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Westinghouse GOCO Conduct of Casualty Drills

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

**Westinghouse
Hanford Company** Richland, Washington

Management and Operations Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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CHAPTER I: INTRODUCTION

A. PURPOSE

The purpose of this document is to provide Westinghouse Government Owned Contractor Operated (GOCO) Facilities with information that can be used to implement or improve drill programs. The elements of this guide are highly recommended for use when implementing a new drill program or when assessing an existing program.

Casualty drills focus on response to abnormal conditions presenting a hazard to personnel, the environment, or equipment. Casualty drills are distinct from Emergency Response Exercises in which the training emphasis is on site, field office, and Emergency Management Team interaction.

The following DOE documents require team training and conducting drills in nuclear facilities and, in addition, should be used as guidance in non-nuclear facilities:

DOE 5480.19: The guidelines in Chapter 1 of Attachment I state that management is responsible for ensuring personnel are well trained.

DOE 5480.20: Chapter 1, paragraphs 7 a. and d. of continuing training specifically state that team training and drills should be components of a training program.

Casualty drills should be an integral part of the qualification and training program at every DOE facility. Proper response to casualty conditions is vital to ensuring personnel safety and protecting the environment and equipment. Personnel must be able to take the immediate actions necessary to safely mitigate the consequences of an unexpected or abnormal and potentially dangerous condition.

B. OBJECTIVE AND BENEFITS OF A CASUALTY DRILL PROGRAM

The primary objective of a casualty drill program is to train operators. A second objective is to provide a performance based assessment of the training program.

Casualty drills are an integral component for safe and efficient facility operations. To ensure success, casualty drill participation should be integrated into initial operator qualification and continuing training.

The following are benefits of a successful casualty drill program:

- Casualty Control
- Equipment Checkout
- Procedural Verification

- Communication Improvement
- Teamwork Development
- Demonstration of training effectiveness to oversight organizations
- Disciplined Operations

C. **ESSENTIAL ELEMENTS OF A CASUALTY DRILL PROGRAM**

The complexity and capabilities of a casualty drill program will vary with facility size and risk. A high risk, high complexity facility will need to establish a program that reflects the risk and complexity of that facility. A low risk, low complexity facility will need to establish a program appropriate to it. For example the casualty drill program for a reactor facility may involve 20 people, whereas the casualty drill program of a site support facility may involve just one individual.

Regardless of the size, complexity, and risk of a facility, an effective casualty drill program must include the following essential elements:

- A Documented Casualty Drill Program
- Trained Drill Team(s)
- Drill Scenarios

The remainder of this guidance document will describe each of these essential elements in detail and provide suggested good practices associated with each element. Facility management must determine the appropriate level of effort and resources to implement those good practices which will support the casualty drill program commensurate with the risk and complexity of the facility.

CHAPTER II: A DOCUMENTED CASUALTY DRILL PROGRAM

A documented casualty drill program defines the mechanics for conducting drills. The mechanics include scenario development, training of drill team members (discussed in detail in Chapter III), pre-drill brief, drill performance, critique, and records.

A. SCENARIO DEVELOPMENT

All casualty drills should be conducted in accordance with an approved written scenario. The method of preparation and approval authority must be delineated in the program. Any individual may prepare a drill scenario. Examples of possible drill scenarios are included in Attachment F. Qualified individuals should validate the proposed scenario to determine its credibility, technical accuracy, and safety implications. As a minimum, the Facility Manager (see definition in Attachment A) is required to approve drill scenarios and any subsequent modifications to the scenario.

B. PRE-DRILL BRIEF

Drill Team members should attend a pre-drill brief. Review of the drill scenario is required. Particular attention should be given to recent changes in plant status, on-going maintenance, or out-of-service equipment which could affect safety margins.

Drill Controllers should be assigned where disclosures must be made, improper actions could cause problems, or oversight is required. A dedicated communications method for the Drill Team could be specified to allow coordinated and realistic simulations.

A clear method for directing that the drill be stopped and normal or stable conditions restored should be specified. All drill participants must be trained to recognize and respond to that signal.

Pre-drill discussions should include the "what ifs?", possible problems, and unplanned events. Other areas of discussion could include the following:

- How can this particular drill or the way it's planned go wrong?
- What contingency plans are available?
- What went wrong the last time this drill was run, and how can it be avoided?

C. DRILL PERFORMANCE

The documented casualty drill program should state how drills are performed to include drill initiation, drill simulation, drill termination, and facility restoration.

Program guidance on drill initiation should include a check that drill team members are on station, initial conditions are verified, and that approval to conduct a drill has been obtained.

The drill program guidance should provide a list of recognized simulations such as listed in Attachment B. Drill simulations should provide the necessary information (alarms, indications, gage readings, reports, etc.) for drill participants to respond appropriately.

Written guidance should be provided to properly terminate a casualty drill. In addition, guidance should be given to properly restore the facility to a stable condition. For instance a drill could be terminated that will "conveniently" result in a component shutdown for maintenance.

D. CRITIQUE

Program guidance should include the requirements for timely drill evaluation and identification of deficiencies.

A drill critique is not a chronology of events. It is an analysis of what went wrong and what went right. A critique should be held in a timely manner (immediately following the drill or drill set is preferred) and chaired by the Drill Coordinator. Comments should be solicited from the participants. Notes should be kept so that the critique can be referred to the next time that particular drill is run. Lessons learned must be promulgated to all appropriate facility personnel to ensure the maximum training value is gained.

Deficiencies in training, equipment, and procedures identified in the critique need to be documented and corrected. An example form is provided in Attachment C.

E. RECORDS

The program guidance should include maintenance of scenarios, schedules, completion of drills, critique reports, and post-drill corrective action items.

CHAPTER III: TRAINED DRILL TEAM(S)

The Drill Team consists of the Drill Coordinator and Drill Controllers. The functions of the drill team are to provide initiation, ensure safety, and to evaluate. Prior to conducting casualty drills, a drill team should be assembled and trained on their respective positions. The Drill Team shall be qualified to the extent necessary to ensure facility safety.

A. DRILL COORDINATOR

The Drill Coordinator should be designated by the Facility Manager. The Drill Coordinator is responsible for the briefing, conduct, and critique of the drill. The Drill Coordinator may be the Line Manager or his designate (i.e., a supervisor or a senior crew member). Specifically, the Drill Coordinator is responsible for the following:

- Ensure necessary approvals of the scenario and initiation authorizations are obtained prior to conducting the drill.
- Assign Drill Controllers to conduct the drill as required by the written drill scenario.
- Coordinate and conduct a pre-drill briefing for the Drill Controllers to ensure complete understanding of the scenario, limits, abort conditions, and any required actions that may be necessary to maintain safety.
- Ensure completion of any pre-drill notifications.
- Verify the status of the plant, initial conditions, and readiness of the Line Management to begin the drill.
- Coordinate and conduct the drill.
- Abort the drill any time conditions warrant.
- Terminate at the completion of the drill.
- Ensure the post-drill restoration and removal of simulations.
- Ensure that any post-drill notifications have been made.
- Conduct a critique with all personnel involved in the drill.
- Draft and submit a written critique to the appropriate managers for review.

B. DRILL CONTROLLER

The Drill Controller(s) have the responsibilities of initiator, safety observer, and/or evaluator. The responsibilities listed below may be performed by one or more people:

TRAINED DRILL TEAM(S)

- Initiator: Assigned to prompt or take real or simulated actions to transmit information (alarms, indications, etc.) to initiate a casualty drill or cause the drill to continue.
- Safety Observer: Assigned to observe specific facility/system parameters and/or personnel performance to ensure the drill is executed safely and in compliance with the precautions and limitations of the drill scenario.
- Evaluator: Evaluate the performance of drill participants and adequacy of operating procedures.

CHAPTER IV: DRILL SCENARIOS

A collection of drill scenarios for each facility should be created and approved by the Facility Manager. These casualty drills will exercise operators in the use of casualty procedures considered essential to basic operator training for a given facility. A scenario is needed for each of the casualty conditions requiring operator response. An example of a blank and a completed drill scenario are provided as Attachment D and E, respectively.

Simple drills will often accomplish training objectives more effectively than their more complicated counterparts. For example, if the objective is to evaluate operator response to a fire, simulate a paper fire in a trash can. Once operator proficiency is gained for this casualty, consider increasing drill complexity. An example would be a fire in a trash can which results in an injured person. Another way of increasing complexity is to simulate a fire of a larger magnitude.

This progression could be applied to numerous types of casualties including equipment anomalies, radiological control incidents, loss of electrical power, and process specific casualties. Using a standard scenario, drills can be developed that cover a wide spectrum of complexity. A list of suggested casualty drills is given in Attachment F.

Initial conditions, precautions and limitations, drill initiation, expected response, and termination and restoration are components that should be included in all casualty drill scenarios.

A. INITIAL CONDITIONS

The plant and equipment configuration for initiating the casualty drill should be specified. These initial conditions should be specific, but not so prescriptive as to reduce the flexibility of the drill. Affected plant personnel should also be identified.

Provisions must be made for pre-drill notifications and any other specific configurations or simulations. For example, advance notifications to the Fire Department, Security, Emergency Control Center, etc., must be identified.

B. PRECAUTIONS AND LIMITATIONS

Precautions and limitations should address abort limits, operational limits, safety limits, drill team duties, and identify applicable procedures, alarm response guides, etc., to be used during the drill.

Appropriate limiting conditions which will cause the team to stop the drill should be specified. These abort limits must be based on risk of personnel injury, equipment damage, or environmental damage. They may also specify the criteria by which the performance is determined to be unsatisfactory.

C. DRILL INITIATION

The exact actions for the drill team to initiate the drill should be identified. There must be a set of disclosures keyed to each of the drill team members. These disclosures must also specify the time and location in which the disclosure is to be made. This should guarantee a logical, consistent, and comprehensive presentation of the scenario. The intent is to provide indications which are realistic enough that operators can, without prompting from the drill team, analyze the hypothesized situation, reach correct conclusions, and take the prescribed action as if real plant parameters had existed. The key to success is using disclosures which provide appropriately realistic symptoms while also providing qualified operators with consistent, logical, comprehensive clues.

D. EXPECTED RESPONSE

The expected response of the plant and operators to the drill simulation should be described. The applicable procedures to be used by the operators should also be identified.

E. TERMINATION AND RESTORATION

The point at which the objectives of the drill have been met should be specified so that the drill can be formally terminated. The final facility condition should be identified and should include the removal of drill simulations. Any post-drill notifications required should be identified.

CHAPTER V: ALTERNATE FACILITY OPERATOR TRAINING

In addition to casualty drills, three alternate methods of facility operator training include theory-to-practice exercises, table-top discussions, and monitored evolutions. For each of these alternate methods of facility operator training, the essential elements of a casualty drill program that were previously described should be included, as applicable.

A. THEORY-TO-PRACTICE

One method of training personnel or testing knowledge of facility system interrelationships is a theory-to-practice exercise. A theory-to-practice exercise is conducted by selecting a variable system parameter, theorizing the response of that parameter to a given action, and then performing that action to see if the parameter varies as predicted.

B. TABLE-TOP DISCUSSION

A training program can also be highly effective by substituting table-top discussions in place of casualty drills. Table-top discussions involve the talk-through of an evolution or casualty drill without any actual facility manipulation. A facilitator selects an evolution or casualty drill scenario, and the table-top participants discuss various aspects of the scenario such as expected operator actions and prior lessons learned.

C. MONITORED EVOLUTION

A monitored evolution consists of a planned activity performed by a qualified operator. A controller observes the evolution to determine operator proficiency, procedure compliance, and procedure adequacy.

DEFINITIONS

ATTACHMENT A

DEFINITIONS

- Casualty: Abnormal condition presenting a hazard to personnel, the environment, or equipment.
- Disclosures: Real or simulated actions taken to initiate or provide realistic drill scenario conditions.
- Drill: A supervised, hands-on exercise intended to test, develop, and/or maintain proficiency of operators and supervisors to respond to a casualty condition.
- Drillmanship: Concepts of drill conduct and expected player performance. This is also known as "playing the game."
- Drill Controller: A qualified or certified individual briefed on the drill to be conducted and assigned to prompt or take real or simulated operator actions.
- Drill Coordinator: Person who is responsible for the briefing, conduct and critique of a drill.
- Drill Critique: An evaluation of the casualty drill.
- Drill Scenario: A document describing a casualty condition which includes a description of the casualty, approvals, initial and final facility conditions, drill simulations, intervention points, and other information which can be useful when conducting the drill.
- Drill Team: Personnel who will be responsible for drill initiation, drill simulation, plant safety and/or drill critique.
- Evolution: A facility event or operation that follows prescribed procedures without the imposition of simulations.
- Facility Manager: The cognizant manager having direct line management responsibility, including authority for direct operation of the facility, and having intimate knowledge of the details of the day-to-day operations of the facility.
- Line Manager: The senior individual designated by the position description as responsible for all aspects of operation of the facility assigned and to whom all operations personnel report during the assigned shift.

ATTACHMENT B

EXAMPLES OF STANDARD SIMULATIONS

Controller waving grey plastic bag - light smoke

Controller waving black plastic bag - heavy smoke

Controller waving red plastic bag - fire

Controller waving white bag - fire is out

Confetti - explosion

Blue cloth on floor - acid spill

Yellow cloth on floor - radioactive spill

Orange cloth on floor - caustic spill

Electronic buzzer - alarm

Crumpled aluminum foil taped to a pipe - ruptured pipe

Circuit breaker position indicator signs:

Breaker open
Breaker closed
Breaker tripped

Valve position indicator signs:

Valve open
Valve shut
Valve throttled

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CONDUCT OF CASUALTY DRILLS

DRILL EVALUATION/CRITIQUE

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ATTACHMENT C

DRILL EVALUATION/CRITIQUE

DRILL NUMBER:

CREW:

DRILL TITLE:

DATE:

PROCEDURAL DISCREPANCIES:

COMMUNICATIONS DEFICIENCIES:

MATERIAL DISCREPANCIES DISCOVERED BY OR DURING THE DRILL:

DRILL CONTROLLER, DRILL INITIATION, SIMULATION DEFICIENCIES:

OPERATOR DEBRIEF WAS CONDUCTED AT:

NOTEWORTHY PRACTICES:

GRADE ASSIGNED:

REVIEWED BY:

Facility Manager

Training Manager

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CONDUCT OF CASUALTY DRILLS

DRILL SCENARIO

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ATTACHMENT D

DRILL SCENARIO

DRILL NUMBER:
PLANT IMPACT:

APPROVAL: _____

FACILITY MGR./DATE

TITLE:

I. INITIAL CONDITIONS

PLANT MODE:

SYSTEM/EQUIPMENT:

PARTICIPANTS:

SPECIAL EQUIPMENT:

PRE-DRILL NOTIFICATIONS:

SPECIAL CONDITIONS AND INSTRUCTIONS:

II. PRECAUTIONS & LIMITATIONS

ABORT LIMITS:

OPERATIONAL LIMITS:

SAFETY LIMITS OR PRECAUTIONS:

DRILL TEAM DUTIES:

REFERENCES:

III. DRILL INITIATION

IV. EXPECTED RESPONSE

V. TERMINATION & RESTORATION

ATTACHMENT E

DRILL SCENARIO

DRILL NUMBER: DRAFT
PLANT IMPACT: MINOR

APPROVAL: _____
FACILITY MGR./DATE

TITLE: AIR SYSTEM LEAK FROM F-51

I. INITIAL CONDITIONS

PLANT MODE: Any

SYSTEM/EQUIPMENT: Compressed Air

PARTICIPANTS: Control Room, Service Systems

SPECIAL EQUIPMENT: None

PRE-DRILL NOTIFICATIONS: None

SPECIAL CONDITIONS AND
INSTRUCTIONS: T-25 should be on line at the beginning of the
drill with either T-194 or T-196 available.

II. PRECAUTIONS & LIMITATIONS

ABORT LIMITS: Instrument air header pressure reaches 90 psig
or any significant plant casualty at the
discretion of the SOM.

OPERATIONAL LIMITS: Containment H&V CIS required if instrument air
header pressure reaches 75 psig and a reactor
scram required if instrument air header pressure
reaches 70 psig.

SAFETY LIMITS OR
PRECAUTIONS: 17.3/4.2.7 Dump Heat Exchangers

DRILL TEAM DUTIES: The drill controller in the Control Room
evaluates Control Room procedure and drawing use
and control of the problem solving actions.
Ensure appropriate actions are taken to maintain
instrument air header pressure greater than 90
psig. The drill monitor in the field evaluates
actions of the Service Systems Watch. Ensure
That T-25 is not left to complete its post shut
down purge with its outlet path isolated. (23-V-
27 must be left open until the filter is
unisolated or until the power to T-25 is turned
off.)

REFERENCES: PR-14, SN-23.1-1, H-4-11075

ATTACHMENT E

III. DRILL INITIATION

Crack open the F-51 drain valve 23-V-33 to simulate a blown out cover gasket for the filter. Report to the Control Room that while walking past the air compressor area you heard abnormally loud air noise and you believe there is a leak.

IV. EXPECTED RESPONSE

The Control Room should dispatch the Service Systems Watch to investigate the air leak. To isolate the air leak the Shutdown Watch should first direct opening 23-V-27 to bypass the filter and then closing 23-V-29 and 23-V-30. In this way T-25 can remain on line until another tower can be placed in service.

V. TERMINATION & RESTORATION

Secure from the drill when F-51 is isolated, T-25 is secured with another air dryer on line. Ensure that all valves operated are returned to their normal positions.

ATTACHMENT F

LIST OF SUGGESTED CASUALTY DRILLS

1. Loss of equipment power
2. Steam leak
3. Spill of radioactive liquid
4. Dry radioactive spill
5. Loss of cooling water
6. Loss of ventilation
7. Loss of breathing air
8. Loss of radioactive source
9. Small fire
10. Fire in electrical motor
11. Loss of communications
12. Alarm response drills
13. Spill of hazardous material
14. Loss of electrical power
15. Injured person
16. Missing watchstander
17. Lubricating oil leak
18. Loss of backup/emergency power

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REFERENCES

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REFERENCES AND RESOURCES

DOE 5480.19, Conduct of Operations Requirements for DOE Facilities,
of 5-18-92.

DOE 5480.20, Personnel Selection, Qualification, Training, and Staffing
Requirements at DOE Reactor and Non-Reactor Nuclear Facilities, of 2-
20-91.

DOE EM-25, Breakout Session on Conduct of Drills, Conduct of Operations
Working Group.

WHC-SP-0329, Hanford 400 Area [Fast Flux Test Facility (FFTF)] Training Plan,
July 1991.

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