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Revised Safety Label Standards Create Opportunity and Risk

by Kenneth Ross

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Introduction

Recently, there have been and will be revisions to the primary U.S. and European labeling standards in an attempt to harmonize them. The goal of these revisions is, in part, to make it easier for manufacturers to comply with both standards and use one kind of safety label in the U.S. and Europe. The result is that a U.S. manufacturer would be able to create labels that comply with the European standard and also use them in the U.S., thereby creating worldwide safety symbols.

Given the differences in labeling systems, legal systems, and approaches to safety, this is a significant change and one that has ramifications for potential liability in the U.S. and Europe. This article will discuss the U.S. and European labeling standards, how they will be revised, and some legal concerns.

Basic Duty

A manufacturer has a duty to warn where: (1) the product is dangerous; (2) the danger is or should be known by the manufacturer; (3) the danger is present when the product is used in the usual and expected manner; and (4) the danger is not obvious or well-known to the user. See *Billiar v Minnesota Mining and Manufacturing Co.*, 623 F.2d 240, 243 (2d Cir. 1980).

Once the decision has been made to warn, the manufacturer needs to determine whether the warning is adequate. The law has said that a warning is legally adequate if:

- it is in a form that could reasonably be expected to catch the attention of a reasonably prudent person in the circumstances of the product's use
- the content is of such a nature as to be comprehensible to the average user
- it conveys a fair indication of the nature and extent of the danger to the mind of a reasonably prudent person

Bituminous Casualty Corp. v Black and Decker Manufacturing Co., 518 S.W.2d 868 (Tex.App. 1974).

In *Shanks v Upjohn Co.*, 835 P.2d 1189, 1200 (Alaska 1992) the court similarly found that, for a warning to be adequate, it should: "(1) clearly indicate the scope of the risk or danger posed; (2) reasonably communicate the extent or seriousness of harm that could result from the risk or danger; and (3) be conveyed in such a manner as to alert the reasonably prudent person."

A statute in Louisiana defines an adequate warning as follows:

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> Adequate warning means a warning or instruction that would lead an ordinary reasonable user or handler of a product to contemplate the danger in using or handling the product; and either to decline to use or handle the product or, if possible, to use or handle the product in such a manner as to avoid the damage for which the claim is made.

Despite these definitions, terms such as "reasonable user," "fair indication," and "reasonably be expected to catch the attention of the user" make it clear that, in the U.S., the jury gets to decide the adequacy of warnings. And, the cases have not been particularly helpful because there are so many variables in the hazards, the avoidance procedures, and the skills and backgrounds of the readers of the warnings. Is the reader educated, uneducated, skilled, unskilled, illiterate, or semi-literate, etc?

Thankfully, labeling standards in the U.S. have provided some good guidelines on creating safety labels that do provide some amount of protection if there is an accident.

Current U.S. Labeling Standard

The most significant standard in the area of U.S. safety labels was developed by a committee of the American National Standards Institute. This standard, referred to as ANSI Z535, was initially published on June 6, 1991, with revisions in 1998 and 2002.

This ANSI standard provides the basis for developing a safety label system. Unlike some other labeling standards, ANSI Z535.4 sets forth performance requirements for the design, application, use, and placement of safety labels. The purpose of this standard is "to establish a uniform and consistent visual layout for safety signs and labels applied to a wide variety of products." It is also designed to create a "national uniform system for the recognition of potential personal injury hazards for those persons using products."

ANSI Z535.4 deals with on-product safety labels and provides for a specific format label containing a signal word panel, word message panel, and an optional pictorial or symbol panel. The message required by the standard to be transmitted, with words or symbols individually or in combination, is (1) nature of the hazard, (2) the seriousness of the hazard or probability that the user will encounter the hazard, (3) the consequences of encountering the hazard or the severity of the injury, and (4) how to avoid the hazard. These requirements are consistent with the cases that require a label to convey the "nature and extent" of the danger.

The ANSI standard defines a symbol or pictorial as a graphic representation intended to convey a message without the use of words. It goes on to say that the symbol or pictorial may represent a hazard, a hazardous situation, a precaution to avoid a hazard, a result of not avoiding a hazard, or any combination of these messages. Z535.4 also states that symbols should be readily understood and effectively communicate the message. The courts also talk about labels that are "comprehensible" to the average user.

In 2002, the ANSI standard was changed to allow the manufacturer to use a symbol to substitute for all or a portion of the required messages in the word message "if it has been demonstrated to be satisfactorily comprehended . . . or there is a means (e.g., instructions, training materials, manuals, etc.) to inform people of the symbol's meaning."

The original text of the ANSI standard did not allow a manufacturer to substitute a part of the message with a symbol unless the symbol had been tested to be "satisfactorily comprehended." The 2002 change was meant to allow symbols that haven't been tested be on a label as long as they were described in the manual.

However, while the 2002 ANSI standard allowed for symbols to take the place of words in the message panel, manufacturers realized that they should be careful before they fully rely on a symbol to fully communicate the message. Since symbols may represent a hazard, a hazardous situation, a precaution to avoid a hazard, a result of not avoiding a hazard, or any combination of these messages, it would be unusual for a symbol to be able to replace all word messages that are generally required by the law or the standard.

Also, in 2002, the ANSI Z535.3 standard, which deals with symbols on safety labels, was changed to add a reference to the type of symbols used in the European ISO standard. The revision said that the formats for symbols in the ISO standard "may be considered." This was the first attempt to harmonize the ANSI and ISO labeling standards.

ISO Labeling and Product Standards

The International Organization for Standardization (ISO) has a labeling standard, ISO 3864-2, that is very different than ANSI Z535. Symbols are the essential ingredient of this labeling system. Through the use of shape, colors, and symbols, ISO believes that each symbol can adequately communicate a safety message.

Such a system is preferable in Europe because there are many languages spoken and read in different countries and there are open borders that allow products to easily move from country to country. The result can be that for many products, the manufacturer may not know where the product will be initially used or subsequently used during its lifetime. Having symbols that transmit at least part of the message provides some warning of the hazard.

Another reason for the different systems is that European employers provide more safety training on the job. The result is that symbols don't have to be readily comprehensible to someone with no training. The assumption is that the employee encountering a symbol on a machine in the workplace will have been trained as to the symbol's meaning.

And with consumer products, there are government safety agencies in many European countries that are active in trying to educate consumers as to the meaning of safety symbols placed on consumer products.

In the U.S., it is very different. Manufacturers generally can't assume that the employee has had safety training, so safety labels over the years have had word messages and symbols to try to communicate quickly and completely the entire message required by the law and the standards.

And there is little attempt by the government or manufacturers to try to educate consumers on the meaning of safety symbols. This is because most labels have word messages that transmit the entire message.

In any event, the ISO standard has developed a much more comprehensive system of symbols than ANSI Z535. Below is an example of the different shapes for ISO 3864-2.

The formats are combined to portray the entire message. The following is a sample label that contains a description of the hazard and how to avoid it, including prohibited actions and a mandatory action.

Given the development of the ISO standard and the desire of manufacturers to be able to use one set of labels for worldwide use, the ANSI committee met in September 2004 to consider further harmonization of the ANSI and ISO systems in the area of symbols.

ANSI Revisions

In Annex C to the current ANSI Z535.4, it says that "it may be possible for a safety sign or label to be in conformance with ANSI Z535.4 and an ISO standard." It didn't describe how it may be in conformance and the Annex is not an official part of the standard. As a result, while the committee in 2002 raised this possibility, it did not officially allow for the manufacturer to say that a particular label complied with both the ANSI and ISO standards.

This issue was addressed and resolved by the ANSI Z535 Committee in September. The committee voted to include in the 2006 version language, which will allow the manufacturer who sells in the U.S. to comply with the ISO standard and not the ANSI standard. In a reference to ISO 3864-2, the new version of the standard will say that the ISO standard may be used as an "alternate standard" to the ANSI standard.

The result of this revision is that manufacturers will finally be able to use symbol-only labels in the U.S. without running the risk of having a plaintiff's lawyer claim that their label violated the ANSI Z535 standard. This change, if approved by ANSI, will give manufacturers the opportunity to make significant changes in their labels, both in the U.S. and elsewhere. But are such changes a good idea?

Legal Concerns

The requirements in the law and in the ANSI standard for warning adequacy may not be satisfied with some symbol-only labels. In some cases, it may be very hard to create a symbol that portrays some of the message requirements. Symbols are excellent at portraying the hazard and injury that can be suffered if encountering the hazard and not so good at portraying the severity of the injury, the probability that the injury will occur, and how to avoid the hazard.

Despite this, it is very possible that some symbols that do not transmit all of this information will be deemed sufficient because they provided enough information to put the reader on notice of a potential hazard and put the responsibility on the reader to get more information about the severity, probability, or how to avoid it.

Some courts have encouraged the use of symbols when potential readers are illiterate or do not read English. The courts feel that transmitting at least the hazard should be sufficient to put the reader on notice. This argument can be made when symbol-only labels are used.

However, some safety experts are skeptical about the use of symbol-only labels. The British Department of Trade and Industry (DTI) said:

> Pictograms are not the language-free answer to written safety warnings. There is no clear objective evidence to suggest that they have any significant effect on ultimate compliance with safety warnings on products. Therefore the desire to decrease text information on packaging due to the internationalization of markets must not take the route of language-free pictorial warnings unless they have been proven to be effective across all the relevant cultures.

DTI mentioned the use of symbols if they have been "proven" to be effective. This means that the symbols have undergone comprehension testing.

As more manufacturers decide to go to symbol-only labels, more of them are

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considering comprehension testing in the U.S. and Europe. The ANSI Z535.3 standard contains a testing protocol for testing in the U.S. And there is a specific ISO standard for testing the comprehension of symbols.

These developments will be interesting to watch. How many manufacturers will go to symbol-only labels? How many symbols will be tested? Will plaintiff's lawyers challenge the testing protocols, the lack of testing, and the adequacy of the symbols? Time will tell.

Conclusion

This area is dangerous because it is so easy for a plaintiff to argue that the manufacturer should have done something different. If the label had words, then all it had to do is add a few more words and the accident would not have happened. If there are only symbols, then the plaintiff didn't understand it, and all he or she had to do was test the label for comprehension. The remedy is cheap and simple and it may be hard to defend a particular label given a serious injury and sympathetic plaintiff.

Manufacturers can certainly use symbol-only labels in the U.S. At least they will be able to say that the label complies with ANSI Z535. However, compliance with a voluntary standard is not an absolute defense. Therefore, they need to be prepared to argue that the symbol adequately transmitted sufficient information.

Using symbols that have been in use for years and have possibly been tested is one answer. Testing new symbols in the U.S. is another possibility. However, manufacturers will have to live with the testing results. If DTI is correct, some testing may confirm what the manufacturer doesn't want to hear—that the symbol is not comprehensible. ■

Attend the Loss Control Section's Session at the CPCU Society's Annual Meeting and Seminars

Controlling Inland Marine Loss Exposures

Tuesday, October 25 10 a.m. - Noon

This seminar will focus on loss control issues and techniques for builders' risk, contractors' equipment, and cargo exposures. Speakers will present loss situations and describe how the losses could have been prevented. They will also suggest how equipment might have been recovered. This is a must-attend seminar for loss control professionals, agents, and underwriters!

Presenters:

Ken Mikkelson, CPCU
The Cincinnati Insurance Company

David Shillingford
Art Loss Register, Inc. and
National Equipment Register, Inc.

Eli Shupe Jr., CPCU

Barry Tarnef, CPCU, CMS, CPP
Chubb CCI

United States Longshore & Harbor Workers Compensation Act

by Chris Conti, CPCU, CSP, ALCM, ARM

Editor's Note: The following article is based upon research by Chris Conti, who is the founder and owner of RiskWise, a risk management, loss control, and injury management firm in Prairieville, LA. In addition to the CPCU designation, he is also a CSP, ALCM, and an ARM, as well as a certified instructor for OSHA General Industry and Construction training classes. A frequent contributor to the *LCQ,* Conti can be reached at Chris@riskwise.biz, or by telephone at (225) 413-7542.

The United States Longshore & Harbor Workers Compensation Act (LHWCA) is a federal statute that dictates the benefits that will be provided by the employer (or insurance carrier) in the event the injured worker is deemed to be a longshoreman. To be considered a longshoreman the injured worker must have ***situs and status.*** The law is invoked in workplaces that provide services on, near, or adjacent to navigable waters of the United States. Workers that are injured on the Outer Continental Shelf have automatic situs and status. Workers injured in federal waters usually enjoy this coverage. Workers in shipyards are deemed longshoreman. Workers injured in other areas have to look to the location and circumstances of the work to enjoy longshoreman classification.

Situs

The site or location where the accident occurred must be on, over, or adjacent to or otherwise near navigable water. The situs may include any adjoining pier, wharf, dry dock, terminal, building way, marine railway, or other adjoining area commonly used in the loading, unloading, repairing, or building of vessels. Situs has also been found a few miles from navigable water when that was the only suitable land for the longshoreman's employer's purpose.

Status

Traditionally, longshoreman status involves employees who load or unload vessels, build or repair ships, or engage in stevedoring, ship breaking, and related services. Office and clerical workers (who are employed exclusively as such), individuals employed by a club, camp recreational operation, restaurant, museum, or retail outlet fall outside of the act and would probably be covered by state workers compensation. However, courts have found other occupations to be covered when the work is "integral" to the longshoreman business and is performed regularly. Examples include security guards performing safety functions, maintenance and repair personnel, and carpenters.

The Outer Continental Shelf Lands Act (OCSLA)

Under this act, employees who work in the Gulf of Mexico on the Outer Continental Shelf (beyond three miles of the Louisiana coasts) are specifically covered under the Longshore Act, provided they do not qualify as seamen under the Jones Act.

The benefits for LHWCA coverage are significantly higher than land act (state act) rates and therefore the premiums paid for such are much higher. For that reason, injured workers often pursue legal action to enjoy the determination of being a longshoreman and the corresponding federal higher benefit levels.

Note that unlike state workers compensation, corporate officers cannot be excluded from longshoreman coverage.

Waiting Period

The waiting period is three days commencing on the first day of disability. It is paid to the employee after the fourteenth day after the employer has knowledge of the injury. (33 U.S.C. § 906(a) & 4(b)).

Average Weekly Wage (AWW)

The Average Weekly Wage is determined in one of three ways: (1) if the employee worked in the same employment substantially the whole year (37 weeks), his average annual earnings shall consist of 300 times the average daily wage or salary for a six-day worker or 260 times the average daily wage or salary for a five-day worker (33 U.S.C § 910(a)). (2) If the employee worked in the same employment substantially less than the whole year (or one day hired for permanent position), the AWW is based on the wages of an employee of the same classification, computed in the same manner as stated above (33 U.S.C. § 910(b)). (3) If the employee's work is seasonal (part-time), or if there is insufficient wage information for a calculation by either of the two previously stated methods, the AWW takes the actual earnings for one year prior to the injury and divides them by 52 weeks. Periods in which the employee was laid off, disabled, or on strike are deducted from initial 52-week divisor (33 U.S.C. § 910 (c) & (d)).

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Compensation Rate

Temporary Total Disability (TTD or TT Rate)

The TTD rate is 66 2/3 percent of the employee's AWW subject to the annual maximum rate (33 U.S.C § 908 (b)). The compensation is paid based on a seven-day week. At the time of the first payment, form LS 206 Payment of Compensation without Award is sent to the DOL with a copy with the payment to the employee (33 U.S.C. § 914(c)). If any changes are made in the AWW, an amended form LS 206 is sent (33 U.S.C. § 914 (c)). Failure to pay compensation as it becomes due adds 10 percent to the amount of the installment due (33 U.S.C. § 914(e)). Compensation payments should be made every two weeks unless the DOL directs otherwise (33 U.S.C § 914(b)). Minimum rate is 50 percent of the national AWW; the exception is if an employee's AWW is less than 50 percent of the national AWW, then the employee receives the actual AWW (33 U.S.C. § 906 (b)(2)). The maximum compensation is 200 percent of the national AWW (33 U.S.C § 906 (b)(l)). Employer/carrier must file a form each time that TTD is ceased LS-208 Notice of Final Payment or Suspension (33 U.S.C. § 914 (c)). Within 16 days after the final payment of compensation, the employer/carrier must notify the deputy commissioner of the date of final payment, total amount of compensation paid, date of injury and/or death, and name of employee via form LS-208 Notice of Final Payment or Suspension (33 U.S.C. § 914(g)).

Temporary Partial Disability (TP or TPD)

This is a partial reduction, of 66 2/3 percent of the difference between the employee's pre-injury AWW and current AWW, not to exceed five years or 260 weeks of actual paid benefits (33 U.S.C. § 908 (e)).

Death Benefits

Widows/widowers receive 50 percent of the decedent's AWW and each child receives an additional 16 2/3 of the AWW (33 U.S.C. § 909(b)). Various dependent family members are defined in the act and might be entitled to varying amounts (33 U.S.C. § 909 (c)(d)). The total death benefit cannot exceed 66 2/3 percent of the decedent's AWW. If the widow/widower remarries, he/she receives a lump sum payment equal to 2 years of benefits. Upon remarriage by or death of a widow/widower, the children of the decedent would then share in equal parts 66 2/3 percent of the decedent's AWW. The minimum compensation will not be less than the AWW of the deceased (33 U.S.C § 909 (e)). The maximum compensation for death is 200 percent of the national AWW figured on 10/1 annually (33 U.S.C § 906 (b)(l)). If death is caused by a combination of pre-existing permanent disability and an injury causing death, the Special Fund assumes responsibility for payments on the 105th week (33 U.S.C. § 908 (f) & 44 (I) (2)). If an employee, receiving scheduled PPD per Section 8 (c) (1)-(22) but not including Section 8 (c) (21), dies from causes unrelated to his work injury, his dependents will receive the balance of his award (33 U.S.C. § 908 (d)). However, deaths before 9/28/84 unrelated to a work-related injury for which the decedent was receiving PPD per Section 8 (a) or 8 (c) (21) will be compensable and survivors can file a claim for death benefits. If there are no survivors, the Special Fund receives (1) death following injury, $5,000 will be paid (33 U.S.C. § 944 (c)(l)), or (2) death unrelated to injury while receiving a scheduled PPD, the balance of the award will be paid (33 U.S.C. § 908 (d)(3)).

Funeral Benefits

The law calls for reasonable expenses not to exceed $3,000 upon receipt of a certified statement for services. The dependent may submit a form LS-265 Certification of Funeral Director's Burial Expenses. The funeral expenses for all deaths before 9/28/84 is $1,000 (33 U.S.C. §909(a)).

Medical Treatment

The employer must furnish the employee with the form LS-1 Request for Examination and/or Treatment, authorizing the employee to seek treatment as required and reasonable costs of travel (33 U.S.C. § 907(a), #20 CFR 702.401, 402, 412 (b)). The employee has free choice of initial physician in all cases, except he may not select from a list of debarred doctors, as listed by the Secretary of Labor. The employer/carrier or employee may thereafter request a change of physician; however the employee must seek the prior consent of the employer, carrier, or deputy commissioner (33 U.S.C. § 907(b) (c), #20 CFR 702.406). If an employee obtains medical care for an injury without requesting such from the employer/carrier and the employer has no knowledge of the injury, it is considered self-procured and the sole responsibility of the employee (33 U.S.C. § 907 (d)). Special exams—an employer/carrier may request an exam by a physician of its choice at reasonable intervals (33 U.S.C. § 907(d)). If an employee refuses to submit to a special exam requested by the employer/carrier or deputy commissioner or surgery, the employer/carrier may

petition the deputy commissioner to request issuance of an order suspending further compensation and treatment until the employee becomes available for the exam or treatment (33 U.S.C. §907(d), (k)(2)). IME—may be appointed by the deputy commissioner, and the cost is charged to the employer/carrier. If any party is dissatisfied with the IME results, another exam may be ordered by the deputy commissioner (33 U.S.C. §907 (e)(f)(g), #20CFR 702.408, 409, 410, 411, 412).

Medical Records

If the employer/carrier authorizes medical care and the physician fails to submit a medical report to the deputy commissioner and the employer/carrier within 10 days following first treatment, this will act as a bar to the enforcement of any claim for treatment made against the employer/carrier, unless the directorate excuses this in the interest of justice (33 U.S.C. §907(d)(2), $20 CFR 702.422).

Vocational Rehabilitation

Voluntary, if started, the employer/carrier is obligated to file form LS-222 Carriers Report of Rehabilitation accompanied by medical reports (20 CFR §702.502). If rehabilitation is recommended by the treating physician, employee requests it, or employer/carrier believes it will restore the employee to meaningful employment, the case may be referred to the OWCP rehabilitation specialist or a private vendor. If the OWCP specialist refers the employee to a vendor, all costs of the exam will be paid by the Special Fund. If a training program is approved by the OWCP specialist, the costs will be paid by the Special Fund (33 U.S.C. §939(c)(l)(2), #20 CFR 702.502.503, 504, 505). Ongoing payments to the employee should continue while in rehabilitation.

Permanent Partial Disability (PPD)

Scheduled injuries—when the employee is compensated for the loss of or the loss of use of an affected body part. The employee receives 66 2/3 percent of AWW for a number of weeks not to exceed the entitlement listed below next to each member (33 U.S.C. §908(c)(1)-(20)). There are other details in the act about partial amputation of body parts, vision loss, total loss of use but not amputation, amputation or loss of use of more than one member. Reduction in scheduled permanent disability is allowed if the employee has been previously compensated by the LHWCA for disability to the same member, however benefits paid by any other jurisdiction will not be deducted. See Table 1.

Non-scheduled injuries—for any member or condition not listed in the schedule. It is computed on the basis of loss of wage-earning capacity and is 66 2/3 of the difference between the AWW and his wage-earning capacity after his RTW in the same or other employment (33 U.S.C. §908(c)(21)).

Permanent Total Disability (PTD)

This is defined as the inability to earn any wages possibly for life until there is an improvement in the medical impairment or until alternative employment can be found, entitling the employee to 66 2/3 percent of the AWW. Claims for PTD may be based on a scheduled injury (33 U.S.C. §908(c)(l)-(20)), unscheduled (33 U.S.C. §908(c)(21)), or any combination of injuries that render the employee unable to work in any suitable and gainful employment. There is an annual cost of living allowance every 10/1, which is limited to the lesser of the (1) a percentage equal to the difference between the national AWW and the national AWW for the preceding year, or (2) five (5) (33U.S.C § 910 (f)). The employee must show his inability to earn any wages in his "usual employment."

Once the employee has met this burden of proof, the burden shifts to the employer/carrier to prove that the employee can return to his job or another

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Table 1

Lost Member	Weeks
Arm	312
Leg	288
Hand	244
Foot	205
Eye	160
Thumb	75
First (index) finger lost	46
Great toe	38
Second (middle) finger	30
Third (ring) finger	25
Toe, other than great toe	16
Fourth (little) finger	15
Loss of Hearing 1 ear 2 ears	 52 200
Disfigurement	up to $7,500

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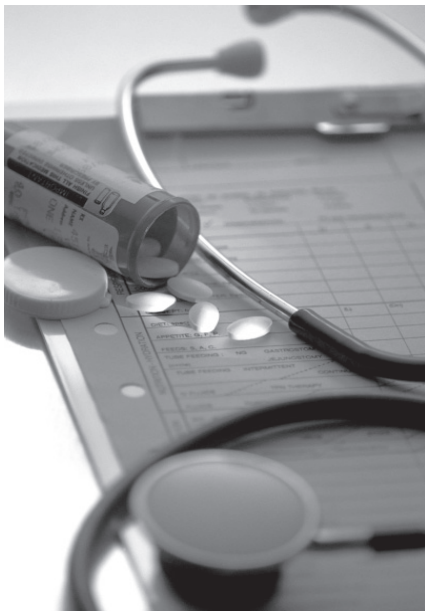
job with the same employer or other suitable alternate employment.

Second Injury Fund

Generally limits the employer/carrier's liability to 104 weeks, for PPD, PTD, and death (33 U.S.C § 908(f)). Employer submits LS-141 Notice of Informal Conference and shows (1) pre-existing PPD, (2) the existing PPD must contribute to the subsequent PPD, (3) the existing PPI must be manifest to the employer. The employer/carrier remains liable for reasonable, necessary related medical.

LHWCA Workers Compensation Forms

- LS-1 Request for Exam and/or Treatment
- LS-18 Pre-Hearing Statement
- LS-33 Approval of Compromise of Third Person Cause of Action
- LS-141 Notice of Informal Conference
- LS-200 Report of Earnings
- LS-201 Notice of Employee's Injury or Death
- LS-202 Employers' First Report of Injury or Occupational Illness



- LS-203 Employee's Claim for Compensation
- LS-204 Attending Physician's Supplementary Report
- LS-206 Payment of Compensation Without Award
- LS-207 Notice of Controversion of Right to Compensation
- LS-208 Notice of Final Payment or Suspension of Compensation Benefits
- LS-210 Employer's Supplementary Report of Accident or Occupational Illness
- LS-215a Notice to Employer and Insurance Carrier that Claim has been Filed
- LS-222 Carrier's or Self Insurer's Report on Rehabilitation to Deputy Commissioner
- LS-262 Widow's, Widower's, &/or Children's Claim for Death Benefits
- LS-263 Other Dependents' Claim for Death Benefits
- LS-265 Certification of Funeral Director's Burial Expense
- LS-266 Application for Continuation of Death Benefit for Student
- LS-280 Memorandum of Informal Conference
- LS-462 Stipulation of Facts
- LS-464 Compensation Order/Award of Compensation
- LS-465 Compensation Order-Approval of Agreed Settlement-Section 8(1)
- LS-521 Notice to Insurance Carrier or Self-Insured Employer
- LS-226a Subpoena Duces Tecum
- SSA-7050 Request for Social Earnings Information
- RS-4506 Request for Copy of Tax Form ■

The Columbia Disaster: What Went Wrong?

by Elizabeth Shimer

Editor's Note: As regular readers of the *LCQ* will recall, Fred Manuele had an excellent article on the Columbia shuttle disaster in the February 2005 issue (reprinted with permission from *Professional Safety*). The following article, reprinted with permission, from the Spring 2005 *Lehigh University Alumni Bulletin,* lends a slightly different perspective to this tragedy, but nevertheless is well worth reading for all of us who have an abiding interest in this national tragedy. Kurt Pfitzer also contributed to this article.

On the evening of February 1, 2003, as the space shuttle Columbia lay on the ground in more than 84,000 pieces across two states, and seven families mourned the deaths of their loved ones, stunned people around the world wondered: "What went wrong?"

In the months leading up to NASA's first scheduled space shuttle launch since the Columbia disaster, a class of 15 Lehigh seniors became the only undergraduate students in the world to assume the solemn task of analyzing debris from the tragedy.

Several months after the crash, NASA investigators discovered what caused it: a piece of insulating foam that spalled, or broke away, from the fuel tank during launch and struck the shuttle's wing panel. The impact damaged the panel's thermal protection system, exposing the panel to deadly heat when the shuttle reentered the Earth's atmosphere.

But according to Arnold Marder, the R.D. Stout Distinguished Professor of Materials Science and Engineering, there may be much more to it. "How do materials behave under conditions of hypersonic reentry?" asks Marder. "We had the opportunity to analyze technology that was developed in the 1970s and how it responded to a very unusual situation. Future spaceflight may never see this situation again."

Marder and the students in his failure analysis class analyzed pieces of Columbia debris last semester and presented their findings to NASA on April 12 and 14, which included suggestions for building future spacecrafts. NASA was pleased with the results.

"The students were able to give us information for the parts we didn't get a chance to study that will certainly be applied or compared to what we have and put toward future generations of vehicles," says Steve McDanels, chief of NASA's Failure Analysis and Materials Evaluation Branch. "We're looking to go to the moon again and on to Mars, and there's always room for lessons learned and new information."

NASA's decision to send pieces of the Columbia debris to Lehigh for analysis also placed the university in the national spotlight. More than 100 news outlets across the country covered the story, including CNN *Headline News*, Fox News, the Associated Press, *Los Angeles Times*, *Washington Post*, and *Newsday*.

Clues to a Tragedy

Each year, students in Marder's failure analysis course peer through microscopes to learn the variety of ways in which different materials—usually everyday items such as pieces of machines or gym equipment that have been damaged in real-life situations—deform and crack.

But there was nothing everyday about the materials they worked with this year, as NASA and the Kennedy Space Center entrusted the students with the sobering responsibility of analyzing 50 pieces of Columbia, ranging from windshield to wing.

During a sabbatical with NASA in the spring of 2004, Marder proposed that students in his failure analysis class be given the chance to analyze the debris. Impressed with Marder's work on several projects, including NASA's Return to Flight Program on the Columbia accident, the space agency entrusted him with the project.

"Lehigh's Materials Science and Engineering Department is an ideal site for such a post-mortem," Marder says. "The department is one of the few in the country that offers a failure analysis course, and its microscopy facilities are unrivaled."

Bags containing 50 pieces of the shuttle arrived at Lehigh in early February. "When I first saw the debris, I was overwhelmed and the students appeared to be in shock," Marder recalls. "They were completely awed by the concept of doing something so important, something for which the seven astronauts gave up their lives."

Each of the 15 students in the failure analysis class was given a piece of the shuttle to study, photograph, cut, grind, polish, and examine under a microscope to determine how the material reacted to the extreme temperatures and conditions.

"The project was sort of like forensics—like *CSI Miami*. We looked for clues, and a lot of those clues were on the fractured surfaces of the materials," says Ryan Deacon, a Ph.D. candidate in materials

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The Columbia Disaster: What Went Wrong?

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science and engineering and the graduate student Marder selected to be the teaching assistant for the class.

With the help of Lehigh research scientist Arlan Benscoter, a world-renowned metallographer, the seniors looked at their pieces under powerful electron and light microscopes to determine how they reacted under the extreme forces and temperatures, as well as why and when the parts stopped working.

"The students dug for information on how hot the pieces got and whether they broke quickly like a plate dropping from the counter or slowly like silly putty pulling apart," Deacon says.

Kandice Cohen, a materials science and engineering major, analyzed a piece of the Columbia's windshield and ultimately determined that—because of the particle impact zones she discovered on the piece while examining it under the scanning electron microscope—the part fractured during reentry from the blast, not when it hit the ground.

"A lot of the pieces of tile (which protect the underside of the shuttle from the heat of reentry) showed failure from a process of heating from the inside, for example," Deacon says. "We saw some really interesting material properties coming out of these pieces, and that was NASA's reason for giving us the project—so we can learn more."

Marder concurs. "We've learned how parts fail, and you always make better parts by learning how they fail. This is why automobile companies run their cars into barriers to see if they're crash-worthy. I hope NASA never sees another crash, but we can know that we gave them information that will help them design better materials for the future."

For example, the aluminum used in the shuttle could be improved in the future. "The aluminum of the 1970s had stuff in it that didn't belong," he says. Marder, however, is quick to add that Columbia's aluminum skeleton was not unsafe; no manmade material could likely have withstood the extreme forces at work in the shuttle disaster.

The point, Marder says, is that materials are often improved by finding out at what point they cease performing as they should—and why. "The concept of failure analysis is to make a better product in the end," he says.

Making Future Spaceflights Safer

In addition to being a part of history, the 15 students gained valuable real-world experience they'll take with them into their careers.

"Some of these pieces came back with pine needles and dirt on them—these were sitting in Louisiana for a few days before they were picked up," Deacon says. "And more importantly, there was a lot of data missing. In some cases, we weren't sure where a part came from and we didn't have all the information. And that's what analyses like these are like in the real world."

Mikolaj Bykowski, who analyzed a piece of a wing, feels better prepared to enter the workforce as a result of his experience. "This was a tremendous opportunity, a once-in-a-lifetime shot," he says. "I got to do something as an undergraduate student that most materials scientists will never get the chance to do. Hopefully, my results will help NASA design a better material to promote the safety of the crews flying the space shuttle."

The students also learned what it's like to work in a high-security environment.

"Security was a big issue with this project—it was part of the proposal Professor Marder submitted to NASA," Deacon says. "Everything had to be documented. The students had to sign out their pieces and could only work on them between 8 a.m. and 5 p.m., which was an adjustment for those who like to work at the last minute at midnight. And while we normally have a pretty open lab here, the students couldn't walk away from their pieces for a second, even to just run to the next room to get something."

The students and professors involved with the project never forgot that the opportunity set before them came at the highest cost.

"Throughout the time they were doing the investigation, the students always kept the seven astronauts who lost their lives in mind," Marder says. "They all used a photograph of astronauts as a memorial to conclude their presentations, and I didn't have to ask them to do that—they did it on their own. This was an awesome responsibility, and these students learned how to respond to a tragic incident and make it positive."

Cohen opened her presentation on the results of the windshield piece she analyzed with one of the final photographs taken from the Columbia before it crashed—an image of night falling across France, England, and Ireland. "There is still a lot left to be discovered through space exploration and a lot of beautiful images to capture," she told the audience.

As part of the relationship with NASA, Lehigh invited Pam Melroy, a NASA astronaut, to speak at the closing of the student presentations. Melroy told the group she was impressed—the students' findings closely paralleled those from NASA engineers, despite the students' limited information about the spacecraft.

She also offered words of encouragement and inspiration about the future of space travel, which includes a planned human visit to Mars in 20 to 30 years.

"There is a huge amount of work left for us to do in space. And it's not just for rocket engineers," Melroy told the students. "This is the challenge of your generation. And it will take all different career fields to come together and make this happen. Who knows? One of you in this room could be the first human to walk on Mars." ■

Getting to "Yes"

Attend the 2005 CPCU Society Annual Meeting and Seminars in Atlanta

by Kathleen J. Robison, CPCU, CPIW

Kathleen J. Robison, CPCU, CPIW, has more than 30 years of experience with leading claims organizations, and possesses a wide range of commercial and personal insurance coverage knowledge and applicability. K. Robi & Associates, LLC, which she founded in 2004, provides customized consultant services in the property and casualty insurance fields, including expert witness testimony, litigation management, claims and underwriting best practices reviews/audits, coverage analysis, and interim claims management. Robison previously served as vice president, claims and operations at DaimlerChrysler Insurance Company, where she was responsible for claims and litigation management throughout the United States and Canada; and whom she led to ISO 9001 certification. Robison has served on national insurance boards and associations, including the CPCU Society, the former NAII (now PCIA); NICB; and ISO. She earned a B.A. from Western College; studied at the graduate level at the University of Illinois and Miami University; and completed numerous executive courses at Wharton Business School, the CPCU Society's National Leadership Institute, and elsewhere. Robison is a former NAIW "Claims Woman of the Year." She can be reached at (423) 884-3226 or (423) 404-3538; or at info@krobiconsult.com.

So you want to attend the CPCU Society's Annual Meeting and Seminars this year in Atlanta. You last attended when you received your designation. You enjoyed the educational sessions, the many interesting insurance professionals whom you met, and came away feeling you had learned a lot formally and informally. You are now reviewing the agenda and think, "Gosh, there is a lot of good stuff here. What I could learn, I could bring back and use right away in my current position. But the Annual Meeting is for new designees. Those are the only people going from around here."

Please think again. Our Annual Meeting and Seminars is our premier educational showcase. All CPCUs are invited and encouraged to attend. With more than 45 sessions available, one is guaranteed to find more than enough sessions to meet individual needs and desires than there are hours in the day. In fact, you might find yourself trying to select between two or three at one time.

So now all you have to do is to get your manager to agree that your attending the CPCU Society's Annual Meeting and Seminars would benefit the company. Here are some suggestions that have worked well for other CPCUs.

It Meets My Goals for This Year

Does your company have you establish your performance goals each year? Is one of your goals continuing professional development/training? Should one of your goals for next year be continuing professional development/training? If it is, then you have found a perfect sales tool. The Annual Meeting sessions abound with technical training and leadership development.

It Assists in Next Level Development

In discussions with your boss, has he or she mentioned skills that you should enhance and/or acquire for your current position or moving to the next level? If so, review the Annual Meeting agenda and show your boss the many sessions that will get you the specific training needed. If you have not had this type of discussion, initiate it with the Annual Meeting agenda in hand.

I Will Get the CE Credits I Need to Do My Job

Does your position require licenses resulting in continuing education credits? At the Annual Meeting and Seminars some attendees can accumulate up to 24 CE credits.

I Will Gain the Needed Knowledge for Our New Business Opportunities

Is your company considering new business endeavors, opportunities for growth in which you might be involved? If so, check the Annual Meeting agenda. You just might find sessions that cover the same areas. You can then demonstrate that your attendance at the Annual Meeting will enhance your knowledge, allow you to gain greater insights, and make key contacts that will enhance the company's future success.

I Will Contribute to the Company's Overall Efficiency through My CPCU Networking

Many of us in our business lives are facing the same issues—benchmarking, regulations, Sarbanes-Oxley, process management, knowledge management, etc. Meeting others who have faced similar issues is very beneficial. When you have the opportunity to utilize your network on a company project there are many savings. One type of savings may be time. The knowledge gained via the network may save the committee two hours of research. Thus "a" committee members x average wage costs x 2 hours = "b" amount of savings.

I Can Assist with Training and Knowledge Management

This is a constant endeavor. You can offer

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Getting to "Yes"

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to bring back specific knowledge and share it within the organization. This could be accomplished through a written report, writing an article for circulation, and/or doing training sessions for your peers.

However, you say, while these are all good points it still comes down to the costs—***the dreaded budget question.*** And you are correct. But most budgets contain some dollars for training.

To help your manager maximize the training budgets, you might offer any or a combination of the following:

- Reduce the cost of the airfare by using your frequent flyer miles.
- Reduce the hotel cost by staying at an offsite hotel within walking distance of the conference. Make sure that the offsite hotel you select is in an area where it is safe to walk at all hours. Share the hotel cost with a roommate. Perhaps you have friends or relatives who live in the same city as the Annual Meeting whom have been asking you when you are going to come out and see them. Now could be the opportune time.
- Forego the rental car and use the less expensive mode called public transportation.
- Offer to pay your own expenses (using the above tips) provided the company will pay for the Annual Meeting and Seminars registration fee.
- Offer to pay your own expenses and the Annual Meeting and Seminars registration fee provided the time you spend at the meeting is not counted as vacation.

Dollar for dollar the CPCU Society's Annual Meeting and Seminars is the best insurance educational, networking, and communication event you can attend. The return on investment is high for both yourself and your company. ■

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