

Perception of Risk – Employer, Worker, and Juror Perspectives
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Litigation commonly involves incidents affecting workers who suffer injury due to hazards in the workplace. This is especially true in those states that have created a legislative standard for loss of tort immunity (i.e., "deliberate intent"). This paper presents an overview of what risk is, its relationship to hazards, how it can be assessed and used to make intelligent business decisions, and how risk may be perceived by employers, workers, and those that help decide matters involving litigation – jurors.

Introduction

The world is a dangerous place in which to live. This, despite the fact that advances in science and medicine have eradicated many diseases. Food safety has improved. Environmental measures have resulted, in some cases, in cleaner water being discharged into surface and ground waters than the water that was processed by the companies to make their products.

Yet new risks have arisen in the technical and information age. Consider the risks associated with nanotechnology, nuclear energy, hazardous wastes, irradiated food, artificial sweeteners, air pollution, terrorism, and sexually transmitted diseases. All have risks associated with them. However, not everyone has the same perception of those risks. How one perceives risk is a decision made within the context of one's own life. It is the issue of risk, and the perception of risk by employers, workers, and jurors, that affects work place safety and workers compensation insurance claims.

What Is Risk?

A discussion of risk is best prefaced with a few useful definitions¹:

Harm: Physical injury or damage to health of people. Note: This may be a result of direct interaction with the [machine] or indirectly as a result of damage to property or to the environment.

Hazard: A potential source of harm.

Protective measures: Design, safeguards and complementary protective devices, administrative controls, warnings, work procedures, training or personal protective equipment used to eliminate hazards or reduce risks.

Residual risk: Risk remaining after protective measures have been taken.

Risk: A combination of the probability of the occurrence of harm and the severity of that harm.

Risk assessment: The process by which the intended use of the machine, tasks and hazards, and the level of risk are determined.

Tolerable risk: Risk that is accepted for a given task and hazard combination [hazardous situation].

Within the context of occupational safety and health, occurrences of harm stem from hazard exposure experienced in the workplace. These exposures include inhalation of or contact with hazardous chemicals, unguarded machinery, fire and explosion situations, and so forth. Therefore, a more comprehensive definition of risk could be “the measure of the *probability* that *exposure* to a *hazard* will result in a negative *consequence*.” Risks are acceptable if they are judged to be tolerable (“acceptable risk”). Minimum risk is achieved when all risks deriving from hazards are at a realistic minimum. Minimum risk does not mean zero risk, which may not be attainable. Safety is defined as that state for which the risks are judged to be acceptable.

Risk Assessment Decision Matrix

Manuele² provides guidance on establishing hazard categories as a starting point for evaluating risk. This framework can be used in any situation where death, system loss, or property, equipment or environmental damage is a concern. These categories require understanding the particular product or process being evaluated, and what the terms mean to an individual operation. Consider the following definitions of categories of hazard severity suggested by Manuele:

Description	Category	Definition
Catastrophic	1	Death, system loss, devastating property damage or environmental damage
Critical	2	Severe injury or occupational illness, major system or environmental damage
Marginal	3	Minor injury, minor occupational illness, or minor system or environmental damage
Negligible	4	Less than minor injury or occupational illness, or less than minor system or environmental damage

Second, one must establish criteria for defining hazard probability. The word “probability” implies a quantitative determination of likelihood. Unlike the chemical process industry, where published statistical failure data based on historical operational data and research data is available, many times quantitative probabilities are not available. Typically, a consensus of subjective, professional opinions of knowledgeable persons is used. Consider the following qualitative definitions of hazard probability rankings suggested by Manuele:

Probability	Level	Category Parameters
Frequent	A	Likely to occur frequently
Probable	B	Will occur several times during a product’s life cycle or person’s life span
Occasional	C	Likely to occur some time during a product’s life cycle or a person’s life span
Remote	D	Unlikely but possible to occur during a product’s life cycle or person’s life span
Improbable	E	So unlikely it can be assumed the occurrence may not be experienced

Using the above definitions helps establish a basic matrix to develop qualitative assessments of risk as to establish priorities.

Occurrence Probability	Severity of Consequence			
	Catastrophic - 1	Critical - 2	Marginal - 3	Negligible - 4
A – Frequent	1 – A	2 – A	3 – A	4 – A
B – Probable	1 – B	2 – B	3 – B	4 – B
C - Occasional	1 – C	2 – C	3 – C	4 – C
D - Remote	1 – D	2 – D	3 – D	4 – D
E – Improbable	1 – E	2 – E	3 – E	4 – E

Where,

Hazard Risk Index	Suggested Category
1-A, 1-B, 1-C, 2-A, 2-B, 3-A	Unacceptable
1-D, 2-C, 2-D, 3-B, 3-C	Undesirable, written management decision required for action
1-E, 2-E, 3-D, 3-E, 4-A, 4-B	Acceptable, with management review
4-C, 4-D, 4-E	Acceptable, without management review, <i>but action must be taken to further control the identified hazards</i>

If risk analyses and risk assessments are to be effectively made, those responsible for conducting assessments must be skilled in the use of the special analytical techniques that are available. There are over 25 hazard analysis techniques and each has its advantages and limitations. The techniques most applicable to the chemical process industry are discussed in OSHA's Process Safety Management regulation, 29 CFR 1910.119. The most common assessment and analysis methodologies include Checklists, Fault Tree, What IF Technique, Hazard and Operability Study (HAZOP), Failure Modes and Effect Analysis (FMEA), and Management Oversight and Risk Tree (MORT).

Implications for Employers

All risk is derived from hazards. Therefore, hazards must be the focus of design efforts to achieve a state for which the risks are judged to be acceptable. In determining minimum risk, design objectives and the practicality of risk reduction measures and their costs, and their probable acceptance by users, will be decision factors.

Management has the primary responsibility to provide a safe and healthful work place under the General Duty Clause of OSHA. Proper systems and processes should be in place to accomplish this goal. Such processes include:

- Performing competent hazard analyses;
- Implementing appropriate hazard control programs and measures;
- Providing necessary monitoring and feedback of those systems and procedures;
- Conducting effective injury investigations to determine the root cause of accidents; and
- Ensuring that appropriate correct actions are taken in a timely and proper manner and ensuring that the corrective actions loop back to the hazard analysis.

A competent workplace hazard analysis considers and evaluates the foreseeable and predictable uses and misuses of machines, tools, and equipment on people, property and the environment. However, issues that involve workers are sometimes neglected. These issues are perception of risk, hazard assessment, the role of proper training (not just training for the sake of fulfilling a requirement), acknowledging and compensating for bad habits, lapses, mistakes and forgetfulness, and unrealistic or perhaps even unsafe demands by supervisors.

Hazard control flows from the hazard analysis. A logical thought process has been developed and available since the early 1960s to guide the achievement of controlling hazards. This thought process is known as the “Safety Hierarchy”³ and presents basic measures for preventing accidental injury in order of effectiveness and priority preference. The measures are:

1. Eliminate the hazard from the machine, method, material, or plant structure.
2. Control the hazard by enclosing or guarding it at its source.
3. Train or warn 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 hazard.

Eliminating the hazard through design is preferred because there is no residual hazard requiring further action.

Design changes and guards are the next but lower level of protection. A residual hazard remains, either by the design of the guard itself (which is an inherent design defect) or by the actions of the worker to properly and regularly use or maintain the guard.

“... that which is clearly known hath less terror than that which is but hinted at and guessed.” (Arthur Conan Doyle, *The Hound of the Baskervilles*). The third lowest priority intervention is to provide warnings and training. We are much more afraid of risks when uncertainty is high and less afraid when we know more, which explains why we meet many new technologies with high initial concern.⁴ Most people are less afraid of a risk they feel they have some control over [like operating a hazardous machine alone], and more afraid of a risk they don’t control [like a complex machine involving multiple operators and control stations].⁵

Safety, health, and environmental training is an important element of an effective overall safety, health, and environmental program. Historically, safety, health, and environmental training has been specifically addressed by only a few regulations with limited scope, such as asbestos, hazard communication, and storm water management. The regulations usually only specify the technical issues to be covered in a training course. But training that is not competently developed, delivered, and measured for effectiveness can be disregarded, or forgotten due to stress or other stimuli. A recent consensus standard on effective safety and health training⁶ stipulates how to adequately design, develop, deliver, and evaluate training and is applicable to a broad range of training and training programs. The goal of risk communication is to provide information to workers so that they may make informed – and hopefully, the correct - choices.

According to product warning research, risk estimates of novice workers will likely be higher than that of their experienced counterparts. The greater accident frequency of the novice worker may be more a function of insufficient knowledge regarding proper operating procedures or lack of familiarity with them than an intentional nonexecution of those procedures.⁷ Therefore warnings are an important element of worker safety and complements safety and task training. However, warnings are typically overused and poorly designed despite numerous standards published by the American National Standards Institute (ANSI). Warnings are often not only improperly designed but are frequently not properly located relative to the hazard. This creates a situation whereby the warning can be overlooked or not evoke the proper response by the worker because it is not present close in time and location relative to the hazard and the worker’s point of need. These defects in warnings can lead to a high level of noncompliance and subsequent injury.

Personal protective equipment is the lowest form of safeguard. Its use is an acknowledgement that the hazard continues to exist at a level that constitutes a sufficient injury potential. Unfortunately, employers frequently resort to the use of personal protective equipment as the sole remedy for a hazard. Sometimes personal protective equipment is relied on until an engineering control is developed and implemented. However, the engineering control often gets delayed or forgotten due to the lapse of time, budget constraints, or other competing priorities and the personal protective equipment is the workers' sole line of defense against the persistent hazard. Failures involving personal protective equipment include: improper equipment selection for the hazard, workers not knowing when to wear specific equipment, and not knowing how to properly maintain the equipment.

Implications for Workers

Although OSHA establishes the ultimate responsibility for worker safety on the employer, workers should not be divorced from the risk assessment process. Often, the workers know as much or perhaps more than some members of management about the process and ways to improve and make it safer. In fact, each worker should be encouraged and trained to conduct a simple risk assessment thought process before beginning just about any task in the work place. Human instinct is to "go ahead and do it". Often, this occurs without thinking through the ramifications of one's actions. A simple risk assessment is something that can be done by anyone, anywhere, at any time, and does not require documentation or a committee to do it.

A simple risk assessment makes you stop, ask and answer the following questions before performing a task:

- Why am I doing it?
- What could go wrong?
- How could it affect me or others?
- How likely is it to happen?
- What can I do about it?

This sounds like common sense. And it is. However, in the population at large, common sense is often an uncommon virtue. Unfortunate incidents involving injury and death, whether in the workplace, on the highways, in the home, or elsewhere are a testament to that statement. Why is this so? Perhaps the well known saying "Familiarity breeds contempt" is true. Most people are more afraid of risks that are new than those that they have lived with for awhile.⁸ We become accustomed to performing a particular, risky action the same way that we have always performed it. And we have performed it without negative consequence. It is the "It hasn't happened to me" or "I have never seen or heard of that kind of incident occurring" syndrome. As this self-confidence ("risk taking behavior") or "risk habituation" increases due to the worker's experience with the situation, the worker's perception of the risk tends toward zero.

Until the inevitable happens. Then the worker's perception of risk and potential injury increases resulting in desirable behavior for some time. Those who have experienced negative consequences involving personal injury in the work place have a different view of evaluating risks. We are more afraid of risks that we are more aware of and less afraid of risks that we are less aware of.⁹ That is because risk can be emotional. Perception of risk and danger is a powerful and fundamental driver of behavior, emotion, and thought. But we should not have to experience negative consequences that result in personal injury in order to learn the proper way to perform our jobs. This is the purpose of competent employee training - to equip and motivate workers to think and to act safely.

Implications for Jurors

The ubiquitous “Murphy” is on everyone’s payroll. Despite our best efforts, something goes wrong and a significant injury occurs. This may involve a products liability law suit with the employer sued as a third party defendant by the product manufacturer. Or it may involve a suit against the employer in an “intentional tort” or “deliberate intent” law suit in New Jersey, Michigan, Louisiana, Ohio, West Virginia, and perhaps other states with comparable legislation.

Jurors are confronted with many different technical and legal issues that are presented to them in lofty terms. These issues typically involve engineering and scientific principles that explain the hazards and risks involved with the incident. But where do the facts about the risks come from? Many times scientific facts still have much uncertainty. The science may be imprecise, but it is all we have available.

Toxicology, for example, is the study of poisons. Animal testing is most often used because of the ethical issues of exposing humans to toxic substances. But what do the animal data mean? Can tests on animals be properly extrapolated to humans? If they can be extrapolated to humans, then what precision is associated with that extrapolation? Throw *in vivo* versus *in vitro* testing into the mix and the problem escalates further. Toxicology is important in evaluating risks and control measures, but it cannot state with absolute accuracy how animal tests in laboratories translate to human health and well-being in the real world.

Epidemiology is another discipline that is often used to explain risks. Epidemiology is essentially the study of disease and illness in populations. Historical and current data can be used to describe associations that *may* exist between a hazard and *possible* negative consequences of exposure to that hazard. However, associations are not proof. Associations indicate a probability or possibility of a negative consequence. The strength of the association depends on the quality of the epidemiology study.

Statistical analyses may be the most confusing for jurors, especially when the same data are interpreted differently by the testifying experts. Statistics can provide some insights about a risk, but they may still be equivocal and subject to interpretation in terms of defining and quantifying risk.

Thus, jurors are required to digest this avalanche of information and decide and apportion fault. How they digest this information depends on the skill and simplicity by which the parties present their case. Remember the simple risk assessment? Who better than jurors to use this elementary process to weigh the facts and make conclusions regarding liability? The simple risk assessment applied to a juror distills to the following:

- Why was the Plaintiff doing what (s)he was doing at all, and does it make sense?
- What went wrong?
- Did it affect the Plaintiff in a manner and to the extent claimed?
- Was this a likely or foreseeable failure mode?
- Why did the failure exist in the first place?

Typically, jurors do not and cannot engage in a quantitative evaluation of the risks involved in an incident. Instead, they may chase the illusion of a risk-free existence. As U.S. Supreme Court Justice Oliver Wendall Holmes once stated, “Most people think dramatically, not quantitatively”. They tend to think more about the visceral intensity of an incident and not the pragmatic issues involved behind the incident. The constant challenge is to present the most simple and credible scenario of the events

to educate the jury so that they can make a proper and informed judgment about the facts and circumstances before them.

Summary

Risk assessments have entered mainstream industry through the standards process. They may eventually become an integrated part of business, like quality. Incorporating risk assessments in business decisions will result in fewer incidents (and the associated costs) of worker injuries and illnesses, and damage to property, equipment, and the environment. Employers and manufacturers who fail to conduct competent risk assessments, or fail to implement programs and processes that incorporate appropriate corrective actions and design features, warnings, worker training, and personal protective equipment face the increased risk and cost of worker injuries. Worse yet, they face the additional costs imposed through adverse verdicts by jurors who may have skewed perspectives of those risks.

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¹ Association for Manufacturing Technology (November 2000). "ANSI B11.3.TR3-2000, Risk Assessment and Risk Reduction: A Guide to Estimate, Evaluate and Reduce Risks Associated with Machine Tools". McLean, VA.

² Manuele, Fred A. (1995). "Guidelines: Designing for Safety". M&M Protection Consultants, New York. 11-14.

³ McElroy, Frank E., Editor. (1964). Accident Prevention Manual for Industrial Operations, 5th Edition. National Safety Council, Chicago, IL. P. 4-1.

⁴ Ropeik, David and George Gray. (2002). *Risk – A Practical Guide for Deciding What's Really Safe and What's Really Dangerous in the World Around You*. Houghton Mifflin Company, Boston, MA. 17.

⁵ Ibid. 17.

⁶ ANSI Z490.1-2001, "Criteria for Accepted Practices in Safety, Health and Environmental Training". American National Standards Institute, New York.

⁷ Curry, David G., et al. (September 2004). "Injuries and the Experienced Worker". *Professional Safety*. American Society of Safety Engineers, Des Plaines, IL. 31.

⁸ Ibid. 16.

⁹ Ibid. 17.