GLOBAL EDITION

Occupational Safety and Health

For Technologists, Engineers, and Managers

EIGHTH EDITION

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ALWAYS LEARNING

PEARSON

OCCUPATIONAL SAFETY AND HEALTH

For Technologists, Engineers, and Managers

REVIEW QUESTIONS

1. List the criteria to decide if a duty to warn exists for a particular product or service.
2. Explain the procedure for the reporting requirements component of the Community Right-to-Know Act.
3. Explain how the safety coordination duties can be improved in a company.
4. Briefly explain the concept of strict liability in tort.
5. List the three criteria governing a company's duty to warn.
6. What are two purposes of the Consumer Product Safety Act?
7. Define the following concepts associated with product liability law: *patent defect*, *latent defect*, and *prudent man concept*.
8. Explain the reporting requirements component of the Community Right-to-Know Act.
9. List and briefly explain the three components of a comprehensive product safety program.
10. How may assigning product safety coordination duties to an executive of the company affect the success of the program?
11. What role do you think safety and health professionals should play in a product safety program?
12. Define the term quality management, and list its components.
13. Explain why record keeping is so important in safety.
14. List four strategies for producing high-quality, effective product literature.

ENDNOTES

1. D. A. Colling, *Industrial Safety: Management and Technology* (Upper Saddle River, NJ: Prentice Hall, 2013), 263.
2. Ibid., 264.
3. American Law Institute, *Second Restatement of Torts,* Paragraph 402A. 2011.
4. Ibid., Paragraph 388.
5. Colling, *Industrial Safety*, 267.
6. Ibid.
7. Ibid., 266.
8. Ibid., 426.
9. Ibid.
10. Ibid., 427.
11. Ibid.
12. Ibid., 434.
13. Ibid.
14. *Product Recalls and Managing the Risk of a Defective Product*. Retrieved from carrm-aloney.com/elements/articles/PRODUCT_RECALLS.pdf on July 6, 2013.
15. Ibid.

PART THREE

THE HUMAN ELEMENT

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CHAPTER TEN

ERGONOMIC HAZARDS: MUSCULOSKELETAL DISORDERS (MSDs) AND CUMULATIVE TRAUMA DISORDERS (CTDs)

MAJOR TOPICS

- Ergonomics Defined
- Human Factors and Ergonomic Hazards
- Factors Associated with Physical Stress
- Ergonomics: A Political Football
- OSHA's Voluntary Ergonomics Guidelines
- Worksite Analysis Program for Ergonomics
- Hazard Prevention and Control
- Medical Management Program
- Training and Education
- Common Indicators of Problems
- Identifying Specific Ergonomic Problems
- Ergonomic Problem-Solving Strategies
- Economics of Ergonomics
- Cumulative Trauma Disorders (CTDs)
- Participatory Ergonomics

The history of workplace development in the Western world is characterized by jobs and technologies designed to improve processes and productivity. All too often in the past, little or no concern was given to the impact of the job process or technology on workers. As a result, work processes and machines have sometimes been unnecessarily dangerous. Another result has been that new technologies have sometimes failed to live up to expectations. This is because, even in the age of high technology, human involvement in work processes is still the key to the most significant and enduring productivity improvements. If a machine or system is uncomfortable, difficult, overly complicated, or dangerous to use, human workers will not be able to derive its full benefit.

The proliferation of uncomfortable and dangerous workplace conditions, whether created by job design or unfriendly technologies, is now widely recognized as harmful to productivity, quality, and worker safety and health. The advent of the science of ergonomics is making the workplace more physically friendly. This, in turn, is making the workplace a safer and healthier place.

ERGONOMICS DEFINED

Minimizing the amount of **physical stress** in the workplace requires continuous study of the ways in which people and technology interact. The insight learned from this study must then be used to improve the interaction. This is a description of the science of **ergonomics**. For the purpose of this book, ergonomics is defined as follows:

> Ergonomics is a multidisciplinary science that seeks to conform the workplace and all of its physiological aspects to the worker. Ergonomics involves the following:
>
> Using special design and evaluation techniques to make tasks, objects, and environments more compatible with human abilities and limitations.
>
> Seeking to improve productivity and quality by reducing workplace stressors, reducing the risk of injuries and illnesses, and increasing efficiency.

The word *ergonomics* is derived from the Greek language. *Ergon* is Greek for *work*; *nomos* means *laws*. Therefore, in a literal sense, ergonomics means work laws. In practice, it consists of the scientific principles (laws) applied in minimizing the physical stress associated with the workplace (work). Figure 10–1 summarizes some of the widely accepted benefits of ergonomics.

There are benefits to be derived from ergonomics (as listed in Figure 10–1). There are also problems, both financial and health related, that can result from giving too little attention to ergonomics. The matter is complicated further because health problems tend to multiply a company's financial problems. Consequently, modern safety and health professionals need to be well versed in ergonomics.

HUMAN FACTORS AND ERGONOMIC HAZARDS

When the topic of ergonomics is discussed, the term *human factors* will usually find its way into the conversation. But what is meant by the term? It can be defined as follows: Consumers are demanding safe and effective products. However, not all people have control over products they use. Therefore, all products must be carefully designed. For example, if a child car seat fails because it does not fit the child or is difficult to install, everyone will lose: the child, the parent, the designer, and the manufacturer. Human factors is a profession to help ensure that equipment and systems are safe and easy to operate by human beings.[1] A human factors researcher gathers and analyzes data on human beings (how they work, their size, their capabilities, and limitations). A human factors engineer works with designers as a team to incorporate data into designs to make sure people can operate and maintain the product or system. Human factors professionals then determine the skills needed to operate or maintain a finished product. Human factors is difficult to define because it is a compilation of many sciences dealing with both humans and machines. Some of the disciplines human factors experts are trained in include the following: psychology, anthropology, engineering, biology, medicine, education, and physiology.[2]

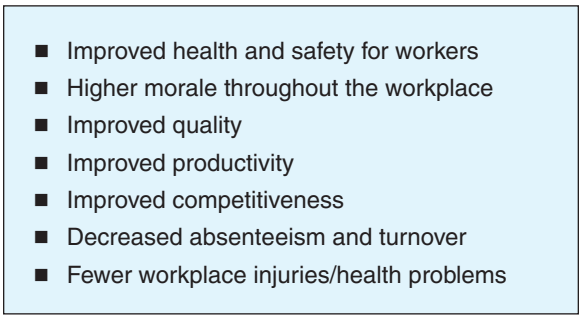

FIGURE 10–1 Benefits of ergonomics.

Human Factors Defined

Human factors is a science that combines research with the application of human data.[3] The concept can also be viewed as a science that bridges research about human beings and the application of that research in designing products and systems for human beings.

Human Factors in Action

Perhaps the best way to get a feel for the concept of human factors is to consider several of these examples:

1. **Predesign analysis.** In this stage of the design process, human factors professionals conduct research to answer such questions as: What is the best way for humans to interact with computers? What factors contribute to fatigue and stress in an office environment? How can designers overcome these factors?
2. **Preliminary design.** In this stage, human factors professionals study machine and human capabilities to determine which tasks should be undertaken manually and which should be automated.
3. **Detail design and development.** In design and development, human factors professionals define the environment required for operator safety, enhanced operator performance, and the reduction or prevention of operator stress and fatigue.
4. **Test and evaluation.** In this stage of the process, human factors professionals test actual humans in using the prototype equipment or system.[4]

Human Factors and Safety

Human factors can play an important role in both product safety and workplace safety (where many products are used). What follows is how the science of human factors can help reduce both product and workplace hazards:

1. **Hazard elimination by design.** Human error is frequently the root cause or a contributing cause in accidents on the job. Intelligent design can reduce human errors by providing controls that are simple to understand and operate and by proving human–machine interaction that is not boring or overly demanding physically.
2. **Provision and location of safety devices.** The design and location of safety devices such as emergency cutoff switches can reduce human error on the job, correspondingly reducing the chances of an accident.
3. **Provision of warning devices.** The color, location, and wording of warning devices; the pitch and volume of warning signals; and the design of caution markings on gauges and video displays are all important factors in reducing the likelihood of human error that might lead to an accident. The science of human factors can help determine the appropriate way to apply all of these factors in a given setting.
4. **Establishment of procedures/provision of training.** When hazards cannot be realistically designed out of a system, administrative procedures for hazard reduction must be established, and training relating to those procedures must be provided. Human factors professionals can help establish appropriate administrative procedures and help develop the necessary training.[5]

FACTORS ASSOCIATED WITH PHYSICAL STRESS

Eight variables that can influence the amount of *physical stress* experienced on the job are as follows:

Sitting versus standing

Stationary versus moveable/mobile

Large demand for strength/power versus small demand for strength/power