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EMERGENCY EXERCISE METHODOLOGY

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ABSTRACT

Competence for proper response to hazardous materials emergencies is enhanced and effectively measured by exercises which test plans and procedures and validate training. Emergency exercises are most effective when realistic criteria is used and a sequence of events is followed. The scenario is developed from pre-determined exercise objectives based on hazard analyses, actual plans and procedures. The scenario should address findings from previous exercises and actual emergencies. Exercise rules establish the extent of play and address contingencies during the exercise. All exercise personnel are assigned roles as players, controllers or evaluators. These participants should receive specialized training in advance. A methodology for writing an emergency exercise plan will be detailed.

PERFORMANCE BASED TRAINING

An emergency exercise is a test. More specifically, it is a systematic procedure for evaluating behavior. The behavior is response to an emergency situation and the evaluation is the emergency exercise.

"...Evaluation is not merely a collection of techniques - it is a process, a systematic process that plays a significant role in effective teaching... It begins with the identification of the intended learning outcomes and ends with a judgement concerning the extent to which the learning outcomes have been attained." 1

Evaluation is the final phase of performance-based training, which is a total approach for the development and implementation of training. Performance-based training is a five-step process, composed of analysis, design, development, implementation and evaluation.

An emergency exercise, given at the end of instruction, should be based on the training received. The training should be based on actual emergency plans and procedures. An emergency exercise is a final step and a means to validate that training. The evaluation needs to be relevant, comprehensive and purposeful. *"Following training, drills and exercises may be a good source of evaluation. In fact, it is often best to evaluate training by observing student performance on the job."* 2

An emergency exercise is a method for measuring mastery learning, that is, skills to be "mastered." Mastery learning realizes that all of the trainees are adults, have a base level of knowledge, and can be trained to perform a skill adequately. The exercise participants should be able to demonstrate that they have "mastered" their skills. *"Everyone should have a reasonable chance of acquiring an adequate level of skilled performance. The purpose of training and education is NOT for some trainees to be successful and for others to fail. Steps need to be taken to insure that the majority of people realize the objectives of satisfactory performance in desired tasks."* 3

The overall objective of an emergency exercise is to validate training on emergency plans and procedures. The participants should have a reasonable chance to demonstrate the skills that they have mastered. To be most effective, the learning should precede the actual exercise. It is crucial that formal training be presented focusing on the plan. The emergency exercise then becomes a method of validating and reinforcing that training. *"Conducting exercises is the principal method of testing and validating your hazardous materials contingency plan other than its use in an actual emergency."* 4

EXERCISE PLANNING AND THE EMERGENCY PLAN

The initial focus of exercise planning is the emergency/contingency plan of the organization. If none exists, a basic plan should be developed prior to exercise planning. A more detailed plan could be developed later, based upon exercise results. It is crucial that an emergency exercise test actual plans and procedures. The exercise should follow training and should be staged as realistic events.

As an example of this planning process, please consider a small municipality. The local emergency services agency is planning an exercise which has been approved by the city council. In accordance with the city's plan for response to HAZMAT emergencies, the fire department contacts the local mutual aid HAZMAT Team for initial response and a local waste contractor for clean-up services. During the course of the exercise, it would NOT be prudent to task the city's fire department to make an actual HAZMAT response. The plan calls for the mutual aid asset to respond.

The correct scenario should test the timeliness and accuracy of the request for HAZMAT assistance. Further, the time required for response by the HAZMAT Unit and waste contractor should be measured. In addition to the timeliness of the response, the equipment brought to the scene should be evaluated for adequacy in light of the scenario. In short, the exercise would test the city's response using the plan as the objective criteria.

The exercise coordinator should determine the content of the exercise (or drill). A drill is a test of a localized emergency response function or specific procedure. An exercise is a test of integrated emergency response activities. A series of small scale drills may often precede an integrated, or full-scale exercise. The focus of the following information is for an exercise.

SEQUENCE OF EVENTS

The sequence of events is critical to the outcome of the exercise. They are:

- Examine the emergency response plan
- (STOP: Write a draft plan if one does not exist)
- Conduct training based upon the plan
- Determine exercise objectives
- Determine a set of "rules"
- Select date (check on conflicts)
- Develop exercise scenario
- Develop timeline
- Determine players, controllers and evaluators
- Develop controller messages
- Conduct table-top drill
- Prepare controller/evaluator information packets
- Conduct pre-exercise briefing for controllers and evaluators
- Conduct exercise
- Conduct controller and evaluator de-briefing
- Conduct post-exercise critique
- Prepare exercise report
- Incorporate corrected exercise findings into the emergency plan and training

Review of the emergency/contingency plan and the importance of training has been discussed. The next task is to determine the objectives of the exercise. Objectives are the key points on which the exercise will be evaluated, and should be based upon the content of the emergency/contingency plan. Emergency exercise objectives may involve some of the following categories:

- Personnel notification and activation
- The Incident Command System
- Direction and control
- Decision-making
- Response by facility personnel
- Request for mutual aid
- Response by contractors
- Communications
- Documentation
- Implementation of the emergency/contingency plan
- Facilities, such as an Emergency Operations Center (EOC)
- Off-site notifications and contacts, such as the Environmental Protection Agency (EPA), the National Response Center or CHEMTREC
- Proper recognition and identification of hazardous materials
- Accident assessment
- Proper use of personal protective equipment (PPE)
- Contamination control techniques and decontamination
- Traffic/access control or security
- Availability and use of Materials Safety Data Sheets (MSDS)
- Proper use of equipment
- Specific procedures
- Emergency medical services
- Onsite and community evacuation
- Public information

OBJECTIVES

Objectives for an emergency exercise can be written like performance objectives for training. The objectives are used to measure achievement of the intended learning. At a minimum, the objectives need to identify the desired behavior and the content of the task. A sample of properly written exercise objectives are:

Demonstrate the ability to:

- Recognize that a hazardous material emergency exists
- Contact proper offsite agencies
- Activate the emergency response team in a timely manner (e.g. "in 15 minutes") using proper notification methods
- Use the Incident Command System according to procedure
- Contain contamination
- Perform decontamination according to procedure
- Respond to media requests for information effectively
- Relocate the emergency response team (if they are potentially in a dangerous area)

EXERCISE RULES

A set of rules which govern the extent of play are mandatory. Rules specify limits to the exercise and contingency actions. All exercise participants should be informed of the rules before the exercise. A sample set of rules that have been used effectively at Argonne National Laboratory include:

- Real events may terminate the exercise.
- All activities should be carried out with safety in mind. No exercise participant should be placed at any risk to simulate incident conditions.
- A safety engineer will provide safety oversight during the exercise.
- The safety engineer and controllers may "stop action" if safety is compromised.
- All exercise messages should carry the statement "This is a drill."
- Building evacuations should be simulated.
- Actual weather and meteorological data will be used.
- Calls for offsite support may be simulated.
- Any confusion over intended degree of response or scenario items should be brought to the attention of a controller.
- There will be no offsite activities.
- All controllers and evaluators will be identified.
- Simulations will be kept to a minimum.

EXERCISE DEVELOPMENT

The development of the scenario requires a great deal of consideration. The selection of a date may affect the planned scenario. It is also important to determine other scheduling conflicts and the availability of key players. If the exercise will take place during possible inclement weather, the scenario may be written to contain an indoor activity component.

A scenario development committee is effective. The committee provides greater planning perspective. A team leader needs to be appointed to make the final scenario decisions. All scenario development members are required to keep the scenario confidential.

Hazard analyses should be reviewed prior to scenario planning. This may provide a framework for developing the scenario. For example, a hazard analysis identifies that the site has deteriorating natural gas lines. A ruptured natural gas line could be the initiating event triggering the incident. Using findings from previous exercises and actual events is

valuable. The incorporation of the hazard analyses, exercise findings, and information from actual occurrences adds a portrayal of probable event, real-life problem-solving, and a degree of realism into the exercise.

An exercise timeline is created after the scenario is written. This is properly named the Master Sequence of Events List (MSEL). This details the information in the scenario and lists the order in which the events are to occur.

Other items that need attention are:

- If offsite agencies are involved in the exercise, pre-exercise agreements may be needed.
- If the public will be able to witness the exercise, it may be prudent to inform the local community.
- Logistics, including the mechanics of using specific equipment and props, need to be arranged. It may be necessary to assign a specific individual or team to this "staging" duty.

EXERCISE ROLES

A list of exercise personnel should be prepared at this point in the planning process. The personnel involved in an emergency exercise are identified as players, controllers, evaluators, victims and observers. A *player* is an actual responder for the emergency exercise. A *controller* is responsible for providing exercise data or messages to the players and ensures that the scenario sequence is followed. A controller may not prompt a player as to the actions that he should take. An *evaluator* observes the actions of the players, critiques these actions, and makes recommendations in the exercise report. This report documents the events and actions taken, and provides the necessary feedback. A *victim* plays a role of an injured or contaminated person. An *observer* is an individual who is not involved in the exercise, but is simply observing. This may be a safety engineer or someone from another company who is an invited observer.

Specific detailed messages which controllers interject at specified times are called "controller messages." Each controller must understand the messages and the appropriate time frame that he will interject them. All controllers should have a complete set of controller messages. This will enable them to be aware of the full extent of play and be prepared to interject exercise information, if required. A lead controller should be identified. During the exercise, things do not always follow the plan. The lead controller has the authority to make the final decision if a contingency arises.

SAFETY

Safety **MUST** be prime concern. The exercise must never compromise the safety of exercise participants and the general public. The scenario should reflect this consideration. A site safety engineer or other designated individual should be used as an observer to ensure that all events are carried out in a safe manner. If events are not proceeding safely, he has the authority to halt the exercise play.

TABLE-TOP DRILL

A table-top drill for representatives from the response groups is strongly recommended. The scenario should be similar but not identical to the exercise scenario. The table-top drill for the emergency responders identifies some of the minor problems that may arise with the emergency plans and procedures. A table-top is conducted in a classroom format and is for discussion purposes only. No hands-on response activities are included.

INFORMATION PACKETS

Information packets should be prepared for the controllers and evaluators. These packets should contain all relevant information, which includes:

- Rules
- Scenario
- Exercise objectives
- Exercise timeline
- Charts and diagrams (e.g. contamination levels)
- Maps of the site and incident scene
- Anatomical charts prepared for victim injuries or contamination
- Complete set of controller messages
- Individual controller messages for that person (inserted in a plastic page or otherwise specifically marked)
- List of controller and evaluator assignments
- Telephone/pager list of other controllers and emergency response facilities
- MSDSs for any hazardous materials involved in the scenario

PRE-EXERCISE BRIEFING

A pre-exercise briefing for the controllers, evaluators, and victims should be held a few days in advance of the exercise. The information packets should be given to them at this time. This information as well as final tasks and events that will be staged should be discussed in detail. Specific training for their roles should be provided to ensure that they know what is expected of them. Identification should be provided for evaluators, controllers and observers. Identification provides a means for identifying those that are not involved in exercise response activities or who may be questioned for clarification regarding the extent of play. This identification could be a vest, a badge, an armband, or a hat.

EXERCISE AND POST-EXERCISE TASKS

During the exercise, the lead controller has the primary authority for ensuring that the exercise follows the schedule. The other controllers ensure that the scenario activities are followed. All messages should carry the statement "This is a drill." A time log of events and the actions taken should be documented by evaluators. If a real emergency occurs, the exercise activity should cease and be noted in the logs. The exercise may be terminated by the lead controller, incident commander or other official, as designated in the exercise rules.

Post-exercise events include a post-exercise evaluator and controller debriefing, a post-exercise participant critique and preparation of an exercise report. A remedial drill should be conducted if serious findings were observed, and all exercise findings should be tracked. These findings should be incorporated into the next exercise and the emergency plan. The exercise planning loop has come full cycle as one prepares for the next exercise.

CONDUCT OF EXERCISES AT ARGONNE NATIONAL LABORATORY

Argonne National Laboratory is a Federal Research and Development Laboratory with approximately 4,000 employees. Argonne has its own fire department and security, which provide 24 hour/day emergency response capabilities. Additionally, there are approximately 300 persons who have part-time emergency response duties.

The Emergency Management Officer and Deputy are the only full-time emergency planners at the site, and the only persons who are responsible for the planning and conduct of the integrated emergency exercises and drills. At least one integrated emergency exercise is conducted annually. Additionally, hundreds of small-scale drills are also conducted.

The exercises are evaluated by Argonne personnel from the Environmental Assessment and Information Sciences Division. They also prepare the final report and track exercise findings. This group has a strong emergency exercise evaluation background. They are also contracted by the Federal Emergency Management Agency (FEMA) to evaluate the offsite response activities during exercises at U.S. commercial nuclear power plants.

LESSONS LEARNED AT ARGONNE NATIONAL LABORATORY

We have several "lessons learned" from emergency exercises that may be of value to your exercise planning.

- 1) The emergency exercises are photographed and videotaped. The photographs are included in articles written for the employee information publications. They also serve as a permanent record. A 10 minute videotape excerpt of the exercise is shown at the post-exercise critique. It is used to show the overall activities of the event, which were only partially observed by most of the players. Some of them were located within the Emergency Operations Center (EOC) or other emergency facilities, and did not have the benefit of actually seeing the events at the scene. The video is a good way to lead into the discussion of concerns as noted by the participants. The video is also used as an introduction before the evaluators give brief exercise findings.
- 2) An exercise schedule and an exercise manual have been developed at Argonne. The exercise manual specifies the format for your organization's conduct of drills and exercises. It covers the exercise rules and contingency actions. This manual is revised with lessons learned.
- 3) In the last exercise, there was a planned time jump in the exercise. A detailed information sheet summarizing the simulated events was given to the players prompting discussion of recovery and reentry operations plans.
- 4) There have been several lessons learned regarding exercise personnel. a) A specific person has been used to organize the staging of equipment and props. We use many visual and special effects, which lend realism. These effects typically include smoke machines, alarms, vehicles, and moulage to simulate injuries. b) Knowledgeable persons are used to play the roles of victims. For example, a radiation safety officer would be used to play the part of a radiation worker. This person is then able to correctly respond to questions that may be asked by the players. c) We have expanded the number of controllers and evaluators at the incident scene. There can be so much activity occurring that it is not possible to be handled by only one or two evaluators and controllers.

5) We have used someone to play the role of a reporter. It is good for players to learn to exercise care around persons who are not "responding to the incident." This "reporter" is purposely unaware of the scenario but observes the exercise activities. At the post exercise critique, the "reporter" reads a sample article that could be written about the event. It contains comments that the responders have said without realizing that they were overheard. It also describes the events at the scene. Emergency responders do not realize what their actions many look like to the "untrained eye." It has been a very valuable learning experience for us.

6) The major "finding" that occurred in the last exercise, was with regard to the communication of information. The flow of information was not smooth nor completely accurate. For example, the Emergency Operations Center (EOC) did not have the correct casualty count. To address this problem, we are planning to use an electronic status board system in our EOC and other supporting emergency facilities. This is a computer-based program that projects the current status of information onto a large screen monitor for viewing by participants. It would be seen in each of our emergency response facilities.

7) The controllers at scene carry cellular telephones for communication between the scene and the controllers at other locations. There are often times when unplanned events occur or personnel do not respond as anticipated. It is important to have that controller relay the changes to the other controllers. During the last exercise, due to an unanticipated response, it became necessary to speed up the sequence of events. It was imperative that the other controllers knew this information. The cellular phone provides limited security amongst the controllers.

CONCLUSION

Our exercise methodology has been the result of a professional team using lessons learned to continuously improve quality. I want to emphasize that this method of doing business is not static. We change and improve our approach after every drill and exercise. Our emergency response team is trained and evaluated by using emergency exercises as the tool. The preparation for emergencies NEVER STOPS. Well planned and professionally executed exercises can keep an edge on your emergency responders. If this method is too involved for your organization, use this plan as a framework, and scale-down, as appropriate.

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