## 1—SAFETY THROUGH DESIGN

1. The Z10 standard includes the following safety through design provisions:
   - Addressing safety and health needs in the design and redesign processes
   - Identifying and analyzing hazards and assessing and prioritizing the risks that derive from them
   - Applying a prescribed hierarchy of controls, to reduce risks to an acceptable level
   - Implementing a management of change procedure so that hazards and risks are properly considered and minimized when changes are made
   - Including safety and health specifications in purchasing documents to avoid bringing hazards and risks into the workplace
2. Safety through design is defined as the integration of hazard analysis and risk assessment methods early in the design and redesign processes and taking the actions necessary so that the risks of injury or damage are at an acceptable level. This concept encompasses facilities, hardware, equipment, tooling, materials, layout and configuration, energy controls, environmental concerns, and products.
3. The following benefits will derive if decisions affecting safety, health, and the environment are integrated into the early stages of the design processes:
   - Significant reductions will be achieved in injuries, illnesses, damage to the environment, and the attendant costs
   - Productivity will be improved
   - Operating costs will be reduced
   - Expensive retrofitting to correct design shortcomings will be avoided.
4. There is a remarkable correlation between quality management and safety through design principles. We borrow from W. Edwards Deming, who was world renowned in quality management. Deming stressed again and again that, "Processes must be designed to achieve superior quality if that is the quality level desired, and that superior quality can not be attained otherwise." If the goal is to achieve superior quality, or superior safety, systems must be designed to achieve those performance levels, and a continuous improvement program must be maintained for the redesign of existing work places and work methods.
5. Acceptable risk: Is that risk for which the probability of a hazard-related incident or exposure occurring and the severity of harm or damage that may result are as low as reasonably practicable, and tolerable in the setting being considered.

   Safety: Safety is defined as that state for which the risks are judged to be acceptable.

   Hazards: Are the potential for harm. Hazards include all aspect of technology and activity that produce risk. Hazards include the characteristics of things (equipment, dusts) and the actions or inactions of people.

   Risk: An estimate of the probability of a hazards-related incident or exposure occurring and the severity of harm or damage that could result.

   Probability: The likelihood of a hazard being realized and initiating an incident or exposure that could result in harm or damage—for a selected unit of time, events, population, items or activity being considered.

   Severity: The extent of harm or damage that could result from a hazard-related incident or exposure.

   Residual risk: The risk remaining after preventive measures have been taken. No matter how effective the preventive actions, there will always be residual risk if a facility or operation continues to exist.
6. The Hazard Analysis/Risk Assessment Process

   Establish the Analysis Parameters

   Identify the Hazards

   Consider the Failure Modes

   Determine the Frequency and Duration of Exposure

   Assess the Severity of Consequences

   Determine Occurrence Probability

   Define the Risk

   Rank Risks in Priority Order

   Develop Remediation Proposals

   Follow Up on Actions Taken

   Document the Results
7. A risk assessment matrix includes combinations of occurrence probabilities and severities of harm, and the risk levels that derive from those combinations. A matrix helps in communicating with decision makers and influencing their decisions on risks and the actions to be taken to ameliorate them. Also, risk assessment matrices can be used to compare and

prioritize risks, and to effectively allocate mitigation resources.

8. Hierarchy of Controls

   Eliminate or reduce risks in the design and redesign processes

   Reduce risks by substituting less hazardous methods or materials

   Incorporate safety devices

   Provide warning systems

   Apply administrative controls (work methods, training, work scheduling, etc.)

   Provide personal protective equipment

9. The ameliorating actions described in the first, second, and third levels are more effective because they:
   - Are preventive actions that eliminate or reduce risk by design, substitution, and engineering measures
   - Rely the least on personnel performance
   - Are less defeatable by supervisors or workers
   - Actions described in the fourth, fifth and sixth levels are contingent actions and rely greatly on the performance of personnel.

10. A major premise to be considered in applying a hierarchy of controls is that the outcome of the actions taken is to be an acceptable risk level.

11. The definition of acceptable risk requires taking into consideration the:

    Practicable minimization of each of the two distinct aspects of risk as risk reduction actions are decided upon:
    - Avoiding, eliminating, or reducing the probability of a hazard-related incident or exposure occurring
    - Reducing the severity of harm or damage that may result, if an incident or exposure occurs
    - Feasibility and effectiveness of the risk reduction measures to be taken, and their costs, in relation to the amount of risk reduction to be achieved.

12. The safety professional can influence the design of the workplace and work methods at three critical points:

    Pre-operational in the design process where the opportunities are greatest and the costs are lower for hazard and risk avoidance, elimination, or control;

    In the operational mode where hazards are to be eliminated or controlled and risks reduced before their potentials are realized and hazards-related incidents or exposures occur;

    Post incident - as investigations are made of hazards-related incidents and exposures for causal factor determination and risk reduction.

13. Although behavior modification and training are important elements of a safety and health initiative, such measures are misdirected when applied to solve workplace or work methods design problems.

14. Place the burden of accident prevention on the individual worker.

15. The improvement in system performance that can be realized from the redesign of equipment is usually greater than the gains that can be realized from the selection and training of personnel.

16. Haddon espoused the concept that unwanted transfers of energy can be harmful (and wasteful) and that a systematic approach to limiting their possibility should be taken.

17. To provide guidance for those who consider adopting safety through design methods, and, subsequently, in applying the hierarchy of controls.

18. a. Avoid introduction of the hazard: Prevent buildup of the form of energy or hazardous materials.
    b. Limit the amount of energy or hazardous material.
    c. Substitute, using the less hazardous.
    d. Prevent unwanted energy or hazardous material buildup.
    e. Prevent unwanted energy or hazardous material release.
    f. Slow down the release of energy or hazardous material.
    g. Separate in space or time, or both, the release of energy of hazardous materials from that which is exposed to harm
    h. Interpose barriers to protect the people, property, or the environment exposed to an unwanted energy or hazardous material release.
    i. Modify the shock concentrating surfaces.

19. The objective of a management of change process is to prevent the introduction of new hazards and risks into the work environment when changes are made in technology, equipment, facilities, work practices and procedures, design specifications, raw materials,

organizational or staffing changes impacting on skill capabilities, and standards or regulations.

20. Having safety specifications included in purchasing documents (purchase orders and contracts) provides suppliers and vendors with knowledge of the safety specifications that are to be met. That substantially reduces the possibility of bringing hazards and the risks that derive from them into the workplace.

## 2—BUILDINGS AND FACILITY LAYOUT

1. Any five of the following:
   a. Illumination
   b. Noise and vibration control
   c. Product flow
   d. Ventilation (particularly of dust, vapors, and fumes)
   e. Control of temperature and humidity
   f. Work positions and movements of employees
   g. Supervision and communication
   h. Support requirements for such things as vehicles, portable ladders, material handling devices, monitoring and controlling systems, and cleaning and maintenance equipment.
2. d
3. The specific safety code for electric wiring and electrical installations is NFPA 70, National Electrical Code, issued by the National Fire Protection Association (NFPA).
4. a. Construction and procedures
   b. Visual displays, signs, and labels
   c. Protective features and guards
   d. Controls and handles
   e. Maintenance and service needs
   f. Safety signs
5. To protect pedestrians when their entrances are located near railroad tracks or busy thoroughfares, fence part of the right-of-way, install traffic signals, and build subways or pedestrian bridges.
6. b
7. a. Identify all confined spaces.
   b. Identify all potential hazards for each confined space and the methods to eliminate them.
   c. Develop a confined space work permit form.
   d. Train personnel on the dangers and proper observance of confined spaces.
   e. Ensure that a trained and equipped rescue team is available to respond to an emergency.
8. a
9. a. Keep the number of openings to a minimum.
   b. Secure all windows.
   c. Use protective lighting.
   d. Have entrances and service doors lead to a reception area.
   e. Install alarm systems that detect fire, fumes, vapors, and intruders.
   f. Limit access to docks and other receiving areas.
10. Safety engineers use warm colors to call attention to dangerous machine parts or hazards because warm colors (reds, yellows, and oranges) have longer wavelengths than cooler colors. Due to the human eye's reflective response to color, warm colors with longer wavelengths seem to move toward the observer.
11. Neutral colors of low-light reflectance values should be used in laboratories where reflected color might prevent accurate observation of materials being tested and analyzed.
12. d
13. a. Load
    b. Durability
    c. Maintenance
    d. Noise
    e. Dustiness
    f. Drainage
    g. Heat conductivity
    h. Resilience
    i. Electrical conductivity
    j. Appearance
    k. Chemical composition
    l. Slip-resistance

## 3—CONSTRUCTION OF FACILITIES

1. c
2. a
3. c
4. a
5. d
6. a
7. c
8. d
9. d
10. d
11. d
12. d

## 4—MAINTENANCE OF FACILITIES

1. d
2. a. Footings
   b. Column bases
   c. Foundation walls
   d. Pits
3. c
4. b
5. a. Clear a path from the center of the roof to the drains to avoid ice and snow buildup near drain areas.
   b. Clear a path leading to the roof's edge to allow drainage on a pitched roof with no drains.
   c. Never use blowtorches or similar devices to melt ice from drains or roof surfaces.
   d. Use care when removing ice and snow to avoid puncturing the roof.
6. a. Exit signs should be appropriately placed.
   b. Exits should not serve as storage areas.
   c. Exits should be well-lit with smooth floors.
   d. Exit doors should move freely with no obstructions.
   e. Exit signs and emergency lighting, designed to operate in the dark in case the lighting system fails, should be tested.
7. a. Inspect and thoroughly clean the heating systems.
   b. Annually inspect chimneys and vent pipes for cracks, missing mortar, and rusted holes.
   c. Keep the inside of buildings at a minimum temperature of 40 F.
   d. Do not leave buildings unattended for long periods of time.
   e. Each day check that the heating equipment is operating properly.
8. d
9. Any five of the following:
   a. Choose a heating, ventilating, and air conditioning (HVAC) system that fits the building size and anticipated uses.
   b. Allow for a generous number of intake and exhaust vents.
   c. Locate intake vents where they will receive the largest supply of fresh air away from cars, buildings, and process exhausts, and as close as possible to trees and bushes.
   d. Fit the HVAC system with regulating generators that are flexible enough to adjust to the varying air pressures of intake and exhaust vents.
   e. Use only steam humidifiers.
   f. Use prefilters to clean the air before it passes over higher-efficiency filters.
   g. Institute a preventive-maintenance program. Provide for regular inspections of drain pans, filters, and any area of the HVAC that is accessible and that might fall prey to germs.
10. a. Accidents and injuries from landscaping tools and machines
    b. Poisonous vines, shrubs, fruits, insects, and reptiles
    c. Pesticide poisoning
    d. Snow-shoveling injuries
11. a. Changing hand position while the trimmer is running
    b. Holding branches away from the cutting bar
    c. Removing debris from the trimmer
    d. Holding the trimmer with only one hand
    e. Failing to wait for the blades to stop after turning the trimmer off
12. A CPM program is a preventive measure that monitors equipment before malfunctioning or failure begins. In addition to alerting the proper personnel to potentially hazardous conditions, a CPM program also provides the record keeping required by state and federal safety regulations.
13. a. Their experience
    b. Their alertness
    c. Their mechanical ability
14. b
15. When employees work underneath pipelines that carry chemicals, isolate or cover the overhead pipelines so they will not drip on workers or materials. Issue special protective equipment to workers, such as chemical-protective goggles, protective suits, rubber gloves, or respiratory-protective equipment. Provide emergency showers with plainly marked locations.

## 5—BOILERS AND UNFIRED PRESSURE VESSELS

1. The ASME Code provides guidelines for inspection during the construction of boilers and pressure vessels. The NB Code provides guidelines for inspection after the installation, repair, or alteration of boilers and pressure vessels.
2. a. Errors in design, construction, and installation
   b. Improper operation, human failure, and improper operator training
   c. Corrosion or erosion
   d. Mechanical breakdown, failure, or blocking of safety devices
   e. Failure to inspect thoroughly and frequently
   f. Improper application of equipment
   g. Lack of planned preventive maintenance.
3. b
4. A boiler is a closed vessel in which water is heated by combustion of fuel or other heat source.
5. d
6. When it is suspected that there is a fire in the gas passages
7. To relieve excess pressure or vacuum
8. As soon as the boiler has cooled
9. Direct the water to the outside of the pile and move toward the center. Water aimed directly at the center of an ash pile can cause an explosion.
10. d
11. a. Proper ventilation
    b. Proper equipment
    c. Proper protection
12. Water in a closed system under high pressure that remains liquid instead of turning to steam when the temperature exceeds 212 F (100 C)
13. A vessel designed to withstand pressure or vacuum, but not external heat sources, such as burning fuel or electric heaters
14. a. Blueprints
    b. Manufacturer's data reports and instructions
    c. Design data
    d. Installation information
    e. Records of process changes
    f. Historical profile, including repair records and inspection reports
15. If the vessel cannot be inspected internally
16. When the vessel's contents are dangerous (e.g., toxic, flammable)
17. It is a U-pipe filled with water, with one end connected to the pressure side of the pressure vessel and the other vented to the atmosphere. It is used on pressure vessels that operate on low pressure or slight vacuum.
18. Closure devices, and failure or blocking of automatic control

## 6—SAFEGUARDING

1. Safeguarding is any means of preventing personnel from coming in contact with the moving parts of machinery or equipment that would potentially cause physical harm.
2. a. Integrated as part of the machine
   b. Well-constructed, durable, and strong
   c. Able to accommodate workpiece feeding and ejection
   d. Protective
   e. Easy to inspect and maintain
   f. Relatively tamper-proof or foolproof
3. b
4. a. Built-in safeguards
   b. Barrier guards
   c. Interlocking barrier guards
   d. Automatic safeguarding devices
5. a. Built-in safeguards conform more closely to the contours of the machine, making them superior in appearance and placement.
   b. Built-in safeguards eliminate hazards completely and permanently while withstanding daily wear and handling.
   c. Built-in safeguards tend to cost less because the cost is usually spread over a large number of machines.
6. c
7. a. It must guard the hazardous area before the machine can be operated.
   b. It must stay closed until the rotating equipment is at rest.
   c. It must prevent operation of the machine if the interlocking device fails.
8. b
9. Nonmetal barriers are less expensive and resist the effects of splashes, vapors, and fumes from corrosive substances that would react with metal.
10. a. The workplace should require a minimum amount of strenuous lifting and traveling.
    b. The work height of workstations should be the optimal height for stand-up or sit-down operations.
    c. Controls should be standardized and readily accessible.
    d. Materials handling aids should be provided to minimize manual handling of materials.
    e. Factors contributing to operator fatigue should be minimized, including excessive speed-up, boredom from monotonous operations, and awkward work motion or operator position.
11. a. Check the machine or equipment and the surrounding area to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.
    b. Check the work area to ensure that all employees have been safely positioned or removed from the area.
    c. Verify that the controls are in neutral.
    d. Remove the lockout devices and reenergize the machine or equipment.
    e. Notify affected employees that the maintenance is completed and the machine or equipment is ready to use.
12. d
13. a. Photoelectric cells
    b. Pressure-sensitive mats
    c. Light or sound curtains

## 7—PERSONAL PROTECTIVE EQUIPMENT

1. a. Engineering controls
   b. Administrative controls
   c. Personal protective equipment (PPE)
2. Personal protective equipment is referred to as the use of respirators, special clothing, safety glasses, hard hats, or similar devices whose proper use reduces the risk of personal injury or illness resulting from occupational hazards.
3. e
4. a
5. The standard established for eye and face protection is ANSI Z87.1 1989, Practice for Occupational and Educational Eye and Face Protection.
6. b
7. a. Enclosure—completely surrounds the head, such as an astronaut's helmet
   b. Aural insert—acts as a plug, commonly called earplug
   c. Superaural—cap seals the external edge of the ear canal, also called canal cap
   d. Circumaural—cup covers the external ear, also called earmuff
8. a. Passive
   b. Active
9. a. General all-purpose nets
   b. Personnel nets
   c. Debris nets
10. b
11. a. Safety belts
    b. Fall arresters and shock absorbers
    c. Harnesses
    d. Lifelines
    e. Fall-arresting systems
12. a. Identify the hazard.
    b. Evaluate the hazard.
    c. Select the appropriate, approved respiratory equipment.
13. a. Air-supplying respirators
    b. Air-purifying respirators
14. c
15. a. Compression resistance
    b. Impact resistance

## 8—INDUSTRIAL SANITATION AND PERSONNEL FACILITIES

1. e
2. d
3. One of the most common ways a water supply becomes contaminated is by accidental entry of sewage or septic water into a drinking water supply.
4. a
5. A worker can easily disinfect a drinking water system by filling it with water containing not less than 100 mg/l of available chlorine. This solution should remain for 24 hours in either a new system or one that has not previously carried treated water.
6. a. Filtration
   b. Chemical disinfection
7. a. Glass
   b. Metals
   c. Paper
   d. Batteries
   e. Chemicals
   f. Cardboard
8. a. Drinking fountains
   b. Washrooms
   c. Locker rooms
   d. Showers
   e. Toilets
9. a
10. a. Nonabsorbency
    b. Durability
    c. Sanitation
    d. Slipping and falling hazards
11. c
12. a. All repairs should be made by manufacturer authorized repair personnel.
    b. Persons with cardiac pacemaker units should be warned against coming too close to microwave ovens.
13. a. Cafeterias
    b. Canteens or lunchrooms
    c. Mobile canteens
    d. Box-lunch services
    e. Vending machines
14. c
15. Food-service equipment should receive the approval from or meet established standards of the National Sanitation Foundation (NSF).

## 9—OCCUPATIONAL MEDICAL SURVEILLANCE

1. The ultimate goal of surveillance in the workplace is prevention of illness or injury due to ambient risks.
2. The four components of an occupational surveillance program are:
   a. gathering information on adverse health events and exposure circumstances
   b. distilling and analyzing the data
   c. disseminating data to interested parties
   d. intervening on the basis of the evidence provided by the data to alter the factors that produced the hazards and adverse health outcomes.
3. Specific uses of a surveillance system include allowing public health officials, employers, researchers, enforcers, and other stakeholders to:
   a. become familiar with the magnitude and distribution of occupational illnesses and injuries
   b. monitor trends over time
   c. identify emerging injury and exposure problems
   d. flag specific case or situations for follow-up investigations
   e. set intervention priorities
   f. evaluate intervention activities
4. The difference between surveillance and screening is surveillance is defined as prevention of injury or illness due to ambient risk. Surveillance focuses on monitoring the health of working populations and the exposure to hazards in the workplace. Medical screening involves the performance of medical testing on workers and worker populations for the purpose of detecting organ dysfunction and/or disease before the worker would seek medical care when intervention would be most beneficial.
5. Some components to consider when establishing a medical screening program include, assessing the hazards; identifying the target organ toxicity; developing action criteria; standardizing the testing process; performing the tests; interpreting the results; and evaluating and controlling exposure, to name a few.
6. A "sentinel health event" is a disease, disability, or untimely death that is occupationally related. It is significant because its occurrence may provide the impetus for epidemiological or industrial hygiene studies and/or serve as a warning that materials substitution, engineering control, personal protection, or medical care may be required.
7. Biomarkers are substances, structures, or processes that can be measured in human tissues that may predict disease. Limitations on biological monitoring include, difficulty correlating a health risk with exposure; short biological half-lives of some substances; ineffective monitoring for surface active agents; interference of tobacco, alcohol, and other agents; measurements that may reflect multiple exposure sources. One ethical and legal concern of using biomarkers is the potential for discrimination against workers on the basis of racial or cultural characteristics and acquired or inherited genetic susceptibility.
8. The synergistic effect of substances can be described as the way the human body responds when exposed to more than one toxin or hazardous substance at the same time. That is, with each chemical or substance to which a worker is exposed, the total effect becomes greater than the sum of the parts. An example of this is cigarette smoking combined with exposure to asbestos. When someone is exposed to these two substances simultaneously, the chance of developing lung cancer is greatly increased.

## 10—ELECTRICAL SAFETY

1. Skin surface
2. Prevents the victim from breaking contact with the circuit
3. Resistance
4. a. Current flow: the amount of current that flows through the victim
   b. Time: the length of time that the body receives the current
5. Current-carrying parts are exposed and an arc forms when the switch is opened.
6. Size, material, insulation, and the way they are installed
7. To interrupt the current flow when it exceeds the conductor capacity
8. A strip of fusible metal that links two terminals of a fuse block
9. Thermal and magnetic
10. Thermal element is connected in the power circuit to the motor
11. Prevent the occurrence of excessive voltages from sources such as lightning, line surges, or accidental contact with higher voltage lines.
12. Bonding the identified conductor to a grounding electrode by means of an unbroken wire called a grounding electrode conductor.

## 11—FIRE PROTECTION

1. a. fire prevention
   b. fire detection and response
   c. fire control, suppression, and extinguishment
   d. recovery from fire in order to resume normal business operations
2. a. National Fire Protection Association (NFPA)
   b. Society of Fire Protection Engineers (SFPE)
   c. International Code Council (ICC)
3. a. define the scope/objective of the fire risk assessment
   b. perform a comprehensive fire hazard analysis
   c. develop loss scenarios from the result of the fire hazard analysis
   d. determine consequence estimates for each loss scenario
   e. determine frequency estimates for each loss scenario
   f. aggregate and present the fire risk
   g. evaluate the risk reduction effects of new or enhanced fire protection methods
4. Fire prevention activities should first occur during the design of the facility
5. a. site planning (adjacent building exposures, access by fire fighters, traffic patterns)
   b. types of construction materials (structural and interior finishes)
   c. layout of exit access corridors, exits, and exit discharges
   d. use of a sophisticated fire-detection and alarm system suitable for the facility's occupancy.
   e. Use of a sophisticated fire suppression system (e.g., automatic sprinklers/water spray) suitable for the facility's occupancy.
6. The major cause of occupant injury and death in structural fires is smoke inhalation (inhalation of toxic gases, chemical asphyxiation)
7. a. Perform routine fire safety inspection and follow up inspections to ensure findings are resolved.
   b. Maintain good housekeeping habits (reduce rubbish, reduce combustible loading).
   c. Maintain fire walls and fire doors (ensure fire wall penetrations are maintained, ensure fire doors are maintained and not blocked open)
   d. Maintain fire protection equipment (maintain fire detection and alarm systems, maintain fire extinguishers, maintain automatic sprinkler systems).
8. a. cool fuel
   b. remove fuel
   c. remove air (oxygen)
   d. interrupt the fire's chemical chain reaction
9. a. The fire could block an exit.
   b. The fire is spreading beyond its point of origin.
   c. The employee is unsure how to use a fire extinguisher.
   d. The use of one fire extinguisher fails to suppress or extinguish the fire.
10. Class A fires are associated with ordinary combustible materials, such as wood, paper, and rubbish.
11. Class B fires are associated with fires related to flammable or combustible liquids.
12. Class C fires involve energized electrical equipment. When the electrical equipment is de-energized, a Class C fire becomes a Class A or Class B fire (based on the materials that continue to burn after the electricity is turned off).
13. Class D fires are associated with fires involving combustible metals such as magnesium and titanium. Fire extinguishers not rated for Class D fires should not be used on them, as the wrong extinguishing agent on a Class D fire can make the fire more intense.
14. Class K fires involve vegetable and animal fat fires in commercial kitchens. These fires are different from Class B fires because of the presence of the very hot cooking surfaces facilitating the vaporization of the fuel.
15. a. NFAP 1 (Uniform Fire Code)
   b. NFPA 101® (Life Safety Code® )
   c. NFPA 5000 (Building Construction and Safety Code® )
   d. ICC (International Building Code® )

## 12—FLAMMABLE AND COMBUSTIBLE LIQUIDS

1. A flammable liquid, as defined by NFPA 30, Flammable and Combustible Liquids Code is any liquid having a closed-cup flash point below 100 F (37.8 C) and having a vapor pressure not exceeding 40 psia (1,276 kPa) at 100 F.
2. a. The flash point of the liquid
   b. The concentration of vapors in the air (whether the vapor-air mixture is in the flammable range or not)
   c. The possibility of a source of ignition at or above a temperature or energy level high enough to cause the mixture to burst into flame
   d. The amount of vapors present
3. Autoignition temperature is the minimum temperature at which a flammable gas-air or vapor-air mixture will ignite from its own heat source or a contacted heated surface without the presence of an open spark or flame.
4. Flash point is the minimum temperature at which a liquid gives off vapor concentrated enough to form an ignitable mixture with air near the surface of the liquid within a vessel specified by the appropriate testing procedure and apparatus.
5. a
6. Static electricity is generated by the contact and separation of dissimilar materials.
7. Bonding eliminates a difference in the static-electrical-charge potential between two or more objects. Grounding eliminates a potential difference between an object and the ground (earth). Bonding and grounding are effective only when the bonded objects are conductive materials.
8. d
9. f
10. a. Set the brakes.
    b. Stop the engine (unless power takeoff is required for unloading).
    c. Turn off the lights.
    d. Make the bonding connection before the dome cover is opened for inspection or gauging.
11. a. If a person is killed
    b. If a person is injured and requires hospitalization
    c. If estimated carrier or property damage exceeds $50,000
    d. If fire, breakage, spillage, or contamination involving a radioactive material occurs
12. Use dry chemicals or carbon dioxide on a flammable liquid fire.
13. a. Cover with at least 3 ft (0.9 cm) of earth.
    b. Cover with 18 inches (0.46 m) of tamped earth plus 6 inches (15 cm) of reinforced concrete
    c. Cover with 18 inches (0.46 m) of tamped earth plus 8 inches (20 cm) of asphalt concrete.
14. Aluminum, pastel, and white paint reflect the heat and help reduce the internal vapor pressure of tanks that are exposed to the sun.
15. a. An unblanked line or connection
    b. A break in the bottom of the tank
    c. Sludge, sediment, or sidewall scale
    d. Wood structures soaked with the liquid

## 13—WORKERS WITH DISABILITIES

1. a. Title I—Employment Provisions
   b. Title II—State and Local Government Provisions
   c. Title III—Public Accommodations and Services Operated by Private Entities
   d. Title IV—Telecommunications
   e. Title V—Miscellaneous Provisions
2. a. The job would put the individual in a hazardous situation.
   b. Other employees would be placed in a hazardous situation if the person were on the job.
   c. The job requirements cannot be met by an individual with certain physical or mental limitations.
   d. Accommodation of the job cannot reasonably be accomplished.
3. a. Many individuals with disabilities were hired to help fill job vacancies left by employees who joined the military.
   b. Companies established affirmative action programs to help each returning disabled veteran to become an employable person.
   c. The U.S. Department of Labor published a study that showed disabled workers were as productive as other workers, had lower frequency and severity of injury rates, and were absent from work only one day more per year than other workers.
4. a. The disabled individual
   b. The disabled veteran
   c. The qualified disabled individual
5. f
6. a. Maintaining close liaison with the Equal Employment Opportunity manager-coordinator and with medical and personnel departments when they are placing disabled employees
   b. Making job safety hazard analysis of existing work based on the job responsibilities and the abilities and limitations of the disabled employee or applicant when employing, promoting, transferring, and selecting workers with disabilities
   c. Making recommendations for safety modifications of machine tools, established processes and procedures, and existing facilities and workplace environment when the company must make reasonable accommodations for disabled employees
   d. As required, cooperating with the plant or building engineer or mechanical engineer and the planning, production, and maintenance departments when disabled employee accommodations are being evaluated
7. The safety evaluation form for disabled employees should be kept for at least one year after the employee leaves the company.
8. a. Physical requirements
   b. Working conditions
   c. Health hazards
   d. Accident hazards
9. a. Cafeteria, washroom, and restroom facilities
   b. Width of doors
   c. Height of plumbing fixtures
   d. Electrical controls
   e. Phones
   f. Drinking fountains
10. b
11. a
12. One means of safely evacuating wheelchair users and permanently or temporarily disabled persons is through the use of an evacuation chair.

## 14—NANOMATERIALS IN THE WORKPLACE

1. Nanoparticles are materials at the nano (one billionth of a meter) scale, also called the "near-atomic" scale. Guidance documents from the National Nanotechnology Initiative describe nanotechnology as including materials in the length scale of 1 to 100 nanometers in any one direction.
2. Yes, scientist have known for decades that nano-scale materials have properties of strength, electrical conductivity, and chemical reactivity that are different and distinct from the same materials at their normal scale of traditional use.
3. Because nanoaerosol particles are very small and little is known about how they will react, there may be different and perhaps more intense likelihood of reactions that lead to fire or explosion hazards. Precautions are regularly taken with conventional-size chemicals and particles to avoid explosion and fire hazards. It is safe to assume that such hazards will also exist with these smaller particles.

## 15—MATERIALS HANDLING AND STORAGE

1. b
2. a. Task repetition
   b. Load location
   c. Load weight
3. It lessens the stress on the lower back.
4. a
5. a. Hook—the hook glancing off a hard object and injuring the worker
   b. Crowbar—slippage
   c. Rollers—fingers or toes may be pinched or crushed between the roller and the floor
6. Metal-to-metal contact between the jack head and the load can be avoided by using a hardwood shim between the jack and the load.
7. Such extenders should not be used
8. Strap or chain the items to the hand truck
9. It causes less stress to the lower back and protects the worker's heel from being caught under the truck back
10. a. Running wheels off bridge plates or platforms
    b. Colliding with other trucks or obstructions
    c. Hands may be jammed between the truck and other objects
11. a. Stabilize the lumber pile
    b. Allow for air circulation though the lumber pile
12. a. The material being piped
    b. The hazards involved
    c. Directions for safe use
13. c
14. c
15. Moisten the material
16. b
17. No smoking or open flame
18. 19.5%
19. An open-mouthed, nonpressurized, vacuum-jacketed vessel used to hold liquid oxygen, nitrogen, or helium
20. Four times the heaviest expected load

## 16—HOISTING AND CONVEYING EQUIPMENT

1. A load should be lifted only when it is directly under a hoist because stresses for which the hoist was not designed could be imposed upon it. If the load is not properly centered, it can swing, and injury could result.
2. The three general types of chain hoists include spur geared, differential, and screw geared. The spur geared is the most efficient because it can pick up a load with the least effort on the part of the operator.
3. A spring return guarantees that if the operator releases a lever it will automatically move into the OFF position.
4. The Stop movement control hand signal should be obeyed even if it is being given by someone other than the signaler in charge.
5. c
6. a. The crane must be moved to a location where there will be minimum interference with other cranes and operations.
   b. All controllers should be placed in the OFF position.
   c. The main power source should be disconnected/deenergized and locked, tagged, or flagged in the deenergized position. All power sources should be neutralized so that they are in a state of energy isolation.
7. a. Hand-operated monorail—material is raised with a hand-powered hoist, and the trolley is propelled by hand.
   b. Semi-hand operated monorail—has a power hoist and is moved horizontally by hand.
   c. Power-operated monorail—electrically actuated for both vertical and horizontal movements.
8. Hoists and cranes should not be used to lift, support, or transport people because they do not provide an alternate means of supporting the load if the suspension element fails.
9. b
10. Light service is operation with loads that are usually half or less of the rated load.
11. Frequent inspections are usually completed by the operator with no record-keeping requirement. Periodic inspections require records and are done by an appointed person.
12. a. Operator error
    b. Support failure
    c. Failure to use outrigger
    d. Crane failure
    e. Rigging
13. c
14. a. Boom length
    b. Boom angle
    c. Capacity
15. d
16. a. To ensure that the boom configuration and load lines are adequate
    b. To ensure that no interference of any kind exists and protection devices are working
17. a. Warn others
    b. See that switches are properly set
    c. See that the track is free of obstructions
18. c
19. a. It allows for errors in load weight estimation
    b. It allows for vibration or shock during load handling
    c. It allows for loss of strength at knots or bends
    d. It allows for deterioration of the rope due to wear
20. d
21. a. Tow conveyors
    b. Trolley conveyors
22. Roller conveyors are similar to chute conveyors, except that the angle of slope is 2% to 4% less than chute conveyors.
23. The American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) A17.1, Elevators, Escalators, and Moving Walks, also referred to as the Elevator Code, governs the use and design of elevators.
24. Car safeties are not required for electrohydraulic elevators because they can come down no faster than the fluid can be forced out of the cylinder by the descending plunger.

## 17—ROPES, CHAINS, AND SLINGS

1. a
2. The properties of Manila fiber make it the best-suited natural fiber for cordage and is often recommended for capstan work.
3. a. Nylon
   b. Polyester
   c. Polyolefin
4. b
5. To make a good estimate of the strength of fibers in a rope, and to test for chemical damage, scratch the fibers with a fingernail—fibers of poor strength will readily part.
6. b
7. d
8. a
9. a. The type of service required
   b. The federal, state or provincial, or local codes covering the particular hoisting operation
10. a. Corrosion
    b. Wear
    c. Kinks
    d. Fatigue
    e. Drying out of lubrication
    f. Overloading
    g. Overwinding
    h. Mechanical abuse
11. In the United States, OSHA regulations and other industrial and construction codes prohibit the use of knots in wire rope.
12. In the United States, OSHA requires wire rope or cable to be inspected when installed and weekly thereafter.
13. a. Material used (fiber rope or wire rope)
    b. Fittings of suitable strength for the load
    c. Method of fastening the rope to the fittings
    d. Type of sling
    e. Type of hitch
    f. Regular inspection and maintenance
14. Alloy steel has become the standard material for chain slings because it has high resistance to abrasion and is practically immune to failure since the metal is cold worked.
15. d
16. Synthetic web slings are useful for lifting loads that need their surfaces protected. Metal mesh slings can safely handle sharp-edged materials, concrete, and high-temperature materials.

## 18—POWERED INDUSTRIAL TRUCKS

1. a. Lift trucks
   b. Straddle trucks
   c. Crane trucks
   d. Tractors and trailers
   e. Motorized hand trucks
   f. Automated Guided Vehicles (AGVs)
2. a. Backup alarm lights
   b. Headlights
   c. Turn signals
   d. Enhanced front and rear vision
   e. Noise-reducing insulation
   f. Fail-safe brakes
   g. Comfortable, wrap-around seats that provide protection
3. e
4. Since operators in saddle trucks sit so high off the ground, their angle of sight is reduced immediately to the front and rear, posing a hazard to pedestrians.
5. a. The operator being pinned between the truck and a fixed object
   b. The truck running up on the operator's heels
6. Operators of powered industrial trucks can prevent traffic accidents by using the same safe practices that apply to highway traffic.
7. a. Bumping skids
   b. Pushing piles of material out of the way
   c. Using makeshift connections to move heavy objects
   d. Using the forks as a hoist
   e. Moving other trucks
8. a. Lift trucks are generally steered by the rear wheels.
   b. Lift trucks steer more easily loaded than empty.
   c. Lift trucks are driven in the reverse direction as often as in the forward.
   d. Lift trucks are often steered with one hand.
   e. The other hand is used to operate the controls.
9. a. Company policies
   b. Operating conditions
   c. Types of trucks used

## 19—HAULAGE AND OFF-ROAD EQUIPMENT

1. b
2. a. So the driver can see the signals easily
   b. So the driver will have the helper in sight
   c. So the helper will be clear of the backing vehicle and falling material
3. Twice the weight of the machinery
4. a. No one should go between the vehicles while either one is in motion.
   b. Parked vehicles should have their brakes set, their wheels blocked, or both.
   c. Before moving, the driver should receive an all-clear signal, to indicate that no one is between the vehicle and a solid and immovable object.
   d. Two bars are safer than tow ropes.
   e. Equipment towed on trailers should be secured to the trailer.
5. c
6. Boom stops limit the travel of the boom beyond the angle of 80 degrees above the horizontal plane and prevent the boom being pulled backward over the top of the machine.
7. a. The hook should be centered over the load to keep the load from swinging.
   b. Hands should be kept out of the pinch point when holding the hook or slings in place while the slack is taken up.
   c. The hooker, rigger, and all other personnel must be in the clear before a load is lifted.
   d. Tag lines should be used for guiding loads.
   e. Hookers, riggers, and others working around cranes must keep clear of the swing of the boom and cab.
   f. No load should be lifted without a signal.
8. a. When driving off the road and beyond the shoulder, on steep grades, or at rough places
   b. In congested areas
   c. Under icy or slippery conditions
9. Look down to make sure footing is secure and no vehicles are approaching
10. d

## 20—HAND AND PORTABLE POWER TOOLS

1. b
2. a. Provide proper protective equipment and have employees wear it.
   b. Select the right tool for the job.
   c. Know if a tool is in good condition and keep it in good condition.
   d. Use tools correctly.
   e. Keep tools in a safe place.
3. Central tool control ensures uniform inspection and maintenance by a trained employee.
4. b
5. a
6. When striking another tool, the striking face of the hammer should have a diameter approximately ⅜ in. (0.9 cm) larger than the struck face of the tool.
7. The knife is more frequently the source of disabling injuries than any other hand tool.
8. a. Electrical
   b. Pneumatic
   c. Gasoline
   d. Hydraulic
   e. Powder actuated
9. a. They can easily come in contact with the operator's body.
   b. It is difficult to guard such equipment.
   c. There is the possibility of breakage because the tool may be dropped or roughly handled.
   d. The source of power is brought closer to the operator, creating additional potential hazards.
10. a. Always disconnect the tool from the source of power before changing accessories.
    b. Never leave a tool in an overhead place where there is a chance that the cord or hose can be pulled, causing the tool to fall.
    c. Use proper hearing protection when using power-loaded equipment for driving anchors into concrete, or when using air-driven hammers or jacks.
11. a. Set up an inspection schedule and a system for keeping records for each tool.
    b. Tag defective tools and withdraw them from service until they are repaired.
    c. Provide a visual or external inspection at the toolroom each time a tool is returned. Inspect as specified by the OSHA electrical safety-related work standard.
    d. Use colored tags to tell when the tool was last inspected.
    e. Instruct and train employees to inspect tools and to recognize and report defects
    f. Clean power tools with a recommended nonflammable and nontoxic solvent
    g. Use air drying in place of blowing with compressed air
12. Grounding portable electrical tools and using a ground-fault circuit interrupter (GFCI) provide the most convenient way of safeguarding the operator.
13. Any of the following:
    a. Be sure the trigger switch works properly.
    b. Check carefully for loose power-cord connections and frays or damage to the cord.
    c. Be sure the chuck is tightly secured to the spindle.
    d. Tighten the drill bit securely.
    e. Check auxiliary handles to ensure they are securely installed.
    f. Always wear safety goggles, or safety glasses with side shields, that comply with current national standards and a full face shield when needed.
    g. Always hold or brace the tool securely.
    h. If the drill binds in the work, release the trigger immediately, unplug the drill from the power source, and then remove the bit from the workpiece.
    i. Never attempt to free a jammed bit by starting and stopping the drill.
    j. As the hole is about to be broken through, grip or brace the drill firmly, reduce pressure, and allow the bit to pass easily through the hole.
    k. Unplug the drill before changing bits, accessories, or attachments.
    l. Do not raise or lower a drill by its power cord.

## 21—WOODWORKING MACHINERY

1. a. U.S. Occupational Safety and Health Administration (OSHA)
   b. American National Standards Institute (ANSI)
   c. National Fire Protection Association's (NFPA) National Electrical Code
2. d
3. The working surfaces of the machine should be at a height that will minimize fatigue.
4. a. Operating controls
   b. Safety controls
   c. Power drives
   d. Sharpness of cutting edges and other parts
5. a. Blade cuts or abrasions
   b. Kickbacks
6. When feeding a table saw, make push sticks long enough to keep hands well away from the blade by adding 6 in. (15.2 cm) to the blade's diameter.
7. a. Alter its original design.
   b. Operate it at other than the rated speed.
   c. Change the balance or tension.
8. a. While the blade coasts or idles
   b. When operators attempt to remove a sawed section of board or a piece of scrap
   c. When operators measure boards or place them in position for the cut
9. a. The blade's direction of rotation makes it easy for the operator's hands to be drawn into the revolving saw.
   b. Flying stock can be thrown with enough force to drive the stock through a 1 in. (2.5 cm) board.
10. Since long stock is often ripped on power-feed ripsaws, the clearance at each working end of the saw table should be at least 3 ft (0.9 m) longer than the length of the longest material handled.

## 22—WELDING AND CUTTING

1. The most significant health hazard in the welding process is the generation of toxic fumes and gases.
2. a. Inflammation of the lungs (chemical pneumonitis)
   b. Pulmonary edema (swelling and accumulation of fluids)
   c. Emphysema (loss of elasticity of the lungs)
   d. Chronic bronchitis
   e. Asphyxiation
3. e
4. a
5. a. The containers can be purged with an inert gas.
   b. The containers can be filled with water to within an inch or two of the place where the work is to be done with a vent left open.
6. a. Respiratory protection equipment
   b. Eye protection equipment
   c. Protective clothing
7. Dark, woolen clothing is preferred when welders work with inert-gas-shielded, arc-welding machines because it reduces any reflection to the operator's face underneath the helmet. Woolen clothing is more resistant to deterioration and is not readily ignited.
8. The standards for training and qualifications of welders was established by the American Welding Society (AWS).
9. a. Close the valve, and take the cylinder outdoors well away from any source of ignition. A regulator attached to the valve may be used temporarily to stop a leak through the valve seat.
   b. Properly tag the cylinder, and notify the supplier.
   c. If the leak occurs at a fuse plug or other safety device, take the cylinder outdoors well away from any source of ignition, open the cylinder valve slightly, and permit the fuel gas to escape slowly. Tag the cylinder plainly.
   d. Post warnings against approaching with lighted cigarettes or other sources of ignition.
   e. Promptly notify the supplier, and follow instructions for returning the cylinder.
10. e
11. b
12. Pressure regulators must be used on both oxygen and fuel gas cylinders to maintain a uniform gas supply to torches at the correct pressure.
13. Resistance welding is a metal-joining process where welding heat is generated at the joint by the resistance to the flow of electric current.
14. a. Friction
    b. Ultrasonics
    c. Lasers
15. The installation of resistance-welding equipment should conform to NFPA National Electrical Code, Standard No. 70.

## 23—METALWORKING MACHINERY

1. a. Good housekeeping
   b. Good work habits
2. One of the major causes of accidents from machine tools, especially drilling equipment, is the careless use of high-pressure compressed air to blow chips, cuttings, or shavings from machines or workers' clothing.
3. a. Use faceplates and chucks without projections whenever possible.
   b. Install plastic or fine-mesh screen chip shields, particularly on high-speed operations, because they allow operators to see through them while confining the flying chips.
   c. Provide an overhead hoist or a swinging, welded pipe fixture to lift heavy faceplates, chucks, and stock on both lathes and screw machines.
4. a. Being struck by insecurely clamped work or by tools left on or near a revolving table
   b. Catching clothing or rags for wiping in revolving parts
   c. Falling against revolving work
   d. Calipering or checking work while the machine is in motion
   e. Allowing turnings to build up on the table
   f. Removing turnings by hand
5. a. Be sure the machine is properly grounded, and check that all exposed systems are properly covered.
   b. Place all selector switches in the OFF or neutral (disengaged) position.
   c. Be sure that the machine's push buttons, manual limit switches, or controls are set for a safe setup.
   d. Check that the doors of the main electrical cabinet are closed and that the main disconnect switch is in the OFF position.
6. Injuries from shapers and planers frequently result from contact with projections on the workpiece or with projecting bolts or brackets, especially when the table is being adjusted vertically.
7. c
8. Specifications for operation of grinding machines and construction of guards and safety devices are in ANSI B7.1, The Use, Care, and Protection of Abrasive Wheels.
9. Cold and wetness can cause grinding wheels to break or crack.
10. Many grindstone failures result from faulty handling and incorrect mounting.

## 24—COLD FORMING OF METALS

1. a. Adequate safeguarding of the point of operation
   b. Proper training of operators
   c. Enforcing safe working practices
2. Antirepeat requires release of all actuating mechanisms before another stroke can be initiated.
3. a. Full-revolution clutch: A type of clutch that, when tripped, cannot be disengaged until the drive mechanism has completed a full revolution and the slide, a full stroke.
   b. Part-revolution clutch: A type of clutch that can be disengaged at any point before the crankshaft has completed a full revolution and the press slide, a full stroke.
4. A device designed, constructed and arranged to create a sensing field or area and to deactivate the clutch control when an operator's hand or any other body part is detected in the area
5. Any point of the power press machine, except the point of operation, where a body part can be caught between the moving parts of a press component or between material and moving parts of the press
6. The area of the die or tooling where material is positioned and work is performed during any process such as cutting, forming or assembly
7. a. Guard
   b. Devise
8. a. Fixed die-enclosure guards
   b. Fixed barrier guards
   c. Interlocked press-barrier guards
   d. Adjustable-barrier guards
9. On a full-revolution clutch machine
10. Each operator must have his or her own set.
11. A kickpress is a press that is hand or foot powered, and is used for piercing, notching, forming, or shearing.
12. Interlocking tripping mechanism
13. Strains and hernias, foot injuries, crushing injuries, hand injuries or amputations, lacerations from wrench slippage and eye injuries
14. a. Prevent operators from placing their hands into the point-of-operation.
    b. Prevent or stop the operation if any part of the body approaches the point-of-operation.
15. Adjustable guard
16. Cold bend angles, channels, and curved shapes in plate, strip, or sheet stock
17. The safe distance method is used when guards and devices cannot be used.
18. Two independent control systems on the same power press brake, only one of which is operable at a time
19. An enclosure that covers moving machine parts (excluding point-of-operation)

## 25—HOT WORKING OF METALS

1. a. Vacuum cleaning to remove dust deposits
   b. Using local exhaust systems that remove dust at the point of origin
2. a. Proper labeling
   b. Substituting less hazardous for more hazardous chemicals
   c. Limiting the quantities in use
3. a
4. a. Baseline physical examinations, including chest x-rays, audiometric tests, and pulmonary-function tests
   b. Periodic physical examinations, keeping track of employees' health, detecting incipient disease, and helping to reclassify workers as needed
   c. Adequate first aid facilities, approved by the physician, and employee training in first aid
   d. Observing regulatory requirements if respirators must be worn
   e. Monitoring industrial hygiene where needed
5. Prolonged contact with oil, grease, acids, alkalis, and dirt can produce dermatitis.
6. a. Applicable federal, state/provincial, and local regulations or standards, codes, and recommendations
   b. Comparison with similar operations in a like environment
   c. Collection and analysis of representative air samples taken by qualified personnel in the breathing zone of workers
7. Carbon monoxide (CO) is sometimes generated when charging and blasting take place in cupolas.
8. To eliminate a carbon monoxide explosion hazard, supply adequate natural or mechanical ventilation in back of the cupola, and open two or more tuyeres after the blowers are shut down.
9. The principal danger in handling refractory clay crucibles is that one may break when full of molten metal.
10. a. Excess smoke, gases, and fumes
    b. Unprotected firing pits
    c. Unguarded, vertical sliding doors or their counterweights
    d. Flashbacks from fire boxes
11. c
12. a. A means for immediate quenching of sparks from grinding wheels, disks, or belts
    b. Dust-proof motors to prevent the accumulation of static charges
    c. Explosion doors on the collection system
    d. An automatic interlocking control on the collection system to assure its operation whenever grinding is started
13. c
14. a. Open-frame
    b. Gravity-drop
    c. Steam and air hammers
15. The differences between the conventional coldstamping press and the forging press are that the forging press has its own operating technique, die setup, and maintenance problems, and is designed with a faster-acting slide.
16. The most widely used nondestructive testing method for forgings is the magnetic particle inspection.
17. a

## 26—AUTOMATED LINES, SYSTEMS, OR PROCESSES

1. The disadvantage of automation being designed, implemented, or modified using the JIT philosophy is that machines may be interdependent, with little or no provision for inventory to back up operations between any two stations.
2. CMMS can shorten factory cell downtime by providing easy-to-retrieve information from databases on replacement parts, vendor contact information, and repair instructions.
3. a. By careful identification of hazards
   b. By the development of strategies to control the environment where the processes are taking place
4. a. The type of industry
   b. The type and complexity of machines on the line
   c. The way workers interact with the machinery
   d. The success of the automation used to integrate the various components of the production line
5. A minimum clearance of 18 in. (46 cm) is required between an automated guided vehicle (AGV), with its transported load, and any fixed object in all areas that involve pedestrian travel or interaction with workers.
6. The standard that specifically defines the areas, or envelopes, required for machine motion is Safety Standard for Industrial Robots and Industrial Robot Systems, ANSI/RIA R15.06-1992.
7. a. Conveyors
   b. Automated guided vehicles
8. Refer to ANSI B56.5 for standards on bumper design, activation, and requirements for AGVs.
9. a. A manipulator
   b. A power supply
   c. A system for controlling the robot
10. b
11. a. Safety in the process of manufacturing, remanufacturing, and rebuilding robots
    b. Installation of robots
    c. Safeguarding of workers exposed to hazards associated with the use of robots
12. The highest degree of hazard exists when a robot is in the Teach mode because the teacher must be within the operating envelope of the robot to program its movements within very close tolerance parameters.
13. a. What can go wrong?
    b. What is the probability that something will go wrong?
    c. What would be the consequences if something does go wrong?
14. The formal procedure used to identify hazards in a chemical process facility is commonly known as a hazards and operability (HAZOP) study.

## 27—THE COMPUTER AS A SAFETY INFORMATION TOOL

1. c. The SAFETY list began in 1989, but became a viable source of information a couple of years later.
2. d. While file transfer programs (ftp) may be used by safety professionals at times, it is most likely to be for communication between computers rather than with people.
3. A web directory will provide the ability to browse among the sites that are included in the directory, while a search engine will identify specific pages within its database with the words you ask it to find.
4. OSHA's regulations on confined space entry will be found on their website and it is unlikely that the other organization named would include such information on their website.
5. a. is a raw data question because it has unambiguous answers that will not change depending on the situation.
6. c. Interpretations of government regulations should be reviewed with the agency involved, as locally as possible, to assure that the agency understands the information the same way that you do.
7. a. While all of these are likely to have helpful information, reviewing the website of someone in your industry to see how the new program has been integrated into other safety programs is likely to be the most valuable when such a website is available.
8. a. While none of the other factors are likely to be consistently distinct between in house and commercial computer systems, in house systems are likely to be directly custom fit to your organization.
9. d. achieving the first three items will depend on the particular list and the way it is used. However, ongoing access to more experienced professionals in the field is generally a good way to monitor changes in the field as they evolve.
10. c. It is likely that a, b, and d will need to be supplemented by paper records or face-to-face meetings for a significant component of their use. However, for an organization with routine computer access among its employees, using a website to update and distribute policies and procedures is a good choice.