



# Federal Emergency Management Agency

Region V

536 South Clark Street, 6th Floor  
Chicago, IL 60605-1521

July 11, 2003

Mr. Eric Weiss  
Emergency Preparedness & Health Physics Section  
Operator Licensing, Human Factors and Plant Support Branch  
Division of Inspection Program Management  
Office of Nuclear Reactor Regulations  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-001

Dear Mr. Weiss:

Enclosed is one copy of the D. C. Cook Nuclear Power Plant Medical Services (MS-1) Drill Report. The drill was conducted in Berrien County, Michigan, on May 8, 2003. Participants included members from the State of Michigan, Department of Environmental Quality (DEQ), Medic-1 Ambulance Service, and Lakeland Medical Center, St. Joseph.

No Deficiencies were identified during this drill. Two Areas Requiring Corrective Action (ARCA) were identified for the State of Michigan, DEQ under Criterion 1.e.1: Equipment to Support Emergency Operations and Criterion 6.d.1: Transportation and Treatment of Contaminated Injured Individuals. Two ARCAs were identified for the Medic -1 Ambulance Service under Criterion 1.e.1: Equipment to Support Emergency Operations and Criterion 6.d.1: Transportation and Treatment of Contaminated Injured Individuals.

If you have any questions, please let me know or have a member of your staff contact Ms. Sandra Bailey. We can be reached at (312) 408-5528 or 408-5353 respectively.

Sincerely,

A handwritten signature in black ink, which appears to read "Woodie J. Curtis". The signature is written in a cursive style and is positioned above the printed name.

Woodie J. Curtis, Chairman  
Regional Assistance Committee



# **Medical Services Drill Report for D. C. Cook Nuclear Power Plant**

Licensee: American Electric Power

Exercise Date: May 8, 2003

Report Date: July 11, 2003

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**FEDERAL EMERGENCY MANAGEMENT AGENCY  
REGION V  
536 South Clark Street, 6th Floor  
Chicago, Illinois 60605-1521**

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## I. EXECUTIVE SUMMARY

On May 8, 2003, the Federal Emergency Management Agency (FEMA), Region V, evaluated a Medical Services drill (MS-1) in the 10-mile plume exposure pathway Emergency Planning Zone (EPZ) around the D. C. Cook Nuclear Power Plant (NPP). The power plant is located in Berrien County, Michigan. The purpose of the MS-1 drill was to assess the ability of off-site agencies to respond to a medical emergency involving potentially radiologically contaminated members of the public. The MS-1 drill was held in accordance with FEMA's policies and guidance concerning the exercise of State and local radiological emergency response plans.

The following criteria, which are part of the Federal Register Notice entitled "Radiological Emergency Preparedness: Exercise Evaluation Methodology", Vol. 67 FR, No. 80, dated April 25, 2002, which amends earlier guidance provided in FEMA-REP 14, Radiological Emergency Preparedness Exercise Manual, were evaluated during the MS-1 drill. They are Criterion 1.e.1 - Equipment and Supplies to Support Operations; Criterion 3.a.1 - Implementation of Emergency Worker Exposure Control; Criterion 3.b.1 - Implementation of KI Decision; and Criterion 6.d.1 - Transportation and Treatment of Contaminated Injured Individuals.

FEMA wishes to acknowledge the efforts of the personnel from the State of Michigan Department of Environmental Quality (DEQ), Medic-1 Ambulance Service, and the Lakeland Medical Center, St. Joseph, who participated in the MS-1 drill.

The scenario for the medical services drill was developed by personnel from the State of Michigan and coordinated with personnel from the D. C. Cook NPP. The scenario stated that a release had occurred at the D. C. Cook NPP and had just terminated. Emergency Planning Areas 1, 2, and 3 had been evacuated out to five miles. The State of Michigan had dispatched a radiological monitoring team consisting of two health physics technicians to perform a survey south of the DC Cook Plant on Livingston Road near the beach. They were in route to their next sampling location, when the driver saw an individual coming out of the woods near the plant. The vehicle was stopped and a Technician checked on the individual. The individual had been fishing at the park along the lakeshore. When the fisherman heard the public warning sirens, he began having chest pains and could not make it back to the road or his car. When he saw the approaching Monitoring Team vehicle he tried to reach the vehicle for help but collapsed and fell on a rock, injuring his head. Moulage was used to simulate a superficial laceration to the left side of the victim's head along the hairline and above the ear, which was bleeding profusely, and scrapes on the left arm. A controller's telephone call was made to request Emergency Medical Services (EMS). When the EMS personnel arrived, they found the individual conscious, breathing heavily, sweating profusely, and complaining of pain in his head and chest. The individual's head, arms, hands, and clothing were subject to radiological contamination. Weather conditions mirrored the actual drill day (overcast with a light rain).

The Lakeland Medical Center, St. Joseph, demonstrated knowledge of their organizational emergency response plans and procedures, and adequately implemented

them. No Deficiencies were identified during this drill and there were no outstanding Areas Requiring Corrective Action (ARCA) or Deficiencies from previous exercises/drills. Two ARCAs were identified for the State of Michigan, Department of Environmental Quality under Criterion 1.e.1: Equipment to Support Emergency Operations and Criterion 6.d.1: Transportation and Treatment of Contaminated Injured Individuals. Two ARCAs were identified for Berrien County, Medic-1 Ambulance Service under Criterion 1.e.1: Equipment to Support Emergency Operations and Criterion 6.d.1: Transportation and Treatment of Contaminated Injured Individuals.

## II. DRILL EVALUATION AND RESULTS

Contained in this section are the results and findings of the evaluation of all jurisdictions and functional entities that participated in the May 8, 2003, MS-1 drill to test the ability of off-site agencies to respond to a medical emergency involving a potentially radiologically contaminated member of the public in the area surrounding the D. C. Cook Nuclear Power Plant.

This section provides information on the evaluation of each participating jurisdiction and functional entity, in a jurisdiction based, issues only format. Presented below is a definition of the terms used in this subsection relative to criteria demonstration status.

- **Met** - Listing of the demonstrated exercise criteria under which no Deficiencies or ARCAs were assessed during this drill and under which no ARCAs assessed during prior exercises or drills remain unresolved.
- **Areas Requiring Corrective Actions** - Listing of the demonstrated exercise criteria under which one or more ARCAs were assessed during the current drill, or ARCAs assessed during prior exercises or drills remain unresolved. Included is a description of the ARCAs assessed during this drill and the recommended corrective action to be demonstrated before or during the next biennial exercise.
- **Not Demonstrated** - Listing of the exercise criteria, which were not demonstrated, as scheduled during this drill and the reason they were not demonstrated.
- **Prior ARCAs - Resolved** - Descriptions of ARCAs assessed during previous exercises or drills, which were resolved in this drill and the corrective actions demonstrated.
- **Prior ARCAs - Unresolved** - Descriptions of ARCAs assessed during prior exercises or drills, which were not resolved in this drill. Included is the reason the ARCA remains unresolved and recommended corrective actions to be demonstrated before or during the next biennial exercise.

FEMA has developed a standardized system for numbering exercise issues (Deficiencies and ARCAs). This system is used to achieve consistency in numbering exercise issues among FEMA Regions and site-specific exercise reports within each Region. It also is used to expedite tracking of exercise issues on a nationwide basis.

The identifying number for Deficiencies and ARCAs includes the following elements, with each element separated by a hyphen (-).

- **Plant Site Identifier** - A two-digit number corresponding to the Utility Billable Plant Site Code.

- **Exercise Year** - The last two digits of the year the exercise was conducted.
- **Criterion Number** – An alpha and two-digit number corresponding to the criteria numbers in the six Exercise Evaluation Areas described in Federal Register Notice Vol. 67 FR, No. 80, April 25, 2002, which amends the FEMA-REP 14, Radiological Emergency Preparedness Exercise Manual.
- **Issue Classification Identifier** - (D = Deficiency, A = ARCA). Only Deficiencies and ARCAs are included in exercise reports.
- **Exercise Issue Identification Number** - A separate two (or three) digit indexing number assigned to each issue identified in the exercise.

**A. STATE OF MICHIGAN**

**1. Department of Environmental Quality**

- a. **MET:** Criteria, 3.a.1 and 3.b.1
- b. **DEFICIENCY:** NONE
- c. **AREAS REQUIRING CORRECTIVE ACTION:** Criteria 1.e.1 and 6.d.1

**Issue No.:** 15-03-1.e.1-A-01

**Condition:** Lack of appropriate supplies to limit/control the spread of contamination.

**Possible Cause:** Prior to the start of the drill, the DEQ Technician made the decision to simulate (rather than demonstrate) changing gloves and donning shoe covers. The quantity of on-hand supplies of PPE was inadequate.

**Reference:** NUREG-0654, H.11; K.5.b; L.1.

**Effect:** The lack of sufficient PPE for all player personnel responding to the incident in an area subject to contamination could have spread contamination to persons and equipment.

**Recommendation:** DEQ personnel should have sufficient PPE to perform change-outs as needed. Re-demonstrate the use of adequate supplies of PPE at the next MS-1 drill scheduled for July 22, 2003.

**Schedule of Corrective Actions:**

**Issue No.:** 15-03-6.d.1-A-02

**Condition:** Lack of proper radiological contamination control advice provided to support EMT personnel.

**Possible Cause:** The DEQ Technician did not use available procedures to advise and assist local authorities on radiological and environmental protection matters, including control of contamination... and countermeasures to minimize radiation exposure as required by the Michigan DEQ Nuclear Facility Emergency Response Procedures, Part 1, Section I. B.

**Reference:** NUREG-0654, K.5.b

**Effect:** The lack of contamination control advice by the DEQ Technician to the EMTs resulted in the spread of contamination to ambulance personnel and

equipment.

**Recommendation:** Provide additional training to the State DEQ Technicians on plans and procedures on controlling the spread of contamination and advising other emergency workers regarding implementation of their procedures. Re-demonstrate these procedures at the next MS-1 drill scheduled for July 22, 2003.

**Schedule of Corrective Actions:**

- d. NOT DEMONSTRATED: NONE
- e. PRIOR ARCAs - RESOLVED: NONE
- f. PRIOR ARCAs - UNRESOLVED: NONE

**B. BERRIEN COUNTY**

**1. Medic-1 Ambulance Service**

- a. MET: NONE
- b. DEFICIENCY: NONE
- c. AREAS REQUIRING CORRECTIVE ACTION: Criteria 1.e.1 and 6.d.1

**Issue No.:** 15-03-1.e.1-A-03

**Condition:** Lack of appropriate supplies to limit/control the spread of contamination.

**Possible Cause:** The Medic-1 Ambulance Service EMTs did not have their own on-hand supply of PPE.

**Reference:** NUREG-0654, H.11; K.5.b; L.1.

**Effect:** The lack of sufficient PPE for all player personnel responding to the incident in an area subject to contamination could have spread contamination to persons and equipment.

**Recommendation:** The EMTs should have sufficient PPE to perform change-outs as needed. Re-demonstrate the use of adequate supplies of PPE at the next MS-1 drill scheduled for July 22, 2003.

**Schedule of Corrective Actions:**

**Issue No.:** 15-03-6.d.1-A-04

**Condition:** Lack of proper radiation/contamination control measures implemented to limit the spread of contamination.

**Possible Cause:** The EMTs did not receive adequate training with regard to the need to avoid/control the spread contamination to themselves and their equipment.

**Reference:** NUREG-0654, K.3.a; O.1; O.4.f

**Effect:** The lack of knowledge about contamination control measures resulted in the spread of contamination to the ambulance personnel and their equipment.

**Recommendation:** Provide ambulance personnel with additional training concerning contamination control procedures. Re-demonstrate these procedures at the next MS-1 drill scheduled for July 22, 2003.

**Schedule of Corrective Actions:**

- d. **NOT DEMONSTRATED:** Criteria: 3.a.1 and 3.b.1. Upon arrival at the Lakeland Medical Center, St Joseph, the evaluator questioning the EMTs followed the patient into the hospital to observe the patient transfer process. During this time, the EMTs returned to their dispatch garage before they were interviewed about their knowledge of dosimetry and potassium iodide procedures. These criteria should be evaluated during the next Medic-1 Ambulance Service MS-1 drill scheduled for July 22, 2003.
- e. **PRIOR ARCAs - RESOLVED: NONE**
- f. **PRIOR ARCAs - UNRESOLVED: NONE**

**2. Lakeland Medical Center, St. Joseph**

- a. **MET:** Criteria 1.e.1, 3.a.1, and 6.d.1.
- b. **DEFICIENCY: NONE**
- c. **AREAS REQUIRING CORRECTIVE ACTION: NONE**
- d. **NOT DEMONSTRATED: NONE**
- e. **PRIOR ARCAs - RESOLVED: NONE**
- f. **PRIOR ARCAs - UNRESOLVED: NONE**

### III. DRILL NARRATIVES

#### EVALUATION AREA 1: EMERGENCY OPERATIONS MANAGEMENT

**Criterion 1.e.1:** Equipment, maps, displays, dosimetry, potassium iodide (KI), and other supplies are sufficient to support emergency operations.

Criterion Status: Not Met

#### Department of Environmental Quality

The State of Michigan Department of Environmental Quality (DEQ) Health Physics Technicians dispatched to support a Medical Services (MS-1) drill incident involving the D. C. Cook Nuclear Power Plant provided their own dosimeters and maintained their own record keeping system. Two DEQ Technicians participated in the drill.

Each technician was equipped with a Dosimeter Corporation of America (DCA) Direct Reading Dosimeter (DRD), Model 608, with a range of 0-10R, a Victoreen DRD, Model 541R, with a range of 0-200 mR, and a simulated thermoluminescent dosimeter (TLD). A DEQ Technician stated that leak testing of the DRDs is performed annually and calibration records are kept in the State of Michigan DEQ Office, with copies submitted to FEMA yearly in the State of Michigan Annual Letter of Certification. The DEQ team also was equipped with a DCA Charger, Model 909.

Both DEQ Technicians had their own Emergency Worker Dosimetry Instruction & Record Card, a bottle of Potassium Iodide (KI) tablets containing 14 pills, and an accompanying KI instruction sheet. The inspected bottle of KI had an expiration date of January 2001. A DEQ Technician stated that a letter certifying the shelf-life potency of the KI is on file with the State Police Department in Lansing, and a copy of the shelf-life extension letter was submitted to FEMA in the State of Michigan Annual Letter of Certification.

Each DEQ Technician had a Bicon Surveyor instrument, Model 2000, which was calibrated on June 11, 2002. Each instrument was equipped with a Bicon PGM pancake probe, Model A072P, and a Cesium (Cs-137) check source. Each DEQ Technician had their own decontamination kit, and a kit supply list was given to the Evaluator. The list was titled "Decon Kits" and marked "Attachment VI" of "Part 3" to the Michigan DEQ Nuclear Facility Emergency Response Procedures. The DEQ Technician stated that the list identified the equipment brought to support drill activities. The list indicated that the kit included several types of plastic bags: two large bags, five zip lock bags, five "WhirPak" bags, and two bags marked "Rad Waste." The list also indicated that the kit contained two pairs of booties (shoe covers), two pairs of rubber gloves, two pairs of light cotton gloves, and five pairs of disposable gloves.

According to the scenario, two DEQ Technicians arrived at the accident scene together. They were in route to a sampling location when they saw an injured person. One

Technician was dispatched to the hospital to assist in setting up the Radiological Emergency Area (REA). The second Technician stayed with the injured person to provide radiological consultation to the two ambulance personnel who responded to the accident call. The ambulance personnel arriving at the scene stated that they do not carry Personal Protective Equipment (PPE), other than disposable gloves in the ambulance. They rely on the DEQ Technician for their protective shoe covers (booties). The DEQ Technician concurred that DEQ would provide booties to ambulance personnel. However, no plan reference could be found to support this statement.

The second DEQ Technician did not take her booties from the vehicle before it was driven to the hospital by the first Technician. Consequently, the second Technician simulated giving booties to each of the ambulance personnel to put over their shoes. The second Technician simulated putting a pair of booties over her own shoes. The "Decon Kits" list indicates that each kit contains only two pair of booties. According to the Michigan DEQ Nuclear Facility Emergency Response Procedures, "During sampling, a minimum of two sets of booties or boots, and two sets of gloves should be worn." Consequently, at a minimum, six pairs of booties were required for the three personnel (technician and two EMTs), i.e., three kits. The second Technician also brought only two pairs of disposable gloves to the scene. As a result, she simulated multiple glove changes. The DEQ Technician did not have enough supplies with her to limit/control the spread of contamination during the drill.

#### Medic-1 Ambulance Service

Berrien County Community Health Department maintains its own dosimetry, including the leak testing of dosimeters and keeping records up-to-date. They deliver dosimeters to the St Joseph Township Fire Station # 2, where the ambulance personnel pick up their equipment. In accordance with the extent-of-play agreement, instrument pick-up was simulated. The Controller provided dosimetry packets and a briefing to the ambulance personnel. Packets included the following items: a Civil Defense Category V (CD-V) low-level DRD, Model 862, with a range of 0-200 mR; a CD-V high level DRD, Model 742, with a range of 0-200 R; "Individual Dosimetry Record" cards with instructions displaying the Michigan State administrative exposure limits of 1R in a 24-hour period and 3R total, and EPA limits of 5R for general duties and 25R for lifesaving duties; the "Berrien County Emergency Management Emergency Worker Dosimetry Issuance Log;" a bottle of KI tablets containing 14 pills; and an accompanying "Thyro-Block" instruction sheet.

The KI bottle displayed an expiration date of February 2005. According to State of Michigan procedures, survey instruments are calibrated every four years by contracted laboratory services, and the DRDs are leak tested annually by who ever maintains the equipment, in this case the Berrien County Public Health Department. The dosimeters checked in this drill had a sticker that indicated they were last "calibrated" in 2000 (CDV 862 – April 21, 2000, and CDV 742 – May 1, 2000), with a due date for the next calibration of 2004 (April 20, 2004, and May 31, 2004, respectively). The State of Michigan's Annual Letter of Certification states that "Beginning in 2003, all dosimetry will be leak tested annually with the exception of CD V138, which will be leak tested

quarterly". The EMTs arrived on the scene without protective clothing, except for disposable gloves. They stated that they expected to be met by a DEQ Technician at the accident scene, who would provide them with protective coverings for their shoes (booties). The Medic-1 Ambulance Service plan and procedures were not available for review to verify this statement. The DEQ "Decon Kit" does not contain extra protective clothing including booties (see DEQ write-up for Criterion 1.e.1). The EMTs stated that their company will be purchasing and including protective clothing in all ambulances some time in the near future.

#### Lakeland Medical Center, St Joseph

The Lakeland Medical Center, St Joseph, Radiological Emergency Area (REA) staff had a sufficient supply of radioactive signs, yellow herculite floor covering, yellow ropes with stanchions, waste containers, decontamination process signs, sample collection kits, decontamination step off pads, and decontamination kits with instructions. Signs listing procedures for removing personal protective clothing and decontamination guidelines were posted inside of the REA. The REA also contained two yellow decontamination wastebaskets, a decontamination table, and two water tanks.

Dosimetry and radiological equipment was stored together with other radiological supplies in a locked cabinet in a secure room in the REA. The D. C. Cook Nuclear Power Plant personnel are responsible for maintaining and replenishing supplies in the cabinet after each use. An inventory supply sheet posted inside the cabinet lists the following supplies and equipment: radiation clothing protective packets containing a plastic gown, a head cover, a mask, double gloves, and a pair of booties; TLD badges; a DCA Charger, Model #909, Serial # 123-1187; 22 DRDs with a range of 0-200 mR (last leak tested on 12/15/02 with a leak-test due date of 6/30/03); and an Eberline HP 260 radiation monitoring instrument, Serial # 8695, (calibrated 12/31/02, with a calibration due date of 12/31/03). All supplies were used for the drill except the TLDs, which were simulated.

### **EVALUATION AREA 3: PROTECTIVE ACTION IMPLEMENTATION**

**Criterion 3.a.1:** The OROs issue appropriate dosimetry and procedures, and manage radiological exposure to emergency workers in accordance with the plans and procedures. Emergency workers periodically and at the end of each mission read their dosimeters, and record the readings on the appropriate exposure record or chart.

Criterion Status: Not Demonstrated

#### Department of Environmental Quality

State of Michigan Department of Environmental Quality (DEQ) Technicians checked their Direct Reading Dosimeters (DRDs) every 30 minutes and recorded the results on their individual dosimeter record card starting at 0745 hours. Each technician wore a simulated Thermoluminescent Dosimeter (TLD). They knew to turn in all record cards to their supervisor at the end of each mission. Both individuals were aware of the Michigan administrative dose limits of 1 R in any 24-hour period and not to exceed a total exposure in excess of 3 R.

The DEQ Technician assigned to the Lakeland Medical Center, St Joseph, briefed the hospital personnel and answered questions regarding radiological equipment policies. The Technician provided instructions on how to read the DRDs and how to zero each dosimeter before use.

#### Medic -1 Ambulance Service

The Medic -1 Ambulance Service Emergency Medical Technicians (EMT), received a briefing from the controller on potassium iodide (KI) and dosimetry use. In a real event, ambulance personnel would receive their briefing from St Joseph Township Fire Station # 2 personnel when they picked up their equipment. The EMTs recorded the initial, subsequent, and end-of-mission readings on their dosimetry record card. They wore their dosimeters on the outside of their clothing between the shoulder and waist.

At the beginning of the drill, the ambulance driver notified their 911 Dispatch Center and requested that the dispatcher call them every 30 minutes to remind them to read their DRDs. One EMT kept an Individual Dosimetry Card Log; recording of their readings at 1000, 1030, and 1100 hours. The EMTs were provided with written instructions that explained how to wear the dosimeters, when to read them, what radiation reading to report to their supervisor, that they should report to a decontamination center at the end of their shift, and where to turn in their dosimeters and record keeping forms. The form listed the Michigan administrative dose limits of 1 R in any 24-hour period and a total exposure limit of 3 R.

During the drill, the ambulance personnel were not fully interviewed about their knowledge of dosimetry procedures. Upon arrival at the Lakeland Medical Center, St. Joseph, the Evaluator responsible for interviewing the EMTs followed the patient into the hospital to observe the patient transfer process. During this time, the EMTs returned to their dispatch garage before they were questioned about their knowledge of dosimetry and potassium iodide procedures. A Medic-1 Ambulance Service drill has been scheduled for July 22, 2003, during which time this criterion should be evaluated.

#### Lakeland Medical Center, St Joseph

The Lakeland Medical Center, St. Joseph, Radiological Emergency Area (REA) personnel were knowledgeable of how to use the dosimetry. A personal dosimetry log form was used to record staff names, Social Security numbers, date and time issued, badge numbers, dosimeter numbers, and entry and exit readings of the dosimeters. A buffer nurse recorded the initial and end readings on a form. Under the guidance of a DEQ Technician, the REA personnel read their dosimeters every 30 minutes. REA personnel simulated wearing TLDs. They knew to turn in all record cards and equipment to their supervisor at the end of their missions.

**Criterion 3.b.1:** KI and appropriate instructions are available should a decision to recommend use of KI be made. Appropriate record keeping of the administration of KI for emergency workers and institutionalized individuals (not the general public) is maintained.

Criterion Status: Not Demonstrated

Department of Environmental Quality

State personnel dispatched to support an incident at the D. C. Cook Nuclear Power Plant provided their own Potassium Iodide (KI) tablets and maintained their own record system. Two State of Michigan Department of Environmental Quality (DEQ) personnel participated in the drill. Both individuals had a bottle of KI tablets and accompanying KI instruction sheet. They were knowledgeable about the reason for ingesting KI, dosage, time periods for ingestion of the drug, and possible drug side effects. They would maintain their own record card and report ingestion results to their supervisor at the end of their mission.

Medic -1 Ambulance Service

In addition to printed instructions, each Medic -1 Ambulance Service EMT received a dosimetry/KI briefing at the beginning of the drill from the Controller who acted as the Dosimetry Control Officer. In a real event, ambulance personnel would receive their briefing from St Joseph Township Fire Station # 2 personnel when they picked up their equipment. Both avenues of information listed the reason for taking KI, dosage, time period within which KI should be taken, and the possible side effects of the drug.

However, during the drill the ambulance personnel were not queried about their knowledge of KI procedures. Upon arrival at the Lakeland Medical Center, St Joseph, the Evaluator interviewing the EMTs followed a DEQ Technician into the hospital to observe patient transfer. During this time, the EMTs returned to their dispatch garage before they were questioned about their knowledge of dosimetry and KI procedures. Another Medic -1 Ambulance Service drill has been scheduled for July 22, 2003, during which time this criterion should be evaluated.

**EVALUATION AREA 6: SUPPORT OPERATION/FACILITIES**

**Criterion 6.d.1:** The facility/ORO has the appropriate space, adequate resources, and trained personnel to provide transport, monitoring, decontamination, and medical services to contaminated injured individuals.

Criterion Status: Not Met

Department of Environmental Quality

Two Michigan Department of Environmental Quality (DEQ) Technicians, two Emergency Medical Technicians (EMTs) from the Medic -1 Ambulance Service, and staff from the Lakeland Medical Center, St. Joseph, participated in the drill. Prior to the start of the drill controllers briefed all participants on the initiating events.

An Exercise Controller telephoned the hospital, at 0932 hours, and Medic -1 Ambulance Service, at 0935 hours, to report that a contaminated patient with injuries had been found

near Livingston Road and the beach. These telephone calls simulated a call from the Michigan DEQ Technician to the Field Team Center and a telephone call from the Field Team Center to Berrien County Emergency Management for medical assistance.

The DEQ Technician surveyed the patient before the EMTs arrived at the scene. The Controller provided a set of simulated radiation values: 1,200 counts per minute (cpm) on the head near a simulated laceration injury; 1,000 cpm on the chest; 10,000 cpm on the left arm; 12,000 cpm on the right arm; 10,000 cpm across the back; and 15, 000 cpm on the left leg.

The DEQ Technician re-surveyed the patient after the arrival of the EMTs, being careful not to interfere with the medical treatment of the patient. The Controller provided a second set of simulated radiation values which were the same as the first set. These readings were given to the ambulance crew, and they were informed that the patient was contaminated.

Throughout the drill contamination control procedures were not adequately implemented. For example, while the DEQ Technician was performing the initial survey of the patient, she was not wearing any protective equipment, including gloves or shoe coverings (booties). According to the scenario, the DEQ Technician was performing sampling procedures when she came upon the injured party. The Michigan DEQ Nuclear Facility Emergency Response Procedures state: "During sampling, a minimum of two sets of booties or boots, and two sets of gloves should be worn".

When the Evaluator queried the Technician about the use of gloves and booties, the Technician put on a pair of gloves and simulated putting on booties. When she put on the gloves, air pockets formed at each fingertip. The Technician held the head of the Bicon pancake probe cupped in the palm of her hand, not by the handle of the probe, as she surveyed the patient. As the Technician surveyed the patient, the fingertips of her gloves touched the patient's head, thereby contaminating the gloves. The Technician changed her gloves.

Contact between the DEQ Technician's fingers and the patient occurred repeatedly as the technician surveyed the patient. After the second change of gloves, the DEQ Technician had to simulate the changing of gloves, as she only brought two sets of gloves with her to the drill site (the gloves contained in one "Decon Kit").

After the EMTs examined the patient, the DEQ Technician told them that they would need to decontaminate the Stryker gurney, as it was contaminated during removal from the ambulance. The DEQ Technician told one EMT to cover the patient and other items in order to contain the contamination. The intent of the instruction was to use the blanket to mummy wrap the entire patient and backboard to contain radioactive contamination by placing the blanket between the backboard and gurney to prevent contamination of the gurney. However, the EMT did not understand what the DEQ Technician was suggesting and she placed the contaminated patient directly on the gurney, thereby contaminating the gurney, and then put a blanket on top of the patient. The other EMT put a clean backboard on the ground, thereby contaminating it before slipping it under the patient.

An EMT also put a contaminated scissors into her pocket. Both EMTs entered the ambulance with out changing (or simulating the change of) their booties, thereby contaminating the ambulance. As these and other actions occurred that would have spread contamination, the DEQ Technician did not advise the EMTs concerning contamination control procedures, as required by the Michigan DEQ Nuclear Facility Emergency Response Procedures, Part 1, Section I. B., which state: "The Department also advises and assists state and local authorities on all radiological and environment protections matters, including control of contamination... and countermeasures to minimize radiation exposure". According to these procedures, state health physics personnel receive training that instructs them to include technical assistance to local medical facilities and for contamination monitoring and control.

At 1020 hours, the EMTs began transporting the patient to the hospital, with the DEQ Technician and Evaluator on board. The DEQ Technician monitored the patient and EMT while enroute to the hospital, occasionally instructing the EMT who attended the patient to change his gloves. Contaminated gloves and medical supplies were placed in a plastic bag provided by the DEQ Technician. The bag was labeled "Contaminated Waste". The ambulance arrived at the hospital at 1045 hours.

Transport of the patient was timely (25 minutes from the accident scene to the hospital). The Radiological Emergency Area (REA) was cordoned off with rope, warning signs, and plastic sheets on the ground to reduce contamination. Properly marked plastic bags were used for disposal of contaminated items. The DEQ Technician informed the hospital personal that the patient and backboard were contaminated.

The DEQ Technician advised the Evaluator that because the ambulance and EMTs were contaminated, she would instruct them to drive directly to the St. Joseph Fire Station to be decontaminated. After the Controller advised that contamination of the REA was limited to the disposable plastic ground sheeting, the DEQ Technician stated that D. C. Cook Nuclear Power Plant personnel would collect the sheeting at a later time.

#### Medic -1 Ambulance Service

Two EMT from the Medic-1 Ambulance Service arrived at the accident scene at 0944 hours. The Exercise Controller gave them their dosimetry and briefing. A DEQ Technician surveyed the patient at 0955 hours and informed the EMTs that the patient was contaminated, citing the radiation levels found on the patient.

The EMTs put on disposable gloves, simulated covering their shoes with booties, and began their medical examination of the patient at 1001 hours. They spoke with the patient to assess his level of consciousness, the severity of his injuries, and to gather initial personal information. They determined that he had chest pains, was conscious and alert, and was bleeding from a head injury. They treated the bleeding laceration by applying a compress. During the examination, the EMTs touched the patient, thereby contaminating their gloves. The EMTs reached over the patient and in doing so contaminated their clothes. One EMT returned to the ambulance for supplies. He did not simulate changing his simulated booties before entering the ambulance, thereby

contaminating the vehicle. The same EMT removed a backboard from the ambulance, placed it on the contaminated ground as he exited the vehicle, and proceeded to drag the board and patient restraining straps on the ground, contaminating both the board and straps. A Stryker gurney was removed from the ambulance and contaminated when the wheels touched the ground. As these events took place, the EMTs appeared to be unaware they were contaminating themselves and their equipment. In addition, the DEQ Technician did not provide contamination control advice to the EMTs other than that to tell them that the gurney was contaminated and would have to be decontaminated.

The EMTs continued their medical evaluation and treatment of the patient. Scissors were used to cut the patient's shirt open so his left arm wound could be medically assessed. The scissors were contaminated by contact with the patient's shirt. They were placed in the EMT's pocket, thereby further contaminating the EMTs clothes. During the treatment process an oxygen mask and hose fell on the ground and became contaminated. These items were placed back into the supply kit, thereby contaminating the kit.

The EMTs placed the patient on a backboard with a cervical collar, head bunkers, and restraining straps. They placed the patient and backboard on the gurney. As the patient was being transferred to the gurney, the EMTs experienced difficulty in preventing the gurney from rolling down a hill. For the safety of the patient, three non-players at the drill assisted in stabilizing the gurney.

As the EMTs loaded the contaminated gurney (wheels) into the ambulance no effort was made to limit the spread of contamination by placing a plastic sheet on the ambulance floor. At this time, the EMTs did not simulate changing their gloves and booties. One EMT touched the ambulance supply cabinet surfaces, cabinet counter-top surfaces, and blood pressure cuff, thereby contaminating these items. The EMT simulated starting an IV and recorded the patient's simulated vital signs (normal breathing, sweaty skin, pulse of 120, blood pressure of 120/60 and respirations of 28 and heavy). Gloves were changed before the IV was started and at one other time.

At 1010 hours, with the ambulance loaded, the drill briefly was halted to discuss the extent-of-play and lack of personal protective equipment for the EMTs. After the discussion, the drill resumed and one EMT entered the front cab of the ambulance to drive the vehicle. She did not simulate removing her gloves and booties, thereby contaminating the driver's cab. The ambulance departed for the hospital at 1020 hours. In route radio communications were established with the Lakeland Medical Center, St. Joseph, at 1030 hours. The hospital was advised that the ambulance was carrying a contaminated injured patient. Medical and radiological contamination information was relayed to the hospital, along with an estimated time of arrival. During transport, the EMT riding in the back with the patient had his gloves surveyed for contamination, and he simulated changing them when advised to so by the DEQ Technician.

As the ambulance approached the hospital, the driver telephoned his Dispatcher at 1042 hours and informed him that they were pulling into the hospital with their patient. Three minutes later, the ambulance arrived at the hospital at 1045 hours. The patient was transferred to the hospital personnel, who were provided with patient and survey

information by the EMTs and DEQ Technician. After patient transfer, the EMTs removed their gloves. The DEQ Technician advised them that they should go directly to the emergency worker decontamination center at the St. Joseph Fire Station, as they and the ambulance needed to be decontaminated.

#### Lakeland Medical Center, St Joseph

At 0932 hours, a Registered Nurse (RN) at Lakeland Medical Center, St. Joseph, received a telephone call from an Exercise Controller simulating a Berrien County Emergency Operations Center Dispatcher telephoning the hospital. The call alerted the hospital to prepare its REA to receive an injured and possibly contaminated patient. After receiving the telephone call, the hospital medical, maintenance, and security personnel began setting up the REA and ambulance entry area to receive the incoming ambulance with patient. The medical center received a telephone call from a Medic-1 Ambulance Service EMT at 1030 hours notifying the center that a contaminated injured patient was being transported to the center with an estimated time of arrival of 10 minutes. The EMTs informed the RN call taker of the nature of the patient's injury, physical condition of the patient, and results of radiological monitoring.

A hospital manager, three REA-trained nurses, a physician, and a DEQ Technician staffed the REA. The Buffer Nurse and, later in the drill, an additional DEQ Technician were stationed in the Buffer Zone area. The medical staff in the REA wore required radiation protection clothing, which included: long sleeved gowns, shoe covers, two pairs of surgeons gloves, a head cover, face mask, and splash shield. They also wore the required dosimetry. Prior to the arrival of the patient, the medical staff began to prepare and implement contamination control procedures within the REA. Charts and placards were attached to the walls of the REA that outlined radiation accident instructions, personal protective clothing removal procedures, and decontamination guidelines. Additional protective gloves, waste bags, and two fluid collection-holding tanks used to collect radioactive waste materials were placed in the REA.

The staff explained (by interview) that some items would be removed from the REA in order to limit the spread of contamination. Contamination sampling kits, Radiation Protection Clothing Packets, and radiation monitoring equipment used by the medical staff were taken from an equipment supply cabinet, which is maintained and restocked by D. C. Cook Nuclear Power Plant personnel after each use. The hospital staff explained that the cabinet is kept locked and is stored in a secure area.

Pre-cut yellow herculite was placed on the floor in the REA and Buffer Zone (clean area) to protect the areas from contamination. Yellow/magenta radiation boundary ropes and radiation warning signs were placed on metal stanchions in order to cordon-off an area in the parking lot and control access to the REA. The ambulance bay-unloading zone was also covered with pre-cut yellow herculite flooring. The REA was declared ready to receive a contaminated patient at 1040 hours. A medical center security guard maintained control of the emergency room entrance to ensure that no unauthorized individuals entered the radiation control zone.

The Medic-1 Ambulance arrived at Lakeland Medical Center, St. Joseph, at 1045 hours. The patient was successfully transferred to a clean gurney. A satisfactory transfer of the patient from the ambulance to the REA was completed, with hospital and ambulance personnel stationed at the boundaries of the transfer point. During the transfer of the patient from the ambulance to the REA, the EMTs provided information to the medical center staff regarding the patient's medical and contamination status. Once the transfer was complete, hospital medical personnel performed their own examination of the patient to determine his current medical status. The medical personnel gave particular attention to the patient's injuries and symptoms: chest pains, head injury, and scrapes to the left arm, all of which areas were simulated as being contaminated. The following patient values were reported: blood pressure 100/60, pulse 100 with oxygen, and respiration 28.

Once in the Treatment Room, the patient was connected to a cardiac monitor. A portable X-ray machine was available in the REA to X-ray the patient injuries, but it was not demonstrated. The DEQ Technician assisted the emergency room staff by surveying the patient and providing radiation protection services. The Buffer Zone Nurse maintained the REA's treatment and activity log and provided support, as necessary. Swab samples were taken from the patient's ears, nostrils, and mouth and were scanned for radioactive contamination. These items were placed in separate bags and labeled. It was reported that the samples would be sent to a laboratory for further analysis. Simulated blood samples were drawn from the patient. They were scanned for radioactive contamination and were included with the other samples going to the laboratory for processing. Good contamination control procedures were observed. Samples were kept separate from the contaminated patient and any other potential source of contamination.

After the patient was medically stabilized, procedures for decontamination of the patient were demonstrated and described by the DEQ Technician and the medical staff. An initial scan of the patient showed a contamination level of 15,000 cpm to the laceration on the left side of head and left arm and 9,000 cpm to the left knee. The medical team removed the patient's shirt and conducted decontamination procedures. Using sterile water, the medical team was able to reduce the radiation levels on the patient's head and left arm. The DEQ Technician surveyed the patient a second time and obtained a reading of 8,000 cpm on decontaminated patient's head, and 5,000 cpm on his left arm. The medical staff removed the clothing that covered the patient's left knee. After the clothing was removed, the DEQ Technician surveyed the knee, and it was considered clean.

The medical staff continued to decontaminate the patient by washing the affected areas, the patient was surveyed again and no contamination was detected. The patient was transferred to a fresh gurney in the clean zone and transported to the emergency room for further medical treatment of his wounds. The DEQ Technician instructed the medical staff to change their gloves numerous times throughout the drill. As the medical staff exited the REA, they performed the removal of their protective clothing under the guidance of both DEQ Technicians and the instructions posted on the wall inside the REA. Contaminated clothing and supplies were placed in designated waste containers, which would be removed by D. C. Cook Nuclear Power Plant personnel at a later time.