A PROFILE REFLECTING THE CURRENT STATUS OF HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE (HAZWOPER) TRAINING IN THE PRIVATE SECTOR OF OKLAHOMA

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Technology in conjunction with chemistry, is producing 150 new chemicals every year. Many of these products are very toxic and hazardous to the health and safety for both the employee who handles them as well as, potentially, the general public surrounding their use (Plog, 1988).

Currently, the state of occupational safety and health in the United States and throughout the world is dynamic (Tarrants, 1992). Many major safety and health problems existing within organizations can be traced to what managers have judged to be "acceptable risk." That is, as long as no major losses occur, managers assume that the risks they are taking are "acceptable." Generally, risk determination involves two major components: (1) the existence of a possible unwanted consequence or loss; and (2) the probability such a consequence will occur. Managers can reduce risk either by decreasing the probability of occurrence or by *educating and training* the risk taker to recognize and control the hazard (Gallup, 1992; Laing, 1992).

Powered by federal regulations, a current focus in occupational health and safety involves concern over training for hazardous material handling and disposal. While giant oil and chemical releases receive national attention, small spills in the workplace are a common, but potentially hazardous, occurrence (Bruening, 1990). OSHA estimates that some 13,600 spills of hazardous chemicals occur annually inside stationary facilities

(Bruening, 1990). Training and preparedness for the clean-up and containment of minor spills and releases of hazardous chemicals is a good first step in avoiding damage and injury in the workplace.

To ensure safer working conditions and cleaner environments, the U.S. federal government issued a regulation, 29 Code of Federal Regulations (CFR) 1910.120 in March of 1989. The code is referred to as the Hazardous Waste Operation and Emergency Response standard (HAZWOPER). (Bruening, 1990; Kearney, 1993; Roughton, 1993: Smith, 1993; Woodside & Prusak, 1992).

Included in HAZWOPER are requirements for training, protective gear, clean-up equipment and supplies, and first aid supplies that employers must have in place before a spill occurs. The standard also outlines the duties and responsibilities of spill response teams in both the private sector and in local and state government (Roig, 1993; Witt, 1992). Among other things, the rule (29 CFR 1910.120) requires that employers develop an emergency response plan (Beaudry, 1992) which includes the training of specified individuals to be part of a spill response team (Code of Federal Regulations, 1994 revised; Roig, 1993).

One of the fastest growing commercial training needs is that of Hazardous Waste Operations and Emergency Response (HAZWOPER) (Mansdorf, 1994). Powered by federal and state codes, such as CFR 1910.120, and stiff new fine levels from OSHA, American business and industry is actively pursing safety and environmental training (Dear, 1994; Plishner, 1993; Woodside & Prusak, 1992).

Statement of the Problem

The establishment and initiation of a hazardous material (HAZMAT) management program is vital for the implementation of an effective safety program operating under federal, state, and local regulatory requirements (Griffin, 1992). Training alerts employees to potential hazards they may encounter, and teaches knowledge and skills needed to perform work with minimal risk. A training program must be developed for all employees potentially exposed to safety and health hazards during hazardous waste operations (Roughton, 1993). Providers of HAZWOPER curriculum and training are concerned with the nature of HAZWOPER training needs and the extent of those training needs.

Employees should not perform any hazardous waste operations unless trained to the level required by their job function and responsibility. They must also be certified by a qualified instructor as having completed training (Kindschy, 1992; Loshak, & Mustard, 1991; Smith, 1992; Code of Federal Regulations, 1990 revised).

To date, there were no published reports generated or funded by OSHA/EPA that dealt with the question of training levels or training goals in the private commercial sector of the United States. Neither were there any published studies from the private sector which could provide information on this subject in terms of the status of HAZWOPER training in the private sector or some kind of profile related to HAZWOPER training. This was highlighted in a personal telephone interview with Mr. Don Watson, the Director of Oklahoma State's Public Employee Health & Safety,

Department of Labor, when he noted that statistical data or published reports which may reflect the level of HAZMAT or HAZWOPER training activity in the private commercial sector were non existent (interview conducted on 1-19-95).

The only published study of a similar nature was conducted by the Environmental Research Group (ERG) in Arlington, Massachusetts, as cited in Pomaville (1992). The purpose of the study was to assist OSHA in determining if certification of training providers and/or training programs was necessary. The study also dealt with average training time per course and the student to instructor ratio for classroom and laboratory activities.

The study concluded that ninety-seven (97) percent or organizations surveyed reported that their program satisfied OSHA requirements, that a judgement as to the adequacy of a given course based on specific topics covered in the course was not possible with data collected, and that overall, and that eight-five (85) percent of courses utilized workbooks or manuals. Additionally , only thirty-five (35) percent of the training providers reported that all of their instructors had completed formal education courses. The study did not determine whether or not certification of training providers and/or training programs were necessary (Pomaville, 1992), nor did the study address the question of the percentage or levels of certified training completed in the private commercial sector.

Rather, the purposes and goals of this study were to (1) determine the current status of HAZWOPER training for personnel in the private sector of Oklahoma; (2) determine the type of HAZWOPER curriculum areas that had been achieved; (3)

determine perceived barriers to HAZWOPER training; and (4) determine perceived curriculum priorities for HAZWOPER training.

Published studies on the levels or types of HAZWOPER training were scarce. An indication that the proliferation of Safety and Environmental training programs (such as HAZWOPER) had not kept up with the needs nor the mandates of government had been found in Maryland. According to a survey of 100 Maryland employers, conducted by the National Center for Hazard Communication in Baltimore, 74 percent of safety and health managers also had environmental responsibilities (i.e., HAZWOPER). However, only 10 percent had any formal training in environmental management or industrial hygiene (Occupational Hazards, Jan., 1994).

The need to know this information was of serious concern for HAZMAT trainers as evidenced by the expressed concerns and support of Mr. Doug Forsman, Director, International Fire Service Training Association (IFSTA). Mr. Forsman had, thus, committed some funds towards the operational costs of this study.

It appeared that a study that focused on the private commercial HAZWOPER training profile including the status, type and priorities of HAZWOPER training, as well as the perceived barriers to training was justified and needed. Based upon literature review and personal interviews with content matter experts in the field (see appendix F), it also appeared that the most likely candidates for HAZWOPER training were employees with job titles/classifications such as environmental engineers, safety professionals, industrial hygienists and managers of operations.

Purpose of the Study

The purpose of the study was to gain insight regarding the (1) current status of and type of HAZWOPER training for personnel in the private sector of Oklahoma; (2) type of HAZWOPER curriculum areas that had been achieved; (3) perceived barriers to HAZWOPER training, if any; and (4) perceived curriculum priorities for HAZWOPER training. In March 1989, OSHA mandated HAZWOPER training for business and industry (Bruening, 1990). This research proposed to gather data that would begin to identify and categorize existing levels of HAZWOPER training for company employees.

Research Questions

1 - What is the current status of HAZWOPER training for personnel in the private sector of Oklahoma?

2 - What type of HAZWOPER curriculum areas have been achieved?

3 - What are the perceived barriers to HAZWOPER training in the private sector of Oklahoma?

4 - What are the perceived curriculum priorities for HAZWOPER training in the private sector?

Scope of the Study

The scope of this study was restricted to those individuals in manufacturing and processing businesses as listed in the Oklahoma Directory of Manufacturers and Processors, 1994-95 edition, Standard Industrial Classification (SIC) Listings. Based upon the readings and information gathered from professionals and content matter experts (see: Appendix F) this was the most defined population group in Oklahoma which best represented the target population for this study. Individual employees within this population are most likely to handle, or be responsible for, emergency response actions related to toxic or hazardous material(s) incident(s) should they occur. A listing of these individuals and others (i.e., owner/operators) are included in the Oklahoma Directory of Manufacturers and Processors, referred to above.

Assumptions

This study was guided by the following assumptions:

1. Concern for safety and environmental issues presented a significant concern to manufacturing and processing business in Oklahoma;

2. Management within these organizations were aware of the necessity for training in safety and environmental areas;

3. Management within organizations were interested in professional growth for employee training, particularly in the areas of safety and environmental issues;

4. Respondents to the questionnaire would participate in a complete and honest manner, and that their answers would accurately reflect their opinions;

5. The *Standard Industrial Classification* (SIC) listings as published in the Oklahoma directory of manufacturers and processors (1994-95 edition) was complete and that it represented the private commercial concerns most likely involved with either the manufacturing of toxic and hazardous chemicals or the use and handling of some type of hazardous material within the course of doing business activities;

6. The selected individuals for the survey were familiar enough with, or were knowledgeable in, the HAZWOPER training (as enumerated in 29 CFR 1910.120) so as to provide meaningful responses to the survey questionnaire; and,

7. The results of this study could be generalized only to those who participate in the study.

Delimitations

This study did not investigate every possible aspect of HAZWOPER training and development. Neither was it the intent of this study to be an all encompassing and exhaustive review. It was delimited to the responses of survey participants in terms of their current status, priority, and type of HAZWOPER training in addition to perceived barrier(s) of HAZWOPER training. Additionally, responses regarding the levels of training competencies for HAZWOPER training, the status of that training, priorities for curriculum related to that training and barriers for training were based upon the

subjective perceptions of participating surveyed personnel.

Scope

This study was limited to key personnel in processing and manufacturing businesses in Oklahoma as listed by the *Standard Industrial Classification* (SIC) listings in the published Oklahoma Directory of Manufacturers and Processors (1994-95 edition) by the Oklahoma Department of Commerce (Research and Planning Division). Key personnel were operationally defined by such titles as owner, operations manager, environmental engineers, safety professionals, industrial hygienists. Further, the study, was limited to those personnel who participated in the study.

Expected Outcomes

It was expected that results of the survey questions would provide meaningful answers to the previously stated research questions. It was expected that the creation of a data base would be an additional result of this study. It was expected that providers of HAZMAT oriented training would be able to use this data base to help guide current and future training and growth decisions.

Organization of the Study

Chapter I introduces the study and presents the problem, need and purpose of the study, the objectives, the scope, and definitions of terms. Chapter II includes a review of related literature. Chapter III explains the methodology used for the research of this study and describes the population and survey sample; the process of formulating and reviewing the survey instrument used to collect the data; and explains how the instrument was administered, the data analyzed, and the results reported. Chapter IV describes and reports survey data; both narratively and in table form. Chapter V includes a summary of the survey findings; the conclusions drawn from the findings; implications of the study; unexpected findings of the study; and recommendations for further research.

Definitions of Terms

The following acronyms and definitions of terms were furnished as part of the survey instrument to provide, as nearly as possible, the clear and concise meanings of terms as used therein:

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act (also known as "Superfund Law");

CFR: Code of Federal Regulations;

COMMITMENT: Agreement or pledge;

CSHO: Compliance Safety and Health Officer;

DOL: Department of Labor;

EPA: Environmental Protection Agency;

HAZWOPER: Hazardous Waste Operations and Emergency Response (as defined by the U.S. Department of Labor, Occupational Safety and Health Administration);

NCP: National Contingency Plan;

NIEHS: The National Institute of Environmental Health Sciences;

NIOSH: National Institute for Occupational Safety and Health (established within the Department of Health and Human Services);

OFFICER: For purposes of this study, the term officer represents all of those who have designated responsibility and authority for hazardous waste and emergency response operations;

OSHA: Occupational Safety and Health Administration (The National Safety Council's publication: ACCIDENT PREVENTION MANUAL for Business and Industry, 10th edition);

OSHRC: Occupational Safety and Health Review Commission (a quasi-judicial board of three members appointed by the president and confirmed by the Senate);

PPE: Personal Protection Equipment;

RCRA: Resource Conservation and Recovery Act;

SARA: Superfund Amendments and Reauthorization Act (Public Law No. 99-499);

SIC: Standard Industrial Classification (Codes 20 through 39 provide information to employees about the hazardous chemicals to which they are exposed by means of a hazard communications program, labels, and other forms of warnings, information and training.); and,

USC: United States Code.

Study Population

The study solicited responses from individuals most likely to have a responsible association with HAZWOPER training in the manufacturing and processing sector as published in the Oklahoma directory of manufacturers and processors (1994-95), *SIC* listings. Additionally, these employees, by virtue of their job responsibilities, positions, and title descriptions, may add meaning and understanding of those persons in businesses who are responsible for HAZWOPER.

The job titles for persons responsible in HAZWOPER events may enhance identification and location of them in the Chamber of Commerce listings used in this study as well as give aid in understanding the data findings. Thus, it was believed that the following job classification listings represented persons who were most likely involved with HAZWOPER issues, concerns and responsibilities. It is for that reason, the following job titles and descriptions were appropriated from those listed in the Dictionary of Occupational Titles, and is set forth as follows:

Job Titles

JOB TITLE I

INDUSTRIAL-SAFETY-AND HEALTH TECHNICIAN:

Plans and directs safety and health activities in an industrial plant by evaluating and controlling environmental hazards by:

Testing noise levels and measures air quality, using precision instruments ;
Maintaining and calibrating instruments;
Administering hearing test to employees;
Training forklift operators to qualify for licensing;
Enforcing use of safety equipment;
Lecturing employees to obtain compliance with regulations;
Developing and monitoring emergency action plans;
Investigating accidents and prepares accident reports;
Assisting management to prepare safety and health; budget; and
Recommending changes in policies and procedures to prevent accidents and illness.

JOB TITLE II

SAFETY MANAGER:

Plans, implements, and coordinates program to reduce or eliminate occupational injuries, illnesses, deaths, and financial losses by:

Identifying and appraising conditions which could produce accidents and financial losses;
Evaluating potential extent of injuries resulting from accidents;
Conducting or directing research studies to identify hazards and evaluate loss producing potential of given system, operation or process;
Developing accident-prevention and loss-control systems

and programs for incorporation into operational policies of organization;
Coordinating safety activities of unit managers to ensure implementation of safety activities throughout organization;
Compiling, analyzing, and interpreting statistical data related to exposure factors concerning occupational illnesses and accidents and preparing reports for information of personnel concerned;
Maintaining liaison with outside organizations, such as fire departments, mutual aid societies, and rescue teams to assure information exchange and mutual assistance;
Devising methods to evaluate safety program and conducting or directing evaluations;
Evaluating technical and scientific publications concerned with safety management and participates in activities of related professional organizations to update knowledge of safety program developments; and
Storing and retrieving statistical data, using a computer.

JOB TITLE III

ENVIRONMENTAL ENGINEER:

A term applied to engineering personnel who utilize engineering knowledge and technology to identify, solve, or alleviate environmental problems. Environmental engineers typically apply knowledge of chemical, civil, mechanical, or other engineering discipline to preserve the quality of life by:

Correcting and improving various areas of environmental concerns, such as air, soil, or water pollution.
Conducts environmental impact analysis, relating to quality of life.
May function at an administrative level to plan and coordinate pollution monitoring activities within a particular industrial framework.

JOB TITLE IV

INDUSTRIAL HYGIENIST:

Conducts a health program in the industrial plant or governmental organization in order to recognize, eliminate, and control occupational health hazards and diseases by:

Collecting samples of dust, gases, vapors, and other potentially toxic materials for analysis;
Investigating adequacy of ventilation, exhaust equipment, lighting, and other conditions which may affect employee health, comfort, or efficiency;
Conducting evaluations of exposure to ionizing and nonionizing radiation and to noise, and recommending measures to ensure maximum employee protection;
Collaborating with industrial-health engineer and occupational physician, to institute control and remedial measures relating to hazardous and potentially hazardous conditions and equipment;
Preparing reports including observations, analysis of contaminants, and recommendation for control and correction of hazards;
Participating in educational meetings to instruct employees in matters pertaining to occupational health and prevention of accidents;
Specializing in a particular area, such as collection and analysis of samples.

CHAPTER II

REVIEW OF LITERATURE

Regulatory History

On October 17, 1986, former President Reagan signed into law the Superfund Amendments and Reauthorization Act of 1986 (SARA) (Public Law 99-499). As part of SARA, the Secretary of Labor was directed to issue an interim final rule within 60 days after the date of enactment of SARA, which was to provide no less protection for employees engaged in covered hazardous waste operations than the protection contained in two specified documents. Those two documents were the Environmental Protection Agency's (EPA) "Health and Safety Requirements for Employees Engaged in Field Activities" manual (EPA ORDER 1440.2), dated 1981 and the existing Occupational Safety and Health Administration (OSHA) standards under Subpart C or 29 CFR part 1926, OSHA's Construction Industry Safety and Health Standards. OSHA published an interim final rule as directed in the Federal Register on December 19, 1986 (51 FR 45654).

In section 126 of SARA, the Congress also directed the Secretary to issue, within one year after the date of enactment of SARA, a final standard under section 6(b) of the Occupational Safety and Health Act of 1970 for the health and safety of employers

engaged in hazardous waste operations and emergency response. SARA also indicated that certain specific areas of employee protection, in particular employee training, were relevant to protect employees engaged in hazardous waste operations.

Later on, OSHA issued a proposed rule on hazardous waste operations and emergency response including provisions for training on August 10, 1987 (52 FR 29620). Public hearings on the proposed rule were held during October 1987. As a result of that proposed rule OSHA published a permanent final rule for hazardous waste operations and emergency response (HAZWOPER) on March 6, 1989 (54 FR 9294). That permanent final rule became effective on March 6, 1990 (Federal Register, December 19, 1986 (51 FR 45654).

In a related action, on December 22, 1987, as part of an omnibus budget reconciliation bill (Public Law 100-202), the language of SARA was amended. The amendment addressed section 126(d) (3) of SARA. Section 126 (d) (3) of SARA reads as follows before the amendment: "(d) Specific Training Standards. (3) Certification; Enforcement. Such training standards shall contain provisions for certifying that general site workers, on-site managers, and supervisors have received the specified training and shall prohibit any individual who has not received the specified training from engaging in hazardous water operations covered by the standard" (Federal Register, December., 1986 (51 FR 45654).

The amendment to section 126 (d) (3) contained in Public Law 100-202 added the following language to the end of paragraph (d) (3):

"That section 126 (d) (3) of SARA is amended by adding a new sentence at the end thereof as follows: The certification procedures shall be no less comprehensive than those adopted by the Environmental Protection Agency in its Model Accreditation Plan

for Asbestos Abatement Training as required under the Asbestos Hazard Emergency Response Act of 1986" (Federal Register, December 19, 1986 (51 FR 45654).

In response to the amendment, OSHA on January 26, 1990, issued a Notice of Proposed Rulemaking (NPRM) (55 FR 2776) addressing the accreditation of training programs for hazardous waste operations. Since January, 1990, OSHA has been working to develop a final rule addressing the accreditation of certain training programs required in 29 CFR 1910.120 and 29 CFR 1926.65. OSHA will complete in the near future action on that final rule (Federal Register, February 1, 1987, 56 FR 3253).

On June 30, 1992, OSHA republished 29 CFR 1910.120 in 29 CFR Part 1926 as Sec. 1926.65 at the request of the OSHA Advisory Committee on Construction Safety and Health (ACCSH) (Occupational Safety and Health, 1994). This republication codified most of the requirements affecting construction activities in one part of the CFR for the convenience of construction industry employers and employees.

The most recent action on this rule concerns the development of the non-mandatory appendix to be added as Appendix E to Sec. 1910.120. This action took place during the September 30, 1993 meeting of the Occupational Safety and Health Administration's Advisory Committee on Construction Safety and Health (ACCSH) held in Washington, D.C. As part of the Advisory Committee's action, a work group chaired by Mr. John Moran, Director of Safety and Health for the Laborers' Health and Safety Fund, made specific recommendations to the full advisory committee concerning OSHA's proposed 29 CFR 1910.121 rulemaking. The first recommendation of the work group was, "that OSHA promptly issue a non-mandatory appendix to Sec. 1910.120, establishing minimum training curriculum guidelines and minimum training provider guidelines" (ACCSH Tr. pg. 148, lines 22-25). Mr. Moran made a formal motion that the

ACCSH recommend, "the prompt issuance of a non-mandatory appendix to Sec. 1910.120 which contains guidelines for minimum training curriculum, and that minimum training provider requirements to meet the training standards established in 120" (ACCSH Tr. pg. 152, lines 3-11). The formal report containing the recommendations developed by the work group was presented to the Assistant Secretary by the ACCSH on October 1, 1993 (On-Line-Data-Base, U.S. Department of Labor, Occupational Safety and Health Administration.).

That report included a December, 1991 document titled, "Minimum Criteria for Worker Health and Safety Training for Hazardous Waste operations and Emergency Response." The National Institute of Environmental Health Sciences (NIEHS) Training Grant Technical Workshop on Training Quality developed the document during a technical workshop on training quality. The workshop, "Minimum Criteria for Worker Health and Safety Training for Hazardous Waste Operations and Emergency Response" was held March 22-24, 1990 in Washington, D.C. and was sponsored by NIEHS. Approximately 60 individuals from labor, industry and the government, including representatives from OSHA, participated in the workshop.

The report recommended that OSHA should promptly issue a non-mandatory appendix to 29 CFR 1910.120 which provided guidelines as to minimum training curriculum and training provider requirements for those training activities mandated by the 1910.120 standard. It was recommended that this appendix be essentially the consensus of the NIEHS National Technical Workshop.

The ACCSH recommendation to the Assistant Secretary suggested that the non-mandatory appendix for HAZWOPER training address two topics. First, ACCSH recommended that the appendix should provide guidelines as to the minimum training

curriculum for those training activities mandated by Sec. 1910.120. Second, ACCSH recommended that the appendix should provide guidelines as to the minimum training provider requirements for those training activities mandated by Sec. 1910.120.

OSHA used non-mandatory appendices for a number of purposes such as to provide non-regulatory guidance to employees and employers for the purpose of complying with various OSHA regulations or to assist them in developing more effective safety and health operations. They may also be an amplification of interpretive information that was included in the preamble discussions of rulemakings when they were published in the Federal Register.

Also, non-mandatory appendices provided a non-regulatory mechanism to keep employer and employee populations aware of new technical information that became available to the agency subsequent to the issuance of a standard. These new technologies and new types of information may be of assistance to employer and employee populations in complying with the regulatory text to which the appendix was attached (Hazardous Waste Operations and Emergency Response, 1989).

Under the direction of Joseph Dear, Assistant Secretary of Labor for Occupational Safety and Health, U. S. Department of Labor, document 29 CFR 1910.121, known as Appendix E (HAZWOPER training recommendations) was prepared. In the development of Appendix E, OSHA adapted documents developed by the National Fire Protection Association, the International Association of Fire Service Instructors, and others to supplement the guidance provided by the National Institute of Environmental Health Sciences.

Literature Review

A review of related literature was conducted in order to become better acquainted with the numerous aspects of HAZWOPER training as applied to Oklahoma. To insure an adequate review of related literature, particular attention was paid to the specific aspects of: (1) Historical aspects of HAZWOPER legislation; (2) the importance of HAZWOPER to business and industry in the private sector of Oklahoma; (3) the nature and curriculum of certified HAZWOPER training; (4) the impact of HAZWOPER training on business and industry in Oklahoma state; and (5) a summary.

In 1994 the U.S. Congress authorized over seven billion dollars for operation and enforcement of acts and codes related to, or under the authority of, the Environmental Protection Agency (EPA). In contrast, OSHA's budget for that same period was just over one billion dollars. Through the Clean Air Act (CAA), Clean Water Act (CWA), Toxic Substances Control Act (TSCA), Safe Drinking Water Act (SDWA), Resource Conservation Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation Liability Act (CERCLA) also known as "Superfund," the EPA enforced environmental regulations. These regulations have encompassed a vast amount of everyday work activities in most business and industry areas (Laing, 1992).

According to one RCRA provision, mere ownership of property made a business or corporation responsible for any adverse impacts to the air, soil, and water caused by previous owners or renters. Congress mandated the EPA to promulgate and enforce HAZWOPER for state and private employees in the federal OSHA States (Bosch &

Novak, 1993; Pomaville, 1992).

The EPA has a list of approximately 700 chemicals that were deemed hazardous. Any business, industry, or corporation that handled, produced, or transported any or all of these chemicals, came under the direct jurisdiction of the acts generated by EPA (Bosch & Novak, 1993; Laing, 1992).

Increasingly numerous and complex regulations implied an enhanced standard of care that required regulatory knowledge and technical expertise. The occupational health regulations most likely to impact business and industry included hazard communication, respiratory protection, confined space entry, exposure hazards, bloodborne pathogens, emergency response, and highly hazardous chemicals (Bosch & Novak, 1993). HAZWOPER applied, aside from those regularly involved with hazardous waste cleanup operations handling, to employees who were employed in commercial businesses and industries involved in emergency response operations which may have involved a release (or potential release) of hazardous substances (Roughton, 1993).

In 1990, OSHA proposed a training accreditation rule for HAZWOPER (Loshak,& Mustard 1991), but had yet to issue a final standard. The rule would establish a process for certifying training courses and developing a list of topics to be covered. OSHA planned to issue a final rule in the fourth quarter of fiscal year 1994 (Occupational Hazards, 1994).

The mandates from government for performance were in place in the form of the Code of Federal Regulations (09-21-94), 29 CFR Parts 1910 and 1926. Insurance incentives for training in business and industry have taken the form of lower rates (Anderson, 1994; Van Valkenburgh, 1990). Certified training in the areas of hazardous material handling, fire protection, and industrial safety was blossoming. It was evident

that many Oklahoma businesses would have to comply with EPA regulations in general, and HAZWOPER in particular. It was safe to conclude that training would be needed in this area. The extent of training (private sector) in Oklahoma state was yet to be determined.

Additionally, the extent of perceived HAZWOPER training, as well as, barriers and priorities was also yet to be investigated. As reflected in the literature, barriers to job training range from economic barriers, language barriers, emotional barriers, and priority barriers (Barnes, 1994; Brown, 1994; Charner, 1986; DiMattia & Yeager, 1989; Fitzgerald & Patton, 1994; and, Tompkins, 1995). Results of this survey help to address these concerns and problem areas related to HAZWOPER training.

CHAPTER III

METHODOLOGY

Introduction of Procedures

Research questions influence and help determine the sequential ordering of methodology involved with the process and procedures of any study. In this study, the primary objective was to describe the current state of HAZWOPER training, the type of training achieved, priorities to HAZWOPER training, and the common barriers to HAZWOPER training. The focus of the study was on employees in the Oklahoma private commercial sector who were responsible for hazardous waste operations and emergency response. The purpose of this chapter was to describe and provide the rationale for the methods used, and the sequence of procedures incorporated, in the study. It was anticipated that a substantial data base from the survey sample would be formed as a result of information gained through the survey.

Research Design

Good survey designs should have six components: (1) specific, measurable objectives; (2) sound choice of population or sample; (3) sound choice of research design;

(4) reliable and valid instruments; (5) appropriate analysis; (6) accurate reporting of survey results (Fink, 1995). This study used a self-administered questionnaire, one of the most frequently used methods for collecting data in research studies (Bourque & Fielder, 1995).

Statistical methods are largely determined by the type and nature of the information sought. In this study, descriptive information was the primary focus. Thus, descriptive statistics, such as frequency, percentages, means and ranges were considered appropriate statistical tools. Clustering of categories enhanced the identification of major themes and trends of the data.

Population and Sample

The first design step in this study was initiated by the random selection of 351 manufacturers and processors from a larger population of 3,800 manufacturers and processors registered in Oklahoma (re: Oklahoma directory of manufacturers and processors, 1994-95 edition). Support and rationale in using a sample of only 351 was derived from a table for determining needed sample size as determined by Krejcie, & Morgan, and cited in Issaac (Issaac, Stephen, 1981). A replication of this table is reproduced in appendix D. The larger population composed of all the manufacturers and processors in Oklahoma, included those who were not engaged in the handling of toxic or hazards materials (as defined by OSHA/EPA). The population, thus, came from those classified in the *Standard Industrial Classification* (SIC) listings as published in the Oklahoma directory of manufacturers and processors (1994-95 edition), Oklahoma department of commerce, research and planning division.

A diskette containing this information was ordered from the Oklahoma department of commerce in Oklahoma City and loaded into a Microsoft ACCESS software program

for processing. The population sequence was first randomized, then the sample was systematically stratified by choosing every tenth entry from the top of the list to the bottom. Choosing every tenth entry yielded a sample pool of three hundred and eighty, which was closest to the required number of three hundred and fifty one (351). The first three hundred and fifty one (351) entries (names) were then selected from this "short list" for the study sample.

Data for each business included categories for company name (alphabetical), mailing address, location address, number range for people employed, names of company leaders (presidents, vice presidents and others), and main products or services. Accordingly, with the aid of Mr. Curtis Rich (a systems analyst and programmer for IFSTA at the Oklahoma State University campus) a randomizing formula was entered into the program and applied to the business data entries. After this process, a randomizing of the business names was observed. To strengthen the randomization, the business list was coded from top to bottom, every tenth entry. Systematically marking every tenth entry yielded a sample size closest to that needed for the study (re: appendix D). Thus, by this means, a list of three hundred and fifty one (351) names and businesses were drawn out of the population of 3,800 businesses.

The rationale to use such a large and broadly defined population (some of which did not need HAZWOPER training) was made because this group was the best defined and available listing available for this research project. Additionally, it came closest to representing the "ideal" target population.

Instrument Design and Validation

The next activity was the design and validation of an appropriate self-administered

survey instrument. This activity included adapting established survey questions of similar nature, customizing them to fit this study and then pilot testing the survey questionnaire using content matter expert reviews for purposes of readability and face validity. Finally, came the process of administering the survey itself.

In this study, the population consisted of all manufacturers and processors as published in the 1994-95 Oklahoma State Department of Commerce listings, which totaled 3,800 companies. The survey sample consisted of 351 randomly selected companies from this list. It was anticipated (by virtue of the determination of manufacturing or processing outputs) that some companies in this population base were not in need of HAZWOPER training because they were not involved in the handling of hazardous wastes or toxic chemicals as defined by OSHA and the EPA. This resulted in the population group being a mixture of those who perceived a need for HAZWOPER training (the "does apply group") and those who did not perceive a need for or have HAZWOPER training (the "does not apply group," those who do not perceive a need for this training).

Due to the imperfections and lack of specific information needed for weeding out the "does apply group" from the "does not apply group" in the Chamber of Commerce listings, the "does apply" group could not be separated from the "does not apply" group before the sampling process started. The survey results provided feedback and clues in order to sustain such a "weeding out" in future efforts.

Development of the Instrument (Questionnaire Design)

Concurrent with the review of literature, was a search for a suitable survey instrument. After exhaustive inquiry of literature and INTERNET list servers related to EPA and OSHA issues in both the United States and Canada, no suitable instrument was

found. Thus, it was determined that it would be necessary to design an original instrument with the aid of other instruments similar in design as resources.

This conclusion precipitated a search for other survey instruments that had been tested, validated and used successfully in a similar study or purpose to the one needed for this study. Additionally, the search was selectively focused to just those questionnaires which had questions posed in a preselected closed style format. Even though closed questions are more difficult to write than open ones, because the answers or response choices must be known in advance, it was perceived that responders in this population would be better able to express themselves and provide more detail while self-administering the survey questionnaire.

Furthermore, due to the political climate regarding the legal liability for HAZWOPER training, it was decided not to focus the questionnaire on whether or not training was required of a company. Rather, it was decided to focus on whether or not HAZWOPER training was actively being used. Thus, descriptive style questions were used in formatting the survey.

Two survey instruments of a similar nature were found to serve as models and guides for the development of the HAZWOPER instrument. They were chosen because their question formats were closed and easily adaptable to the objectives and needs of this study. Additionally, because their objectives were similar, it meant that the questions would not have to be significantly re-worded in order to fit the needs of this study. Both instruments had been used earlier in Oklahoma, thus added to their value as guides for question construction, adaptation and modification.

The instruments used were: 1) a study by Murray, Elizabeth J., May, 1982, A survey of staff development programs and needs for student services personnel staff in community and junior colleges, unpublished master's thesis; and, 2) a survey instrument

published and circulated by the Oklahoma State University Engineering Extension program, October, 1994. Instrument number one was procured from the OSU Edmond Low library and instrument number two was secured from Mr. Stan Dunham, manager of extension programs for the College of Engineering, Architecture and Technology at Oklahoma State University.

Due to cost, time restrictions and other limitations, a self-administered survey instrument was chosen over telephone interviews or personal interviews as the method for data collection. Additionally, it was reasoned that this method would yield data that may be easier to keep uniform and objective. After extensive research and review, it was decided that the requirements of the HAZWOPER questionnaire could basically be met by incorporating and adapting questions from the two studies listed above.

Construction of HAZWOPER Survey Questionnaire

Although writing clear questions was accepted as a general goal in surveys, procedures to ensure that each key term was consistently understood were not routine (Fowler, 1992). For this reason, guidance for the development of this instrument involved the input and critiques of several professional sources familiar with HAZWOPER training who included: Mr. Doug Forsman (Director of the International Fire Service Training Association) and Mr. Mike Laws (lead instructor for the Moore-Norman VocEd, HAZWOPER program). These individuals, and others (complete listing in: appendix F) of similar backgrounds, aided in the construction, alignment and validation of the survey instrument.

Key questions from the thesis study (referred to as Questionnaire # 1) done by Elizabeth Murray (1982) are reproduced in Appendix A. Key questions used from the

Oklahoma State University Engineering Extension program (1994)(referred to as Questionnaire # 2) are also reproduced in the second half of Appendix A .

Survey questions should be as short as possible without sacrificing the clarity of the question's meaning. Good questionnaire items should: (1) include vocabulary that is simple, direct, and familiar to all respondents; (2) be clear and specific; (3) not involve leading, loaded, and double-barreled questions; (4) be as short as possible; (5) include all conditional information prior to the key idea; and, (6) be edited for readability (Shaughnessy, & Zechmeister, 1990, p. 110).

Through the additional aid of Dr. Reynaldo Martinez, Jr., Assistant Professor for Occupational and Adult Education at Oklahoma State University, a survey for HAZWOPER training, designed to fulfill the objectives of this study, was developed (see Appendix B). This process was completed through the guidance of the study research questions (re: list on page 6), and by adaptation of the questionnaire resource materials cited above. For purposes of clarification, the research objectives are listed below along with the correlating survey question material.

Research Objective # 1:

To describe the current status of HAZWOPER training for personnel in the private sector the following three questions were developed:

(1) Rate, in your opinion, the degree of HAZWOPER training within your company; and

(2) Characterize, in your opinion, the HAZWOPER training activities within your company; and

(3) Rate the percentage, in your opinion, of employees who have HAZWOPER training.

Research Objective # 2:

To describe the type of HAZWOPER curriculum areas that have been achieved, the following question was developed:

(4) From the following list of HAZWOPER training course topics, check all those that have been delivered/received by company employees within the past three years

Research Objective # 3:

To describe the perceived barriers to HAZWOPER training in the private sector of Oklahoma, the next two questions were developed:

(5) In your opinion, what is your company's commitment to HAZWOPER training; and

(6) From the following list of possible barriers to training, check all those which you have encountered in the implementation of HAZWOPER training.

Research Objective # 4:

To describe the perceived curriculum priorities for HAZWOPER training in the private sector, the following question was developed:

(7) Please rate the following HAZWOPER training topics, in order of priority, in which to meet the needs of your company.

In addition, the following question was added to the list for the purpose of providing more meaningful perspectives in terms of narrowing the target study group for future surveys in this field and for a better understanding of questionnaire responses:

Which classification best identifies your title?

( ) Industrial Engineer
( ) Industrial Hygienist
( ) Safety Engineer
( ) Safety Manager
( ) Environmental Specialist
( ) Environmental Engineer
( ) Environmental Manager
( ) Hazardous Operations Specialist
( ) Industrial Technician
( ) Safety Technician
( ) Other: _____

In addition, a question was added so that survey respondents could indicate whether they wanted to receive a copy of the survey, summarizing the results.

Subject Matter Expert Review

Questions that appeared objective and unambiguous to the researcher may strike others as slanted and ambiguous. To address this concern, copies of the drafted survey were reviewed by experts (appendix F), who had knowledge of survey research methods and with special expertise in the area of HAZWOPER training (see appendix F). The instrument was reviewed by five of the eight members of the Oklahoma State Fire Marshal's select committee on HAZWOPER training who included the chairperson, Enid Fire Marshal, Mr. Bill Presley. Additionally, other reviews were done by two highly qualified and experienced instructors in the field of hazardous waste and emergency response operations. First, was Mr. Jim Hanson, a faculty member of the Fire Protection and Safety Technology program at Oklahoma State University and second, was Mr. Mike Laws, HAZMAT and HAZWOPER instructor at Moore-Norman Area Vocational-Technical Institute.

Feedback from these reviews were studied and analyzed. Where necessary, changes were made in the instrument to improve the face validity, readability, and

construct integrity. Thus, the survey instrument was revised for content and subject matter accuracy.

Pilot Testing of Survey Instrument

The instrument was pilot tested with individuals who represented the target population at the following businesses in Stillwater, Oklahoma: Fluid Technology, Inc. (five individuals), and MercCrusier (Safety Manager only). Those involved in the pilot testing at Fluid Technology, Inc. were the Safety Manager, the Operations Manager and three engineering technicians (five total). As a result of pilot testing, the instrument was modified to have more accurate and specific curriculum topics, and an easy-to-read format design.

Institutional Review Board (IRB)

Federal regulations and Oklahoma State University policy require review and approval of all research studies that involve human subjects before investigators can begin their research. The Oklahoma State University Research Services and IRB conducted this review to protect the rights and welfare of human subjects involved in biomedical and behavioral research. In compliance with the aforementioned policy, this study was granted permission to continue on March 9, 1995. Furthermore, this research was assigned the following research project number: ED-94-055 (see appendix H).

Survey Procedure and Data Collection

After identifying the sample, a cover letter was composed (Appendix C). The cover letter described the objectives and need of the study, the specifics regarding privacy of responders, the deadline for response, and directions for mail-in. The definitions of terms used in the instrument were printed on a separate sheet (see appendix E). Cover letters were then printed and merged with the survey name listings and signed by Mr. Doug Forsman (Fire Protection Publications director), Dr. Reynaldo Martinez (thesis committee chair) and LeRoy Anderson (researcher). Each person who was surveyed received a cover letter on Oklahoma State University, Fire Protection Publications letterhead (see: appendix C). The cover letter explained the nature and the purpose of the survey as well as the date of return needed for participating in the survey questionnaire. Additionally, a sheet of word and acronym definitions (appendix E) was enclosed to enable participants to operationalize the survey questionnaire. The questionnaire itself (appendix B) was number coded at the upper right-hand corner to aid in the confidentiality process. Finally, a self-addressed, stamped return envelope was enclosed for purposes of returning the survey in a timely fashion. All instruments were mailed April 17, 1995 at the Stillwater, Oklahoma post office.

After twenty days, those who had not responded were contacted by telephone. At that time reasons for not responding were solicited. If the respondents indicated a willingness to answer a second questionnaire, it was agreed to be sent. If the respondents indicated that the survey was "nonapplicable" it was so noted. After all the data was collected, a master data base with which to conduct a statistical and comparative analysis was composed.

A list was produced which contained all those who failed to respond, their names,

phone numbers and name of business or company. Four weeks after the survey was mailed, telephone follow-up calls to all "non-responders" were made over a period of three to four weeks. Those who could not be contacted for one reason or another on the first telephone attempt were tried at least two other times before dropping their names and placing them into the "no response category." Thus, those dropped had three attempts at being contacted.

The purpose of the telephone calls was not to conduct the survey over the phone, but rather to: (1) ascertain whether or not these people received the survey, and if so; (2) their reason for not participating in the study. The process and activity of calling the "non-responders" took place during the last three weeks of June. A grand total of eight hundred (800) telephone calls were made to survey "non-responders."

Analysis of the Data

Frequency distributions and percentages were calculated for each question where appropriate. Open-ended responses were categorized by similarities and dissimilarities, common themes, and concepts. A careful examination of the technical adequacy of the descriptive statistics was done.

Next, a comparative analysis of the measures of central tendency was conducted on the survey data. Each survey question was compiled into a matrix for easy analysis. Upon the completion of this assessment, tables and graphs showing the results were formulated for easy comparison.

Summary of Project Steps of Procedures

The following is a chronological description of this study's methodological steps:

a) Compiling a comprehensive list of all personnel likely to be involved with hazardous waste and emergency response operations working in the private commercial sector of Oklahoma;

[note: this list has come from the Oklahoma Chamber of Commerce]

b) Researching the library data bases of ERIC, Sociological data base, dissertation abstracts, abi inform, periodicals, CD-NET, Applied Science and Technology Index, Congressional Information Services (CIS), and (other sources) in the library;

c) Randomizing the target population sample;

d) Construction and design of the survey instrument;

e) Subject matter expert reviewing of survey instrument;

f) Pilot testing of the survey instrument for readability and face validity;

g) Mailing survey questionnaire to each individual in the sample population;

h) Telephoning for a follow-up for all non-respondents;

I) Tabulating of raw data into tables and columns in preparation of statistical analysis;

j) Applying statistical techniques used in measures of central tendency and descriptive analysis such as counts, percentages; and

k) Determining conclusions, implications and recommendations.

CHAPTER IV

DATA PRESENTATION AND FINDINGS

Introduction

The purpose of this study was to describe the perceived status of HAZWOPER employee training related to the Code of Federal Regulations (CFR) 1910.1200 Hazardous Waste Operations and Emergency Response (HAZWOPER) from the private sector of Oklahoma. Additionally, it was intended to describe the nature, barriers and priorities and type of HAZWOPER training.

The profile of HAZWOPER employee training was achieved by addressing the following research questions through the medium of mailed survey questionnaires: (1) What is the current status of HAZWOPER training for personnel in the private sector of Oklahoma? (2) What type of HAZWOPER curriculum areas have been achieved to date? (3) What are the perceived barriers to HAZWOPER training in the private sector of Oklahoma? and, (4) What are the perceived curriculum priorities for HAZWOPER training in the private sector? The research instrument had seven questions which generated the information used to answer the four research objectives cited above.

Data Methodology

Ideally, the population would be identified as only those businesses that handled or used toxic or hazardous materials (as defined by the EPA) in the course of their operational activities. However, an exhaustive search to identify the "ideal" population, that included the Oklahoma Department of Labor, the Oklahoma Chamber of Commerce, the OSU campus library, OSU's engineering extension training and education service, the governor's select committee on hazardous material training and standards and other professional societies related to the support and/or education of employees who may handle hazardous or toxic materials, revealed that such identification was not feasible in the state of Oklahoma. Thus, the next best group was determined to be the population category for all the manufacturers and processors in the private sector, as published by the Oklahoma department of commerce (research and planning division).

Because of this unforseen and unavoidable limitation for identifying only those businesses that handled hazardous or toxic materials, the target population chosen for this study was the 3,800 manufacturers and processors listed in the Oklahoma department of commerce 1994-95 list of businesses.

During the third week of April, 1995, three hundred and fifty one surveys were mailed. The respondents were requested to return the survey within two weeks from the date of its receipt. This request was stated in the body of the cover letter.

Forty-three (43) persons initially responded to the survey and returned the completed questionnaire (except for one individual who wrote on the survey that it did not apply to his company and sent it in). Three hundred and eight (308) did not respond to

the survey (see Table I for further clarification).

The results of the follow-up telephone calls were that two hundred and fifty (250) of the three hundred and eight (308) non-respondents were contacted. Fifty-eight (58) of the non-respondents could not be reached either because there was no answer to attempted telephone contacts or because the telephone number had been disconnected.

Of the two hundred and fifty contacted, eighty (80) individuals stated that they had either lost, or for some reason did not get, their survey, but would be willing to complete one if a replacement would be sent. Following a survey candidate's statement of willingness, their address was verified over the telephone and corrections were made if needed. Of the eighty (80) who voiced a willingness to participate, thirty (30) individuals followed through with their pledge to participate and returned the questionnaire. The balance of that group, fifty (50), was lost to the survey. The survey may have applied to them or it may have not (re: Table I).

The remaining one hundred and seventy (170) non-respondents who were contacted via telephone (directly, person-to-person or indirectly via an intermediary, i.e., administrative assistant), one hundred and twenty seven (127) stated that the reason they had not responded to the survey was that the survey topic did not apply to them. The other fifty one (51) contacts resulted in various statements of reasons listed below:

(1) moved from the company (n=13);
(2) on vacation (n=6);
(3) out of the office frequently (n=12);
(4) not interested or hostile refusal (n=8);
(5) no time to fill out the survey (n=10); and
(6) deceased (n=2).

The telephone contact follow-up, revealed that one hundred and twenty-seven (127) individuals perceived that their company had no involvement with hazardous waste or toxic materials as part of their operations. Those individuals responded that the survey "didn't apply to them."

Thus, the net response result of the survey was: (1) a total of seventy-three (73) survey responses were received through the mail (43, initially, and 30, due to follow-up telephone contacts minus one individual who wrote "does not apply" on the returned survey questionnaire); (2) a total of one hundred twenty-seven (127) responded that the survey "did not apply" via telephone contacts; (3) fifty (50) individuals were dropped from the survey due to failure to contact through either the mail or telephone; and, (4) one hundred and one (101) individuals who did not respond for a variety of reasons such as death, moved from the company, on vacation, out of the office frequently, not interested or hostile refusal, no time to fill out the survey, or some other unknown factor (see Table I for further clarification). Figure 1 graphically depicts the categories represented in table I.

TABLE I

A SUMMARY OF SURVEY RESPONSES AND RESULTS

Single categories	Frequency	Percentages
Surveys returned after first mailing*	43	12
Surveys returned after second mailing**	30	9
TELEPHONE RESPONSES (to follow-up phone calls of non-responders) :		
"Does not apply"***	127	36
Unable to contact****	101	29
Promised participation, but failed to do so*****	50	14
Total frequencies and total percentage	351	100

Table I (Continued)

A SUMMARY OF SURVEY RESPONSES AND RESULTS

CATEGORIES COLLAPSED		
Early and late responders [1st & 2nd mailing]	73	21
"Does not apply" responses	127	36
Non-participants	151	43

*Surveys returned after first mailing--Those individuals who participated in the survey by filling out and sending back the survey in response to the first mailing.

**Surveys returned after second mailing--Those individuals who participated in the survey by filling out and sending back the survey as a consequence of telephone contact with researcher and subsequent second mailing.

***"Does not apply"--Those individuals who were contacted by telephone and stated that the survey topic *did not apply* to them and therefore they did not elect to participate.

****Unable to contact--Those individuals who could not be contacted because it was ascertained that they were either on extended vacation, out of the office frequently, not interested in participation, no time to participate, moved to another company, or deceased.

*****Promised participation, but failed to do so--Those individuals who were contacted by telephone and stated that they would participate in response to a second mailing, but who failed to do so.

It should be remembered that the following tables (two through thirty-one) only reflect the combined data of the early and late survey responders (N= 73). Responses to the survey are tabulated and presented in tables two through thirty-one in this chapter.

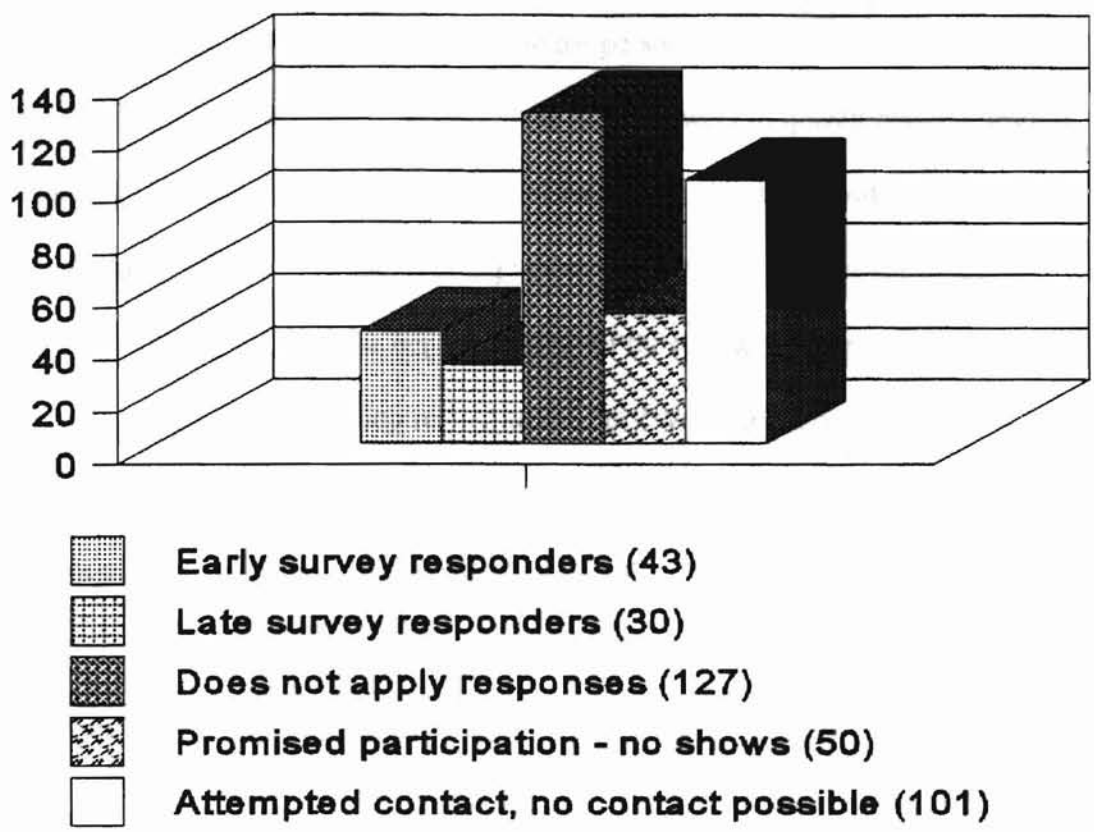

Figure 1. A Summary of Survey Response

Data Findings

Collected data from survey respondents is reproduced in the following tables, most of which have two halves. The upper half of the table lists single categories as itemized in the survey instrument itself. The lower half of the table is a representation of categories collapsed for purposes of highlighting illustrations of significant clusters, trends and, in some cases, weighted percentages.

Additionally, it should be noted that all responses reflected in the tables are only those of responders who mailed back their survey questionnaires. This group numbered seventy three (73).

The table that represents data relating to objective number one, what is the perceived current status of HAZWOPER training for personnel in the private sector of Oklahoma, is reflected in Table II. This data came from answers to questionnaire question number one, "Rate, in your opinion, the degree of Hazardous Waste Operations and Emergency Response (HAZWOPER) training within your company" (see: appendix B). Data from Table II indicates that the majority (85%) of those who participated in the survey have already had some training related to the HAZWOPER curriculum. This training may have been company sponsored or otherwise.

The central tendency is in the "little" to "moderate" training groups. The lower half of Table II shows that sixty two (62) percent of the respondents have little to moderate training. Twenty three (23) percent have good to high training levels.

TABLE II

A SUMMARY OF RESPONSES RATING THE DEGREE OF PERCEIVED HAZWOPER TRAINING

Single Categories	Frequency	Percent of Total
No Training	11	15
Little Training	23	32
Moderate Training	22	30
Good Training	16	22
High Training	1	1
Total	73	100

CATEGORIES COLLAPSED FOR SIGNIFICANT HIGH/LOW CLUSTER ILLUSTRATION

No Training	11	15
Little and Moderate Training	45	62
Good and High Training	17	23

Fulfilling objective number one from a different perspective is survey question number two, what is the current status of HAZWOPER training for personnel in the private sector of Oklahoma. Data from question # 2 "Rate the percentage, in your opinion, of employees who have had HAZWOPER training, is presented in Table III. Central tendency seemed to center between 1 and 33% of the employees being perceived as having had HAZWOPER training. For further clarification, see: appendix B.

The perceived degree of training is most apparent when categories are collapsed. Here it is observed that in most firms sixty three (63) percent of the respondents perceived that fewer than thirty three (33) percent of the employees had received HAZWOPER training.

TABLE III

A SUMMARY OF RESPONSES REFLECTING THE EXTENT TO WHICH THE RESPONDENTS PERCEIVED EMPLOYEES TO HAVE RECEIVED HAZWOPER TRAINING

Category By Percent	Frequency	Percent of Total
0%	13	18
1 to 33%	32	45
34 to 66%	11	15.5
67 to 99%	11	15.5
100%	4	6
Total	71*	100

*Of the 73 surveys, 71 respondents answered this question.

Additionally, table IV also represents data fulfilling objective number one, what is the current status of HAZWOPER training for personnel in the private sector of Oklahoma. Table IV's data came from answers to question number four, "In your opinion, characterize the HAZWOPER training activities within your company." For further clarification, see: appendix B.

The nature or orientation of HAZWOPER training received is reflected in Table IV. It can be observed from the structure of the collapsed categories that of the employees who had training, a substantial (60%) number had received their training from company sponsored or company driven training programs.

TABLE IV

A SUMMARY OF RESPONSES CHARACTERIZING THE PERCEIVED NATURE OF HAZWOPER TRAINING FOR COMPANY EMPLOYEES

Single Categories	Frequency	Percent Of Total
No HAZWOPER training activities	8	11
Voluntary HAZWOPER training activities	21	29
Some Informal Company Sponsored HAZWOPER training	12	17
Some company sponsored formal HAZWOPER training, but no program	25	35
A comprehensive company sponsored, formal HAZWOPER training program	6	8
Total	72*	100

Table IV (Continued)

A SUMMARY OF RESPONSES CHARACTERIZING THE PERCEIVED NATURE OF HAZWOPER TRAINING FOR COMPANY EMPLOYEES

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS		
No HAZWOPER training activities	8	11
Voluntary HAZWOPER training activities	21	29
Some Informal Company Sponsored HAZWOPER training--and-- Some company sponsored formal HAZWOPER training, but no program; A comprehensive company sponsored, formal HAZWOPER training program	43	60

*Of the 73 returned surveys, 72 respondents answered this question.

Information addressing objective number two, determining the type of HAZWOPER curriculum areas that had been presented, is supplied by awareness to question number five, "From the following list of HAZWOPER training course topics, check all those that have been delivered to or received by your company's employees within the past three years". For further clarification, see appendix B. Specifically, respondents were requested to put a check by all course work that they believed had been received by company employees in the past three years. The results of question number five is reflected in Table V with the most frequently occurring response listed first and the least occurring response listed last in the table.

Grouping the first five categories together, reveals that at least 87% of all those who responded to the survey had received training in communication, recognition, regulations, and identification of materials and / or data related to hazardous materials. Conversely, grouping the last five categories together, reveals that at most, only 40% of

all those who responded to the survey perceived to have had received training in self-contained breathing apparatus (SCBA), hazardous emergency simulation exercises, identification of category contaminants such as dusts, aerosols, vapors and gases, toxicology, and the Oklahoma State Hazard Communication Standard. Additionally, eight (8) of the twenty two (22) categories (a total of 36%) received less than a fifty percent (50%) perceived rate of training received. Eight categories were between fifty and seventy five percent (50-75%).

TABLE V

A SUMMARY OF HAZWOPER COURSE AREAS WHICH WERE PERCEIVED AS RECEIVED BY PERSONNEL IN THE ORDER OF HIGHEST FREQUENCY

Single groupings	Frequency	Percent of Total
Understanding Material Safety Data Sheets	45*	100
Hazardous Substances	40	89
OSHA Regulations-Respirators and Personal Protection	39	87
OSHA Hazard Communication Standard	39	87
Recognizing and identifying hazardous materials	39	87
Types of hazards (physical, health, combined effects, electrical hazards)	35	78
PPE - respiratory protection	33	73
OSHA permissible exposure limits	32	71
Classification of hazardous material	31	69
Industrial hygiene-recognition, evaluation and control	26	58
EPA regulations identifying hazardous waste	26	58
Standard Operating Guides - Health and Safety plans	26	58
Air purifying respirators	25	56
Chemical protection clothing	24	53

Table V (Continued)

A SUMMARY OF HAZWOPER COURSE AREAS WHICH WERE PERCEIVED AS RECEIVED BY PERSONNEL IN THE ORDER OF HIGHEST FREQUENCY

OSHA HAZWOPER Standard (1910.1200)	21	47
Reactive and explosive substances	20	44
CERCLA reportable quantities	20	44
Self-contained breathing apparatus (SCBA)	18	40
Hazardous emergency simulation exercises	18	40
Categories of contaminants (dusts, aerosols, vapors, gases)	17	38
Toxicology	13	29
ACGIH threshold limit values	0	0
Oklahoma State Hazard Communication Standard	11	24

*45, out of the 73 respondents, responded to this question.

Information addressing objective number three, determining the perceived barriers to HAZWOPER training, was partially supplied by answers to question number three, "In your opinion, what is your company's commitment to HAZWOPER training?" For further clarification, see appendix B. Results of question number three are reflected in Table VI.

The smallest percentage was in the high commitment category, eight (8) percent. Eleven (11) percent responded that they perceived their company to have had no commitment regarding HAZWOPER training. Thirty five (35) percent responded that their company had a good commitment toward HAZWOPER training.

Results in the collapsed section indicate commitment to be at either the Low or High end of the commitment spectrum. Forty (40) percent had little or no commitment and forty three (43) percent had high or good commitment.

TABLE VI

A SUMMARY OF RESPONSES REFLECTING THE DEGREE OF PERCEIVED COMPANY COMMITMENT OF HAZWOPER TRAINING

Single Categories	Frequency	Percent of Total
No commitment	8	11
Little commitment	21	29
Moderate commitment	12	17
Good commitment	25	35
High commitment	6	8
Total	72*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No and Little commitment	29	40
Moderate commitment	12	17
Good and High commitment	31	43

*Of the 73 returned surveys, 72 respondents answered this question.

Additional information for the fulfilment of objective number three, determining the perceived barriers to HAZWOPER training, was supplied by answers to question number seven ("From the following list of possible barriers to training, check all those that you have encountered which impact the implementation of HAZWOPER training"). For further clarification, see appendix B. Specifically, question seven asked participants to choose from a list of items related to barriers of training, all those items which they perceived as significant to their situation. Results of question number seven are reflected in Table VII.

The time related issue was the most frequently marked barrier to training (29%).

Next most frequent was the financial barrier (16%), with priority coming in third (15%). Combining the top five categories in table VII indicates that the overwhelming majority (84%) of those surveyed felt that most common barriers to training were either time, financial, priority, informational, or personnel related.

TABLE VII

A SUMMARY OF RESPONSES TO PERCEIVED BARRIERS TO TRAINING

Single groupings	Frequency	Percent of Total
Time related	39	29
Financial related	22	16
Priority related	20	15
Information related	18	13
Personnel related	15	11
No problems	11	8
Company policy related	5	4
Other (see itemized response)*	5	4
Total	135 ♮	100

* "Lack of perceived HAZWOPER material (or danger) in the work place."
"We do not train for HAZWOPER, our emergency plan uses the Fire Dept."
"Limited exposure to commercially available substances is in small containers."
"Identifying qualified trainers."
"Distance and Time."

♮ Of the 73 returned surveys, some respondents answered this question by checking more than one item on the list.

To answer objective number four, determining the perceived HAZWOPER curriculum training priorities, question number six was asked, "Please rate the following HAZWOPER training topics, in the order of priority that meets the needs of your company." For further clarification, see appendix B. Specifically, a list of HAZWOPER

training subjects was provided, and respondents were asked to rank, by order of priority, their perception regarding the importance of each to their situation.

Specific results of question number six are itemized and reflected in Tables VIII through XXX. In table VIII, regarding the OSHA HAZWOPER STANDARD, the frequency distribution looks fairly even with "moderate priority" ranking highest at fifteen (15) and "highest priority" ranking lowest frequency at five (5). The collapsed categories in the lower half of table VIII reveals that the majority of respondents feel that their situation reflects "no priority" or "some priority."

TABLE VIII

A SUMMARY OF THE PRIORITY OF OSHA HAZWOPER STANDARD 1910.1200

Single Categories	Frequency	Percent of Total
No priority	11	21
Some priority	10	19
Moderate priority	15	29
Strong priority	11	21
Highest priority	5	10
Total	52*	100
CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS		
No priority & Some priority	21	40
Moderate priority	15	29
Strong priority & Highest priority	16	31

*Of the 73 returned surveys, 52 respondents answered this question.

Table IX reflects a summary of the curriculum priority as related to the OSHA communication standard, (CFR 1910.1200). Seven (7) responses or thirteen (13) percent chose no priority, while most frequent fourteen (14) or twenty six (26) percent, chose highest priority. Moderate priority and strong priority were evenly split with thirteen (13) responses each or twenty five (25) percent each.

The collapsed categories reveal that over half of respondents (51%) chose either a strong or high priority for this curriculum. The other categories, no and some priority, and the moderate priority groups were evenly split at twenty five (25) percent each.

TABLE IX

A SUMMARY OF THE PRIORITY FOR THE OSHA COMMUNICATION STANDARD CFR1910.1200

Single Categories	Frequency	Percent of Total
No priority	7	13
Some priority	6	11
Moderate priority	13	25
Strong priority	13	25
Highest priority	14	26
Total	53*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	13	25
Moderate priority	13	25
Strong priority & Highest priority	27	51

*Of the 73 returned surveys, 53 respondents answered this question.

Table X reflects a summary of the curriculum priority as related to the Oklahoma State Hazard Communication Standard. The highest single response group thirteen (13) or thirty six (36) percent, chose "moderate priority." The second highest was ten (10) "no priority" response or twenty eight (28) percent. The fewest was two (2) responses for "highest priority" or six (6) percent.

According to the collapsed categories, fifty (50) percent of respondents cited either "little" or "no" perceived priority for this curriculum. "Moderate priority" was second largest at thirty six (36) percent and only fourteen (14) percent responded with either strong or highest priority.

TABLE X

A SUMMARY OF THE PRIORITY FOR THE OKLAHOMA STATE HAZARD COMMUNICATION STANDARD

Single Categories	Frequency	Percent of Total
No priority	10	28
Some priority	8	22
Moderate priority	13	36
Strong priority	3	8
Highest priority	2	6
Total	36*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	18	50
Moderate priority	13	36
Strong priority & Highest priority	5	14

*Of the 73 returned surveys, 53 respondents answered this question.

Table XI reflects a summary of the priority related to OSHA regulations on the subject of respirators and personal protection equipment. "Strong priority" appeared with most frequency (16) at thirty one (31) percent. "No priority" and "highest priority" received the same frequency of nine (9) or seventeen and a half (17.5) percent each. The moderate frequency received the fewest choice with eight (8) or fifteen (15) percent.

Looking at the collapsed categories, a substantial percentage of respondents, forty eight (48) percent indicated a "strong" or "high priority" in this curriculum. Those indicating "no" or "some priority" was the next largest group at thirty seven (37) percent, with moderate remaining at fifteen (15) percent.

TABLE XI

A SUMMARY OF THE PRIORITY RELATED TO OSHA REGULATIONS ON RESPIRATORS AND PERSONAL PROTECTION EQUIPMENT

Single Categories	Frequency	Percent of Total
No priority	9	17.5
Some priority	10	19
Moderate priority	8	15
Strong priority	16	31
Highest priority	9	17.5
Total	52*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	19	37
Moderate	8	15
Strong priority & Highest priority	25	48

*Of the 73 returned surveys, 52 respondents answered this question.

Table XII reflects a summary of priority related to OSHA regulations on permissible exposure thresholds and limits. "Strong priority" appeared with the most frequency (16) or thirty and a half (30.5) percent. Next was "moderate priority" (14) which had twenty six and a half (26.5) percent "No priority" was selected by ten (10) or nineteen (19) percent and "highest priority" was the fewest response (6) at eleven (11) percent for this curriculum.

Looking at the collapsed categories, the majority of respondents (22) forty two (42) percent indicated a "strong" to "high priority" in this curriculum. The next most frequent cluster was the "no" and "some priority" groups at thirty two (32) percent. Fourteen respondents (26.5%) chose a moderate priority for this topic.

TABLE XII

A SUMMARY OF PRIORITIES RELATED TO OSHA REGULATIONS ON PERMISSIBLE EXPOSURE LIMITS

Single Categories	Frequency	Percent of Total
No priority	10	19
Some priority	7	13
Moderate priority	14	26.5
Strong priority	16	30.5
Highest priority	6	11
Total	53*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	17	32
Moderate priority	14	26.5
Strong priority & Highest priority	22	42

*Of the 73 returned surveys, 53 respondents answered this question.

Table XIII reflects a summary of priority related to industrial hygiene recognition evaluation and control. "The least frequent (4) was "highest priority" at eight (8) percent response. "No priority" had ten (10) responses for twenty (20) percent response. The most frequent response (13) was equally split between "some priority" and "strong priority" at twenty seven (27) percent each.

Looking at the collapsed categories, "no" and "some priority" accounted for forty seven (47) percent of responses. "Strong" and "highest priority" combined had a thirty five (35) percent response, and "moderate priority" had eighteen (18) percent.

TABLE XIII

A SUMMARY OF PRIORITIES RELATED TO INDUSTRIAL HYGIENE RECOGNITION EVALUATION AND CONTROL

Single Categories	Frequency	Percent of Total
No priority	10	20
Some priority	13	27
Moderate priority	9	18
Strong priority	13	27
Highest priority	4	8
Total	49*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	23	47
Moderate priority	9	18
Strong priority & Highest priority	17	35

*Of the 73 returned surveys, 53 respondents answered this question.

Table XIV reflects a summary of priority related to the recognition of hazardous substances. The most frequent (14) single category was moderate priority with thirty one (31) percent response rate. The next most frequent response was stong priority with ten (10) or twenty two (22) percent. Highest priority (7) or sixteen (16) percent and no priority (6) at thirteen (13) percent.

Looking at the collapsed categories, each of the clusters are fairly evenly distributed. No priority and some priority had the same percentage as moderate priority which was thirty one (31) percent. The strongest cluster was strong and highest priority with thirty eight (38) percent.

TABLE XIV

A SUMMARY OF PRIORITIES RELATED TO RECOGNITION OF HAZARDOUS SUBSTANCES

Single Categories	Frequency	Percent of Total
No priority	6	13
Some priority	8	18
Moderate priority	14	31
Strong priority	10	22
Highest priority	7	16
Total	45*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	14	31
Moderate priority	14	31
Strong priority & Highest priority	17	38

*Of the 73 returned surveys, 45 respondents answered this question.

Table XV reflects a summary of perceived priority related to Toxicology curriculum. In the single category groupings, the most frequent selection was for both "some priority," at twelve (12) or twenty five and a half (25.5) percent, and "moderate priority," at twelve (12) or twenty five and a half (25.5) percent. "Strong priority," was the next most frequent response (10) at twenty one (21) percent. "Highest priority" had the least frequent response (5) at eleven (11) percent.

Looking at the collapsed categories, the majority of respondents, forty two and a half (42.5) percent, perceived this topic as having a low end priority. Strong and highest priority combined had fifteen (15) or thrity two (32) percent. The "moderate" group had twelve (12) responses or twenty five and a half (25.5) percent.

TABLE XV

A SUMMARY OF PRIORITIES RELATED TO TOXICOLOGY CURRICULUM

Single Categories	Frequency	Percent of Total
No priority	8	17
Some priority	12	25.5
Moderate priority	12	25.5
Strong priority	10	21
Highest priority	5	11
Total	47*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	20	42.5
Moderate priority	12	25.5
Strong priority & Highest priority	15	32

*Of the 73 returned surveys, 45 respondents answered this question.

Table XVI reflects a summary of priority related to the Recognition and identification of hazardous materials. The "strong priority" group(15) had the most frequency at twenty eight (28) percent. The next most frequent response was the "moderate priority" at thirteen (13) or twenty four and a half (24.5) percent. "No priority" (9) had a seventeen (17) percent response.

Looking at the collapsed categories, the "no priority" / "some priority" group (combined twenty five percent) was fairly evenly matched with the "moderate priority" (twenty four and a half percent) group. However, the majority of respondents (fifty and a half percent) perceive this topic as having a "strong" or "high end priority".

TABLE XVI

A SUMMARY OF PRIORITIES RELATED TO THE RECOGNITION AND IDENTIFICATION OF HAZARDOUS MATERIALS

Single Categories	Frequency	Percent of Total
No priority	9	17
Some priority	4	8
Moderate priority	13	24.5
Strong priority	15	28
Highest priority	12	22.5
Total	53*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	13	25
Moderate priority	13	24.5
Strong priority & Highest priority	27	50.5

*Of the 73 returned surveys, 53 respondents answered this question.

Table XVII reflects a summary of priority related to Familiarization of EPA regulations identifying hazardous waste. The most frequently chosen response was "strong priority," at thirteen (13) or twenty seven (27) percent. Next was "Some priority" (10) or twenty one (21) percent. "Highest priority" (9) tied with "moderate priority," (9) or eighteen and a half (18.5) percent each. Last was "No priority" (7) at fifteen (15) percent.

Looking at the collapsed categories, the majority of respondents chose this topic as having a high end priority (forty five and a half percent), with the next most frequent distribution in the low end priority cluster (thirty six percent).

TABLE XVII

A SUMMARY OF PRIORITIES RELATED TO FAMILIARIZATION OF EPA REGULATIONS IDENTIFYING HAZARDOUS WASTE

Single Categories	Frequency	Percent of Total
No priority	7	15
Some priority	10	21
Moderate priority	9	18.5
Strong priority	13	27
Highest priority	9	18.5
Total	48*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	17	36
Moderate priority	9	18.5
Strong priority & Highest priority	22	45.5

*Of the 73 returned surveys, 48 respondents answered this question.

Table XVIII reflects a summary of priority related to Familiarization of CERCLA regulations on reportable quantities. In the single category, the most frequent was "some priority," thirteen (13) or twenty eight (28) percent. "No priority" (11) and "moderate priority" (11) were tied at twenty three (23) percent. "Highest priority" (7) had fifteen (15) percent, "strong priority" (5) had eleven (11) percent.

Looking at the collapsed categories, the majority of respondents indicat ed this topic as having a "low priority" (fifty one percent), with the "moderate" (twenty three percent) and "strong" / "highest priority" (twenty six percent) clusters relatively equal in percentage.

TABLE XVIII

A SUMMARY OF PRIORITIES RELATED TO FAMILIARIZATION OF CERCLA REGULATIONS ON REPORTABLE QUANTITIES

Single Categories	Frequency	Percent of Total
No priority	11	23
Some priority	13	28
Moderate priority	11	23
Strong priority	5	11
Highest priority	7	15
Total	47*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	24	51
Moderate priority	11	23
Strong priority & Highest priority	12	26

*Of the 73 returned surveys, 47 respondents answered this question.

Table XIX reflects a summary of priorities related to Personal Protection Equipment (PPE) respiratory protection. The "highest priority" (14) group had twenty six and a half (26.5) percent. The "strong priority" group thirteen (13) had twenty four and a half (24.5) percent. "No priority" (11) had twenty (20) percent. "Some" and "moderate priority" groups, eight (8) and eight (8) respectively, were equal at fourteen and a half (14.5) percent each.

Looking at the collapsed categories that reflect that the most frequent response was that of "strong priority" at (fifty one percent). Next was "no and some priority" at thirty four and a half (34.5) percent. "Moderate priority" received fourteen and a half (14.5) percent.

TABLE XIX

A SUMMARY OF PRIORITIES RELATED TO PPE RESPIRATORY PROTECTION

Single Categories	Frequency	Percent of Total
No priority	11	20
Some priority	8	14.5
Moderate priority	8	14.5
Strong priority	13	24.5
Highest priority	14	26.5
Total	49*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	19	34.5
Moderate priority	8	14.5
Strong priority & Highest priority	27	51

*Of the 73 returned surveys, 49 respondents answered this question.

Table XX reflects a summary of priorities related to Air purifying respirators. "Some priority" (15) responses were equal to the "strong priority" (15) response group, and have thirty (30) percent each. "No priority" (14) received twenty eight (28) percent. "Moderate priority" (4) had eight (8) percent. "Highest priority" (2) was least responed to and received a four (4) percent response rate.

Looking at the collapsed categories, it is evident that the majority of respondents (fifty eight percent) selected this curriculum as having a "low end priority." "Strong" and "highest priority" received thirty four (34) percent response.

TABLE XX

A SUMMARY OF PRIORITIES RELATED TO AIR PURIFYING RESPIRATORS

Single Categories	Frequency	Percent of Total
No priority	14	28
Some priority	15	30
Moderate priority	4	8
Strong priority	15	30
Highest priority	2	4
Total	50*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	29	58
Moderate priority	4	8
Strong priority & Highest priority	17	34

*Of the 73 returned surveys, 50 respondents answered this question.

Table XXI reflects a summary of priorities related to Self-contained breathing apparatus (SCBA). Twenty five (25) or fifty one and a half (51.5) percent chose "no priority" for this curriculum. Ten (10) or twenty (20) percent choose "some priority" as their response. "Moderate priority" (7) had fourteen and a half (14.5) percent. "Strong priority" (6) had twelve (12) percent, and "highest priority" (1) had two (2) percent.

Looking at the collapsed categories shows that seventy one and a half (71.5) percent regard this curriculum as having "some" or "no priority." Fourteen (14) percent chose this curriculum as having "strong" or "high priority," moderate was close at fourteen percent.

TABLE XXI

A SUMMARY OF PRIORITIES RELATED TO SELF-CONTAINED BREATHING APPARATUS (SCBA)

Single Categories	Frequency	Percent of Total
No priority	25	51.5
Some priority	10	20
Moderate priority	7	14.5
Strong priority	6	12
Highest priority	1	2
Total	49*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	35	71.5
Moderate priority	7	14.5
Strong priority & Highest priority	7	14

*Of the 73 returned surveys, 49 respondents answered this question.

Table XXII reflects a summary of priorities related to Chemical protection clothing. The most frequent response was "no priority" (18) at thirty six (36) percent. "Moderate priority" (11) received twenty two (22) percent. "Some priority" (8) received sixteen (16) percent. "Strong priority" (9) received eighteen (18) percent, followed by "highest priority" (4) at eight (8) percent.

Looking at the collapsed categories reveal that the majority of respondents chose this topic as having a "low end priority" (fifty two percent). The "moderate" group and the "strong" and "highest priority" group are closely divided in priority choice (twenty two and twenty six percent respectively).

TABLE XXII

A SUMMARY OF PRIORITIES RELATED TO CHEMICAL PROTECTION CLOTHING

Single Categories	Frequency	Percent of Total
No priority	18	36
Some priority	8	16
Moderate priority	11	22
Strong priority	9	18
Highest priority	4	8
Total	50*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	26	52
Moderate priority	11	22
Strong priority & Highest priority	13	26

*Of the 73 returned surveys, 50 respondents answered this question.

Table XXIII reflects a summary of priorities related to Standard operating guides for health and safety. The most frequent was "strong priority" (19) which received thirty six (36) percent. Next was "moderate priority" (13) at twenty five (25) percent, followed by "no priority" (9) at seventeen (17) percent. "Highest priority" (7) received thirteen (13), and "some priority" (5) received nine (9) percent.

Looking at the collapsed categories, the majority (forty nine percent) of respondents perceive this topic as having a high end priority. Comparing the "moderate priority" group to that of the collapsed "no priority" and "some priority" group reveals a fairly even split (twenty five and twenty six percent respectively).

TABLE XXIII

A SUMMARY OF PRIORITIES RELATED TO STANDARD OPERATING GUIDES FOR HEALTH AND SAFETY

Single groupings	Frequency	Percent of Total
No priority	9	17
Some priority	5	9
Moderate priority	13	25
Strong priority	19	36
Highest priority	7	13
Total	53*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	14	26
Moderate priority	13	25
Strong priority & Highest priority	26	49

*Of the 73 returned surveys, 53 respondents answered this question.

Table XXIV reflects a summary of priorities related to the Classification of hazardous materials. The most frequently chosen category was "strong priority" (17) at thirty three (33) percent. Second was "moderate" (13) at twenty five and a half (25.5) percent. Next was "no priority" (9) at eighteen (18) percent, then "highest" (8) at fifteen and a half (15.5) percent. Last was "some priority" (4) at eight (8) percent.

Looking at the collapsed categories, the majority of respondents (forty nine percent) selected this topic as having a high end priority. The "no" to "some priority" cluster compared to the "moderate" grouping are evenly split at twenty five and a half.

TABLE XXIV

A SUMMARY OF PRIORITIES RELATED TO THE CLASSIFICATION OF HAZARDOUS MATERIALS

Single Categories	Frequency	Percent of Total
No priority	9	18
Some priority	4	8
Moderate priority	13	25.5
Strong priority	17	33
Highest priority	8	15.5
Total	51*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	13	25.5
Moderate priority	13	25.5
Strong priority & Highest priority	25	49

*Of the 73 returned surveys, 51 respondents answered this question.

Table XXV reflects a summary of priorities related to Reactive and explosive substances. The most frequently chosen category was tied between "no priority" (13) and "some priority" (13) at twenty eight (28) percent. Next was "strong priority" (10) at twenty one (21) percent, and "moderate" (8) at seventeen (17). Last was "highest priority" (3) at six (6) percent.

Looking at the collapsed categories, the majority of respondents (fifty five percent) chose this topic as having a low end priority. The second strongest frequency is found in the "strong" and "highest priority" grouping. "Moderate" received seventeen (17) percent.

TABLE XXV

A SUMMARY OF PRIORITIES RELATED TO REACTIVE AND EXPLOSIVE SUBSTANCES

Single groupings	Frequency	Percent of Total
No priority	13	28
Some priority	13	28
Moderate priority	8	17
Strong priority	10	21
Highest priority	3	6
Total	47*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	26	55
Moderate priority	8	17
Strong priority & Highest priority	13	27.5

*Of the 73 returned surveys, 47 respondents answered this question.

Table XXVI reflects a summary of priorities related to the Understanding of material safety data sheets (MSDS). "Highest priority" (18) was the most frequently chosen category at thirty three (33) percent. Next was "strong priority" (16) at thirty (30) percent. "No priority" (7) and "moderate priority" (7) were tied at thirteen (13) percent. "Some priority" (6) had eleven (11) percent.

Looking at the collapsed categories, the majority of respondents (sixty three percent) chose this curriculum as having a high end priority. The second largest cluster was in the "no priority" and "some priority" groups (twenty four percent).

TABLE XXVI

A SUMMARY OF PRIORITIES RELATED TO THE UNDERSTANDING OF MATERIAL SAFETY DATA SHEETS (MSDS)

Single Categories	Frequency	Percent of Total
No priority	7	13
Some priority	6	11
Moderate priority	7	13
Strong priority	16	30
Highest priority	18	33
Total	54*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	13	24
Moderate priority	7	13
Strong priority & Highest priority	34	63

*Of the 73 returned surveys, 54 respondents answered this question.

Table XXVII reflects a summary of priorities related to Understanding types of hazards (physical, health, combined effects, electrical hazards). Twenty three (23) or forty four (44) percent chose "strong priority." Ten (10) or nineteen (19) percent chose this curriculum as "highest priority." Eight (8) or fifteen (15) percent chose "moderate," six (6) or twelve (12) percent choose "none," and five (5) or ten (10) percent choose "some."

Looking at the collapsed categories, the majority of respondents (sixty four percent) chose this curriculum as having a high end priority. The second largest grouping was that of the "no priority" and "some priority" cluster (twenty one percent).

TABLE XXVII

A SUMMARY OF PRIORITIES RELATED TO UNDERSTANDING TYPES OF HAZARDS (PHYSICAL, HEALTH, COMBINED EFFECTS, ELECTRICAL HAZARDS)

Single Categories	Frequency	Percent of Total
No priority	6	12
Some priority	5	10
Moderate priority	8	15
Strong priority	23	44
Highest priority	10	19
Total	52*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	11	21
Moderate priority	8	15
Strong priority & Highest priority	33	64

*Of the 73 returned surveys, 52 respondents answered this question.

Table XXVIII reflects a summary of priorities related to Understanding categories of contaminants (dusts, aerosols, vapors, gases). The most frequently chosen category was "moderate" (19) or thirty four (34) percent. Next was "highest" (11) or nineteen and a half (19.5) percent. "Some priority" (10) had eighteen (18) percent, "no priority" (9) had sixteen (16) percent, and "strong priority" (7) had twelve and a half (12.5) percent.

Looking at the collapsed categories reveals that the respondents are fairly evenly distributed on percentages with approximately thirty three (33) percent each.

TABLE XXVIII

A SUMMARY OF PRIORITIES RELATED TO UNDERSTANDING CATEGORIES OF CONTAMINANTS (DUSTS, AEROSOLS, VAPORS, GASES)

Single Categories	Frequency	Percent of Total
No priority	9	16
Some priority	10	18
Moderate priority	19	34
Strong priority	7	12.5
Highest priority	11	19.5
Total	56*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	19	34
Moderate priority	19	34
Strong priority & Highest priority	18	32

*Of the 73 returned surveys, 56 respondents answered this question.

Table XXIX reflects a summary of priorities related to Hazardous emergency simulation exercises. The most frequently chosen category was "no priority" (17) at thirty six (36) percent. Next was "strong priority" (11) at twenty three (23) percent "Some" (8) and "moderate priority" (8) were tied at sixteen and a half (16.5) percent, with "highest priority" (4) trailing at eight (8) percent.

Looking at the collapsed categories, respondents indicated this subject to be of low end priority (fifty two percent). The second highest grouping was that of the "strong" to "highest priority" grouping (thirty one percent).

TABLE XXIX

A SUMMARY OF PRIORITIES RELATED TO HAZARDOUS EMERGENCY SIMULATION EXERCISES

Single Categories	Frequency	Percent of Total
No priority	17	36
Some priority	8	16.5
Moderate priority	8	16.5
Strong priority	11	23
Highest priority	4	8
Total	48*	100

CATEGORIES COLLAPSED FOR HIGH/LOW CLUSTERS ILLUSTRATIONS

No priority & Some priority	25	52
Moderate priority	8	16.5
Strong priority & Highest priority	15	31

*Of the 73 returned surveys, 48 respondents answered this question.

Table XXX reflects a summary of priorities related to Other types. Only one respondent elected to choose this response option and write their response. It is listed as a high priority item. Respondent wrote that "compliance with codes regarding availability of equipment, planning, hazards and floor plans to emergency agencies (fire, ambulance, police) were extremely important."

TABLE XXX

A SUMMARY OF PRIORITIES RELATED TO OTHER TYPES OF COURSES OR EXERCISES

Single groupings	Frequency	Percent of Total
No priority		
Some priority		
Moderate priority		
Strong priority		
Highest priority	1	100
Total	1*	100

* Of the 73 returned surveys, one respondent answered this question.

In a effort to summarize and identify by order of the highest frequency of training to the least, table XXXI was created. This table displays responses by priority from most priority to least priority. Additionally, the percent of responses for each category is stated.

TABLE XXXI

A SUMMARY OF SURVEY RESPONSES REFLECTING THE PERCEIVED HAZWOPER TRAINING PROFILE

Survey Categories	Outcomes
NATURE OF CURRICULUM	89% have informational, regulations, and communication
BARRIERS TO TRAINING	73% related to time, financial, priority, information
SELF-CONTAINED BREATHING APPARATUS	71% responded little priority
UNDERSTANDING TYPES OF HAZARDS	64% responded strong priority
UNDERSTANDING OF MSDS SHEETS	63% responded strong priority
EXTENT OF HAZWOPER TRAINING	63% have 0 to 33% trained
HAZWOPER TRAINING	62% have little to moderate training
NATURE OF COMPANY SUPPORT	60% have some to high company support
AIR RESPIRATORS	58% responded little priority
REACTIVE & EXPLOSIVE SUBSTANCES	56% responded little priority
EMERGENCY SIMULATION EXERCISES	52.5% responded little priority
CHEMICAL PROTECTION CLOTHING	52% responded little priority
PPE RESPIRATORY PROTECTION	51% responded strong priority
CERCLA REGUATIONS	51% responded little priority
HAZARDOUS MATERIALS RECOGNITION	51 % responded strong priority
OSHA COMMUNICATION STANDARD	51% responded strong priority
OK. STATE HAZARD COMM. STANDARD	50% responded little priority
HEALTH & SAFETY OPERATING GUIDES	49% responded strong priority
CLASSIFICATION OF HAZARDOUS MATERIALS	49% responded strong priority
RESPIRATOR & PPE EQUIPMENT	48% responded strong priority
INDUSTRIAL HYGIENE	47% responded little priority
EPA REGULATIONS ON HAZARDOUS WASTE	45.5% responded strong priority
TOXICOLOGY	43% responded little priority
COMPANY COMMITMENT TO TRAINING	43% have good to high commitment
PERMISSIBLE EXPOSURE LIMITS	41.5% responded strong priority
OSHA HAZWOPER STANDARD (1910.1200)	40% responded little priority
RECOGNITION OF HAZARDS (physical-health)	38% responded strong priority
DUSTS, AEROSOLS, VAPORS, & GASES	33% evenly split on priority

Note: In the interest of brevity in the above table, little priority means both no priority and little priority. Strong priority means both strong and highest priority grouping clusters.

To identify which job title best represented the survey respondents, question number eight was asked. Specifically, a list of job titles was provided and respondents were requested to check the title which best identified themselves. This information is summarized and represented in Table XXXII. The overwhelming response in the first two categories (listed by order of frequency) seems to indicate that those who are responsible for and or currently have some level of HAZWOPER training responsibility are classified as either safety manager or plant manager in this sample.

TABLE XXXII

A SUMMARY OF JOB TITLES WHICH BEST REPRESENTS THOSE WHO RESPONDED TO THE SURVEY

Single Categories	Frequency	Percent of Total
Safety Manager	22	34
Plant Manager	12	18.5
Owner/Operator	6	9.5
General Manager	5	7.5
Safety Engineer	4	6
Environmental Manager	3	4.5
President of Company	3	4.5
Industrial Engineer	2	3
Hazardous Operations Specialist	1	1.5
Other	7♮	11
Total	65*	100

♮ Write in responses: Environmental, Health and Safety Engineering Technical Manager;
Emergency Preparedness/Response Coordinator
Project Engineer
Paint Shop Manager
Office Manager
Quality Assurance
No title, employee

* More than one response was given by several respondents

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This study was to determine and develop a research based profile of private sector training needs for Hazardous Waste Operations and Emergency Response (HAZWOPER) training in the state of Oklahoma pursuant to the Code of Federal Regulations (CFR) 1910.1200. Additional to the main objective, data was gathered to describe the nature of HAZWOPER curriculum that had already been taught, the perceived priorities of HAZWOPER curriculum, and the perceived barriers to HAZWOPER training. Furthermore, survey participants were asked to rate their company's commitment to HAZWOPER training activities by indicating the level and nature of training within the company.

The research instrument contained seven specific research questions (next page) and one demographic question which was developed and pilot tested for this study. The research questions were:

1. Rate, in your opinion, the degree of HAZWOPER training within your company.
2. Characterize, in your opinion, the HAZWOPER training activities within your company.

3. Rate the percentage, in your opinion, of employees who have HAZWOPER training.

4. From the following list of HAZWOPER training course topics, check all those that have been delivered/received by company employees within the past three years.

5. In your opinion, what is your company's commitment to HAZWOPER training?

6. From the following list of possible barriers to training, check all those which you have encountered in the implementation of HAZWOPER training.

7. Please rate the following HAZWOPER training topics, in order of priority in which to meet the needs of your company.

8. From the list provided, please check the best title which represents your own within the company.

The subjects of this study were private sector company officers selected from the business listing of the Oklahoma Chamber of Commerce, Standard Industrial Classification (SIC) Listings of Manufacturers and Processors most likely to handle or be responsible for chemical or toxic emergencies within their organizations. Names for the subjects were obtained from the Chamber of Commerce listings. Typically, these names were of either company managers or company vice presidents and presidents.

To date, many forms of HAZWOPER training have developed nation-wide. In Oklahoma there are Vocational-Technical schools and private schools which supply curriculum for HAZWOPER training. However, there are no published reports that address the need for generating a HAZWOPER training profile for the state of Oklahoma, private sector. Additionally, no study to date has answered questions related to the

nature of HAZWOPER curriculum already developed and promulgated, nor given a profile regarding the perceived priorities of HAZWOPER curriculum, nor an assessment of the barriers to HAZWOPER training. This study sought to address this void. The issues and answers to the study's questions are important, especially to those who provide training in this area as well as those interested in assessment of current curriculum and training delivery systems.

As a result of this study, a better understanding of HAZWOPER training and curriculum profile has been achieved in the private sector of Oklahoma. The data reflects, in part, the current nature of HAZWOPER training and curriculum needs. Additionally, some barriers have been identified (Table VII). The perception of company commitment was also investigated (Table VI). Furthermore, an extensive priority list of HAZWOPER curriculum topic areas has been created as a direct result of the respondents' choices of perceived priorities (Table V).

A telephone contact was made (in so far as practical and possible) to each and every non-responder to the survey. These individuals were contacted in the month of June over a period of approximately four weeks. As a result of this effort, two hundred and seven (207) non-responder individuals were contacted. Of those, eighty (80) stated that they would be willing to fill out and return the survey if a new one could be sent. Of those eighty (80), thirty (30) were returned. The balance (remainder) of this group was categorized as a "failed to respond" (see table I). The others who were contacted cited "does not apply to them" as their reasons for no participating in the survey.

Conclusions

As a result of this research, the following conclusions are drawn (note: each conclusion is underneath the study's four research questions):

RQ #1: What is the current status of HAZWOPER training for personnel in the private sector of Oklahoma?

1. Approximately fifty-three percent (53%) of survey respondents reported they perceived their company as having had a "moderate" to "high" level of HAZWOPER training (re: Table II). The nature of that training mainly consisted of company sponsored and supported types (re: Table IV, collapsed categories section) which focused in informational, regulations, and communications HAZWOPER curriculum (re: Table XXXI).

The current HAZWOPER training profile for private sector employers responsible for hazardous waste, hazardous/toxic chemicals in the State of Oklahoma falls slightly below a moderate level of training. Moderate level of training is defined as referring to a person who has completed one half of all the required HAZWOPER training curriculum (re: Table V).

Most survey respondents indicated that they have had some form of HAZWOPER training. However, when asked to specify which types (from a list of 22 course topics), less than half indicated they were trained in more than twelve specified areas (half of the list). This means that they have completed a little under half of the required training topics (curriculum) for HAZWOPER proficiency.

2. Approximately forty-seven percent (47%) of survey respondents reported

having "no" or "little" HAZWOPER training. That sixty two (62) percent of the respondents perceived fifteen (15) percent had no training, thirty two (32) percent had little training, and thirty (30) percent had moderate training. This indicates that seventy seven (77) percent perceived training to be at best "moderate" -- thus the degree of HAZWOPER training is not perceived to be at good or high levels (re: Table II). The data seem to indicate that more HAZWOPER training may be needed for the private sector.

Data from Table III shows that eighteen (18) percent of respondents perceived that "no" HAZWOPER training had been received in their companies and forty five (45) percent reported that only one to thirty three (1 - 33) percent of coworkers had received training. In combination, sixty three (63) percent of the respondents perceived none to at most one third of their coworkers had received HAZWOPER training. Additionally, when the first two categories of Table III are combined, sixty three (63) percent are perceived as having none to little training. Thus, it can be concluded that the respondents generally felt that low percentages of their coworkers had received HAZWOPER training (re: Table III).

RQ #2: <u>What type of HAZWOPER curriculum areas have been achieved</u>?

1. HAZWOPER curriculum that is regulation connected (legalities), easy to present, economical to give and which requires little student interactive activities are the types of curriculum areas that the survey respondents most frequently reported as having been given. An example of this would be the overwhelming number (100%) of respondents reporting having received curriculum on the Understanding of Material Safety

Data Sheets -vs- those who reported having received field training involving the simulation of emergency scenarios or training exercises.

From this data, conclusion is made that some topics are perceived as being widely achieved (Table V). Eight (8) topics received seventy to one hundred (70 - 100) percent response. These topics were: Understanding Material Safety Data Sheets; Hazardous Substances; OSHA Regulations-Respirators and Personal Protection Equipment; OSHA Hazard Communication Standard; Recognizing and identifying hazardous materials; Types of hazards (physical, health, combined effects, electrical); PPE - respiratory protection; and OSHA permissible exposure limits.

Six topics were perceived as being achieved to a moderate level (53 - 69%). These topics were: Classification of hazardous material; Industrial hygiene-recognition, evaluation and control; EPA regulations identifying hazardous waste; Standard Operating Guides - Health and Safety plans; Air purifying respirators; and Chemical protection clothing.

Nine topics were reported to have been achieved on low levels (0 - 49%). Conclusion is that the majority fifteen (15) of the twenty three (23) topics (65%) were perceived as receiving moderate to low levels of training, and further that the following topics are perceived as having had low levels of training: OSHA HAZWOPER Standard (1910.1200); Reactive and explosive substances; CERCLA reportable quantities; Self-contained breathing apparatus (SCBA); Hazardous emergency simulation exercises; Categories of contaminants (dusts, aerosols, vapors, gases); Toxicology; and Oklahoma State Hazard Communication Standard.

2. The high frequency of those who reported time (29%) and finances (16%) as

the number one barrier to training (re: Table VII) may be related to the nature and type of HAZWOPER training most frequently given (re: Table V). Responses regarding company commitment to HAZWOPER training (re: Table VI) indicates a binomial frequency distribution and which seems to be related to how much HAZWOPER training employees receive (re: Table II) and the nature of that training (re: Table V). The distribution has two clusters; on one side, there is either "no" or "little" company commitment, or there is "good" to "high" company commitment. "Moderate" commitment is substantially lower than either of the two groups.

RQ #3: What are the perceived barriers to HAZWOPER training in the private sector of Oklahoma?

1. The survey data shows that a leading barrier is the element of "time" (29%). Following is a cluster of three with similar levels of responses: Financial (16%); Priority (15%); and Information (13%). The review of literature indicate, and the survey results confirm, that economic reasons pose a significant barrier to HAZWOPER training (re: page 23, and Table VII).

Additionally, the responses in Table VI (Perceived Company Commitment of HAZWOPER Training) seem to support the nature of training found in Table IV (Perceived Characteristics of the Nature of HAZWOPER Training). Further, the twenty-nine (29) percent response for "time related barriers" in Table VII seems to correlate with the twenty-nine (29) percent frequency response in Table VI for "no or little commitment" (re: first collapsed frequencies group) as well as the twenty-nine (29) percent frequency response in Table IV showing "no HAZWOPER training (11%) or the voluntary

HAZWOPER training (29%). Adding the first two categories together yields forty (40) percent response. A conclusion here is that approximately forty percent of all respondents perceive little or no HAZWOPER training due to a variety of reasons. Chief among the reasons given them appears to be economical and time related constraints.

2. The lack of priority placed on HAZWOPER training as a significant barrier to training is also substantiated within the survey findings. In Table VII (Perceived Barriers to Training), "priority" has a fifteen (15) percent response rate. This response rate is supported by Table IV (the Nature of HAZWOPER Training Among Company Employees). In this table, eleven (11) percent responded that their company had no HAZWOPER training activities. In Table VI (Perceived Company Commitment of HAZWOPER Training), eleven (11) percent responded that their company had no commitment to HAZWOPER training. Thus, it would appear that the significant training barriers are connected to company commitment and priority, as well as the company policy which may imply a reflection of that commitment.

RQ #4: What are the perceived curriculum priorities for HAZWOPER training in the private sector?

1. The results of survey question number seven (7), the rating of HAZWOPER training topics by order of priority, are broken down per subject and reflected in Tables VIII through XXXI. It is evident that curriculum on recognition and the understanding of hazard types are of highest priority by survey respondents. The highest curriculum priorities seem to be related to recognition, handling, communication responsibilities of hazards, the classification of hazards and operation/disposition guidelines for hazardous

materials or toxic chemicals. Examples of these are summarized in Table XXXI, i.e., self-contained breathing apparatus, understanding types of hazards, understanding MSDS sheets, and air respirators. Of equal priority is that of training in the use of the self-contained breathing apparatus. The strength of this is reflected in Tables XI, XIV, XX, and XXI. Table XII further backs up the priority level in that it shows respondents' substantial interest in knowledge of permissible exposure limits, which is necessary in order to determine whether or not either a respirator or a self-contained breathing apparatus is needed in any given situation. The curriculum with the least priority are the areas of: (1) the Oklahoma State Hazard Communication Standard, Table X; (2) Industrial Hygiene Recognition Evaluation and Control, Table XIII; and, (3) Reactive and Explosive Substances, Table XXV.

2. Approximately sixty (60) percent of the respondents perceive their company as currently supporting employee training in a proactive manner (re: Table IV, collapsed clusters), and conversely, approximately forty (40) percent of respondents perceived their companies as having HAZWOPER training that was passive. This finding is reflected in Table VI (Perceived Company Commitment of HAZWOPER Training) where approximately sixty (60) percent of companies were perceived as having a positive commitment to HAZWOPER and approximately forty (40) percent were perceived as having little or no commitment for HAZWOPER training.

3. A surprise result of the survey was respondent rejection of ACGIH (threshold limit values) curriculum. It may be that this curriculum is not regarded (perceived) as necessary with the other HAZWOPER related curriculum topics and may indicate inappropriate training.

4. Though not an original research objective, the last question in the survey attempted to ascertain the job title which best described or represented the appropriate personnel responsible for HAZWOPER activities. Question number eight (8) requested the survey responders to check, from a given list, the job title which best represented theirs. This was done to help validate the survey and to provide guidance for future survey work to the HAZWOPER group.

5. The job titles most frequently associated with the survey participants were: (1) Safety Manager; (2) Plant Manager; (3) General Manager; and (4) Owner/Operator. The validity of these responses is taken in good faith that the participant answering was honest, correct and true.

6. An additional unexpected result was that a significant number of respondents contacted self-identified their businesses as having no relationship to HAZWOPER. One hundred and twenty seven (127) responded that the survey was "not applicable" to their situations. This then brings a conclusion that this "manufacturing and processing" population list has a significant number of businesses which are not HAZWOPER related. Therefore, it is not the best population in which to ascertain HAZWOPER survey results.

It could be conjectured that knowing the kind and nature of the products may help "weed out" the businesses that HAZWOPER does not apply in. However, the fact is that knowing a businesses product cannot predict HAZWOPER relevancy and is illustrated in Appendix G. Appendix G is a bipolar listing of respondents who either stated that HAZWOPER applied (evidenced by the nature of their survey responses) or that HAZWOPER didn't apply along with their principle product. The commercial printing businesses are provide a good illustration of this problem. Several in the sample stated

they needed HAZWOPER and several stated HAZWOPER did "not apply" to them.

Implications

Based on the review of literature and the results of this study, the following implications are offered:

1. Barriers to training may to be influenced by the companies' level of commitment to training (re: Table VI) and, as well, by the existence of an active company sponsored training program (re: Table IV). "Time," "financial," and "priority" related issues were chosen as the most frequent reasons for training barriers (re: Table VII). The results of Table VII on "barriers to training" seem to imply, more than anything else, that employee HAZWOPER training activity is a function of the companies' commitment and resources.

2. Comparison of the data from Tables IV and VI may imply a relationship between those companies which have a high percentage of HAZWOPER trained employees and those who are also active in sponsoring HAZWOPER training (as reflected in past training and policy). Further research needs to be done in this area.

3. As reflected in the survey results, HAZWOPER curriculum priorities center around the need for understanding and knowledge of chemical hazards, communication of hazards, recognition of chemical hazards, identification/classification of hazards and knowledge of the OSHA and EPA regulations of chemicals. This implies that employees have a high need for the acquisition of high cognitive awareness levels for these subjects. Further research needs to be done in this area.

4. Grouping (collapsing) the first five categories of Table V reveals that 87% of

all those who responded to the survey had received training primarily in communication, recognition, regulations, and identification of materials and / or data related to hazardous materials. The choices could reflect (1) the curriculum which was easiest to present was received first; (2) the curriculum which was most economical to take was received first; and/or (3) the curriculum most needed was centered around the subject areas of cognitive knowledge of toxic chemicals, and their recognition and safe disposition of them in accordance with established regulations. This finding could also be a result of a combination of two or more reasons stated above. Further research is needed.

5. Survey responses to question number eight (8), Table XXXII, indicate that fifty- two and a half (52½) percent of those who are responsible for and/or have HAZWOPER training are classified as either Safety Manager or Plant Manager. This would seem to imply that the person(s) responsible for HAZWOPER activity tend to be those who already have many other responsibilities in different areas within the company. If this is the case, it may have a direct impact upon: (1) company policy related to HAZWOPER training activity; (2) company commitment related to HAZWOPER training activity; (3) company priority related to HAZWOPER training activity; (4) company financial resources and budget related to HAZWOPER training activity; and (5) perceptions for the needs of HAZWOPER training. Since all but one of the respondents who mailed in their surveys reported having some HAZWOPER training, it may indicate that most of the survey participants are responsible for HAZWOPER events.

Recommendations

Based on the review of literature and the results of this study, the following recommendations for practice and further research are provided:

Practice

Based upon the results of this study:

1. Providers of HAZWOPER training may wish to adjust their training efforts to meet the results reported by the respondents;

2. Financial costs related to training may be a significant barrier that needs to be addressed by both the companies who use toxic and/or hazardous products and their wastes as well as those agencies involved in regulating and enforcing the laws related to HAZWOPER, because of lean budgets in smaller companies;

3. Because of the self-identified nature of the respondents, governmental agencies and State agencies involved in promulgation of HAZWOPER regulations and education may consider that some companies who have and use toxic/hazardous chemicals may not be aware of the regulatory impact of their activity and are ignorant of the legalities;

4. Private manufacturing and processing businesses in the sector of Oklahoma should be afforded training opportunities;

5. The information collected from this study may be used as base line data in an effort to design a guide for HAZWOPER training development in Oklahoma;

7. Articles should be written showing survey results and needs for added research in this area.

Research

Based upon the results of this study:

1. Research should be conducted that would better identify the target population within business and industry (those responsible for HAZWOPER) so that data obtained from future studies can be more viable and reliable;

2. Research should be conducted to further develop an assessment instrument for determining HAZWOPER training needs in the private sector for all states;

3. Research should be conducted to ascertain the best HAZWOPER awareness program for the private sector in Oklahoma;

4. Research should be conducted to ascertain the best delivery system of HAZWOPER training for the private sector of Oklahoma. This is needed so that providers of training can focus their curriculum and delivery system towards that end and so that training is kept efficient and economical for the companies involved;

5. More extensive research should be conducted to determine the barriers to HAZWOPER training and their solutions;

6. Further research could be expanded to determine the identity, location, and nature of financial resources for HAZWOPER training in the private sector of Oklahoma;

7. Curriculum priorities should be assessed to determine the basis for their perceived priority by the target population;

8. A comparison study of HAZWOPER training needs in the public/governmental sector of Oklahoma should be made to determine significant contrasts; and

9. Development and implementation of a national survey of this type which will broaden the scope, and clarify strengths and weaknesses of HAZWOPER training more

precisely is recommended.

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APPENDICES

APPENDIX A

SOURCE MATERIAL FOR SURVEY QUESTIONNAIRE

QUESTIONNAIRE # 1:

[exurbs from a survey instrument used in a master's thesis study done by Murray, Elizabeth Jeanette, May, 1982, A survey of staff development programs and needs for student services personnel staff in community and junior colleges.]

Question 14:

In your opinion, what is your institution's commitment to staff development (in terms of dollars committed, number of activities available for staff, encouragement to improve skills, etc.)?

___High level of commitment ___Moderate commitment ___Little commitment

Question 16:

How would you characterize staff development activities for student development personnel on your campus?

___ A formalized staff development program (staff person responsible for program activities, ongoing formalized program, etc.)
___ Some staff development activities but no formal program
___ A number of informal activities (staff attendance at workshops and conference, etc.)
___ No staff development activities

Question 17:

Many activities can be included in a staff development program (participation in professional conferences, bringing in outside experts or resource consultants, on-campus and in-service education, attendance at specialized workshops, attending formal academic courses, participation in staff retreats, etc.). In your opinion, which of these activities would you rank as the most important?

_____

Which would you rank as the least important?

_____

Question 19:

In your opinion, what is the current status of staff development programs on your campus?

____ will continue to grow and receive support
____ will remain static
____ will receive less support in the future

Question 21:

What is the major problem that you have confronted in implementing a staff development program or activities?

QUESTIONNAIRE # 2

[exurbs from a survey instrument published and circulated by the Oklahoma State University Engineering Extension program, October 1994]

Question 4:

Assuming the training is job relevant, how would you assess the value of an OSU *Professional Certificate Program in Fire Protection & Safety*?

( ) Increase knowledge of loss control sciences, technologies, processes & issues
( ) Enhance professional credibility
( ) Fulfill continuing education requirements of my professional affiliation
( ) Meet professional development requirements of my employer
( ) Increase chances for promotion
( ) Improve job security
( ) Expand capabilities to perceive new avenues for professional growth
( ) Derive a heightened sense of personal accomplishment
( ) Review important basics that I may have forgotten

Question 5:

Which program appears more relevant to your professional development?

( ) **Loss Control Management Training Certificate** (Approx. 130 training hrs.; little or no hands-on training requirements)
Featured courses might include:
- Fire Safety Hazards
- Occupational Safety Techniques
- Fire Protection Management
- Design & Analysis of Sprinkler Systems
- Elements of Industrial Hygiene
- Industrial Safety Organization
- Structural Designs for Fire and Life Safety
- Fire Protection Hydraulics & Water Supply Analysis
- Hazardous Materials Incident Management

( ) **Fire Protection Technician Training Certificate** (Approx. 150 training hrs.; some hands-on training required)
Featured Courses might include:
- Fire Safety Hazards
- Fire Suppression and Detection Systems
- Design & Analysis of Sprinkler Systems
- Inspection, Testing & Maintenance of Sprinkler Systems
- Fire Protection Hydraulics & Water Supply Analysis
- Advanced Extinguishing Systems Design & Analysis
- Structural Designs for Fire & Life Safety
- Industrial Fire Pumps

Question 6:

Please rank your preferred mode of course delivery (1 = highest; 5 = lowest):

( ) Lab intensive training sessions on the Oklahoma State University campus
( ) Live short course presentations at various locations (2 - 3 days per course)
( ) Videotaped training packages
( ) Live, interactive video training
( ) Independent & correspondence studies (no video)

APPENDIX B

HAZWOPER SURVEY QUESTIONS

Code #

HAZARDOUS WASTE AND EMERGENCY RESPONSE SURVEY

DIRECTIONS

On this page, **circle** the number [0 through 4] which best represents your views or perceptions.

1. Rate, in your opinion, the degree (percentage) of Hazardous Waste Operations and Emergency Response (HAZWOPER) training within your company.

   0 = No training;
   1 = Little training;
   2 = moderate training;
   3 = Good training;
   4 = High training

   Circle here → 0 1 2 3 4

2. Rate the percentage, in your opinion, of employees who have had HAZWOPER training.

   0 = 0%;
   1 = 1 to 33%;
   2 = 34 to 66%;
   3 = 67 to 99%;
   4 = 100%

   Circle here → 0 1 2 3 4

3. In your opinion, what is your company's commitment to HAZWOPER training?

   0 = No commitment;
   1 = Little commitment;
   2 = Moderate commitment;
   3 = Good commitment;
   4 = High commitment

   Circle here → 0 1 2 3 4

4. In your opinion, characterize the HAZWOPER training activities within your company.

   0 = No HAZWOPER training activities;
   1 = Voluntary HAZWOPER training activities;
   2 = Some Informal Company Sponsored HAZWOPER training;
   3 = Some company sponsored formal HAZWOPER training, but no overall program;
   4 = A comprehensive company sponsored, formal HAZWOPER Training Program

   Circle here → 0 1 2 3 4

DIRECTIONS

On this page, place a ✔ next to the item(s) you know have been given or received.

5. From the following list of HAZWOPER training course topics, check all those that have been delivered to or received by your company's employees within the past three years.

( ) OSHA HAZWOPER Standard (1910.1200)
( ) OSHA Hazard Communication Standard (1910.120)
( ) Oklahoma State Hazard Communication Standard
( ) OSHA regulations-respirators and personal protection
( ) OSHA permissible exposure limits
( ) ACGIH threshold limit values
( ) Industrial hygiene-recognition, evaluation and control
( ) Hazardous substances
( ) Toxicology
( ) Recognizing and identifying hazardous materials
( ) EPA regulations identifying hazardous waste: 40 CFR 261
( ) CERCLA reportable quantities
( ) PPE. - respiratory protection
( ) Air purifying respirators
( ) Self-contained breathing apparatus (SCBA)
( ) Chemical protection clothing
( ) Standard Operating Guides - Health and Safety plans
( ) Classification of hazardous materials
( ) Reactive and explosive substances
( ) Understanding material safety data sheets (MSDS)
( ) Types of hazards (physical, health, combined effects, electrical hazards)
( ) Categories of contaminants (dusts, aerosols, vapors, gases)
( ) Hazardous emergency simulation exercises
( ) Other, please explain:

_____

_____

_____

DIRECTIONS

In question # 6, it is possible to rank several items using the same number.

6. Please rate the following HAZWOPER training topics, in the order of priority that meets the needs of your company.

1 = no priority;
2 = some priority;
3 = moderate priority;
4 = strong priority;
5 = highest priority

( ) OSHA HAZWOPER Standard (1910.1200)
( ) OSHA Hazard Communication Standard (1910.120)
( ) Oklahoma State Hazard Communication Standard
( ) OSHA regulations-respirators and personal protection
( ) OSHA permissible exposure limits
( ) ACGIH threshold limit values
( ) Industrial hygiene-recognition, evaluation and control
( ) Hazardous substances
( ) Toxicology
( ) Recognizing and identifying hazardous materials
( ) EPA regulations identifying hazardous waste: 40 CFR 261
( ) CERCLA reportable quantities
( ) PPE. - respiratory protection
( ) Air purifying respirators
( ) Self-contained breathing apparatus (SCBA)
( ) Chemical protection clothing
( ) Standard Operating Guides - Health and Safety plans
( ) Classification of hazardous materials
( ) Reactive and explosive substances
( ) Understanding material safety data sheets (MSDS)
( ) Types of hazards (physical, health, combined effects, electrical hazards)
( ) Categories of contaminants (dusts, aerosols, vapors, gases)
( ) Hazardous emergency simulation exercises
( ) Other, please explain:

_____

_____

DIRECTIONS

On this page, place a ✔ next to all the items you believe apply.

7. From the following list of possible barriers to training, check all those that you have encountered which impact the implementation of HAZWOPER training.

( ) Company Policy Related
( ) Financial Related
( ) Information Related
( ) Personnel Related
( ) Time Related
( ) Priority Related
( ) No Problems
( ) Other, please explain:

_____

_____

_____

8. Which classification best identifies your title? Indicate by placing a ✔ next to the classification.

( ) Industrial Engineer
( ) Industrial Hygienist
( ) Safety Engineer
( ) Safety Manager
( ) Environmental Specialist
( ) Environmental Engineer
( ) Environmental Manager
( ) Hazardous Operations Specialist
( ) Industrial Technician
( ) Safety Technician
( ) Other, please explain:

_____

_____

_____

□ I **do**, □ I do **not** wish to receive a copy of the study summary results.

Send a copy for the survey results to: _____
[Please Print] Address: _____
_____

APPENDIX C

SURVEY COVER LETTER

April 17, 1995

Mr. Icarealot, president
ICAREALOT manufacturing corporation
2201 West Desert Cove
Big Time City, Oklahoma 74029
(602) 870-5000

re: Hazardous Waste Operations and Emergency Response (HAZWOPER) training

Dear President Icarealot,

In conjunction with the International Fire Service Training Association (IFSTA), and as partial fulfillment of a Master of Science degree in Occupational and Adult Education, We are conducting research in the area of employee HAZWOPER training needs. This survey will reach a representative sample of manufacturing companies throughout Oklahoma. The purpose of this survey is to collect data on existing staff development programs as related to HAZWOPER training, as well as some specifics regarding staff development needs.

All of your responses will remain anonymous. We are requesting your help in completing the attached survey questionnaire. We expect that you should be able to complete the questionnaire in five minutes or less. Directions and definitions for terms used in this survey are subjoined and provided. If you should desire a copy of the final summary report, please indicate so in the space provided on the survey. We will be happy to mail you a copy.

Please complete and return the survey by **May 1, 1995**. A self-addressed, stamped envelope is enclosed for your convenience.

Thank you very much for contributing to this important research project and for taking your very valuable time helping us with this effort.

Sincerely,

Doug Forsman, Director, Fire Service Programs	Reynaldo Martinez, Jr., Assistant Professor, Occupational & Adult Ed.	LeRoy M. Anderson Graduate Assistant, Occupational & Adult Ed.

APPENDIX D

SAMPLE SIZE SOURCE TABLE

TABLE FOR DETERMINING NEEDED SIZE *S* OF A RANDOMLY CHOSEN SAMPLE FROM A GIVEN FINITE POPULATION OF *N* CASES SUCH THAT THE SAMPLE PROPORTION *p* WILL BE WITHIN ± .05 OF THE POPULATION PROPORTION *p* WITH A 95 PERCENT LEVEL OF CONFIDENCE

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Table from:

Krejcie, Robert & Morgan, Daryle W.
EDUCATIONAL and PSYCHOLOGICAL MEASUREMENT
Determining Sample Size for research activities
Autumn 1970, vol. 30, no. 3, p. 608

APPENDIX E

OPERATIONAL DEFINITIONS SHEET

DEFINITIONS OF TERMS

HAZWOPER	Hazardous Waste Operations and Emergency Response (as defined by the U.S. Department of Labor, Occupational Safety and Health Administration)
OSHA	Occupational Safety and Health Administration (The National Safety Council's publication: ACCIDENT PREVENTION MANUAL for Business and Industry, 10th edition)
PPE	Personal Protection Equipment
COMMITMENT	Agreement or pledge
RCRA	Resource Conservation and Recovery Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (also known as "Superfund Law")
EPA	Environmental Protection Agency
SARA	Superfund Amendments and Reauthorization Act (Public Law No. 99-499)
SIC	Standard Industrial Classification (Codes 20 through 39 provide information to employees about the hazardous chemicals to which they are exposed by means of a hazard communications program, labels, and other forms of warnings, information and training.)
NIOSH	National Institute for Occupational Safety and Health (established within the Department of Health and Human Services)
DOL	Department of Labor
OSHRC	Occupational Safety and Health Review Commission (a quasi-judicial board of three members appointed by the president and confirmed by the Senate)
CSHO	Compliance Safety and Health Officer
CFR	Code of Federal Regulations
USC	United State Code

APPENDIX F

LIST OF OUTSIDE PEOPLE INVOLVED IN SURVEY DEVELOPMENT

People involved with population determination for this study:

Mr. Mike Laws, lead instructor for the Moore-Norman VocEd HAZMAT program

Chris Neal, Stillwater City Fire Chief, Stillwater, Oklahoma

Bill Presley, Fire Marshal for Enid, Oklahoma and the chairperson of the governor's select committee on HAZWOPER training and regulations

Mr. Stan Dunham, manager of engineering extension programs at OSU

Mr. Don Watson, Director of Oklahoma state's Public Employee Health and Safety, in the Department of Labor for Oklahoma

Mr. Ralph Shelton, Oklahoma Employment Security Commission

Mr. Doug Forsman, Fire Protection Publications and Fire Service Training

Mr. Jim Hanson, CSP, CHMM, Fire Protection and Safety, OSU

Mr. J.D. Brown, P.E., CSP, Fire Protection and Safety, OSU

Mr. Jim D. Mason, CED, EDFP, Chief Executive Officer, Stillwater, Chamber of Commerce

APPENDIX G

RESPONDENT PRODUCT COMPARISON LIST

Product comparison list between those in the sample who perceived HAZWOPER training relevant AND those who do not perceive that relevancy

SeqN	HAZWOPER relevancy?	Product of company
12	YES	Aerosol grades of propane, butane, & mixtures
16	YES	Calcium carbide
24	YES	Inorganic fluorides, chlorides, bromides, nitrates
36	YES	Nutritional products
42	NO	Diagnostic and therapeutic allergenic extracts
54	NO	Industrial cleaners
60	NO	Bacterial/enzyme concentrate
72	NO	Paints and coatings
78	NO	Sealers - wood, metal, & aluminum
90	YES	Urea, urea ammonium nitrate
102	NO*	Fertilizer blending
114	NO	Cut flower preservative
120	NO	Liner seal for cooling systems
138	YES	Asphalt emulsification plant
144	YES	Petroleum products
162	YES	Latex and oil based striping paints
168	YES	Commercial roofing products
174	YES	Automatic transmission fluid
198	NO	Steam boiler gaskets
204	YES	Molded rubber products
210	NO	"O" rings, stuffing box packing, gaskets
216	YES	Food wraps
234	NO	Plastic pipe and gas fittings
240	NO	Bio-degradable packaging products
246	NO	Polystyrene and foam products
252	NO	Haydite light weight concrete aggregate
276	YES	Gypsum nuggets, road materials

288	YES	Resin coated sand, coated proppants
294	NO	Commercial printing
306	NO	Gray, ductile and nickel alloy castings
312	NO	Cast aluminum letters, plaques, industrial casting
318	NO	Slab zinc, cadmium balls, lead/silver residue
324	YES	Scrap metal processing
331	YES	Aluminum, brass, & bronze castings
337	NO	Bronze art castings
343	NO	Nonferrous investment castings
349	YES	Aluminum heat treat, machining
361	YES	Levels & hand tools
367	NO	Metal pulley blocks
373	YES	Pouring spouts and can holding brackets
379	NO	Shelf brackets, tail light brackets
385	NO	Commercial printing
391	NO	Commercial printing
397	NO	Fabrication of structural steel & misc. iron
409	NO	Aluminum storefronts
421	NO	Metal doors, frames, aluminum storefronts
439	NO	Solid waste containers for commercial industry
451	YES	Plate rolling
457	NO	Air-cooled heat exchangers
463	YES	Tank heads (ASME code ellipticals, hemispheric)
493	YES	Industrial tank liners
499	NO	Waste heat recovery equipment
505	NO	Heat exchanger elements, convoluted tubes
511	NO	Drop in metal liners
517	NO	Sheet metal work
276	YES	High pressure pipe welding & fabrication
282	NO	Metal fabrication
288	NO	Steel fabrication, custom fixtures

306	NO	Rupture disk and disk holders
312	YES	Gas match strikers, long handled
318	YES	Permanent magnets & magnetic assemblies
324	NO	Commercial printing
331	YES	No till golf course fairway planters
337	NO	Combine hillside and regular raddles
349	NO	Hay-moving trailers
355	YES	Mushroom compost turner/processor
361	YES	Mechanical & hydraulic worm gear & planetary
415	NO	Oil well sucker rod fishing tools
421	NO	Parts for lg. bore, 1 cylinder stationary engines
439	YES	Commercial printing
451	NO	Fixtures, tooling, dies, injection molds
457	YES	Industrial patterns
463	NO	Tooling
493	NO	Quick printing
499	NO	Garbage packers
505	NO	Refrigeration and air conditioning compressors
511	NO	Envelope feeder
517	NO	Custom tooling for assembly & automation
541	NO	Document processing machines & pg printing systems
559	NO	Commercial printing
565	NO	Industrial water heaters
583	YES	Chemical plant equipment
589	NO	Glass industry parts
595	NO	Broom manufacturing equipment
607	NO	roller bearings
613	NO	Non-lubricated gas compressors, 50 hp & under
619	NO	Fiberglass filter, coalescer, and sep. element
636	YES	Commercial printing, letterpress & offset
667	NO	Label machine for meat plant industry

691	NO	Electric heat trace equipment
703	NO	Replacement coils for hot water washers
722	NO	Industrial & medical filters
728	YES	Industrial filters
782	YES	Gas dehydration systems, gas sweetening units
819	YES	Gypsum nuggets, road materials
825	NO	Insulation
837	YES	Resin coated sand, coated proppants
855	YES	Pipeline filters and strainers
867	YES	2.75" to 3.00" dia. FHP DC electric motors
873	NO	Propane cooking stove
879	NO	Aircraft component repair
885	YES	Motor coaches, custom built
891	YES	Commercial printing
909	NO	Heavy equipment and oilfield trailers
939	YES	Automobile engines
993	NO	Machined parts
1005	NO	Central vacuum cleaning systems (commercial & domestic)
1011	YES	Electronics design
1023	YES	Components for aerospace/defense/space
1048	NO	Commercial printing
1066	NO	Broaching, n/c turning, surface grinding
1072	YES	Telecommunications transmission equipment
1090	NO	Commercial printing
1108	NO	Heliarc welding, aluminum & stainless items
1114	NO	Motorcycle camper trailers
1120	YES	Gauges, switch gauges, & automated systems
1132	NO	Prosthetic orthotic devices, limbs & braces
1189	NO	Machine shop & fabrication, gearing capabilities
1196	NO	Accessories for citizen band radio hardware
1214	YES	Gauge hatch, vent line valves, emergency vents

1234	NO	Corrugated steel pipe & related drainage products
1240	YES	Commercial printing
1246	NO	Trigger shoes for handguns, shotguns & rifles
1252	NO	Sheet metal products
1270	YES	Metal stamps
1276	NO	Valve seats, butterfly and gate
1294	YES	Commercial printing
1300	NO	Drop in metal liners
1312	NO	Shelf brackets, tail light brackets
1330	YES	Scrap metal processing
1336	NO	Ultrasonic thickness gauges
1342	YES	Railroad tank cars
1390	NO	Rechromed bumpers
1396	YES	Commercial printing
1402	NO	Cab-overs and covers
1426	NO	Gray, ductile and nickle alloy castings
1432	NO	Solid waste containers for commercial industry
1438	YES	Commercial printing
1468	NO	Machined parts, mill and lathe work
1474	YES	Rubber to metal bonding
1486	NO	Iron fences, gates, railings
1510	NO	Aircraft doors for flight simulators
1516	NO	Rebuilt alternators, starters, generators
1552	YES	Industrial tank liners
1570	NO	Cast aluminum letters, plaques, industrial castings
1582	YES	Custom built boat trailers
1607	NO	Measuring equipment - gas, water, chemical
1613	YES	Compressor & engine machine work (industrial)
1619	NO	Precision machined & fabricated parts & assemblies
1661	NO	Metal pulley blocks
1679	NO	Vaporizer regulators

1685	NO	Air-cooled heat exchangers
1703	NO	High fidelity speakers
1733	NO	Commercial trailers
1739	NO	Bronze art castings
1751	NO	Slab zinc, cadmium balls, lead/silver residue
1757	NO	Measurement systems for oil & gas processing
1781	YES	Commercial printing
1793	NO	Metal doors, frames, aluminum storefronts
1805	YES	Plate rolling
1811	NO	Heat exchanger elements, convoluted tubes
1841	NO	Instrumentation for drilling control applications
1865	NO	Horse & stock trailers
1889	NO	Screen process printing
1895	NO	Job shop, pump related parts
1907	YES	Commercial printing
1913	YES	Screws, washers, pins, bushings, spacers
1925	YES	Aluminum, brass, & bronze castings
1931	YES	Tank heads (ASME code ellipticals, hemispheric)
1937	YES	Machine shop - oil field equipment & aerospace
1943	YES	Sport fishing sonar, navigational receivers
1947	NO	Industrial electronics, custom
1967	NO	Machine work on plastics
2027	NO	Sheet metal work
2063	NO	Machine shop
2099	YES	Aluminum heat treatment, machining
2105	NO	Machine shop services
2111	YES	Aluminum beverage cans
2117	YES	Commercial printing
2123	YES	Modular shielding (Lindsay)
2129	NO	Column covers, cladding & fascia work
2171	NO	Sheet metal work, welding and fabrication

2189	NO	Vents for concrete foundations
2195	NO	Electrical wire harness & cable
2231	NO	Sheet metal fabrication
2255	NO	Boat dock (floating)
2267	YES	Commercial printing
2273	NO	Metal buildings
2279	NO	Radio frequency equipment design
2291	YES	Trailers, stock & horse
2297	YES	Offset printing
2303	NO	Remanufactured transmissions
2309	NO	Audio cassette duplication & video duplication
2339	NO	Oil well sucker rod fishing tools
2357	NO	Tubular carriers

* #102 sent their survey questionnaire in with "does not apply" written across the face of it and no responses.
Note: As can be seen in the listings above, it would be very difficult to devise a criteria by which one could determine whether or not a particular company would need HAZWOPER training simply by knowing the kind of product they produce or by knowing the nature of the service offered.

APPENDIX H

IRB FORM

VITA 2

LeRoy Melvin Anderson

Candidate for the Degree of

Master of Science

Thesis: A PROFILE REFLECTING THE CURRENT STATUS OF HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE (HAZWOPER) TRAINING IN THE PRIVATE SECTOR OF OKLAHOMA

Major Field: Occupational and Adult Education

Biographical:

Personal Data: Born in Tacoma, Washington, May 30, 1947, the son of Roger and Louise M. Anderson. Married Carol Sue Lupton, July 21, 1990.

Education: Graduated from Edmonds Senior High, Edmonds, Washington in June, 1966; received Associate of Arts in Arts and Sciences from Shoreline Community College, Seattle, Washington, December 1969; received Bachelor of Arts in Psychology from Seattle Pacific University in Seattle, Washington, May 1992; received Bachelor of Science in Workforce Training and Development from Southern Illinois University, residency at the McChord AFB campus, Tacoma, Washington, December 1993. Completed the requirements for the Master of Science degree with a major in Occupational and Adult Education in May, 1996.

Trade Experience: Plumbing and electrical journey apprentice work during the summers of 1964 - 1968, and from July 1976 to August 1977; licensed plumbing journeyman and Plumbing Contractor, working in residential, light commercial and remodeling areas from August 1977 to 1985, state of Washington; Fire Sprinkler contracting in Auburn, Washington from June 1983 to November 1983; Hyatt Hotel, Sea-Tac Airport, building engineer from September 1987 to May 1988; Plumbing Service Contractor from June 1988 to September 1989; Stationary Operating Engineer and Refrigeration Engineer, Seattle Pacific University from September 1989 to May 1993; State of Washington certified Backflow Prevention Specialist, 1982 to present.

Professional Experience: Police Officer, University of Washington, Seattle, Washington July 1970 to June 1976; Condominium construction superintendent for S/A Construction, Inc. in Seattle, supervising twelve carpenters plus all trades at the "Bye-the-Green" project, Auburn, Washington from March 1981 to May 1983; Consulting Services to such agencies as Washington Natural Gas, and Vocational Teaching for Green River Community College (January 1984 to March 1986); Train the trainer internship at the Washington State Fire Training Academy from May 1993 to August 1993; Administrative assistant and small group facilitator for the SAVE Teacher Institute in July of 1994 and July 1995; Graduate Research Assistant from January 1994 to May of 1995. Graduate Research Associate and College of Education Safety / Security training officer from September 1995 to Present.

Professional Memberships: the National Fire Protection Association; Society of Fire Protection Engineers; Omicron Tau Theta, treasurer for 1995-96; Phi Delta Kappa.

Volunteer Organizations: Active member of Payne County Habitat for Humanity, Family Nurture Committee; Advisor to Alpha Tau Omega, fraternity.

Awards: Lloyd L. Wiggins Scholarship in recognition of outstanding academic achievement and potential for leadership in education (1995).