U.S. Department of Energy Orders Self-Study Program

29 CFR 1910.120

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

NATIONAL NUCLEAR SECURITY ADMINISTRATION
SERVICE CENTER

Change No: 0
29 CFR 1910.120
Level: Familiar
Date: 3/14/05

29 CFR 1910.120
HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE
FAMILIAR LEVEL

OBJECTIVES

Given the familiar level of this module and the resources, you will be able to perform the following:

1. Discuss clean-up operations required by the regulation.
2. Discuss corrective actions during clean-up operations covered by the resource conservation and recovery act (RCRA).
3. Discuss operations involving hazardous wastes that are conducted at treatment, storage, and disposal (TSD) facilities.
4. Discuss emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.
5. Define the following terms: clean-up operation, emergency operation, hazardous material response, hazardous substance, hazardous waste site, qualified person, site safety and health supervisor, uncontrolled hazardous waste site.
6. Describe requirements of the safety and health program, including contractor responsibilities.
7. Discuss the requirements of the site safety and health plan.
8. Describe the requirements of site characteristics, including: preliminary evaluation, hazard identification, required information, personal protective equipment (PPE), monitoring, risk-identification, and employee notification.
9. Discuss site-training requirements, including emergency response and management training.
10. Describe emergency responder medical requirements.
11. Discuss the requirements of engineering controls including the use and care of PPE.

12. Discuss the monitoring requirements for activities as routine operations, initial entry to areas, periodic monitoring, and monitoring of high-risk employees.
13. Discuss requirements for handling hazardous waste drums and containers.
14. Describe decontamination procedures and plan requirements.
15. Discuss the use and implementation of new technologies.
16. Discuss emergency response to a hazardous materials release.
17. Describe the different levels of PPE.

Note: If you think that you can complete the practice at the end of this level without working through the instructional material and/or examples, complete the practice now. The course manager will check your work. You will need to complete the practice at this level successfully before taking the criterion test.

RESOURCES

29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, 7/1/04.

Change No: 0
29 CFR 1910.120
Level: Familiar
Date: 3/14/05

INTRODUCTION

This module will discuss the objectives and requirements associated with this rule from the code of federal regulations. We have provided an example to help familiarize you with the material. The example will also help prepare you for the practice at the end of this module and for the criterion test.

Before continuing, you should obtain a copy of the regulation at Hazardous waste operations and emergency response or through the course manager. You may need to refer to these documents to complete the example, practice, and criterion test.

OBJECTIVES

To establish hazardous waste and emergency response requirements which, when supplemented by other applicable safety and health requirements, will serve to minimize injuries and illnesses associated with the US Department of Energy (DOE) or National Nuclear Security Administration (NNSA) waste operations.

REQUIREMENTS

All requirements of part 1910 of title 29 of the Code of Federal Regulations apply pursuant to their terms to hazardous waste and emergency response operations whether covered by this section or not. If there is a conflict or overlap, the provision more protective of employee safety and health shall apply. The following paragraphs set the requirements for the hazardous waste operations and emergency response requirements for safety and health programs, site characteristics and analysis, site control, training, medical surveillance, engineering controls, work practices, personal protective equipment, monitoring, handling drums and containers, decontamination procedures, emergency response at uncontrolled hazardous waste sites, illumination, sanitation at temporary workplaces, new technology programs, operations conducted under RCRA and emergency response to hazardous substance release.

Change No: 0
29 CFR 1910.120
Level: Familiar
Date: 3/14/05

Safety and Health Programs

Facilities shall develop and implement a written safety and health program for their employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards, and provide for emergency response for hazardous waste operations. The written safety and health program shall incorporate the following: An organizational structure, a comprehensive work plan, a site-specific safety and health plan that need not repeat the facilities' standard operating procedures, a safety and health training program, a medical surveillance program, facilities' standard operating procedures for safety and health, and any necessary interface between general program and site-specific activities.

Site Characterization and Analysis

Hazardous waste sites shall be evaluated to identify specific site hazards and to determine the appropriate safety and health control procedures needed to protect employees from the identified hazards. The following areas of concern shall be addressed in performing the site characteristics and analysis: preliminary evaluation, hazard identification, site topography and overall layout, determination of proper PPE, monitoring requirements, risk identification, and notification requirements.

Site Control

A site control program for protecting employees which is part of the facilities site safety and health program shall be developed during the planning stages of a hazardous waste clean-up operation and modified as necessary as new information becomes available. The site control program shall, as a minimum, include a site map; site work zones; the use of a ''buddy system;'' site communications, including alerting means for emergencies; standard operating procedures or safe work practices; and identification of the nearest medical assistance.

Training

All employees working on site (such as equipment operators, and general laborers) exposed to hazardous substances, health hazards, or safety hazards and their supervisors

and management responsible for the site shall receive applicable training prior to being permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards, and they shall receive review required training. The required training, as a minimum, shall consist of the following: names of personnel and alternates responsible for site safety and health, safety and health hazards present on the site, use of personal protective equipment, work practices by which the employee can minimize risks from hazards, safe use of engineering controls and equipment on the site, medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards.

Medical Surveillance

The medical surveillance program shall be instituted by the facility for the following employees: 1) all employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year; (2) All employees who wear a respirator for 30 days or more a year or as required by § 1910.134; (3) All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and (4) members of HAZMAT teams.

Medical examinations and consultations shall be made available by the facility to each employee in the above paragraph on the following schedules: 1) for employees who meet the description for either area 1,2, or 4, a consultation shall be provided prior to assignment, at least once every twelve months for each employee covered unless the attending physician believes a longer interval (not greater than biennially) is appropriate, at termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months; as soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limits or published exposure levels in an emergency situation, at more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

For employees covered under section 3 described above or are emergency responders who may have been injured, received a health impairment, developed signs or symptoms that may have resulted from exposure to hazardous substances resulting from an emergency incident, or been exposed during an emergency incident to hazardous substances at concentrations above the permissible exposure limits or the published exposure levels without the necessary personal protective equipment being used a medical examination should be conducted as follows: as soon as possible following the emergency incident or development of signs or symptoms or at additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

Engineering Controls, Work Practices, and PPE for Employee Protection

Engineering controls, work practices, PPE, or a combination of these shall be implemented to protect employees from exposure to hazardous substances and safety and health hazards. Whenever engineering controls and work practices are not feasible or not required, any reasonable combination of engineering controls, work practices and PPE shall be used to reduce and maintain employee exposures to or below the permissible exposure limits or dose limits for substances regulated by the rule. The facility shall not implement a schedule of employee rotation as a means of compliance with permissible exposure limits or dose limits except when there is no other feasible way of complying with the airborne or dermal dose limits for ionizing radiation.

A written personal protective equipment program, which is part of the facility's safety and health program and which is also part of the site-specific safety and health plan shall be established. PPE shall be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis. Personal protective equipment selection shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

Monitoring

Monitoring shall be performed where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels that exceed permissible exposure limits, or published exposure levels if there are no permissible exposure limits, for hazardous substances. Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of employee protection needed on site. Monitoring shall be performed for initial entry, during periodic operations and for high risk employees (that is, those employees most likely to be exposed to hazardous materials.)

Handling Drums and Containers

Hazardous substances and contaminated soils, liquids, and other residues shall be handled, transported, labeled, and disposed of in accordance with the following: drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the wastes that they contain, when practical, drums and containers shall be inspected and their integrity shall be assured prior to being moved, drums or containers that cannot be inspected before being moved because of storage conditions (e.g., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile, etc.) shall be moved to an accessible location and inspected prior to further handling, unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled, site operations shall be organized to minimize the amount of drum or container movement, prior to movement of drums or containers, all employees exposed to the transfer operation shall be warned of the potential hazards associated with the contents of the drums or containers, U.S. Department of Transportation-specified salvage drums or containers and suitable quantities of proper absorbent shall be kept available and used in areas where spills, leaks, or ruptures may occur, where major spills may occur, a spill containment program, which is part of the facility's safety and health program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred, drums and containers that cannot be moved without rupture, leakage, or spillage shall be emptied into a sound container using a device classified for the material being transferred, ground-penetrating system or other

type of detection system or device shall be used to estimate the location and depth of buried drums or containers, soil or covering material shall be removed with caution to prevent drum or container rupture, fire extinguishing equipment meeting the requirements of 29 CFR part 1910, subpart L, shall be on hand and ready for use to control incipient fires.

Decontamination

Decontamination operations need to be developed to address all aspects of decontamination. As a minimum these operations consist of decontamination procedures, location, equipment, PPE needs and uses, authorized employees, laundry needs and requirements, and shower/change rooms. The decontamination plan needs to address these requirements and describe them to employees to allow for adequate operations and proper decontamination of equipment and personnel.

Emergency Response by Employees at Uncontrolled Hazardous Waste Sites

An emergency response plan shall be developed and implemented by all facilities to handle anticipated emergencies prior to the commencement of hazardous waste operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, OSHA personnel and other governmental agencies with relevant responsibilities. Facilities that will evacuate their employees from the danger area when an emergency occurs, and that do not permit any of their employees to assist in handling the emergency, do not need to develop an emergency response plan if they provide an emergency action plan complying with 29 CFR 1910.38.

The facility shall develop an emergency response plan for emergencies which shall address, as a minimum, the following: pre-emergency planning, personnel roles, lines of authority, and communication, emergency recognition and prevention, safe distances and places of refuge, site security and control, evacuation routes and procedures, decontamination procedures which are not covered by the site safety and health plan, emergency medical treatment and first aid, emergency alerting and response procedures, critique of response and follow-up, and PPE and emergency equipment.

In addition to the elements for the emergency response plan required in this section, the following elements shall be included for emergency response plans: site topography,

layout, and prevailing weather conditions, procedures for reporting incidents to local, state, and federal governmental agencies, emergency response plan shall be a separate section of the site safety and health plan, emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies, emergency response plan shall be rehearsed regularly as part of the overall training program for site operations, site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information, employee alarm system shall be installed to notify employees of an emergency situation; to stop work activities if necessary; to lower background noise in order to speed communication; and to begin emergency procedures, based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

New Technology Programs

The employer shall develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations, and the same shall be implemented as part of the site safety and health program to assure that employee protection is being maintained.

Operation Conducted Under RCRA

Organizations conducting operations at TSD facilities shall provide and implement the following program: safety and health, hazard communication, medical surveillance, decontamination, new technology, material handling, training, and emergency response. These programs will be similar to the programs mentioned prior in requirements and applicability.

Emergency Response to Hazardous Substance Releases

This section discusses employees who are engaged in emergency response no matter where it occurs except that it does not cover employees engaged in operations. An emergency response plan shall be developed and implemented to handle anticipated emergencies prior

to the commencement of emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, and OSHA personnel. Facilities that will evacuate their employees from the danger area when an emergency occurs, and that do not permit any of their employees to assist in handling the emergency, do not need to develop an emergency response plan if they provide an emergency action plan in accordance with 29 CFR 1910.38.

The facility shall develop an emergency response plan for emergencies which shall address, as a minimum, the following to the extent that they are not addressed elsewhere: pre-emergency planning and coordination with outside parties, personnel roles, lines of authority, training, and communication, emergency recognition and prevention, safe distances and places of refuge, site security and control, evacuation routes and procedures, decontamination, emergency medical treatment and first aid, emergency alerting and response procedures, critique of response and follow-up, PPE and emergency equipment, emergency response organizations may use the local emergency response plan or the state emergency response plan or both, as part of their emergency response plan to avoid duplication.

The senior emergency response official responding to an emergency shall become the individual in charge of a site-specific Incident Command System (ICS). All emergency responders and their communications shall be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.

Personnel, not necessarily the facilities own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by a facilities own employees, and who will be or may be exposed to the hazards at an emergency response scene, are not required to meet the training required in this paragraph for the facilities regular employees. Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge, shall receive training or demonstrate competency in the area of their specialization annually.

Change No: 0
29 CFR 1910.120
Level: Familiar
Date: 3/14/05

Training shall be based on the duties and function to be performed by each responder of an emergency response organization. The skill and knowledge levels required for all new responders, those hired after the effective date of 29 CFR 1910.120, shall be conveyed to them through training before they are permitted to take part in actual emergency operations on an incident. Employees who participate, or are expected to participate, in emergency response, shall be given training in the following areas: first responder awareness level, first responder operations level, hazardous materials technician, hazardous materials specialist, and on scene incident commander. Refresher training for employees who are trained in accordance with the rule shall receive annual refresher training of sufficient content and duration to maintain their competencies, or shall demonstrate competency in those areas at least yearly. Members of an organized and designated HAZMAT team and hazardous materials specialists shall receive a baseline physical examination and be provided with medical surveillance as required.

Chemical protective clothing and equipment to be used by organized and designated HAZMAT team members, or to be used by hazardous materials specialists, shall be of the appropriate type for the response. Upon completion of the emergency response, if it is determined that it is necessary to remove hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident, the facility conducting the clean-up shall comply with one of the following: Meet all of the requirements of the rule from sections (b) through (o) or the clean-up is done on facility property using facility employees, such employees shall have completed the proper training requirements.

EXAMPLE

Using the familiar level of this module and the resources, complete the following exercises.

1. State the five areas that make up the scope of this rule.

2. State the requirements of the health and safety program.

3. State whom is required to receive training for hazardous waste operations and emergency response.

4. State the other agencies that are also responsible for hazardous waste drums and packages.

5. State the purpose of the new technologies program.

Note: When you have finished, compare your answers to those contained in the example self-check. When you are satisfied with your answers, go to the practice.

EXAMPLE 1 SELF-CHECK

1. State the five areas that make up the scope of this rule.

   - Clean-up operations required by a governmental body
   - Corrective actions involving clean-up operations at sites covered by RCRA
   - Voluntary clean-up operations at sites recognized as uncontrolled hazardous waste sites
   - Operations involving hazardous wastes that are conducted at TSD facilities
   - Emergency response operations

   .

2. State the requirements of the health and safety program.

   - An organizational structure
   - Comprehensive work-plan.
   - Site-specific safety and health plan which need not repeat the facilities standard operating procedures
   - Safety and health training program
   - Medical surveillance program
   - Facilities standard operating procedures for safety and health
   - Any necessary interface between general program and site specific activities

3. State whom is required to receive training for hazardous waste operations and emergency response.

   All employees working on site exposed to hazardous substances, health hazards, or safety hazards and their supervisors and management responsible for the site.

4. State the other agencies that are also responsible for hazardous waste drums and packages.

   - DOT
   - OSHA
   - EPA

5. State the purpose of the new technologies program.

To develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations.

Change No: 0
29 CFR 1910.120
Level: Familiar
Date: 3/14/05

PRACTICE

This practice is required if your proficiency is to be verified at the familiar level. This practice will prepare you for the criterion test that will be required if your proficiency is to be verified at the familiar level. You will need to refer to the resources to answer the questions in the practice correctly. The practice and criterion test will also challenge additional skills that you have acquired in other formal and on-the-job training.

1. Discuss the areas of concern for performing a site characterization and analysis.

2. List the minimum required training for employees at a site containing hazardous waste.

3. Describe the four types of employees who are part of the medical surveillance program.

4. What three things are implemented to help minimize employees exposure to hazardous materials?

5. Define “permissible exposure limit.”

6. What is the definition of “qualified person?”

Note: The course manager will check your practice and verify your success at the familiar level. When you have successfully completed this practice, go to the general level.

Change No: 0
29 CFR 1910.120
Level: General
Date: 3/14/05

29 CFR 1910.120
HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE
GENERAL LEVEL

OBJECTIVES

Given the familiar level of this module and a scenario, you will be able to do the following:

1. List the key elements you would look for in the contractor's action plan to correct the situation described in the scenario.
2. State which requirements, sections, or elements of 29 CFR 1910.120 apply to the situation described in the scenario.

Note: If you think that you can complete the practice at the end of this level without working through the instructional material and/or the examples, complete the practice now. The course manager will check your work. You will need to complete the practice in this level successfully before taking the criterion test.

RESOURCES

Code of Federal Regulations Self-Study Program, 29 CFR 1910.120, familiar level, 1/15/05.
29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, 7/1/04.

Change No: 0
29 CFR 1910.120
Level: General
Date: 3/14/05

INTRODUCTION

The familiar level of this module introduced 29 CFR 1910.120. Several responsibilities and requirements from the rule were discussed. In the general level of this module, students are presented with a scenario that depicts a work situation related to 29 CFR 1910.120. The example scenario includes a situation, the actions taken to remedy the situation, and the requirements related to the situation. Students will be asked to review the contractor's actions and decide if they are correct. Students will also be asked to decide if the correct requirements were cited in each situation. Please refer to 29 CFR 1910.120, and the other resources as necessary to make your analysis and answer the questions. You are not required to complete the example. However, doing so will help prepare you for the criterion test.

Note: You do not have to do the example on the following pages, but it is a good time to check your skill and knowledge of the information covered. You may do the example or go on to the practice.

EXAMPLE

Review the scenario and answer the questions that follow it.

SCENARIO

In March 2004 workers were preparing to continue a demolition and decommissioning (D&D) operation of a building that was no longer in service. During the initial walk-through hazardous material canisters believed to contain beryllium were discovered. On March 16, 2004, D&D managers received the analysis results indicating that three containers found in the deactivated facility, which was not posted as a beryllium (Be) area, contained beryllium. The analysis also indicated that beryllium levels in samples from the surrounding area were higher than the level that the site considers the threshold above which an area is contaminated. An industrial hygiene (IH) representative discovered the containers in December 2003 and submitted the swipe samples in February 2004 as a precautionary measure. Investigators determined that the containers were included on a 1998 risk identification and reduction report, but it is not known how long they had been in the facility before the IH representative found them. No known exposures resulted from this occurrence. During a tour of the facility on December 3, 2003, the IH representative found a container with a handwritten label indicating that it contained beryllium metal granules. He notified the site D&D managers, who directed workers to lock the building and post the building, identifying all associated hazards that exist within the facility, and barricade the entrances to restrict access. They also ordered the IH representative to obtain follow-up swipes from the immediate area and several other locations in the building as a precaution. Two months later, in early February 2004, the IH representative took swipe samples from a tabletop where the containers were found and submitted the swipes for analysis.

More than a month later, the laboratory returned the results. Analysis indicated beryllium levels ranging from non-detectable to 11.47 micrograms per 100 cm^2. Nine out of 24 samples exceeded the 0.2 micrograms/100 cm^2 that the site selected as its criterion for designating an area as a beryllium legacy area. Although beryllium's health dangers are well known, management's additional concern was the less-than-adequate response time in addressing the discovery. The lapse in time increased the potential for unidentified

personnel beryllium exposures. This concern is well founded; the longer those containers sat with no protective measures the greater the chance of exposure.

The review of operations identified issues with the response to indications of hazardous material and the communication within the organization sharing this information.

The facility was directed to perform the following:

- Review the hazard analysis and update as necessary
- Ensure all personnel who had contact with the canister get medical attention
- Review air monitoring operations
- Update training to include beryllium safety
- Ensure PPE is being used properly and effectively
- Review site control measures to ensure they are being implemented correctly
- Review beryllium survey results to ensure adequate decontamination
- Review emergency response plan to determine if all corrective actions were completed

. Please answer the following questions.

1. Determine if the investigators, analysis is appropriate. Explain your answer.

2. Determine if the requirements cited are adequate to address the issues found in the scenario.

EXAMPLE SELF-CHECK

1. Determine if the investigators' analysis is appropriate. Explain your answer.

   The analysis is appropriate. The requirement is stated in 29 CFR 1910.120.

2. Determine if the requirements cited are adequate to address the issues found in the scenario.

   The requirement cited was applicable to the scenario. However, the organization needs to determine the reason for such slow response to the fact that hazardous material was found in an uncontrolled area and why it took two months to characterize the waste and take corrective actions for it.

Change No: 0
29 CFR 1910.120
Level: General
Date: 3/14/05

PRACTICE

This practice is required if your proficiency is to be verified at the general level. The practice will prepare you for the criterion test. You will need to refer to the CFR to answer the questions in the practice correctly. The practice and criterion test will also challenge additional analytical skills that you have acquired in other formal and on-the-job training. Please review the scenario and answer the questions at the end of the scenario

SCENARIO

On February 12, 2004 workers preparing to remove waste drums from an unoccupied building noticed an unusual odor, saw wisps of light-green smoke coming from conduit penetrations above an exterior door, and alerted the fire department. Firefighters were able to dissipate the smoke, but they could not identify or eliminate its source because the room was sealed and inaccessible. Because there was evidence of combustion, the facility manager declared an emergency. No injuries or exposures to radiological or hazardous materials resulted from this event. When the event occurred, the building was nearly ready for demolition. Workers had applied an exothermic foaming agent, Autofroth® 9453, to fill underground voids and minimize future ground slumping.

Autofroth is a polyurethane foam agent typically applied between two layers of known temperature, with a final thickness of less than a few inches. When applied at the right depth and allowed to cure correctly, there is no heat/exothermic reaction. Autofroth had been used at the site as a cribbing/padding material in waste cargo containers and as a filler for gloveboxes before disposing of them. In these high-volume applications, adjustments were made to the application process to dissipate the heat generated during the exothermic reaction, thus minimizing the potential for smoking and charring. For large-volume applications, the manufacturer recommends applying the foam so it expands to no more than 24 inches and curing it for at least 90 minutes before applying more foam. Investigators determined that workers applied the Autofroth to a broader area than the manufacturer recommended. They believe that the mass of Autofroth applied, in conjunction with its insulating properties, resulted in excessive heat buildup and the green smoke observed by workers.

Investigators determined that the application process itself was flawed and that incorrect mixing of the two components led to hot spots, and voids in the foam, which trapped oxygen and fed the fire. In addition, only two of the nine crewmembers were fully trained and qualified to perform foaming operations. Investigators also determined that the manufacturer's recommendation for limiting the base depth and allowing curing time for heat dissipation had not been adequately incorporated into the work instructions. Work planning and performance apparently depended largely on subject matter expert knowledge. In addition, the work package did not comply with the integrated work control program process, and this was a contributing factor to the event.

Please answer the questions below and bring the completed practice to the course manager for review

1. Was the situation handled correctly? If not, what should have been done?

2. What requirements need to be improved to prevent this accident from occurring again?

Note: The course manager will check your practice and verify your success at the general level. When you have successfully completed this practice, the course manager will give you the criterion test.