

# **EVALUATING AN ASSOCIATE SAFETY DEGREE CURRICULUM USING JOB ANALYSIS FOR THE OCCUPATIONAL HEALTH AND SAFETY TECHNOLOGIST CERTIFICATION**

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## **Background**

One of the accreditation requirements for certification boards is to ensure content validity for the examination(s) leading to the certification awarded. The certifying organization must demonstrate through recognized methodologies that the examination contents cover what people actually do in practice and the knowledge and skills required to be able to perform their work. In achieving accreditation through the National Commission for Certifying Agencies (NCCA) and the Council of Engineering and Scientific Specialty Boards (CESB) demonstrated that the contents of the examinations leading to the Occupational Health and Safety Technologists® (OHST) designation cover what safety and health technologists do in practice.

The approach used to demonstrate content validity for certification examinations is virtually identical to studies used to establish the contents of training and education programs for trades and professions. The approach is called job analysis or role delineation. The methodology outlines what people do (functions and tasks) and the knowledge and skills required to perform each task. Completion of such studies is expensive, in part driven by the number of participants in the study. As a result, unless practice for a trade or profession changes rapidly, organizations perform such studies every few years only.

The purpose of this article is to summarize the most recent job analysis study conducted for the OHST certification and to demonstrate how to use the results to evaluate an academic curriculum at the associate degree level that prepares people for practice as a health and safety technologist.

## **Job Analysis Methodology**

In 2003, the Council on Certification of Health, Environmental and Safety Technologists (CCHST) completed its most recent study of health and safety practice for people who fill OHST roles. The study<sup>1</sup> was conducted in three stages, following the currently recognized procedures used by certification and licensure boards.

The first stage involved a panel of 17 people, divided among two groups. One group included people who held the OHST certification. The other group represented people who work in loss control for insurance companies. The latter group was looking to see if the OHST certification might serve as a qualification for

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<sup>1</sup>*Role Delineation Study for Occupational Health and Safety Technologist and Loss Control Specialist Examinations*, CCHST Technical Report 2003-1, Council on Certification of Health, Environmental and Safety Technologists, Savoy, IL, March 2003.

loss control work, since a significant number of states regulate who can serve in such a role and the former certification used for qualifying people had been discontinued. In each case, the panel members were from different job settings and geographic locations. The study report provides details on the panel members.

A facilitator led the three-day procedure. The process began by defining the major job functions of Occupational Health and Safety Technologist work and evaluated whether the same functions covered loss control specialist work. Then the group defined the tasks that make up each job function for Occupational Health and Safety Technologist work and again evaluated whether the same tasks covered loss control specialist work. In each step, the group reached consensus on the wording of each function and task. In the final step of the process, the panel defined the knowledge and skills essential for each task. This resulted in 122 knowledge and 64 skill statements that define Occupational Health and Safety Technologist and loss control specialist practice.

The second stage of the study involved drafting a mail-out survey and pilot testing it. The purpose of the survey was to validate the work of the panel with people in both areas of practice and to acquire ratings of each function and task on three rating scales. The purpose of the pilot study was to gain feedback on the survey content and format in order to refine the instrument and to identify any gaps in the definitions of practice.

The final stage of the job analysis study involved a survey of about 500 people holding the OHST and about 500 people working in loss control work. The two sets of responses were analyzed separately to see if there were differences between the two areas of practice. A total of 342 useable surveys were returned.

The survey asked respondents to rate the safety and health job functions and tasks on three scales. One rating was the importance of each function and task in the respondent's own practice. The second rating was the time spent in individual practice on each function and tasks. The third rating involved criticality in terms of protecting the public should someone fail to perform the function or task effectively.

## **Job Analysis Results**

The survey results were compiled and analyzed. One result was the verification of the description of functions and tasks of practice, shown in Appendix A.

One of the major findings was that while there are minor differences between Occupational Health and Safety Technologist and loss control specialist job tasks, the knowledge and skills required for both are the same. The difference in job tasks results from the differences in responsibility of an employer for whom an OHST works and the responsibility of an insurer for whom loss control specialists work.

Another result was estimating the portion of the examination that should be devoted to each function and task. The estimates are based on the three ratings provided by respondents. The study report details the computational procedure. The procedure establishes the recommended weighting for each function. The complete outline of functions, tasks, knowledge and skills with the final weighting (in percent of the examination contents) for each function is called the examination blueprint (see Appendix A).

## Converting Job Analysis Results to Knowledge and Skill Outlines

When considering what knowledge and skills one needs for practice, it is useful to organize the information in the examination blueprint into subject groups, rather than organizing the information around the functions and tasks of practice. After reviewing knowledge and skill statements, the author created a subject classification scheme to complete this stage of analysis. There is not likely to be full agreement on subject group titles or on which knowledge and skill statements should be assigned to a group. The overall goal was to create a reasonable scheme for the purposes of this paper.<sup>2</sup>

There are two major groups of subjects for classifying knowledge statements. The first involves general subjects and the second involves more specific knowledge of particular safety and health subjects. Appendix B is a complete listing of knowledge statements organized by group and subject.

The skills from the job analysis study of OHST and loss control specialist practice were analyzed in a similar manner and classified into major skill groups. Appendix C lists the skills by skill group.

### Results of the Conversion Activity

One can estimate the importance and relevance of a subject in actual practice from the knowledge statements falling under a specific subject. The job analysis study identified 122 knowledge statements. Some knowledge statements occur more than once. The weighting for each subject assumes that each knowledge statement represents approximately 0.82 percent ( $100\%/122 \text{ statements} = 0.82$ ) of all of the key knowledge covered by practice in general. The number of knowledge statements occurring within a subject is then an estimate of the importance and relevance of the subject across all of practice. For example, if a subject contained 20 knowledge statements, including repeated knowledge statements, then 16 percent ( $20 \times 0.82 = 16 \text{ percent}$ ) of the training for occupational health and safety practice might be devoted to the subject. This provides a general indication of the importance of the subject for occupational health and safety practice. Some subjects may also be important in specific areas of practice and be under-estimated or over-estimated by this approach. Table 1 is a list of the group names, subjects and percent of practice weightings.

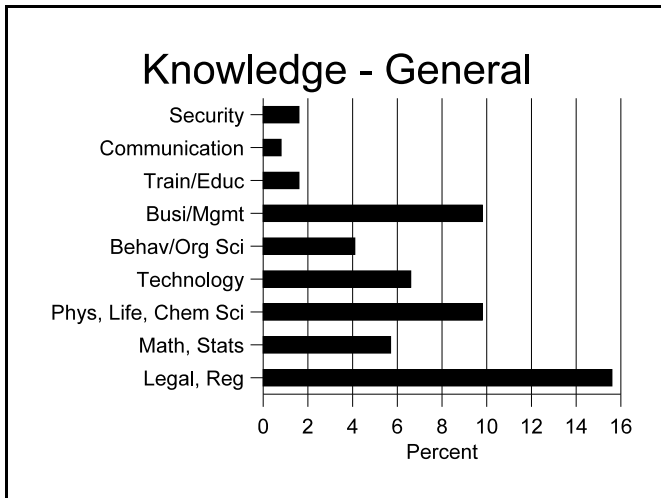
Figure 1 shows the distribution of knowledge statements based on weightings among subjects within the first group, General Subjects. Figure 2 shows the distribution among the specific safety, health and environmental subjects.

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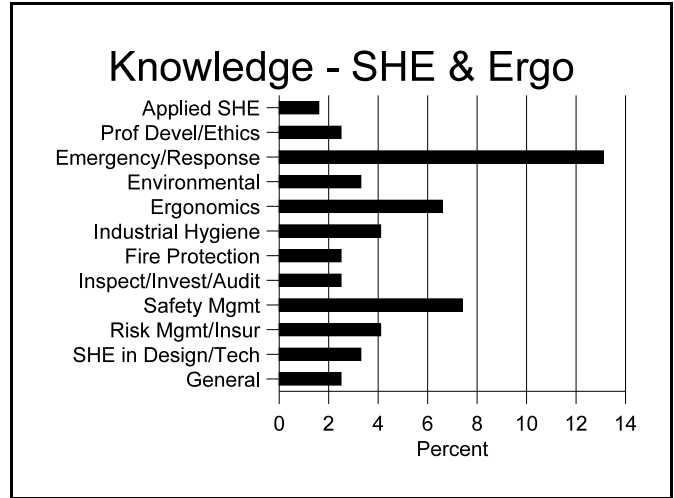
<sup>2</sup> The knowledge and skill subjects used in this paper are the same subjects that were developed for an analysis of the Certified Safety Professional examinations. A goal was to have a consistent classification systems that would allow for later comparisons with other safety and health certifications.

**Table 1. Safety and Health Knowledge Statement Groups and Subjects**

Group/Subject	Number of Statements	Number of Different Statements	Percent of Practice
<b>GENERAL</b>	68	34	55.7
A. Laws, Regulations, Standards, & Government	19	7	15.6
B. Mathematics, Statistics, Physical & Chemical Sciences	17	7	13.9
C. Technology (Engineering, Facilities, Equipment, Processes, Computers & Systems)	8	8	6.6
D. Behavioral and Organizational Science	5	1	4.1
E. Business and Management	12	6	9.8
F. Training and Education	2	2	1.6
G. Communication	1	1	0.8
H. Security	2	2	1.6
<b>SAFETY, HEALTH, ENVIRONMENT AND ERGONOMICS</b>	57	51	46.7
A. General	3	3	2.5
B. SHE in Design, Controls, Technology	4	3	3.3
C. Risk Management and Insurance	5	4	4.1
D. Safety Management	9	7	7.4
E. Inspections, Investigations, Audits	3	3	2.5
F. Fire Protection	3	3	2.5
G. Industrial Hygiene	5	5	4.1
H. Ergonomics <sup>3</sup>	8	2	6.6
I. Environmental	4	2	3.3
J. Emergencies & Emergency Response	16	14	13.1
K. Professional Development and Ethics	3	3	2.5
L. Applied SHE - Construction	0	0	0
M. Applied SHE - Transportation	0	0	0
N. Applied SHE - Product Safety	0	0	0
O. Applied SHE - Process/Petro-Chemical	0	0	0
P. Applied SHE - Systems	2	2	1.6



**Figure 1. Distribution of General Knowledge Statements**



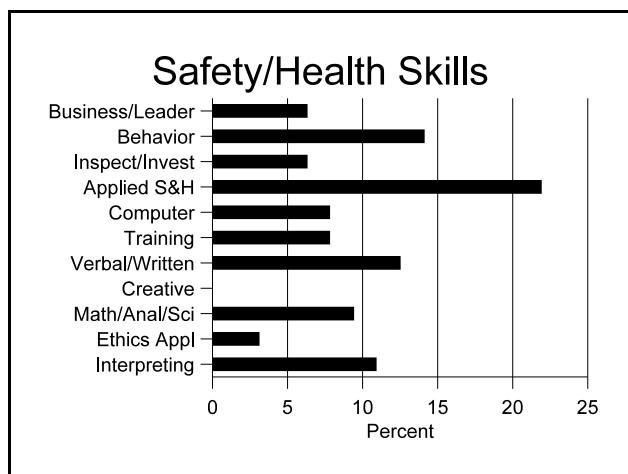
**Figure 2. Distribution of Specific SH&E Knowledge Statements**

<sup>3</sup> Note that ergonomics here is repeated, since ergonomics and human factors are also embedded in knowledge statements falling under "Physical, Life & Chemical Sciences" and "Behavioral and Organizational Science."

The importance of each skill group was estimated in a manner similar to that used for knowledge statements. Since the job study identified 64 skill statements, including repeated skills across functions and tasks, one can estimate the value of each skill statement at approximately 1.56 percent (100%/64 skill statements = 1.5625). The total value for a skill grouping is the number of skills times 1.56 percent. Table 2 identifies the skill groups and the weighting for each group. Figure 3 shows the distribution of skill statements among the skill groups based on group weighting.

**Table 2. Safety and Health Skills**

Group/Subject	Number of Statements	Number of Different Statements	Percent of Practice
A. General and Applied Interpreting Skills	68	34	55.7
B. Ethics Application Skills	7	6	10.9
C. General and Applied Mathematical, Analytical and Scientific Skills	2	2	3.1
D. Creative Skills	0	0	0
E. General and Applied Verbal and Written Communication Skills	8	1	12.5
F. General and Applied Training Skills	5	4	7.8
G. General and Applied Computer and System Skills	5	3	7.8
H. Applied Safety and Health Skills	14	12	21.9
I. Inspection and Investigative Skills	4	4	6.3
J. General and Applied Human Behavior Skills	9	6	14.1
K. General and Applied Business, Organization and Leadership Skills	4	3	6.3



**Figure 3. Distribution of Skill Statements**

### Evaluating a Curriculum

Most certification and licensure examinations test knowledge and not skills. However, academic programs help students acquire both knowledge and skills.

One can use the job analysis data to identify whether particular courses cover various knowledge and skills. The evaluation may cover only the courses in a safety degree major or all courses included in a degree program.

One approach for applying the job analysis data to evaluate a curriculum is to determine whether the curriculum covers the breadth of knowledge identified in the study. The procedure begins by creating one or more

matrices. The vertical axis of a matrix is a list of courses by title and number. The list may include only the courses in the major or all courses in the degree program. The horizontal axis includes a column for each knowledge group or subject. Because the matrix becomes large if there is a column for all subjects in both knowledge group, it may be easier to handle the evaluation in parts with a separate matrix for each group.

Once the matrix is established, someone with knowledge of the contents of each course can mark each cell in the matrix to indicate whether a course covers a knowledge group/subject at all. One may want to refer to the course syllabus in deciding how to mark the cell. Gaps in the matrix suggest where knowledge needed for practice is not covered.

A more detailed analysis may mark each matrix cell in terms of the amount of time a course devotes to a subject. In addition, a rating scheme might establish basic quantitative estimates of coverage. A rating scale might include ratings of “not at all,” “moderately,” or “a great deal.” A rating scheme might also be based on level of difficulty, such as “not at all,” “elementary,” “intermediate,” or “advanced.” Gaps or marks indicating limited coverage may identify opportunities for improvement.

A third approach is to evaluate specific courses in depth. In this case, the evaluation issue is whether a course covers specific knowledge statements. One can estimate whether a course covers each individual knowledge statement that is relevant and important for the course. Table 3 provides an outline for this type of evaluation.

**Table 3. Analysis of a Specific Course for Coverage of Knowledge Statements**

Course ID and Title ----->		
Covered?		KNOWLEDGE GROUP/SUBJECT and Knowledge Statements
Yes	No	BUSINESS AND MANAGEMENT
		Business terminology (e.g., financial terms)
		Basic financial terminology
		Basic cost-benefit analysis
		Organizational types and structures
		Problem solving techniques
		Necessary financial resources

Suppose there is a course that include the subject: “Business and Management.” One could review each knowledge statement in this subject (see Appendix B) to see if the six knowledge statements are adequately covered. If not, the analysis will suggest content improvements for the course.

In another example, a course may cover communication in the General knowledge group. One could rate the course by indicating that it covers communication knowledge a lot, but only at an elementary level. Further study of results might indicate that this course should be covering more advanced communication knowledge to complement the elementary level already covered in other courses.

One can also use the job analysis data to identify whether skills are developed in the entire program of study. Again, a general analysis or a precise analysis can reveal opportunities for improvement. The general analysis

will identify whether specific skills are covered in a logical order during the entire educational program or within specific courses.

One might rate a course on both knowledge and skills. The example above relating to Business and Management knowledge could be extended to communication skills. The analysis for skills may indicate that the course provides a limited opportunity to develop writing skills, but the skill development activities occur at an elementary level and nicely complement other courses that provide greater opportunity for writing skills at an advanced level.

Whether one completes an evaluation at a general or detailed level, the results of the evaluation can identify potential improvements in specific courses or across the program of study for students entering or advancing in OHST and loss control specialist practice.

## **Summary**

The job analysis studies conducted by CCHESST to establish the examination blueprint for the Occupational Health and Safety Technologist and Loss Control Specialist examinations are valuable resources for safety and health degree programs, particularly those at the associate degree level or for undergraduate certificate programs. The knowledge and skills defined in the job analysis study are essential for effective safety and health practice. Schools offering a program, degree or courses in safety and health practice can compare the course contents to the knowledge and skills and use the results of the comparisons to identify opportunities to improve the program. Results will also help determine how effectively the program prepares people for entry into safety and health practice.

## APPENDIX A. Blueprint for Occupational Health and Safety Technologist and Loss Control Specialist Examinations

(DxTyKz or DxTySz refer to the individual knowledge and skill statements for each domain and task.)

### Domain 1. Worksite Assessment (34%)

**Task 1. Research information pertaining to the business or operation using appropriate tools and reference (e.g., World Wide Web, federal and state regulations, consensus standards, and insurance loss control references) to obtain general risk data.**

#### Knowledge

D1T1K1 World Wide Web  
 D1T1K2 Internet search techniques  
 D1T1K3 Computer databases  
 D1T1K4 Insurance and loss control references  
 D1T1K5 Federal, state, and local regulations (e.g., FDA, OSHA, EPA, and DOT)  
 D1T1K6 Standard certifications and approvals (e.g., ANSI, ASTM, NIOSH, NFPA, and API)  
 D1T1K7 Basic biological sciences, including toxicology and ergonomics

#### Skills

D1T1S1 Using computers and software packages  
 D1T1S2 Using Internet search engines  
 D1T1S3 Using basic research techniques

**Task 2. Evaluate actual business and operations data (e.g., monitoring and surveillance data, OSHA logs, incident reports, safety and health programs, and insurance loss data) by comparing the data against internal history as well as national or industry standards in order to recognize and define risks.**

#### Knowledge

D1T2K1 Benchmark standards (e.g., TLVs and PELs)  
 D1T2K2 Acceptable ratios (e.g., loss ratios, incidence rates, and accident rates)  
 D1T2K3 Data sampling procedures  
 D1T2K4 Business terminology (e.g., financial terms)  
 D1T2K5 Basic mathematics (e.g., algebra and ratios)  
 D1T2K6 Spreadsheet, word processor, and database software

#### Skills

D1T2S1 Analytical thinking (comparisons)  
 D1T2S2 Communicating through talking and writing  
 D1T2S3 Using computers and software packages

**Task 3. Conduct surveys of the business or operation in accordance with accepted survey methodology (e.g., observing the facility, referring to process flow charts, verifying safety and health systems, programs and documentation, and interviewing employees and management) in order to recognize hazards and controls.**

#### Knowledge

D1T3K1 Properties of hazardous materials (e.g., basic chemistry and material safety data sheets)  
 D1T3K2 Basic machine guarding techniques  
 D1T3K3 Survey techniques (e.g., checklist, flow chart, and interviewing techniques)  
 D1T3K4 Basic building design and construction (e.g., blueprints and major systems)  
 D1T3K5 Behavioral science, including human factors  
 D1T3K6 Sampling techniques (e.g., air sampling and noise monitoring)  
 D1T3K7 Fire prevention and suppression equipment  
 D1T3K8 Safety and health regulations and best practices  
 D1T3K9 Life safety standards  
 D1T3K10 Basic biological sciences, including toxicology and ergonomics

#### Skills

D1T3S1 Conducting interviews  
 D1T3S2 Calibrating test equipment  
 D1T3S3 Surveying facilities and operations  
 D1T3S4 Reading blueprints  
 D1T3S5 Measuring building dimensions  
 D1T3S6 Computing sample sizes and interpreting data

**Task 4. Communicate the results of surveys to management with appropriate documentation in order to educate management about risks and to recommend and justify appropriate actions for managing current and potential loss scenarios.**

**Knowledge**

D1T4K1 Federal, state, and local regulations (e.g., FDA, OSHA, EPA an DOT)

D1T4K2 Basic cost-benefit analysis

D1T4K3 Organizational types and structures

D1T4K4 Typical communication channels

**Skills**

D1T4S1 Communicating through talking and writing

D1T4S2 Interpreting regulations

D1T4S3 Operating within the corporate environment

## Domain 2. Hazard Control and Loss Prevention (31%)

<b>Task 1. Evaluate risks using established analytical techniques in order to prioritize corrective actions.</b>	
<b>Knowledge</b> D2T1K1 Formulas (e.g., mathematical, scientific, and statistical) D2T1K2 Problem solving techniques D2T1K3 Federal, state, and local regulations (e.g., FDA, OSHA, EPA, and DOT) D2T1K4 Industry standards and best practices D2T1K5 Internal standards D2T1K6 Basic biological sciences, including toxicology and ergonomics D2T1K7 Basic life and physical sciences D2T1K8 Basic health concepts	<b>Skills</b> D2T1S1 Interpreting exposure limits D2T1S2 Reading material safety data sheets D2T1S3 Thinking critically
<b>Task 2. Select hazard control measures by reviewing available options and choosing the most appropriate in order to manage risk.</b>	
<b>Knowledge</b> D2T2K1 Federal, state, and local regulations (e.g., FDA, OSHA, EPA, and DOT) D2T2K2 Industry standards and best practices D2T2K3 Industrial processes D2T2K4 Administrative controls D2T2K5 Personal protective equipment D2T2K6 Engineering controls D2T2K7 Hierarchy of controls D2T2K8 Basic ventilation D2T2K9 Basic machine guarding techniques D2T2K10 Basic life and physical sciences D2T2K11 Basic engineering concepts D2T2K12 Basic ventilation measurement	<b>Skills</b> D2T2S1 Selecting personal protective equipment D2T2S2 Thinking critically
<b>Task 3. Communicate the identified hazard control measures (e.g., recommend engineering, administrative, and personal protective equipment controls) by identifying essential resources and implementation strategies in order to manage risk.</b>	
<b>Knowledge</b> D2T3K1 Organizational types and structures D2T3K2 Strategies for prioritization of risks, hazard control measures, etc. D2T3K3 Necessary financial resources D2T3K4 Basic cost-benefit analysis D2T3K5 Basic financial terminology D2T3K6 Safety and health programs	<b>Skills</b> D2T3S1 Communicating through talking and writing D2T3S2 Negotiating D2T3S3 Presenting D2T3S4 Teaching
<b>Task 4. Assist with the implementation of controls as appropriate (e.g., organize committees; plan, conduct or provide training; maintain record; collect data; collaborate with contractors; select equipment; and manage respirator, confined space entry, lock out/tag out, and other safety and health programs) in order to manage risk.</b>	
<b>Knowledge</b> D2T4K1 OSHA record keeping D2T4K2 Safety and health programs D2T4K3 Protocols for the calibration, maintenance, and use of sampling and monitoring equipment D2T4K4 Effective training solutions D2T4K5 Industry standards	<b>Skills</b> D2T4S1 Organizing D2T4S2 Managing projects D2T4S3 Interpreting analytical data D2T4S4 Influencing and persuading others D2T4S5 Training D2T4S6 Researching and gaining access to documents D2T4S7 Calibrating, maintaining, and using sampling and monitoring equipment

## Domain 3. Verification (17%)

**Task 1. Verify that recommended hazard controls are implemented using management and evaluation techniques (e.g., site surveys, review of records, audits, interviews with key personnel, and follow up with the responsible individuals) in order to ensure risks are adequately managed.**

**Knowledge**

- D3T1K1 Federal, state, and local regulations (e.g., FDA, OSHA, EPA, and DOT)
- D3T1K2 Standard certifications and approvals (e.g., ANSI, ASTM, NIOSH, NFPA, and API)
- D3T1K3 Industry standards and best practices
- D3T1K4 Properties of hazardous materials (e.g., basic chemistry and material safety data sheets)
- D3T1K5 Behavioral science, including human factors
- D3T1K6 Material safety data sheets
- D3T1K7 Basic life and physical sciences
- D3T1K8 Organizational types and structures
- D3T1K9 Types of and methods for conducting audits (e.g., internal and regulatory)

**Skills**

- D3T1S1 Conducting interviews
- D3T1S2 Listening actively
- D3T1S3 Using computers and software packages
- D3T1S4 Conducting verification audits and site surveys
- D3T1S5 Communicating through talking and writing

**Task 2. Investigate incidents, accidents, and near misses using established techniques in order to determine root causes and formulate or update corrective action plans.**

**Knowledge**

- D3T2K1 Basic elements of risk analysis (e.g., failure mode and effects analysis, fault tree analysis, and root cause analysis)
- D3T2K2 Federal OSHA techniques for computing incident rates
- D3T2K3 Hazard controls (e.g., engineering controls, administrative controls, and personal protective equipment)
- D3T2K4 Investigative techniques
- D3T2K5 Basic life and physical sciences
- D3T2K6 Basic mathematics (e.g., algebra and ratios)

**Skills**

- D3T2S1 Computing incident rates using federal OSHA techniques
- D3T2S2 Conducting interviews
- D3T2S3 Listening actively
- D3T2S4 Communicating through talking and writing

**Task 3. Assess the effectiveness of specified hazard controls by analyzing performance data (e.g., records, loss data, incidence rates, environmental samples, and incident reports) in order to ensure risks are adequately managed.**

**Knowledge**

- D3T3K1 Industrial hygiene sampling techniques
- D3T3K2 Industry (e.g., NAISS, BLS) incidence rates
- D3T3K3 Federal, state, and local regulations (e.g., FDA, OSHA, EPA, and DOT)
- D3T3K4 Standard certifications and approvals (e.g., ANSI, ASTM, NIOSH, and API)
- D3T3K5 Types of medical surveillance
- D3T3K6 Basic life and physical sciences
- D3T3K7 Basic statistics

**Skills**

- D3T3S1 Using sampling protocols
- D3T3S2 Calibrating, maintaining, and using sampling and monitoring equipment
- D3T3S3 Computing sampling volumes
- D3T3S4 Computing and interpreting statistical analyses

## Domain 4. Disaster Planning and Emergency Response (14%)

<b>Task 1. Identify catastrophic and emergency response scenarios (e.g., fires/explosions, natural disasters, chemical releases, terrorism, and medical emergencies) using established techniques in order to anticipate risks.</b>	
<b>Knowledge</b> D4T1K1 Consensus standards (e.g., NFPA) D4T1K2 Federal, state, and local regulations (e.g., FDA, OSHA, EPA, and DOT) D4T1K3 Material safety data sheets D4T1K4 Modeling development D4T1K5 Local, regional, and federal resources (e.g., civil defense, FEMA, local fire and police, medical facilities) D4T1K6 Characteristics of emergencies and natural disasters D4T1K7 Behavioral science, including human factors D4T1K8 System failures D4T1K9 Prior analyses conducted at the facility D4T1k10 Physical and electronic security	<b>Skills</b> D4T1S1 Basic modeling D4T1S2 Performing basic risk assessments D4T1S3 Identifying risk
<b>Task 2. Evaluate scenarios using established techniques in order to characterize the probability and severity of occurrence.</b>	
<b>Knowledge</b> D4T2K1 Basic risk assessment D4T2K2 Basic cost-benefit analysis D4T2K3 Organizational types and structures D4T2K4 Basic mathematics (e.g., algebra and ratios) D4T2K5 Basic life and physical sciences	<b>Skills</b> D4T2S1 Computing cost-benefit analysis D4T2S2 Using statistical analytical techniques D4T2S3 Using qualitative analytical techniques
<b>Task 3. Develop response plans for scenarios by reviewing available options, selecting viable strategies, and documenting action plans in order to ensure appropriate response to disasters and other emergencies.</b>	
<b>Knowledge</b> D4T3K1 Basic fire science D4T3K2 Behavioral science, including human factors D4T3K3 Basic life and physical sciences D4T3K4 Basic mathematics (e.g., algebra and ratios) D4T3K5 Properties of hazardous materials (e.g., basic chemistry and material safety data sheets) D4T3K6 Common methods of terrorism D4T3K7 Emergency equipment and supplies D4T3K8 Community response plans D4T3K9 Regulations (e.g., Incident Command System)	<b>Skills</b> D4T3S1 Communicating though talking and writing D4T3S2 Planning and developing disaster plans and emergency response
<b>Task 4. Recommend administrative and engineering strategies for scenarios through communication with management in order to justify appropriate actions for managing responses to disasters and other emergencies.</b>	
<b>Knowledge</b> D4T4K1 Characteristics of emergencies and natural disasters D4T4K2 Basic risk assessment D4T4K3 Administrative and engineering disaster response strategies D4T4K4 Basic life and physical sciences D4T4K5 Mutual aid agreements D4T4K6 Organizational types and structures	<b>Skills</b> D4T4S1 Communicating through talking and writing D4T4S2 Facilitating team process

<p><b>Task 5. Assist with the implementation of assigned responsibilities for response plans as appropriate (e.g., organize committees, provide training, collaborate with contractors, select equipment, and manage specific programs) in order to ensure appropriate response to disasters and other emergencies.</b></p>	
<p><b>Knowledge</b>  D4T5K1 Behavioral science, including human factors  D4T5K2 Adult learning principles  D4T5K3 Available emergency equipment  D4T5K4 Regulatory and consensus standards (e.g., EPA and OSHA)  D4T5K5 Community response plans</p>	<p><b>Skills</b>  D4T5S1 Communicating through talking and writing  D4T5S2 Facilitating committees  D4T5S3 Training diverse populations</p>
<p><b>Task 6. Evaluate the currency and effectiveness of response plans at regularly scheduled intervals by reviewing their applicability for present and emerging conditions (e.g., changes in organizational structure, and new processes or materials) in order to update the plans and ensure appropriate response to disasters and other emergencies.</b></p>	
<p><b>Knowledge</b>  D4T6K1 Procedure, process, and equipment evaluation  D4T6K2 Evaluation of training methods (e.g., exercises, drills, and surveys)  D4T6K3 Emergency equipment inspection and required performance tests  D4T6K4 Federal, state, and local regulations (e.g., FDA, OSHA, EPA, and DOT)</p>	<p><b>Skills</b>  D4T6S1 Using qualitative analytical techniques  D4T6S2 Inspecting and suing emergency equipment  D4T6S3 Training diverse populations  D4T6S4 Conducting and evaluating exercises, drills, and surveys</p>

<b>Domain 5. Professional Responsibility (4%)</b>
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<b>Task 1. Apply the Health and Safety Technologist/Technician Code of Ethics.</b>
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<b>Task 2. Understand OHST disciplinary standards and practices.</b>
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<b>Task 3. Participate in professional development.</b>
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## Appendix B. Outline of Knowledge Required for Occupational Health and Safety Technologist Practice

([xx] is number of times a knowledge statement appears in the examination blueprint.)

**Note: The knowledge topical structure is the same as that used to analyze the knowledge required for professional safety practice.**

### GENERAL

#### Laws, Regulations, Standards, Government

Federal, state, and local regulations (e.g., FDA, OSHA, EPA, and DOT) [8]

Standard certifications and approvals (e.g., ANSI, ASTM, NIOSH, NFPA, and API) [3]

Benchmark standards (e.g., TLVs and PELs)

Consensus standards (e.g., NFPA)

Regulatory and consensus standards (e.g., EPA and OSHA)

Industry standards and best practices [3]

Industry standards [2]

#### Mathematics, Statistics,

Data sampling procedures

Basic mathematics (e.g., algebra and ratios) [4]

Formulas (e.g., mathematical, scientific, and statistical)

Basic statistics

#### Physical, Life & Chemical Sciences

Basic biological sciences, including toxicology and ergonomics [3]

Basic life and physical sciences [8]

Basic health concepts

#### Technology

##### Engineering

Industrial processes

Basic engineering concepts

##### Facilities

Basic building design and construction (e.g., blueprints and major systems)

##### Equipment

##### Processes

##### Computers

World Wide Web

Internet search techniques

Computer databases

Spreadsheet, word processor, and database software

##### Systems

#### Behavioral and Organizational Science

Behavioral science, including human factors [5]

#### Business and Management

Business terminology (e.g., financial terms)

Basic financial terminology

Basic cost-benefit analysis [3]

Organizational types and structures [5]

Problem solving techniques

Necessary financial resources

#### Training/Education

Effective training solutions

Adult learning principles

#### Communication

Typical communication channels

#### Security

Physical and electronic security

Common methods of terrorism

### SAFETY, HEALTH, ENVIRONMENT & ERGONOMICS

#### General

Safety and health regulations and best practices

Industry (e.g., NAISS, BLS) incidence rates

Types of medical surveillance

#### SHE in Design, Controls, Technology

Basic machine guarding techniques [2]

Engineering controls

Hierarchy of controls

#### Risk Management & Insurance

Insurance and loss control references

Acceptable ratios (e.g., loss ratios, incidence rates, and accident rates)

Strategies for prioritization of risks, hazard control measures, etc.

Basic risk assessment [2]

#### Safety Management

Administrative controls

Personal protective equipment

Hazard controls (e.g., engineering controls, administrative controls, and personal protective equipment)

Safety and health programs [2]

OSHA record keeping

Federal OSHA techniques for computing incident rates

Material safety data sheets [2]

#### Inspections, Investigations, Audits

Survey techniques (e.g., checklist, flow chart, and interviewing techniques)

Types of and methods for conducting audits (e.g., internal and regulatory)

Investigative techniques

#### Fire Protection

Fire prevention and suppression equipment

Life safety standards

Basic fire science

#### Industrial Hygiene

Sampling techniques (e.g., air sampling and noise monitoring)

Basic ventilation

Basic ventilation measurement

Protocols for the calibration, maintenance, and use of sampling and monitoring equipment

Industrial hygiene sampling techniques

#### Ergonomics

See: **Behavioral and Organizational Science**  
**Physical, Life & Chemical Sciences**

#### Environmental

Properties of hazardous materials (e.g., basic chemistry and material safety data sheets) [3]

**Emergencies**

Modeling development

Local, regional, and federal resources (e.g., civil defense, FEMA, local fire and police, medical facilities)

Characteristics of emergencies and natural disasters [2]

Prior analyses conducted at the facility

Emergency equipment and supplies

Available emergency equipment

Community response plans [2]

Regulations (e.g., Incident Command System)

Administrative and engineering disaster response strategies

Mutual aid agreements

Procedure, process, and equipment evaluation

Evaluation of training methods (e.g., exercises, drills, and surveys)

Emergency equipment inspection and required performance tests

**Professional Development and Ethics**

Apply the Health and Safety Technologist/Technician Code of Ethics

Understand OHST disciplinary standards and practices.

Participate in professional development.

**Applied SHE - Construction****Applied SHE - Transportation****Applied SHE - Product Safety****Applied SHE - Process/Petro-Chemical****Applied SHE - Systems**

Basic elements of risk analysis (e.g., failure mode and effects analysis, fault tree analysis, and root cause analysis)

System failures

## Appendix C. Outline of Skills Required for Occupational Health and Safety Technologist Practice

([xx] is number of times a skill statement appears in the blueprint.)

**Note: Titles for groupings are the same as those used in Professional Safety Practice.**

### General and Applied Interpreting Skills

Analytical thinking (comparisons)  
Reading blueprints  
Interpreting regulations  
Thinking critically [2]  
Interpreting analytical data  
Researching and gaining access to documents

### Ethics Application Skills

Apply the Health and Safety Technologist/Technician Code of Ethics  
Understand OHST disciplinary standards and practices

### General and Applied Mathematical, Analytical and Scientific Skills

Computing sample sizes and interpreting data  
Computing and interpreting statistical analyses  
Computing cost-benefit analysis  
Using statistical analytical techniques  
Using qualitative analytical techniques [2]

### Creative Skills

*(No knowledge statements resulted for this category.)*

### General and Applied Verbal and Written Communication Skills

Communicating through talking and writing [8]

### General and Applied Training Skills

Presenting  
Teaching  
Training  
Training diverse populations [2]

### General and Applied Computer and System Skills

Using computers and software packages [3]  
Using Internet search engines  
Using basic research techniques

### Applied Safety and Health Skills

Calibrating test equipment  
Interpreting exposure limits  
Reading material safety data sheets  
Selecting personal protective equipment  
Calibrating, maintaining, and using sampling and monitoring equipment [3]  
Computing incident rates using federal OSHA techniques  
Using sampling protocols  
Basic modeling  
Performing basic risk assessments  
Identifying risk  
Planning and developing disaster plans and emergency response  
Conducting and evaluating exercises, drills, and surveys

### Inspection and Investigative Skills

Surveying facilities and operations  
Measuring building dimensions  
Conducting verification audits and site surveys  
Inspecting and using emergency equipment

### General and Applied Human Behavior Skills

Conducting interviews [3]  
Negotiating  
Influencing and persuading others  
Listening actively [2]  
Facilitating team process  
Facilitating committees

### General and Applied Business, Organization and Leadership Skills

Operating within the corporate environment [2]  
Organizing  
Managing projects