject to modification if additional information becomes available, it is my professional opinion that:

1. Working with epoxy materials, without proper training and personal protective equipment (e.g., nitrile or other effective glove materials), are known to cause irritation and sensitization such as alleged by Doe.
2. This dangerous procedure was certain to cause serious injury in a substantial portion of exposed workers.
3. XYZ negligently failed to communicate competent information on personal protection in their MSDS and product labels. Information on proper glove material selection was in XYZ's possession. XYZ's nonspecific glove selection criteria deprived ABC and Doe of critical safety information. The lack of this critical information was a cause of Doe's injuries.
4. Doe received dermal exposure to epoxy potting compounds in the composite manufacturing department of ABC. This exposure was due to Doe's having to wear gloves that tore and dissolved when in contact with the epoxy materials, and caused Doe to be exposed to the epoxy materials. ABC knew this exposure was occurring. This specific unsafe working condition created a high risk of serious injury to Doe.
5. The unsafe working conditions at ABC violated specific and applicable OSHA regulations.
6. These unsafe working conditions were a cause of Doe's injuries.

Ronald D. Schaible, CIH, CSP

ENDNOTES TO THE TECHNICAL REPORT OF THE JANE DOE INCIDENT

ⁱ Clayton, George D., Florence E. Clayton, Editors. *Patty's Hygiene and Toxicology, 3rd Revised Edition, Volume 2A, Toxicology*. John Wiley & Sons, New York. 1981. P. 2145.

ⁱⁱ Ibid. P. 2147.

ⁱⁱⁱ Plog, Barbara A., Editor. *Fundamentals of Industrial Hygiene, 3rd Edition*. National Safety Council, Chicago, IL 1988. P. 23.

^{iv} ANSI Z400.1-1993. *American National Standard for Hazardous industrial Chemicals – Material Safety Data Sheet Preparation*. American National Standards Institute, New York. 1993.

^v Ibid. P. v.

^{vi} Ibid. Pp. vii-viii.

^{vii} Ibid. Pp. 1-2.

^{viii} Ibid. P. 37.

^{ix} Kolp, Paul W., Phillip L. Williams, Robert C. Burtan. "Assessment of the Accuracy of Material Safety Data Sheets". *American Industrial Hygiene Association Journal* (56) / February 1995. Pp. 178-183.

^x McElroy, Frank E. *Accident Prevention Manual for Industrial Operations, 5th Edition*. National Safety Council, Chicago, IL. 1964. P. 4-1.