From: <Joseph_Hegner@dom.com>
To: <mls3@nrc.gov>
Date: Wed, Nov 5, 2003 9:14 AM
Subject: EP Documents- Second of Two

Mike,

The MCV radiation emergency plan is attached to this e-mail.

Joe H.

(See attached file: 021600 MCV Rad Emer Plan.pdf)

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Subject:	EP Documents- Second of Two
Creation Date:	Wed, Nov 5, 2003 9:08 AM
From:	<Joseph_Hegner@dom.com>
Created By:	Joseph_Hegner@dom.com

Recipients
nrc.gov
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MLS3 (Michael Scott)

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021600 MCV Rad Emer Plan.pdf	6247761	
Mime.822	8551147	

Options

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Priority:	Standard
Reply Requested:	No
Return Notification:	None
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Security:	Standard

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MEMORANDUM

Date: February 23, 2000

To: Mr. William F. Renz
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Glen Allen, Virginia 23883

From: Betty Schwab, M.P.H.
Radiation Safety Supervisor

Subject: **Radiation Emergency Plan**

Enclosed is the latest revision of the Radiation Emergency Plan. If there are older versions of the plan in your department, please discard the entire plan and replace with the enclosed revision dated February 16, 2000.

If you have any questions about the Radiation Emergency Plan, please contact me at 828-9131. Thank you.

RADIATION EMERGENCY PLAN

MCVH/VCU-VIRGINIA POWER

I. Introduction

The Medical College of Virginia Hospitals/Virginia Commonwealth University (MCVH/VCU) recognizes its responsibility as a major medical health care center to deal with radiation emergencies. The following plan is designed to provide medical care for either a major or minor radiation emergency in the central Virginia region.

The basic plan revolves around the Radiation Safety Section of the Office of Environmental Health & Safety (OEHS) and the MCVH Department of Emergency Medicine. The expertise and equipment necessary to deal with radiation hazards will be drawn from OEHS. The plan supports Virginia Power's nuclear reactor stations for occupational and/or major accidents. Financial costs for maintenance of the plan are borne by both Virginia Power and the University. Costs of services rendered during an actual emergency will be charged to the organization or individual serviced.

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II. Purpose

To provide MCVH/VCU with a plan of action for handling victims of radiation accidents who are suspected or known to have been, contaminated with radioactive material, or exposed to large amounts of gamma ray or x-ray radiation.

III. Objectives

- To treat and provide service to radiation victims using the best available medical standards ensuring that life saving actions take priority over contamination control.
- To avoid and minimize radiation exposure to hospital personnel and patients.
- To train and inform MCVH/VCU personnel in handling of radiation casualties.

IV. Definitions

Becquerel: The quantity of radioactive material in which one atom is transformed per second. The Becquerel (Bq) is a very small unit of activity and multiples are commonly used:

1 kilobecquerel (kBq) = 10^3 Bq.
1 megabecquerel (MBq) = 10^6 Bq.
1 gigabecquerel (Gbq) = 10^9 Bq.
1 terabecquerel (TBq) = 10^{12} Bq.

Controlled Area: That area controlled by the Radiation Safety Team in order to restrict the spread of contamination within the Department of Emergency Medicine or Sanger Hall. It shall include, but not be limited to the Department of Emergency Medicine, and/or the morgue, shower rooms B2-058 and B2-060, the immediate loading dock area. (See diagrams.)

Curie: The quantity of radioactive material in which 3.7×10^{-10} atoms are transformed per second. Given the symbol Ci, it can further be divided into mCi, uCi, and nCi, equal to 10^{-3}Ci, 10^{-6}Ci, and 10^{-9}Ci, respectively. In SI units, the new unit is the Becquerel. One Curie is equal to 3.7×10^{10} Bq.

Decontamination: The process of removing radioactive material from the external surfaces of a person, objects, etc.

Dose: A measure of energy deposited per unit mass from radiation. Basic unit is the Gray = 1 J/Kg (1 Gray = 100 rad and 1 rad = 100 ergs/gram).

Dosimeter: Any device that measures how much radiation to which an individual is exposed. (Example: Film Badge)

Dr. Yellow: A radiation emergency response involving more victims than the Department of Emergency Medicine can handle at one time necessitating the use of the Sanger Hall morgue (and additional staff) for decontaminating and treating victims.

Exposure: A measure of energy deposited from X or gamma radiation in air. The basic unit is the millicoulomb/kilogram (Roentgens times 0.258 equals exposure in mC/kg).

Externally Contaminated Patient: A patient who has radioactive material on the clothes or skin.

Hot Particles or "Fleas": Very small radioactive particles which may adhere to the victim's skin or clothing. They most commonly contain ^{60}Co or fission products, and range in size from approximately one μm to several hundreds of μm. Hot particles apparently become electrically charged as a result of radioactive decay and, therefore, tend to be fairly mobile, "hopping" from one surface to another.

Internally Contaminated Patient: A patient who is radioactive because of incorporation of radioactive materials in the body by ingestion, inhalation, absorption, or contamination in an open wound.

Irradiated Patient: A patient who has been exposed to high levels of radiation either as a whole body exposure or as an exposure to any part of the body. Depending on the severity of the exposure, the patient may demonstrate symptoms characteristic of the acute radiation syndrome. (See Appendix IV) Individuals exposed to neutron radiation may also be radioactive.

Monitoring Equipment: Any equipment used for the immediate detection of radiation. (Example: GM Counter)

Neutron-Irradiated Patient: A patient who is radioactive due to a very high exposure to neutrons.

Radiation Producing Device: Any electronic product that produces ionizing radiation when energized.

Radioactive Material: Any material which undergoes a spontaneous decay with the emission of radiation.

Radioactive Patient: An individual who has sustained an injury or is otherwise in need of medical treatment and is also contaminated with radioactive material.

Swipe Test: A piece of filter paper or a cotton swab wiped over an area to detect removable radioactivity. Removable radioactivity (if present) adheres to the paper or swab; it is then counted using the appropriate radiation detecting equipment.

V. Description of Potential Emergencies

A. Introduction

A radiation accident may be defined as an unforeseen occurrence which generates contaminated or irradiated patients. The MCVH/VCU Radiation Emergency Plan is a comprehensive plan designed to deal with radiation emergencies which might occur in the central Virginia area. Listed below are brief descriptions of potential radiation emergencies.

B. Potential Emergencies

Transportation: A large volume of radioactive materials is transported throughout the central Virginia area (radiopharmaceuticals, sealed sources, reactor fuel, etc.). The likelihood of a transportation accident occurring in this area resulting in the contamination or irradiation of a number of individuals is small. Usually nearly complete decontamination should be accomplished at the accident site before transporting the patient.

Industrial: There are a number of companies in the central Virginia area using radioactive sources for different industrial purposes (tank monitors, density evaluation, etc.). Most of these sources are sealed. Failure of the container is very unlikely. If, however, this should occur, medical injuries will probably be relatively minor. Assessment of internal uptake should be the major concern.

Power Reactors: There are presently four (4) operating power reactors in Virginia. Inherent in this plan is the ability to deal with occupational and major reactor accidents occurring at these power reactor stations. Occupational accidents will generally be of a minor nature (cuts, contaminated wounds, abrasions, etc.). Usually nearly complete decontamination should be accomplished at the accident site before transporting the patient. Although the likelihood of a major reactor accident is extremely small, the Nuclear Regulatory Commission requires that these power reactor stations maintain a plan for dealing with the patients generated by a reactor accident. If a major accident occurs, this plan can handle up to ten (10) patients at a time. Contamination and/or irradiation problems should be expected. Medical needs may vary from minor abrasions to major surgery.

Hospitals: Many hospitals in the area use radioactive material and/or radiation producing devices. Accidents may also occur within MCVH. Generally these will be of a minor nature and can be dealt with on location. Accidents in Radiation Therapy or Diagnostic Radiology rarely occur. Radiation exposure to the whole body and to the hands and forearms is possible in these areas due either to an equipment malfunction or to improper working techniques. Medically injured individuals need not be treated by this plan unless they are contaminated with radioactive materials.

Research: Many of the Universities and other research institutions in the area use radioactive materials and radiation producing devices for research purposes. Activity levels and radiation levels are generally very small. If an accident should occur, partial decontamination can be accomplished at the accident site before transporting the patient. Most accidents in these facilities will be of a minor nature.

VI. Types of Exposure to Victims

There are three situations to keep in mind in considering the medical problems of a victim of a radiation accident. The first is contamination, in which a radioactive material, in the form of dust, solid particles or liquid, becomes physically attached to the victim's skin or clothes. This can be detected by proper monitoring of the patient and may consist of alpha, beta or gamma emitters, depending on the type of isotope in the contaminant. This type of accident requires physical decontamination. (See definition of "hot particle".)

The second situation is incorporation or internal contamination, in which a radioactive material, in the form of dust, solid particles, or liquid, is inhaled or ingested or contaminates an open wound. In this case, the radioactive material will be able to irradiate internal tissues, causing much more extensive cellular damage than external contamination. Many radioactive elements become biologically and essentially permanently incorporated into the body's molecules. In addition, elements such as uranium pose a toxic threat, as do nonradioactive heavy metals. Such a situation requires immediate decorporation. Treatment for internal contamination is most effective when initiated at the earliest possible time after exposure. For assistance with internally contaminated victims, contact the Radiation Emergency Assistance Center/Training Site (REACTS). (See Appendix XI)

The third situation is irradiation, in which the patient has been subjected to a high flux of gamma rays or x-rays. As such, the patient is not radioactive and no radiation will be detected on his body or clothes. Tissue damage will manifest itself in time. The irradiation may be local, such as exposure of a hand, or total body. Radiation to the total body may produce the radiation syndrome. Although the details of the radiation syndrome are not relevant to emergency department care, the early symptoms should be familiar to emergency department personnel and should be noted on the patient's chart. Exposure to a high flux of neutrons can result in neutron activation.

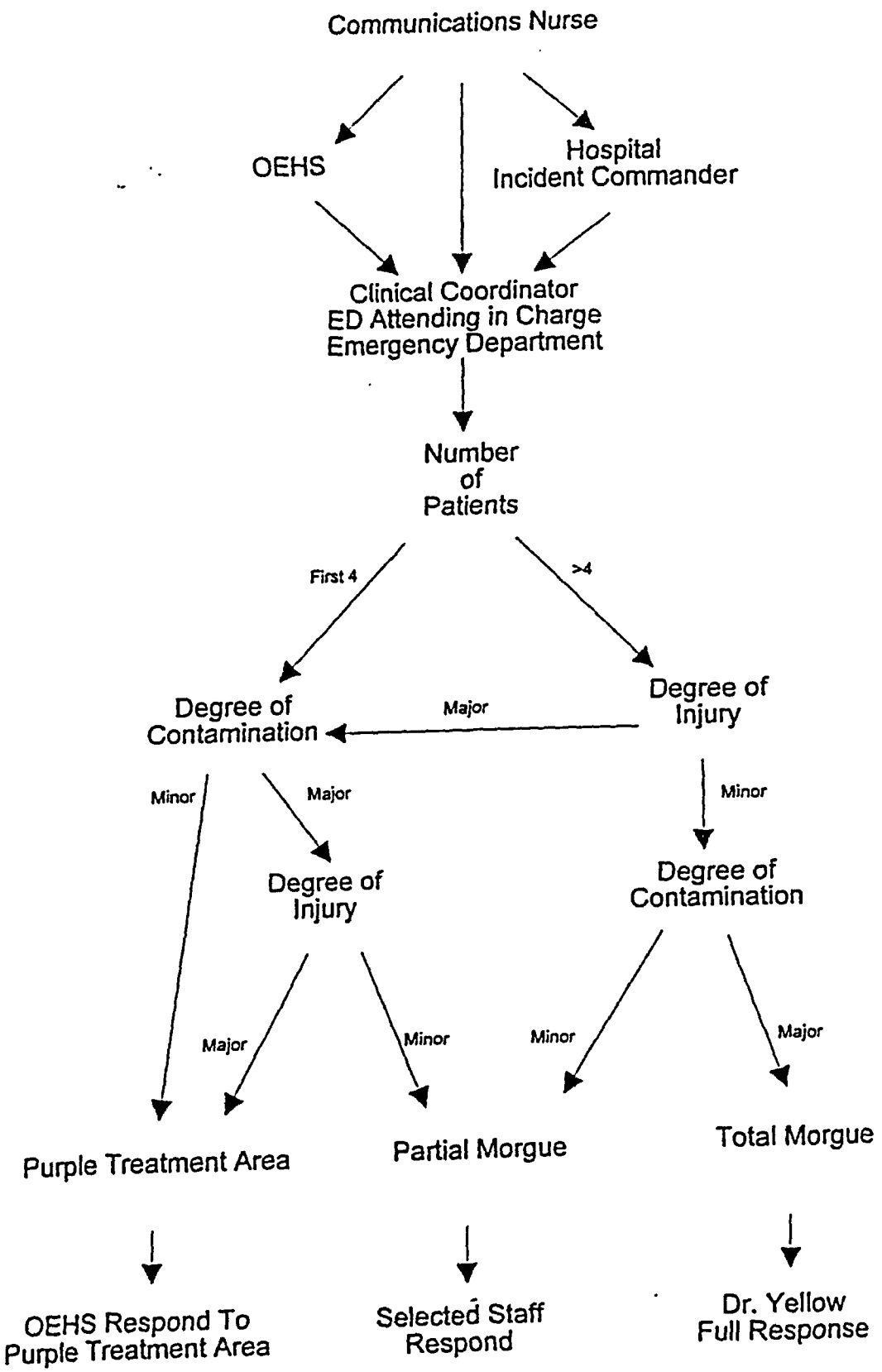
VII. Radiation Emergency Response

A. Introduction

In the event of a major radiation accident, either at one of Virginia Power's reactors or elsewhere in the central Virginia region, it is likely that a number of individuals will require immediate medical attention. Sometimes, lifesaving measures may be necessary. The fact that these individuals may be contaminated and/or radioactive will require that special precautions be taken. The following plan is designed to handle a maximum of ten (10) patients at any one time. The number of patients, the severity of injuries and the degree of contamination are the factors which will determine the routing of the patients. Victims will be brought to a triage area outside the entrance to the decontamination rooms in the Department of Emergency Medicine. If possible, all victims will be decontaminated and treated in the Department of Emergency Medicine on the ground floor of Main Hospital. If there are more victims than can be handled at one time in the Department of Emergency Medicine, the Sanger Hall morgue area will be initially used for contaminated victims with minor or no injuries. When an overflow of victims requires the use of the Sanger Hall morgue, a "Dr. Yellow" radiation emergency alert is called. The MCVH/VCU Department of Emergency Medicine area is equipped to treat as many as four (4) contaminated patients at one time depending upon the degree of emergency medical care needed.

The MCVH/VCU emergency response time (the time required to establish the controlled areas in the Department of Emergency Medicine and/or morgue area, and assemble and fully prepare the necessary medical and radiological staff) is approximately twenty to forty-five minutes during normal working hours (Mon-Fri, 8:00-4:30). After-hours response is dependent on time of day and the location of on-call staff.

Radiation Emergency Routing Diagram



B. Notification

1. For a radiation emergency involving victims that will be transported to MCVH, the initial notification should be routed to the Communication Nurse at 828-8888. This line is manned 24 hours/day. The Communication Nurse will inform the Radiation Safety Staff at the Radiation Emergency Line (828-9834), and the ED Clinical Coordinator. The emergency line accepts calls 24 hours/day. After working hours, emergency calls are transferred to Hospital Telepage and operators there will contact the Radiation Safety staff. The Clinical Coordinator will in turn notify the Hospital Incident Commander, ED Attending in Charge, and Registered Nurse Manager of Medical/Surgical ED or the Nurse-Manager on-call.

2. The Hospital Incident Commander, in conjunction with the ED Clinical Coordinator, will determine the level of response necessary for the number of casualties, severity of injuries involved, and the available beds in the Department of Emergency Medicine.

3. The person receiving the initial call will record the name and location of the caller and also obtain the necessary information about the accident. As much of the following information as possible about the accident and victims should be recorded:

   a. Time that the incident occurred.
   b. Number of victims.
   c. Severity of injuries and status of victims.
   d. Exposure rate from victims and/or clothing (mR/hr)
   e. Location, amount and source of contamination (cpm or dpm)
   f. If there are neutron-irradiated victims.
   g. Estimate of dose received by victims.
   h. If there is airborne contamination
   i. Estimated time of arrival.
   j. Contact person and call back number for additional information.

4. External Disaster Plan: If there are a large number of victims, the Hospital Incident Commander and the Clinical Coordinator will decide whether it will be necessary to utilize the Sanger Hall morgue location. **A *"Dr. Yellow"* alert will be called only when Sanger Hall will be used for decontamination and treatment of victims.**

   a. If a "Dr. Yellow" alert is necessary, verify the notification call as genuine by confirming it with the caller (For the Virginia Power Surry Reactor Plant, call the shift supervisor at Surry Main Control Room (757) 365-2201, 365-2202, or 365-2204. If no answer, call (757)357-7035. For the North Anna Reactor Plant, call the Main Control Room at (540) 894-2512, or 894-2521.

   b. If the Sanger Hall morgue area will be utilized and a "Dr. Yellow" alert is called, the Hospital Incident Commander will instruct Telepage (828-0957) to make the "Dr. Yellow" announcement (warning sound; "Dr. Yellow", "Dr. Yellow", B-2 Sanger Hall; repeat) and to start contacting members on the alert list. (See Appendix X)

C. In Route Communications During Transportation to MCVH

In the event of a Virginia Power accident, Virginia Power is responsible for transporting the injured persons to MCVH via the established routes. If helicopter service is used, the helicopter should be routed to the emergency landing area in "I" parking lot. Emergency vehicle transportation will be waiting. The Department of Emergency Medicine at MCVH currently has three systems for communication with incoming ambulances:

1. The HEAR (Hospital Emergency and Administrative Radio) system, operating on 155.340 MHZ, is available for relaying vital medical information from the ambulance rescue team to MCVH Department of Emergency Medicine. The call number for the HEAR system is KX2-473. The Department of Emergency Medicine can then dispatch this information to the Medical Director for further evaluation, or cellular phones can be used for communication

2. COR (Coronary Observation Radio) System: current frequencies are MED 1, MED 4, MED 5, MED 8.

3. Cellular telephone.

D. External Staff

1. Hospital Incident Commander: Upon receiving notification of a radiation accident the Hospital Incident Commander, in conjunction with the ED Clinical Coordinator, will evaluate the need to initiate the External Disaster Plan. The Hospital Incident Commander will notify the VCU Police to secure the arrival site at the Main Hospital Department of Emergency Medicine and at Sanger Hall only if a Dr. Yellow alert is initiated. If necessary, the Hospital Incident Commander will also arrange transportation from the I Lot helipad to MCVH if helicopter services are to be utilized.

2. University News Services (UNS): The UNS representative is responsible for the handling of all information released to the news media. The UNS representative may be called upon by Radiation Safety to help prevent unauthorized members of the press from entering the controlled area. All news releases will be cleared with the UNS representative (and Virginia Power officials, if involved in the emergency).

3. Housekeeping Staff: For a Sanger Hall response, the Housekeeping Staff located on the B-2 level of Sanger Hall are responsible for removing all vehicles from the loading dock area and closing off and securing their area adjacent to the morgue.

E. Internal Staff: Job Descriptions

1. Radiation Safety Director: The Radiation Safety Director, along with the Medical Director, is responsible for coordinating all radiation emergency activities within MCVH/VCU. The Radiation Safety Director has unrestricted authority in deciding what measures should be taken regarding personnel within the controlled area. The Radiation Safety Director and the Medical Director will evaluate all patient needs.

   The Radiation Safety Director:

   a. Is responsible for alerting those members of the Radiation Safety Team considered necessary.

   b. In conjunction with the Medical Director, the Radiation Safety Director will evaluate the arriving casualties and decide how to prioritize and where to route each victim.

2. Radiation Safety Staff: Depending on the number of individuals responding to the emergency, some may be responsible for more than one of the following job descriptions. If the Sanger Hall morgue is utilized for an overflow of victims, more than one person may be assigned to a job description.

a. Evaluator of Casualties: The Evaluator of Casualties is in charge of the decontamination of patients routed to his/her area. Because the evaluation of radiation dose to casualties is very difficult, accurate notes will be recorded and samples/swipes taken for further analysis.

b. Personnel Monitoring Specialist: The Personnel Monitoring Specialist will see that all persons in the controlled area are properly outfitted with protective clothing and dosimeters as needed. This person is responsible for the radiation monitoring of MCVH/VCU personnel.

1. The need for dosimeter usage and the range of dosimeters needed will be decided by the Radiation Safety Director based on the exposure rate from the victims. A "Dosimeter Assignment for Radiation Emergency Workers" form (Appendix VII) will be completed for each individual wearing a dosimeter.

2. Self reading dosimeters should be read every 30 minutes at a minimum. The Radiation Safety Director is notified when readings of 3 rem are reached so that replacement workers can be found by the time the turn back level, 5 rem, is reached. When a reading of 3 rem is reached, the Radiation Safety Director will determine if the limit for that emergency worker should be extended to 25 rem for lifesaving measures. The risks must be explained to the emergency worker and the worker's acceptance of the extension is voluntary.

3. The protective articles below will be available for workers in the controlled areas. The Radiation Safety Director will determine which of the following items are necessary.

a) Coveralls
b) Waterproof shoe covers
c) head cover
d) surgical gloves
e) surgical mask
f) protective eye goggles
g) respirators

c. Area Monitoring Specialist: The Area Monitoring Specialist will check for contamination throughout the controlled area and receiving areas.

1. As soon as notification is received, cordons off the area to be controlled with rope and warning signs that read Caution: Radioactive Materials - Do Not Enter Without Permission".

2. In conjunction with VCU Police, ensures that no unauthorized persons enter the area.

3. Keeps the area as free of contamination by mopping up spills, etc.

4. Prevents spread of contamination from the main decontamination areas into the non-controlled areas.

5. Periodically monitors the incoming and triage areas, as well as support personnel, and decontaminates where necessary. Monitors the transporting vehicles and the personnel in the vehicles and decontaminates the vehicles, if necessary.

d. Analytic Lab Counting Specialist: The Analytic Lab Counting Specialist will coordinate all radioactive analysis procedures and keep accurate records of counting results.

1. This person will be familiar with the operation of all counting instruments in the Radiation Safety laboratory.

2. The gas proportional counter will be used for the detection of alpha and beta contamination.

3. The liquid scintillation counter will be used for the detection of tritium and other weak beta emitters from swipe samples and urine samples.

4. Two multichannel analyzers, each equipped with a NaI crystal, will be available to detect gamma radiation from samples, radioactive iodine in the thyroid or other radionuclides deposited within the body.

3. Medical Director: The Medical Director is in charge of all medical aspects of the emergency plan. The Medical Director works with the Radiation Safety Director to evaluate the needs and insure the safety of all patients and personnel within the controlled area.

4. Medical Staff

a. The medical staff located in both the Emergency Department decontamination area and the Sanger Hall morgue area shall be capable of providing all necessary medical support. The number of doctors and nurses assigned will be decided by the Medical Director. The Trauma ED Charge Nurse will coordinate notification of the Emergency Department staff, the Radiation Safety staff, the Hospital Incident Commander, and ED Radiology.

b. If the Sanger Hall morgue area is used, the Medical Director will appoint the appropriate individuals to provide general first aid and/or any pre-operational medical care.

c. If the morgue area is used, the Medical Director and designated support staff will be located in the triage area to evaluate all incoming cases.

d. If there are multiple victims, paramedical personnel able to assist in the transfer of patients from incoming vehicles will be located in the triage area of the Emergency Department and, if needed, on the loading dock of Sanger Hall.

5. VCU Police: The VCU police will be called upon to prevent unnecessary vehicles from entering the area and to keep unauthorized personnel away from the controlled areas.

a. In the Emergency Department, one officer will secure the area in the ED driveway where the emergency vehicle will arrive. This officer should secure this area until it has been released for public use by the Radiation Safety team.

b. A second officer will be stationed at the 12th Street entrance to the Emergency Department driveway to direct incoming vehicles and to prevent unauthorized individuals from entering the controlled area.

When Sanger Hall is utilized:

a. One police officer will be located at the Marshall Street entrance to the Sanger Hall loading dock to direct incoming vehicles. Only authorized vehicles will be allowed to enter the loading dock.

b. One police officer will be located on the loading dock to direct incoming vehicles and aid in the control of unauthorized individuals.

c. One police officer will be located at the east end of the hallway outside Radiation Safety to insure that only authorized individuals enter the controlled area.

d. One police officer shall insure that the elevators that open into the controlled area are locked on the B-2 level of Sanger Hall and that no one uses them.

e. Additional police officers responding shall be utilized for controlling and routing traffic outside of Sanger Hall and the receiving area.

F. Internal Support Services

1. Hospital Transportation: When the Sanger Hall morgue area is utilized, the Hospital Transportation Department will be notified to provide four (4) stretchers and three (3) persons to wait in the corridor outside of OEHS. These individuals will be responsible for transporting patients from the controlled area to the Emergency Department in the Main Hospital.

2. Central Service: When the Sanger Hall/morgue area is utilized, Central Service is responsible for bringing two (2) life packs, each including one (1) defibrillator and one (1) heart monitor, one (1) adult code blue cart, and two (2) portable oxygen setups with stands, to the corridor outside the morgue area. A pediatric Code Blue cart is available by request.

3. Pharmacy: When the Sanger Hall morgue area is utilized, the Pharmacy Department will provide and deliver drugs to the morgue area as needed. Call the main inpatient pharmacy at 8-0364 to initiate delivery.

G. Equipment Available to OEHS

The following equipment and instruments are available for a radiation emergency response in the Sanger Hall morgue area.

1. Equipment for Radiation Safety Director
   a. Beta/gamma Geiger counter.
   b. Ion chamber survey meter.
   c. Alpha monitor.
   d. Clipboard with pad and pencil.
   e. Mini-Scaler and Lemo probe.

2. Equipment for Evaluator of Casualties
   a. Beta/gamma Geiger counter.
   b. Clipboard with pad, pencil, and felt marker.
   c. Decontamination supplies.

3. Equipment for Personnel Monitoring Specialist

   a. Beta/gamma geiger counter.
   b. Self-reading dosimeters (1R and 5R).
   c. Based on availability, temporary film badges will be issued to personnel who are not already assigned routine monitors.
   d. Clipboard with pad, pencil, and felt marker.
   e. Personnel protective clothing.

4. Equipment for Area Monitoring Specialist

   a. Beta/gamma Geiger counter.
   b. Air Sampler.

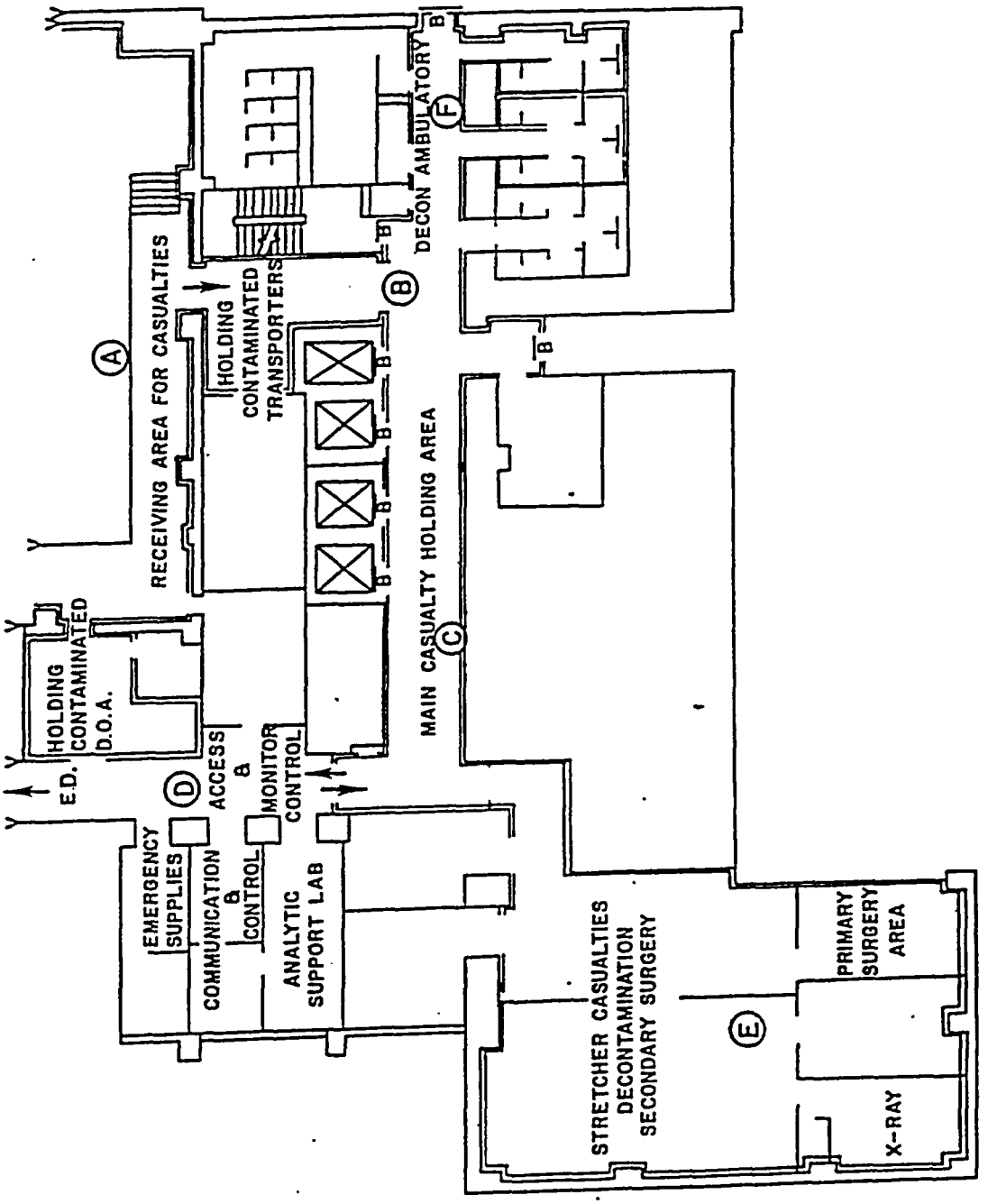
5. Equipment for Analytic Lab Specialist

   a. Gas Proportional Counter.
   b. Liquid Scintillation Counter.
   c. Multichannel Analyzer with NaI well crystal.
   d. Multichannel Analyzer with NaI 2x2 crystal.
   e. Multichannel Analyzer with NaI 3x3 crystal.
   f. Portable gas proportional detector.

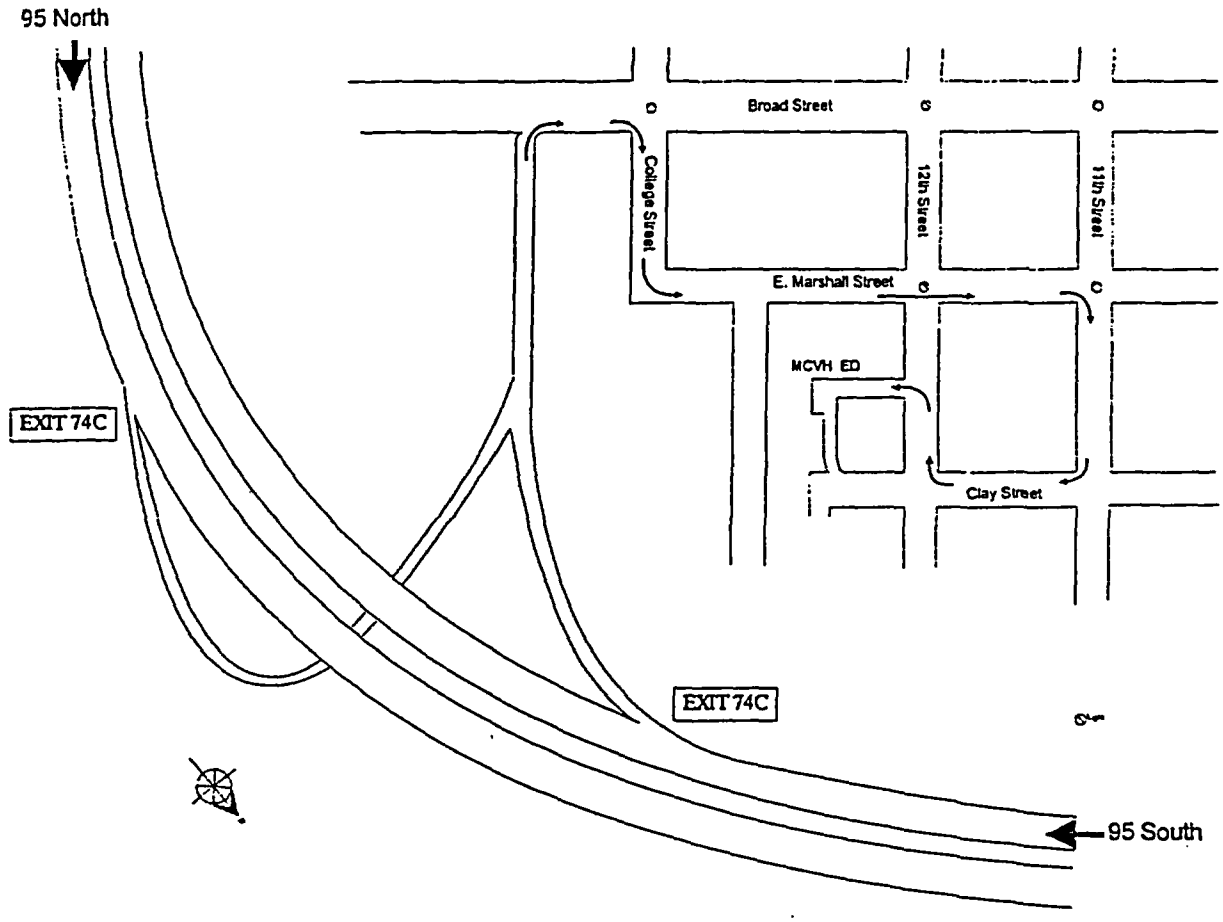
H. Medical Equipment Available to the Area

1. Two "Lifepak 6" defibrillators.
2. One adult code blue cart.
3. Two-portable oxygen setups.
4. Three I.V. poles.
5. Four stretchers and three attendants (to respond to morgue).

Sanger Hall Control Area



Incoming Vehicle Route



I. Equipment Available to Safety Office Personnel

The following emergency equipment is maintained in cabinets in The Emergency Department:

ITEM	MINIMUM QUANTITY
30 gallon drainage drums	2 each
Herculité mats for The Emergency Department and outside receiving area	
Water hoses	2 each
Sampling kits containing: 1 patient data sheet 12 plastic screw top tubes with cotton swabs 6 specimen cups 3 medicine dropper bottles 1 bulb syringe 1 magic marker	2 kits
Terri Wipes	1 box
Cotton tipped applicators	1 bag
Radioactive tags	15 each
Clipboards with paper & pencils	2 each
NaI detector with alpha probe	1 each
Geiger counter	1 each
Ionization chamber	1 each
Check source - ^{137}Cs	3 each
Large plastic bags	10 bags
Decontamination tubs with hoses	2 each
Barrier sign on stand	1 each
Brown paper	1 roll
Lead pig	1 each
1 R pocket dosimeters	10 each
5 R pocket dosimeters	6 each
"Caution-Radioactive Materials" sign	1 each
Masking tape	3 rolls

The items below are stocked by The Emergency Department.

ITEM	MINIMUM QUANTITY
NaCl solution for irrigation	20 each
Tide soap powder	1 box
Lava soap	2 bars
Sterile surgical gloves	2 boxes each for sizes 7, 7 1/2, and 8
Non-sterile exam gloves	1 box each for sizes 7, 7 1/2, and 8
Surgical masks	1 box
Tyvek suits, medium, with hoods and feet	10 each
Tyvek suits, large, with hoods and feet	10 each
Tyvek suits, XL, with hoods and feet	10 each
Tyvek suits, XXL, with hoods and feet	10 each
Stethoscopes	2 each
Plastic shoe covers	20 pairs
Disposable respirators (Expiration Date)	12 each
Safety glasses	12 pair
Telephone receiver	1 each
Clock	1 each
Scissors	3 pair
Sterile gauze pads/sponges	4 boxes
Lotion Soap	4 containers
Nitrile Gloves (L,XL)	2 boxes each
Mask Particulate Respirators (Technol)	2 boxes
Melt-a-way Water Soluble Linen Bags	25 bags
Baking Soda	3 10 lb. boxes

Medical College of Virginia Hospitals
Emergency Medical Services

Policy and Procedure Manual

SUBJECT:	File Section:	H
CARE OF PERSONS EXPOSED TO	Original Date:	12/90
HAZARDOUS/RADIOACTIVE MATERIAL	Review Date:	12/99
	Effective Date:	2/00

POLICY:

The Department of Emergency Medicine staff shall follow a described plan to safeguard patients and staff when a patient has been or is suspected to have been exposed to hazardous substances or radioactive materials.

PROCEDURES

1. The Communication Nurse or any ED employee receiving notification of the impending arrival of a patient contaminated with a potentially hazardous or radioactive material should immediately notify the Clinical Coordinator and the E.D. Attending in Charge.
2. The following information, at minimum, should be obtained from the informant and entered on the HazMat/Radiation Emergency Form:
   a. Is this a radiation or a chemical exposure?
   b. What is the substance? Obtain specific information including the placard number displayed on the vehicle, if applicable.
   c. What is the mechanism of exposure? (ex: inhalation, skin contamination, ingestion)?
   d. Is there a known airborne hazard?
   e. Number of victims?
   f. Status of the victims; what injuries have been identified?
   g. What type of treatment has been rendered in the field?
   h. ETA?
   i. Contact person and call back phone number for additional information.

   For a radiation emergency only, also obtain the following information, if known:

   j. Location, amount, and source of contamination in cpm or dpm.
   k. If there are neutron irradiated victims.
   l. Estimated dose received by victim(s).
   m. Are there any hot particles ("fleas").
3. The following notification will be made by the Communication Nurse:
   a. Notify the Office of Environmental Health and Safety at 828-9834. After working hours, emergency calls are transferred to Telepage. State specifically whether the emergency is a chemical or a radiation emergency. Instruct the Telepage operator as follows: "Please contact an individual on the CHEMICAL EMERGENCY LIST (OR RADIATION EMERGENCY LIST) to call the ED". If no response is obtained via telepage within 5-10 minutes, contact the OEHS staff directly via the long-range beeper system.
   b. Relay information to the following individuals:
      1. Emergency Department Clinical Coordinator
      2. Hospital Incident Commander.
      3. ED Attending In Charge (appoints Medical Director)
      4. Registered Nurse Manager of Medical/Surgical ED or Nurse Manager on-call.
      5. ED Registration Supervisor.
      6. ED Radiology - to have a radiologic technologist available to perform mobile x-ray examinations if needed.

4. The Hospital Incident Commander will notify VCU Police to secure the arrival site, if indicated. If the number of victims or severity of injuries and exposure is beyond the capacity of the Purple Treatment Area, the Hospital Incident Commander in conjunction with the ED Clinical Coordinator, will evaluate the need to initiate the External disaster plan.

5. If the emergency involves a chemical exposure, the Clinical Coordinator should obtain relevant information from the Poison Center.

6. After the Radiation Safety (or Hazardous Materials) and Medical teams report to the Purple Treatment Area (and the Sanger Hall morgue area, if needed), the Radiation (or Chemical) Safety Director and the Medical Director will assign job tasks for the team.

7. The decontamination areas will be prepared and individuals who are assigned to the controlled areas will dress in protective clothing and will wear dosimeters as directed by the Radiation (or Chemical) Safety Director.

8. Incoming patient flow will be as follows: Victims are received in the triage area in the Emergency Department drive. The victim(s) will be assessed in the ambulance by the Medical Director and the Radiation (or Chemical) Safety Director. Based on the medical and radiological/chemical evaluations, the victims will be decontaminated and treated in either the Purple Treatment Area, or transported to the Sanger Hall morgue area. In the morgue area the victims will be decontaminated and medically treated, or stabilized and then transported back to the Emergency Department to be admitted or released. EMERGENCY LIFESAVING MEASURES ARE TO ALWAYS TAKE PRECEDENCE OVER DECONTAMINATION ACTIVITIES.

9. Instruct pre-hospital care providers to remain with their vehicles until they and their vehicles can be thoroughly surveyed, decontaminated, and released for duty by the OEHS.

10. Transport the injured victims(s) to the designated, prepared rooms in the Purple Treatment Area via the doorway that connects the ambulance entrance to the Purple Treatment Area. Place the victim(s) on decontamination tubs that have been strapped to the stretchers.

11. Rooms G-211, 212, 213, 214 in the Purple Treatment Area will be used for all patients seen in the ED unless the number of patients requiring medical care and decontamination exceeds the space available in the designated rooms. In such an event, the Clinical Coordinator, in consultation with the OEHS staff and Medical Director, will determine the placement of patients.

12. Unstable, contaminated patients will be managed in the decontamination area. Necessary monitoring equipment and any other life-support equipment will be transported to the decontamination area. The Radiation (or Chemical) Safety Director, in consultation with the Medical Director, will make the final decision regarding relocation of the patient(s) from the decontamination area.

Preparation of Decontamination Area

All members of the Radiation (or Hazardous Materials) Safety team notified to assist in the handling of the emergency will assemble in the MCVH Department of Emergency Medicine. The Radiation (or Chemical) Safety Director (or team leader) will assign specific positions and responsibilities to each person. (See Emergency Team and Areas of Responsibility).

The emergency cabinets in the treatment and decontamination rooms in the Purple Treatment Area will be opened and the appropriate protective clothing and equipment will be distributed. The responding personnel will be matched to the job descriptions according to their medical and/or radiological/hazardous materials specialties.

To prepare area:

1. Cut on the exhaust fans.
2. Personnel preparation:
   a. Put on Tyvek jumpsuit and head cover.
   b. Put on shoe covers and tape to legs of jumpsuit.
   c. Put on one pair of surgical gloves and tape to sleeves of jumpsuit. Put on a second pair, untaped so that outer gloves can be changed when necessary.
   d. Put on surgical mask if deemed necessary by the Radiation Safety (or Chemical) Director. (Wear respirators if there is airborne radioactivity or chemicals.)
   e. Assign and wear pocket dosimeters *(radiation emergencies only)* as needed.
   f. Place a strip of masking tape on each person designating their job duties, such as R.N. for nurses, M.D. for physicians, Radiation (or Chemical) Safety Director, Radiation Safety staff, etc.
3. Prepare the area using the following materials from cabinets in the Purple Treatment Area. The nurse(s) assigned should assemble medical supplies such as gauze, scissors, saline, etc. in each decontamination room.
   a. Rope to cordon off the area.
   b. Decontamination tub--buckle underneath stretcher.
   c. Hose and carboys.
   d. Clipboard and paper to record events.
   e Absorbent paper, Terri wipes, sheets.
   f. Large plastic bags for contaminated trash--place on linen stand. Place one in the decontamination room and one bag in the hallway where personnel will leave the controlled area. Label bags as radioactive or hazardous waste before removing from controlled area.
   g. Large plastic bag for victim's clothing and articles.

      For a radiation emergency only.
   h. Herculite mats for hallway, decontamination rooms, and emergency vehicle receiving areas.
   i. Self-reading dosimeters.
   j. Radiation signs with rope.
   k. Sample taking kit(s).
   l. Geiger counters and survey meters. Check background in an uncontaminated area and document. Cover probes if deemed necessary by the Radiation Safety Director.
   m. If there is time, cover light switches and door knobs with tape.
   n. "Caution-Radioactive Materials" sign for the outside door to the Purple Treatment Area.
   o. Lead pigs for contaminated specimens.

Radiation Exposure Control and Dose Limits

1. General Population: Up to 5 rem
2. <u>Emergency Workers</u>:
   a. Under 18 years: 0.5 rem
   b. Declared pregnant females: 0.5 rem
   c. Turn back level: 5 rem
   d. Lifesaving activities: 25 rem per event
3. Self-reading dosimeters should be read every 30 minutes at a minimum, and the Radiation Safety Director notified at 3 rem so that a replacement worker can be found. At 3 rem, the Radiation Safety Director will determine if the limit should be extended to 25 rem. This may be done once per event for a lifesaving mission or for the protection of the larger population. The risks must be explained to the emergency worker and the worker's acceptance of the extension is voluntary.

Decontamination of Patients

1. When an ambulance arrives at the Emergency Department, the victims will be assessed by both the Medical Director and the Radiation (or Chemical) Safety Director.

2. Transport the patient(s) on the decontamination tub that has been strapped to a stretcher to the designated rooms in the Purple Treatment Area (G-211, 212, 213, and 214) via the doorway to the Purple Treatment Area entrance.

3. After stabilization and emergency medical treatment of the patient is achieved, initiate decontamination procedures as follows:

   a. If the patient's clothes are contaminated, remove and place them in a plastic bag, and label them with the patient's name and a tag stating "Radioactive - DO NOT DISCARD" or "Hazardous Materials - DO NOT DISCARD". The Radiation (or Hazardous Materials) Safety team will be responsible for decontamination activities associated with the patient's belongings.

   b. If requested by the Radiation Safety Director, skin wipes and evaluation of internal contamination will be done, i.e., cotton swab samples of ear canals, nostrils and mouth. These swabs will be placed in separate containers labeled with the patient's ID # and sample # *(radiation emergencies only)*.

   c. Determine the extent of radiation contamination by holding the radiation detection instrument probe about ½ inch from the item or person and slowly monitoring the entire body, front and back. Record the radiation exposure values and radioactive contamination levels at known distances and sites. Decontamination is to be done in the following priority:

      1. Contaminated open wounds
      2. Contaminated eyes
      3. Contaminated nostrils or mouth
      4. Contaminated ear canals
      5. Contaminated intact skin
      6. Contaminated hair

      If a hot particle or "flea" is found, it should be isolated and removed to a shielded container. A piece of tape, with the sticky side out, can be useful in securing a hot particle.

      If radioactivity is distributed throughout the body and hair, it may be due to neutron activation. In this case a sample of hair will be taken for further analysis and a quick estimate of whole body neutron exposure will be made as follows:

      Place a GM tube against the abdomen with the person bent over or, if this is not practical, under the armpit (keep away from local contamination). The neutron dose received can then be estimated (from the ^{24}Na produced) using the following calculations:

      If surveyed at two (2) hours after accident

$$\text{Dose (rads)} = \frac{8{,}000 \times \text{mR/hr}}{\text{Body wt.(lbs.)}}$$

      If surveyed at fifteen (15) hours after accident

$$\text{Dose (rads)} = \frac{16{,}000 \times \text{mR/hr}}{\text{Body wt. (lbs.)}}$$

      If after decontamination the exposure level at one meter is less than 20 mR/hr, the patient may be released to hospital areas (with the proper warning labels).

d. Open Wounds: The first priority in the decontamination procedure should be contaminated open wounds because these areas allow for rapid incorporation of radionuclides or hazardous materials. Decorporation procedures should be started and irrigation of the wound should begin with copious amounts of normal saline for at least three minutes and repeated as needed. If monitoring shows persistent radioactive contamination, wash with 3% hydrogen peroxide. If repeated monitoring shows that contamination persists, gentle surgical debridement of the surface tissue of the wound should be done. It need not be radical, as most of the contamination will adhere to the outer surface of the wound. Deep debridement and excision should be necessary only when particles or pieces of radioactive material have been imploded into the tissues. Any tissue removed should be placed in a tube and then placed in a lead container for later analysis.

e. Eyes, Nose, and Ears: If radioactive or hazardous material is found in the eyes, gentle irrigation should be undertaken with the stream diverted away from the medial canthus so that it does not force material into the lacrimal duct. Contaminated nose and ear canals should be gently irrigated with frequent suction so that radioactive and hazardous material is not forced deeper into those cavities. It is very important to take immediate action if radioactive or hazardous material is found in the oral cavity, because if it reaches the stomach, internal contamination and incorporation will occur. Gentle irrigation and suction should be started promptly with the mouth turned sideways or down (as the patient's condition allows) so that the irrigation solution runs out of the mouth and is not swallowed. After the mouth has been decontaminated, a nasogastric tube should be inserted into the stomach in order to determine whether radioactive material is present. If so, decorporation should be started, and lavage should be instigated with normal saline in small aliquots (less than 300 cc's) so that the stomach contents are not forced through the pyloric sphincter.

f. Skin: The skin is naturally the most common area of the body to be contaminated. However, gentle scrubbing with soap and tepid water is usually all that is needed to remove the contamination. Hot water should not be used because it causes cutaneous vasodilatation, and this increases the chances of incorporation. For the same reason, a stiff brush should not be used and the area should not be scrubbed too vigorously. If contamination persists after two or three washings, Lava[R] soap can be used as a gentle abrasive. If contamination persists, use a mixture of ½ Tide[R] and ½ cornmeal. As a last resort use bleach, full strength for small areas, diluted for larger areas. (See Appendix II for more personnel decontamination information.) If skin abrasions occur during decontamination, the procedures should be discontinued.

g. Hair: Hair can usually be decontaminated with repeated shampooing with soap and tepid water. If contamination persists, the hair can be removed with clippers, but the scalp should not be shaved, for any breaking of the skin will allow incorporation.

4. If specialized medical treatment is required for patients with ingestion or massive exposure of radiation, the physician directly involved in the management of radiation accident victims can request assistance from the Radiation Emergency Assistance Center/Training Site (REAC/TS) in Oak Ridge, Tennessee. REAC/TS provides telephone consultation on a 24-hour basis, or a response team, after consultation with a Radiation Safety staff member, can be dispatched, if necessary. REAC/TS will accept patients, following initial treatment and provide treatment related to their radiation injuries. REAC/TS can be contacted using the 24 hour emergency number:

(423)481-1000 or (423) 576-3131 (ask for REAC Department)

a. Obtain radiation meter readings throughout the decontamination procedure by the Radiation Safety staff and record. Samples of blood, urine, irrigation fluid from wounds, etc. may be ordered by the Radiation Safety Director to assess contamination levels and possible internal dose estimates.

b. If post-decontamination skin, wound or orifice wipes are ordered by the Radiation Safety Director, dry the patient's body thoroughly and re-swab all previously contaminated areas with cotton-tipped applicators. Mark as "post-decontamination" specimens and store for later analysis by Radiation Safety.

3. When contamination levels are found to be <2,000 dpm* or <200 cpm* (a 10% efficiency is assumed), the patient can be discharged, depending on the clinical condition. Place new floor coverings from the clean line to the stretcher where the patient lies. Bring in a clean stretcher and transfer the patient. Wheel the stretcher and patient to the door. After radiation safety personnel make a final check of the patient and the stretcher (especially the wheels), transport the patient from the area.

d. Personnel not involved with the decontamination procedures should transport the decontaminated patient away from the controlled area.

e. Patients awaiting decontamination should be covered with a sheet and be attended by nursing and medical staff who are wearing appropriate protective clothing.

5. Upon termination of the decontamination efforts, all personnel must adhere to the following dress-out routine. Protective clothing worn by the staff is to be saved for proper disposal under the direction of the Radiation (or Hazardous Material) Safety team. Remove protective clothing as follows *(monitoring applies to radiation emergencies only)*:

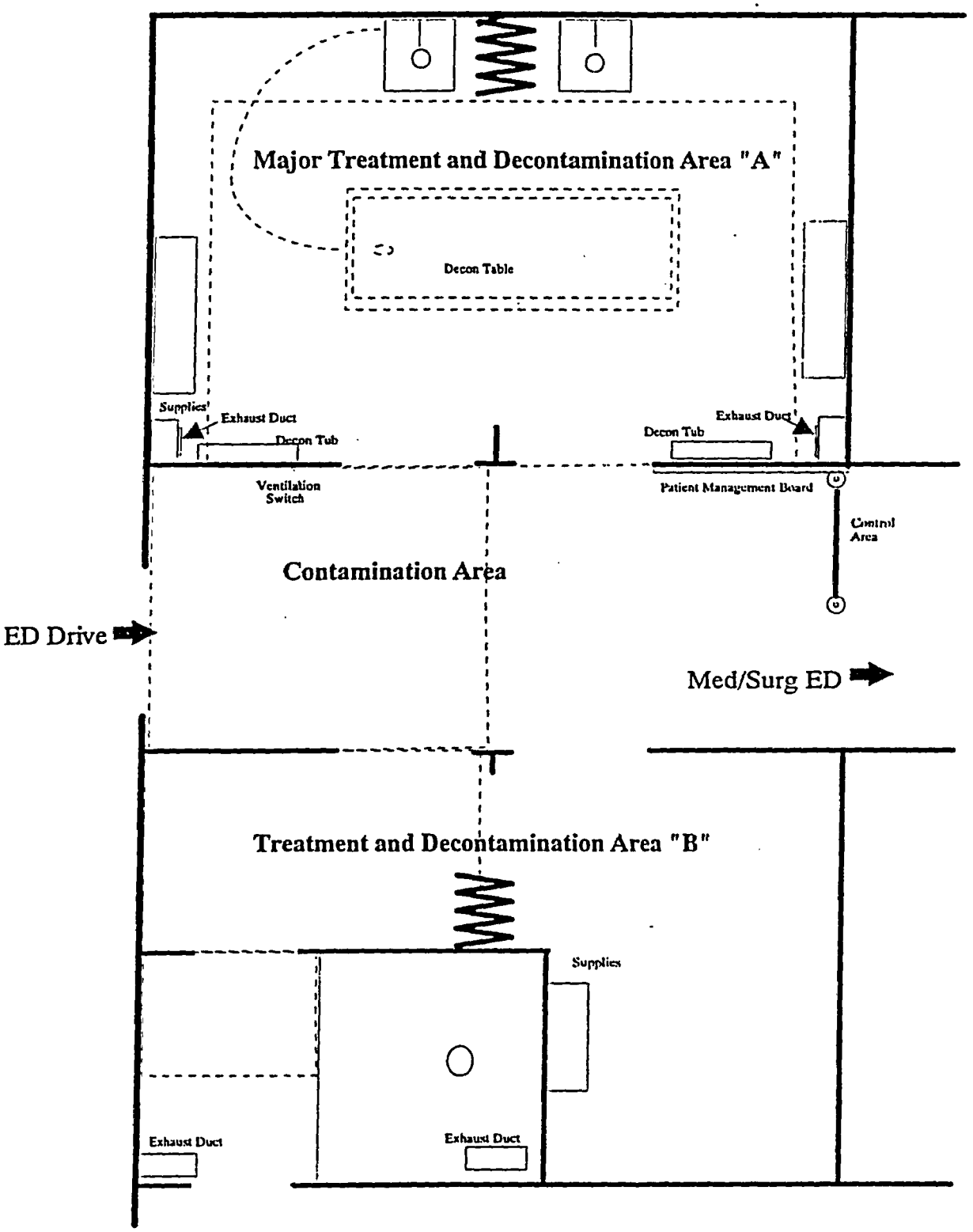
a. Remove tape from around ankles and wrists.
b. Remove outer pair of gloves.
c. Remove hood by leaning backward and pulling the hood back away from head.
d. Remove jumpsuit.
e. Remove one shoe cover. Monitor the uncovered foot. After determining the foot is free of contamination, step from controlled area to intermediate area with uncovered foot. Remove second shoe cover, monitor that foot and follow the same procedure.
f. Remove gloves.
g. Monitor with appropriate instruments. Pay particular attention to monitoring the head, shoulders, hands and feet.
h. Once determining that there is no contamination present, step into the clean area.

6. The Radiation (or Hazardous Material) Safety Team is responsible for monitoring and decontaminating personnel, receiving areas, and controlled areas. The Radiation (or Hazardous Material) Safety team will oversee the disposal of any clothing, linen, refuse, and water found to be contaminated. (When the victim is from a Virginia Power (VP) facility, the VP Health Physics personnel accompanying the victim in the emergency vehicle may be asked to assist in monitoring the interior of the vehicle.) Ambulance attendants and support personnel will be released when contamination levels are <1,000 dpm* or <100 cpm* (a 10% efficiency is assumed).

7. To clear a vehicle *(radiation emergencies only)*, first monitor for contamination on the inside. Then, on the outside, monitor the front grill and bumper, tires, wheel wells, and air intake filter.

*In the case of transuranics, release levels will be determined on a case by case basis.

Treatment & Decontamination Area



APPENDIX I

Rules of Thumb

Alpha Particles

1. It requires an alpha particle of at least 7.5 MeV to penetrate the protective layer of the skin, 0.07 mm thick.

Beta Particles

1. It requires a beta particle of at least 70 keV to penetrate the protective layer of the skin, 0.07 mm thick.

2. The range (R) of beta particles in g/cm (thickness in cm multiplied by the density in g/cm) is approximately equal to the maximum energy (E) in MeV divided by 2 (i.e., R= E/2).

3. The range of beta particles in air is about 12 ft per MeV; for example, a 3 MeV beta has a range of about 36 ft in air.

4. A chamber wall thickness of 30 mg/cm will reduce a flux of 1 MeV (max.) betas by 30% and a flux of 0.4 MeV betas by a factor of 4 or 5.

5. The intensity of bremsstrahlung increases approximately with the energy of the beta particle and about the square of the atomic number of the absorbing material.

6. When betas of 1 to 2 MeV pass through light materials such as water, aluminum, or glass, less than 1% of their energy is dissipated as bremsstrahlung.

APPENDIX II

DECONTAMINATION

Personnel Decontamination

Begin with the method listed first and then proceed to the more severe methods, as necessary.

METHOD	SURFACE	ACTION	TECHNIQUE	ADVANTAGES	DISADVANTAGES
Soap and water	Skin and hands	Emulsifies and dissolves contami-nate	Wash 2-3 minutes and monitor. Do not wash more than 3-4 times.	Readily available and effective for most radioactive contamination.	Continued washing will de-fat the skin. Indiscriminate washing may spread contamination.
Soap and water	Hair	Same as above	Wash several times. If contamination is not lowered to acceptable levels, apply skin decontamination methods.		
Lava soap, soft brush and water	Skin and hands	Emulsifies, dissolves, and erodes.	Use light pressure with heavy lather. Wash for 2 minutes, 3 times. Rinse and monitor. Use care not to scratch or erode the skin. Apply lanolin or hand cream.	Same as above.	Continued washing will abrade the skin.
Tide or other detergent	Same as above.	Same as above.	Make into a paste. Use with additional water with mild scrubbing action. Use care not to erode skin.	Slightly more effective than washing with soap.	Will de-fat and abrade skin and must be used with care.
Mixture of 50% Tide and 50% cornmeal	Skin and hands	Emulsifies, dissolves, and erodes.	Make into a paste. Use with additional water and mild scrubbing action. Use care not to erode the skin.	Slightly more effective than washing with soap.	Will de-fat and abrade skin and must be used with care.
Titanium dioxide paste. Mix precipitated titanium dioxide (very thick slurry, but not dry) with a small amount of lanolin.	Skin, hands, and extremities. Do not use near face or other body openings.	Same as above.	Work the paste into the affected area for 2 minutes. Rinse and wash with soap and warm water, then monitor.	Removes contamination lodged under scaly surface of skin. Good for heavy surface contamination of skin.	If left on too long will remove skin.
Mix equal volumes of a saturated solution of permanganate and 0.2 N sulfuric acid. (Saturated solution of $KMnO_4$ is 6.4 grams per 100 ml of H_2O.) Continue with next step.	Skin, hands, and extremities. Do not use near face or other body openings.	Dissolves contami-nant absorbed in the epidermis.	Pour over wet hands, rubbing the surface and using hand brush for not more than 2 minutes. Rinse with water.	Superior for skin contamination. May be used in conjunction with titanium oxide.	Will remove a layer of skin if in contact with skin for more than 2 minutes.

METHOD	SURFACE	ACTION	TECHNIQUE	ADVANTAGES	DISADVANTAGES
Apply a freshly prepared 5% solution of sodium acid sulfite (dissolve 5 gm $NaHSO_3$ crystals in 100 ml distilled water).	Same as above.	Removes the permanganate stain.	Apply in same manner as above for not more than 2 minutes. Apply lanolin when completed.		Same as above.
Flushing	Eyes, ears, nose, and mouth.	Physical removal by flushing.	Roll back the eyelid as far as possible, flush with large amounts of water or isotonic irrigants, if available.	If used immediately will remove contamination. May also be used for ears, nose, and throat.	When using for nose and mouth, warn patient not to swallow the rinses.
Flushing	Wounds	Same as above.	Wash wound with large amounts of water and spread edges to stimulate bleeding, if not profuse. If profuse, stop bleeding first, clean edges of wound, bandage, and if any contamination remains, it may be removed by normal cleaning methods, as above.	Quick and efficient if wound not severe.	May spread contamination to other areas of body if not done carefully.
Sweating	Skin of hands and feet.	Physical removal by sweating.	Place hand or foot in plastic glove or booty. Tape shut. Place near source of heat for 10-15 minutes or until hand or foot is sweating profusely. Remove glove and then wash using standard techniques. Gloves can be worn for several hours using only body heat.	Cleansing action is from inside out. Part does not dry out.	If glove or booty is not removed shortly after profuse sweating starts and part washed with soap and water immediately, contamination may seep into pores.

APPENDIX III

Area and Material Decontamination

Begin with the first method listed, then proceed to the more severe methods, as necessary.

METHOD	SURFACE	ACTION	TECHNIQUE	ADVANTAGES	DISADVANTAGES
Vacuum cleaning	Dry surfaces	Removes contaminated dust by suction	Use conventional vacuum technique with efficient filter.	Good on dry, porous surfaces. Avoids water reactions.	All dust must by filtered out of exhaust. Machine is contaminated.
Water	All nonporous surfaces (metal, painted, plastic, etc.)	Dissolves and erodes.	For large surfaces: Hose with high pressure water at an optimum distance of 15 to 20 feet. Spray vertical surfaces at an angle of 30 to 40 degrees; work from top to bottom to avoid re-contamination. Work upwind to avoid spray. Determine optimal cleaning rate, if possible; otherwise, use a rate of 4 square feet/min. For small surfaces: Blot up liquid and hand wipe with water and appropriate commercial detergent.	All water equipment may be utilized. Allows operation to be carried out from a distance. Contamination may be reduced by 50%. Water equipment may be used for decontamination liquids. Extremely effective if done immediately after spill and on nonporous surfaces.	Drainage must be controlled. Not suitable for porous materials. Oiled surfaces cannot be decontaminated. Use vacuum on dry, porous surfaces. Spray will be contaminated. Of little value in the decontamination of large areas, longstanding contaminates and porous surfaces.
Steam	Nonporous surfaces (especially painted or oiled surfaces).	Dissolves and erodes.	Work from top to bottom and from upwind. Clean surface at a rate of 4 square ft/min. The cleaning efficiency of steam will be greatly increased by using detergents.	Contamination may be reduced approximately 90% on painted surfaces.	Steam subject to same limitations as water. Spray hazard makes the wearing of water proof outfits necessary.
Detergents	Nonporous surfaces (metal, painted, glass, plastic, etc.)	Emulsifies contaminate and increases wetting power of water and cleaning efficiency of steam.	Rub surface 1 minute with a rag moistened with detergent solution then wipe with dry rag; use clean surface of the rag for each application. Use a power rotary brush with pressure feed for more efficient cleaning. Apply solution from a distance with a pressure proportioner. Do not allow solution to drip onto other surfaces.	Dissolves industrial film and other materials which hold contamination. Contamination may be reduced by 90%.	May require personal contact with surface. May not be efficient on longstanding contamination.

METHOD	SURFACE	ACTION	TECHNIQUE	ADVANTAGES	DISADVANTAGES
Complexing agents	Nonporous surfaces (especially unweathered surfaces (no rust, etc.)	Forms soluble complexes with contaminated material.	Complexing agent solution should contain 3% (by weight) of agent. Spray surface with solution. Keep surface moist 30 minutes by spraying with solution periodically. After 30 minutes, flush off with water. Chemical foam (sodium carbonate or aluminum sulfate) may be added to agent for use on vertical and overhead surfaces.	Holds contamination in solution. Contamination may be reduced by 75% in 4 minutes on unweathered surfaces. Easily stored; carbonates and citrates are nontoxic, noncorrosive.	Requires application from 5 to 30 minutes. Little penetrating power; of small value on weathered surfaces.
Organic solvents	Non-porous surfaces (greasy or waxed surfaces, painted or plastic finishes, etc.)	Dissolves organic materials (oil, paint, etc.)	Immerse entire unit in solvent or apply by wiping procedure (see Detergents).	Quick dissolving action. Recover of solvent possible by distillation.	Requires good ventilation and fire precautions. Toxic to personnel.
Inorganic acids	Metal surfaces (especially with porous deposits; i.e., rust or calcareous growth); circulatory pipe systems.	Dissolves porous deposits.	Use dip-bath procedure for movable items. Acid should be concentration of 1 to 2 normal (9 to 18% HCL, 3 to 6% H^2SO_4.) Leave on weathered surfaces for 1 hour. Flush surface with water, scrub with a water-detergent solution and rinse.	Corrosive action on metal and porous deposits. Corrosive action may be moderated by addition of corrosion inhibitors to solution.	Personal hazard. Wear goggles, rubber boots, gloves, and aprons. Good ventilation required because of toxicity and explosive gases. Acid mixtures should not be heated. Possibility of excessive corrosion if used without inhibitors. Sulfuric acid not effective on calcareous deposits.
Acid mixtures: hydrochloric sulfuric acetic, citric acids acetates citrates Caustics: lye (sodium hydroxide) calcium hydroxide potassium hydroxide	Nonporous surfaces (especially with porous deposits); circulatory pipe systems. Painted surfaces (horizontal).	Dissolves porous deposits. Softens paint (harsh method).	Same as for inorganic acids. A typical mixture consists of 0.1 gal HCL, 0.2 lb sodium acetate and 1 gal. water. Allow paint remover solution to remain on surface until paint is softened to the point where it may be washed off with water. Remove remaining paint with long-handled scrapers. Typical paint remover solution: 10 gal. water, 4 lb. lye, 6 lb. boiler compound, 0.75 lb. cornstarch	Contamination may be reduced by 90% in 1 hour (unweathered surfaces). More easily handled than inorganic acid solution. Minimum contact with contaminated surfaces. Easily stored.	Weathered surfaces may require prolonged treatment. Same safety precautions as required for inorganic acids. Personal hazard (will cause burns). Reaction slow; and therefore not efficient on vertical or overhead surfaces. Should not be used on aluminum or magnesium.
Trisodium phosphate	Painted surfaces (vertical, overhead).	Softens paint (mild method).	Apply hot 10% solution by rubbing and wiping procedure (see Detergent).	Contamination may be reduced to tolerance in one or two applications.	Destructive effect on paint. Should not be used on aluminum or magnesium.

METHOD	SURFACE	ACTION	TECHNIQUE	ADVANTAGES	DISADVANTAGES
Abrasion	Nonporous surfaces	Removes surface.	Use conventional procedures such as sanding, filing, and chipping; keep surface damp to avoid dust hazard.	Contamination may be reduced to as low a level as desired.	Impractical for porous surfaces because of penetration by moisture.
Sandblasting	Nonporous surfaces.	Removes surfaces.	Keep sand wet to lesson spread of contamination.	Practical for large surface areas.	Contaminated materials must be removed.

APPENDIX IV

EMERGENCY DOSE ASSESSMENT

Summary of Clinical Effects

Range	0-100 rad Subclinical Range	100 to 1,000 rad Therapeutic Range			Over 1,000 rad Lethal Range	
		100 to 200 rad	*200 to 600 rad*	*600 to 1,000 rad*	*1,000 to 5,000 rad*	*Over 5,000 rad*
		Clinical Surveillance	Therapy Effective	Therapy Promising	Therapy Palliative	
Vomiting	None	20-50%	50-100%	100%	100%	
	Delay Time	3 hours	2 hours	1 hour	30 minutes	
	Symptoms	mild - moderate	moderate - severe	severe	severe	
Fatigue	None	30-60%	90-100%	100%	100%	
	Delay Time	2.5 hours	2 hours	1 hour	30 minutes	
	Symptoms	mild - moderate	moderate - severe	severe	severe	
Fluid Loss Electrolyte Imbalance	None	None	50-80%	80-100%	100%	
	Delay Time	-	6 hours	5 hours	4 hours	
	Symptoms	-	mild - moderate	moderate - severe	severe	
Headaches	None	None	50-80%	80-100%	100%	
	Delay Time	-	2 hours	2 hour	2 hours	
	Symptoms	-	mild - moderate	moderate - severe	severe	
Organ	None	Hematopoietic Tissue			GI Tract	CNS
Clinical Signs	None	Moderate leukopenia	Severe leukopenia; purpura; hemorrhage; infection. Epilation, skin dose > 300 rad		Severe electrolyte imbalance	Convulsions; *tremor*; ataxia; lethargy
Illness Phase	-	-	4 to 6 weeks		5 to 14 days	1 to 48 hours
Therapy	Reassurance	Reassurance; hematologic surveillance.	Blood transfusions; Antibiotics.	Bone Marrow Transplant	Maintenance of electrolyte balance.	Sedatives
Prognosis	Excellent	Excellent	Good	Guarded	Hopeless	
Death Within	-	-	2 months (50%)		2 weeks	2 days
Cause	-	-	Hemorrhage: Infection		Circulatory Collapse	Respiratory Failure; Brain Edema

APPENDIX V

DATA COLLECTION FOR RADIATION HAZARD ANALYSIS

The radiation problems associated with an accident patient may arise from any or all of the following:

1. External irradiation
2. Neutron activation
3. External contamination
4. Internal contamination

In order to evaluate the relative hazard from a patient it is necessary to collect data and samples from the patient for subsequent analysis. Given below are the types of data and samples that should be collected, depending upon the condition of the patient:

1. External Irradiation

   a. Ionization chamber readings indicating exposure as well as cpm with a geiger counter (for precautionary measures)
   b. Personnel dosimeters, if worn

2. Neutron Activation

   a. Ionization chamber readings indicating exposure as well as cpm with a geiger counter
   b. Metal object (jewelry, belt buckles, coins)
   c. A sample of hair

3. External Contamination

   a. Ionization chamber readings indicating exposure as well as cpm with a geiger counter.
   b. Swipes from skin
   c. Nose swabs
   d. Ear swabs
   e. Swipes around eyes
   f. Clothing samples

4. Internal Contamination

   a. Swabs of body orifices and open wounds
   b. Urine - series of 24 hour samples
   c. Blood - within 72 hours
   d. Feces - series of 24 hour samples
   e. Vomitus

The following data sheet should be filled out for each patient.

APPENDIX VI
Patient Data Sheet

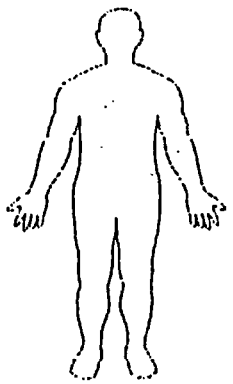
Name: _____ Patient ID: _____ Date: _____

Suspected Contaminants: _____

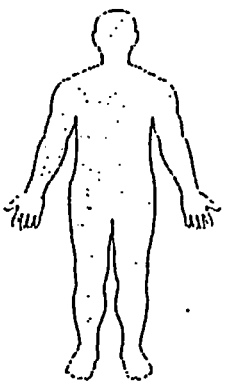
Suspected Internal Contamination: ☐ None ☐ Ingestion ☐ Inhalation ☐ Absorption

Exposure & CPM Rates
(mR/hr at 6", CPM at ½")

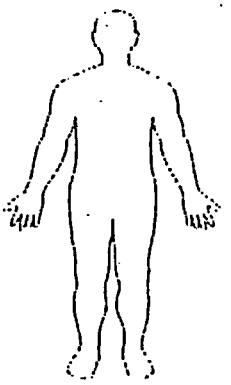
Initial Survey
Time: _____



Decon #1
Time: _____



Decon #2
Time: _____

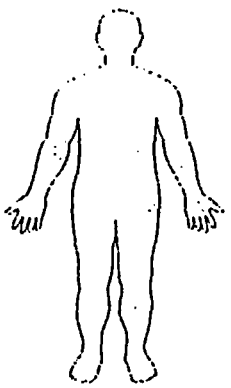


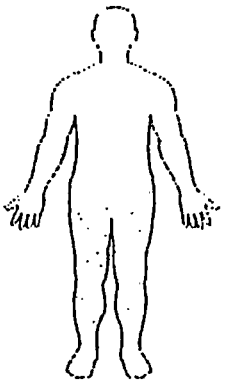
Time	Sample #	Sample Description
	1-	
	2-	
	3-	
	4-	
	5-	
	6-	
	7-	
	8-	
	9-	
	10-	
	11-	
	12-	
	13-	
	14-	
	15-	
	16-	
	17-	
	18-	
	19-	
	20-	

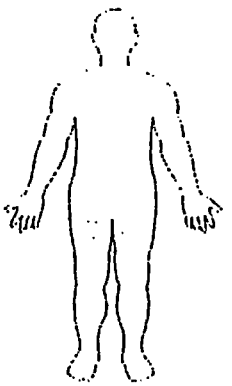
Exposure & CPM Rates

(mR/hr at 6", CPM at ½")

Decon #3	Decon #4	Decon #5
Time:_____	Time:_____	Time:_____







Patient released from controlled area at _____ a.m/p.m.

Comments:

Instruments Used:

Ionization Chamber/Model#_____ Serial #_____

GM Survey Meter/Model #_____ Serial #_____

NaI Survey Meter/Model #_____ Serial #_____

Name of Person Completing Form:_____

TABLE I
FISSION PRODUCTS BY INCREASING TT

TT (meV)	Nuclide	Yield (%)	Half life	Type	Cross References
0.030	Ba-140	11	12.8 d		
0.091	Nd-147	28	5.3 d		
0.134	Ce-144	11	284 d		
0.145	Ce-141	48	33 d		
0.267	Y-95	6	11 m	Solid	Tc-104, La-142, Pr-146
0.293	Ce-143	46	33 d		
0.360	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
0.364	I-131	82	8.1 d	Iodine	I-132, I-133, I-135
0.487	La-140	40	40.2 h		
0.520	I-132	20	2.3 h	Iodine	I-131, I-133, I-135
0.530	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
0.530	I-133	90	21 h	Iodine	I-131, I-132, I-135
0.533	Nd-147	13	11.1 d		
0.537	Ba-140	34	12.8 d		
0.590	Cs-140		66 s	Volatile	
0.65	La-142	48	92.5 m	Solid	Y-95, Tx-104, Pr-146
0.662	Cs-137	85	30 y		
0.670	I-132	144	2.3 h	Iodine	I-131, I-133, I-135
0.724	Zr-95	49	65 d		
0.740	Pr-146	16	24 m	Solid	Y-95, Tc-104, La-142
0.748	Sr-91	27	9.7 h		
0.756	Zr-95	49	65 d		
0.765	Nb-95	100	35 d		
0.773	I-132	89	2.3 h	Iodine	I-131, I-133, I-135
0.780	Pr-146	15	24 m	Solid	Y-95, Tc-104, La-142
0.860	I-135	11	6.7 h	Iodine	I-131, I-132, I-133
0.880	Br-84	51	31.7 m	Halogen	Br-87
0.880	Cs-140		66 s	Volatile	
0.890	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
0.955	I-132	22	2.3 h	Iodine	I-131, I-133, I-135
1.01	Br-84	10	31.7 m	Halogen	Br-87
1.025	Sr-91	30	9.7 h		
1.14	Cs-140		66 s	Volatile	
1.14	I-135	37	6.7 h	Iodine	I-131, I-132, I-133
1.15	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
1.25	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
1.28	I-135	34	6.7 h	Iodine	I-131, I-132, I-133

TT (meV)	Nuclide	Yield (%)	Half life	Type	Cross References
1.37	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
1.40	I-132	14	2.7 h	Iodine	I-131, I-133, I-135
1.44	Br-87		55 s	Halogen	Br-84
1.46	I-135	12	6.7 h	Iodine	I-131, I-132, I-133
1.51	Pr-146	27	24 m	Solid	Y-95, Tc-104, La-142
1.596	La-140	96	40.2 h		
1.6	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
1.62	Cs-140		66 s	Volatile	
1.72	I-135	19	6.7 h	Iodine	I-131, I-132, I-133
1.8	I-135	11	6.7 h	Iodine	I-131, I-132, I-133
1.85	Br-87		55 s	Halogen	Br-84
1.85	Cs-140		66 s	Volatile	
1.90	Br-84	18	31.7 m	Halogen	Br-87
1.90	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
2.06	Cs-140		66 s	Volatile	
2.20	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
2.32	Cs-140		66 s	Volatile	
2.41	La-142	15	92.5 m	Solid	Y-95, Tc-104, Pr-146
2.48	Br-87		55 s	Halogen	Br-84
2.55	La-142	11	92.5 m	Solid	Y-95, Tc-104, Pr-146
2.64	Br-87		55 s	Halogen	Br-84
2.70	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
2.72	Cs-140		66 s	Volatile	
2.98	Br-87		55 s	Halogen	Br-84
3.15	Cs-140		66 s	Volatile	
3.18	Br-87		55 s	Halogen	Br-84
3.20	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
3.40	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
3.70	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
3.80	Br-87		55 s	Halogen	Br-84
3.93	Br-84	13	31.7 m	Halogen	Br-87
4.00	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
4.19	Br-87		55 s	Halogen	Br-84
4.40	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
4.70	Tc-104		18 m	Solid	Y-95, La-142, Pr-146
4.80	Br-87		55 s	Halogen	Br-84
5.00	Br-87		55 s	Halogen	Br-84
5.20	Br-87		55 s	Halogen	Br-84

TABLE II

FISSION PRODUCTS: HALF-LIVES, AND PROMINENT GAMMAS BY INCREASING ATOMIC MASS

Nuclide	Type	Half-life	Critical Organ	Prominent Gammas - meV (Yield in %)
Br-84	Halogen	31.7 m		0.81 (9), 0.88 (51), 1.01 (10), 1.90 (18), 3.93 (13)
Br-87	Halogen	55 s		1.44, 1.85, 2.48, 2.64, 2.98, 3.18, 3.80, 4.19, 4.80, 5.00, 5.20
Sr-91		9.7 h	Bone	0.748 (27), 1.025 (30)
Y-95	Solid	11 m		0.267 (6)
Zr-95		65 d	Total Body	0.724 (49), 0.756 (49),
Nb-95		35 d	Total Body	0.765 (100)
Tc-104	Solid	18 m		0.36, 0.53, 0.89, 1.15, 1.25, 1.37, 1.6, 1.9, 2.2, 2.7, 3.2, 3.4, 3.7, 4.0, 4.4, 4.7
I-131	Iodine	8.1 d	Thyroid	0.364 (82)
I-132	Iodine	2.3 h	Thyroid	0.52 (20), 0.67 (144), 0.773 (89), 0.955 (22), 1.40 (14)
I-133	Iodine	21 h	Thyroid	0.53 (90)
Xe-133		5.3 d		0.081 (37)
I-135	Iodine	6.7 h	Thyroid	0.86 (11), 1.14 (37), 1.28 (34), 1.46 (12), 1.72 (19), 1.80 (11)
Cs-137		30 y	Total Body	0.662 (85)
Ba-137		2.6 m		0.662 (85)
Cs-140	Volatile	66 s		0.59, 0.88, 1.14, 1.62, 1.85, 2.06, 2.32, 2.72, 3.15
Ba-140		12.8 d	Bone	0.030 (11), 0.537 (34)
La-140		40.2 h	Liver	0.487 (40), 1.596 (96)
Ce-141		33 d	Liver	0.145 (48)
La-142	Solid	92.5 m		0.64 (48), 2.41 (15), 2.55 (11), 0.293 (46)
Ce-143		33 h	Liver	0.293 (46)
Ce-144		284 d	Bone	0.134 (11)
Pr-146	Solid	24 m		0.455 (77), 0.74 (16), 0.78 (15), 1.51 (27)
Nd-147		11.3 d	Liver	0.091 (28), 0.533 (13)

TABLE III

ACTIVATION PRODUCTS BY INCREASING GAMMA ENERGY

TT	Yield (%)	Nuclide	Half-life	TT	Yield (%)	Nuclide	Half-life
0.068	42	Ta-182	111 d	0.835	100	Mn-54	300 d
0.072	11	W-187	24 h	0.847	99	Mn-56	2.6 h
0.100	14	Ta-182	111 d	0.865	1.4	Co-58	71 d
0.133	48	Hf-181	40 d	0.87	3	N-17	4.1 s
0.134	9	W-187	24 h	1.039	9	Cu-66	4.6 m
0.152	7	Ta-182	111 d	1.095	56	Fe-59	45 d
0.192	2.8	Fe-59	45 d	1.115	16	Ni-65	2.6 h
0.197	97	O-19	1.8 h	1.122	34	Ta-182	111 d
0.222	8	Ta-182	111 d	1.173	100	Co-60	5.2 y
0.320	9	Cr-51	27 d	1.189	16	Ta-182	111 d
0.346	13	Hf-181	40 d	1.222	27	Ta-182	111 d
0.368	4.5	Ni-65	2.6 h	1.231	13	Ta-182	111 d
0.479	23	W-187	24 h	1.292	44	Fe-59	45 d
0.482	81	Hf-181	40 d	1.293	99	Ar-41	1.8 h
0.511	194	F-18	30 s	1.332	100	Co-60	5.2 y
0.511	30	Co-58	71 d	1.369	100	Na-24	15 h
0.511	38	Cu-64	12.8 h	1.37	59	0.19	1.8 h
0.552	5	W-187	24h	1.481	25	Ni-65	2.6 h
0.618	6	W-187	24h	1.780	100	Al-28	2.0 m
0.686	27	W-187	24h	1.811	29	Mn-56	2.6 h
0.724	49	Zr-95	65 d	2.110	15	Mn-56	2.6
0.756	49	Zr-95	65 d	2.754	100	Na-24	15 h
0.773	4	W-187	24 h	6.13	69	N-16	7.3 s
0.810	99	Co-58	71 d	7.11	5	N-16	7.3 s

TABLE IV

ACTIVATION PRODUCTS BY INCREASING ATOMIC MASS

Nuclide	Half-life	Critical Organ	Prominent Gammas -meV (Yield in %)
H-3	12.3 y	Total Body	N/A
C-14	5700 y	Fat	N/A
N-16	7.3 s		6.13 (69), 7.11 (5)
N-17	4.1 s		0.87 (3)
F-18	30 s	Total Body	0.511 (194)
O-19	1.8 h		0.197 (97), 1.37 (59)
Na-24	15 h	Total Body	1.369 (1-00), 2.754 (100)
Al-28	2 m		1.780 (100)
Si-31	2.8 h	Lung	N/A
Ar-41	1.8 h	Total Body	1.293 (99)
Cr-51	27 d	Total Body	0.320 (9)
Mn-54	300 d	Liver	0.835 (100)
Fe-55	2.9 y	Spleen	N/A
Mn-56	2.6 h	Pancreas	0.847 (99), 1.811 (29), 2.110 (15)
Co-58	71 d	Total Body	0.511 (30), 0.810 (99), 0.865 (1.4)
Fe-59	45 d	Spleen	0.192 (2.8), 1.095 (56), 1.292 (44)
Co-60	5.2 y	Total Body	1.173 (100), 1.332 (100)
Cu-64	12.8 h	Spleen	0.511 (38)
Ni-65	2.6 h	Bone	0.368 (4.5), 1.115 (16), 1.481 (25)
Cu-66	4.6 m		1.039 (9)
Zr-95	65 d	Total Body	0.724 (49), 0.756 (49)
Hf-181	40 d	Spleen	0.133 (48), 0.346 (13), 0.482 (81)
Ta-182	111 d	Liver	0.068 (42), 0.100 (14), 0.152 (7), 0.222 (8), 1.122 (34), 1.189 (16), 1.222 (27), 1.231 (13)
W-187	24 h	Total Body	0.072 (11), 0.134 (9), 0.479 (23), 0.552 (5), 0.618 (6), 0.686 (27), 0.773 (4)

Dosimeter Assignment for Radiation Emergency Workers

Name	SSN	Birth Date	Date of Emergency	Position/Description

Dosimetry Used: ☐ Film Badge ☐ Pocket ☐ TLD ☐ Other
(Check all that apply) (Direct Reading)

Badge Type	Badge #	Location Worn	Time Issued	Time Returned	Total Recorded Exposure

Pocket Dosimeter: ☐ 0-1 R ☐ 0-5 R

Pocket Dositmeter #	Initial Reading	Time	Reading #2	Time	Reading #3	Time	Reading #4	Time	Final Reading	Time

APPENDIX VIII

HazMat/Radiation Emergency Form

Date: _____ Caller: _____ Phone No.: _____

Time of call: _____ Time of incident: _____

Circle: **Radiation Incident** **Chemical Incident**

Substance: _____

(Contaminants, radionuclides, chemical name, vehicle placard #)

Mechanism of exposure: ☐ Inhalation ☐ Skin ☐ Ingestion

Is there a known airborne hazard? ☐ Yes ☐ No

Number of victims: _____ Severity of injuries: _____

_____

_____

_____

_____

_____

ETA: _____ Contact Person: _____ Phone No.: _____

RADIATION ONLY

Estimated dose received by victim(s): _____

_____

_____

_____

Exposure rate from victims and/or clothing (mR/hr): _____

Were victims neutron irradiated? ☐ Yes ☐ No

Are there any hot particles ("fleas")? ☐ Yes ☐ No

Contamination (location, source, cpm or dpm): _____

_____

_____

_____

The following notification will be made by the Communication Nurse:

a. Notify Environmental Health and Safety at 828-9834. After working hours, emergency calls are transferred to telepage. State specifically whether the emergency is a chemical or radiation emergency. Instruct the telepage as follows: "Please contact an individual on the CHEMICAL EMERGENCY LIST (OR RADIATION EMERGENCY LIST) to call the ED". If no response is obtained via telepage within 5-10 minutes, contact the OEHS staff directly via the long-range beeper system.

b. Relay information to the following individuals:

1. ED Clinical Coordinator
2. Director of Emergency Department
3. Patient Representative.
4. ED Attending in Charge.
5. Registered Nurse Manager of Medical/Surgical ED or Nurse Manager on-call.
6. ED Registration Supervisor.
7. ED Radiology - to have a radiologic technologist available to perform mobile x-ray examinations if needed.

Name of person completing this from: _____

APPENDIX IX

HOSPITALS WILLING TO ACCEPT RADIATION ACCIDENT VICTIMS

The following information is taken from the Virginia Radiological Emergency Response Plan issued by the Department of Emergency Services (DES). The hospitals listed below have indicated that they have a radiological emergency response capability and will accept radiation accident victims. In the case of a large scale disaster involving more radiation victims than can be handled at MCVH, the following facilities should be alerted to the situation and asked the number of radiation casualties they can accept.

A. SURRY POWER STATION AREA

1. John Randolph Hospital
   700 North Fourth Avenue
   Hopewell, Virginia 23860

   Telephone: (804)541-1600 or 541-7504

   24-hour emergency department coverage. Can accept 1 to 30 patients; will make final determination at time of notification.

2. Obici Hospital
   1900 N. Main Street
   Suffolk, Virginia 23434

   Telephone: (757)934-4000

   24-hour emergency department coverage. Can accept 4 radiation exposure patients.

3. Sentara Hampton General Hospital
   3120 Victoria Boulevard
   Hampton, Virginia 23669

   Telephone: (757)727-7262

   24-hour emergency department coverage. The number of radiation exposure patients will be determined by the situation in the hospital at the time of the incident.

4. Riverside Hospital
   J. Clyde Morris Boulevard
   Newport News, Virginia 23601

   Telephone: (757)594-2050

   24-hour emergency department coverage. The number of patients will be decided at the time of the accident.

5. Maryview Medical Center
   3636 High Street
   Portsmouth, Virginia 23707
   Telephone: (757)398-2200

   24-hour emergency department coverage. Can accept 2-10 patients.

6. Sentara Norfolk General Hospital
   600 Gresham Drive
   Norfolk, Virginia 23507

   Telephone: (757)668-3296

   24-hour emergency department coverage. During major radiological emergency can accept radiologically-contaminated patients. The number of patients will be decided at the time of emergency.

7. DePaul Medical Center
   150 Kingsley Lane
   Norfolk, Virginia 23505

   Telephone: (757)489-5000

   24-hour emergency department coverage. Has nuclear physicist on staff. Can handle 6 patients.

8. Norfolk Community Medical Center
   2539 Corprew Avenue
   Norfolk, Virginia 23504

   Telephone: (757)628-1500

   9 am. to 9 pm. emergency department coverage. Can handle 2 patients at a time.

9. **Federal Government Hospitals**

These facilities do not normally accept civilian casualties, but indicate that in a radiological emergency, they would assist the State and local governments in any way possible.

a. Naval Medical Center
   Portsmouth, Virginia 23708

   Telephone: (757)953-1365

   Contact: Radiological Safety Officer. Can handle four patients at any one time.

b. U.S. Air Force Regional Hospital
   Langley Field
   Hampton, Virginia

   Telephone: (757)764-6801

   Can accommodate up to 100 people at one time for radiological decontamination.

c. U.S. Army
   McDonald Army Community Hospital
   Fort Eustis, Virginia 23604

   Telephone: 1-800-304-9863
   (757)878-7500

B. NORTH ANNA POWER STATION AREA

1. University of Virginia Hospital
   Jefferson Park Avenue
   Charlottesville, Virginia 22901

   Telephone: (804)924-0211

   Can accommodate 14 patients. Hospital Radiation Safety Office has a radio-equipped vehicle that can respond to accidents away from the hospital.

2. Culpeper Memorial Hospital
   Madison Road, Box 592
   Culpeper, Virginia 22701

   Telephone: (540)829-4100

   24-hour emergency department coverage. Will accept a limited number of patients.

3. Mary Washington Hospital, Inc.
   2300 Fall Hill Avenue
   Fredericksburg, Virginia 22401

   Telephone: (540)899-1111

   24-hour emergency department coverage. Can accept an unlimited number of patients; will make final determination at time of arrival.

4. Martha Jefferson Hospital, Inc.
   429 Locust Avenue
   Charlottesville, Virginia 22901

   Telephone: (804)982-7000 or (804)982-7150

   Backup to University of Virginia Hospital.

APPENDIX X

DR. YELLOW
ALERT LIST

1. RADIATION SAFETY TEAM	OFFICE	HOME	BEEPER	MCV ID
Dean W. Broga, Ph.D.	828-5877	323-3860	756-4301	6072
Mary Beth Taormina	828-9131	266-5820	756-4291	6070
Betty Schwab	828-9131	746-1924	756-4288	6071
Ronald Guye	828-9131	275-2565		6288
Opha Peden	828-9131	526-7654		6826
John Carter	828-9131	(540)894-8648		6289
Burt Ogle Ph.D.	828-4866	795-7463		6075
Mike Miller	828-1392	355-4207		6310
Mike Elliott	828-1392	569-6053		6934
Tracy Mukoda	827-7000x258	290-0114		6967
Panos Fatouros, Ph.D.	828-8282	776-6023		3265
Robert Zwicker, Ph.D.	828-7375	320-5042		3224

2. MEDICAL TEAM				
Arthur C. Ernst, M.D., VA Power	771-4869	262-4717		
James Tatum, M.D.	828-4177	379-3355		3365
Paul Jolles, M.D.	828-7975	750-1730		3475
Melvin Fratkin, M.D.	828-4175	740-8171		3103
Tim Burke, M.D.	675-5115	784-4878	659-0739	
Nuclear Medicine Attending On Call	828-6828 or	828-0951 after 5:00 p.m.		
G. Watson James, III, M.D.	828-9723	272-2612		3156
Chief Med. Resident, Telepage	828-0951			
Chief Surg. Resident, Telepage	828-0951			
Chief Burn Resident, Telepage	828-0951			

3. SUPPORT TEAM				
Telepage	828-0951 or 828-0957			
Emergency Medical Control	828-8888			
Clinical Coordinator	628-0096			
Hospital Incident Commander	828-0951			
Nursing Supervisor	828-0341			
Nursing Administrator	828-4221			
VCU Police & Security	828-1234			
D. Welch, L. Watson (VCU Police)	828-6199			
Pharmacy (Disaster Kit)	828-0364			
Hospital Transportation	828-9421			
Central Service	828-0360 or 828-0361			
Sterile Processing	828-0327 or 828-0432			
Joseph P. Ornato, MD	828-7184	914-3344(cell)	1-888-319-8049	
Stephanie Gonzalez, MD, Disaster Comm.	225-4092	364-3475		3069
David Swanson, Marketing/Public Affairs	225-4437	897-3374		6054
Portable X-ray	828-5498 or 828-3666 or 828-3675			

4. ADDITIONAL SUPPORT SPECIALISTS	OFFICE	HOME	BEEPER	MCV ID
James Cisek, M.D. Poison Control	225-3464	740-4679		3091
John Wilson, Ph.D., Radiobiology	828-7225	598-7682		
W.H. Barr, Ph.D., Pharmacy	828-8334 or 828-5522	355-0916		
Alfred M. Strash, Ph.D.	379-2607	794-8783	418-4949	
Poison Control Center	828-9123, or (800)552-6337			

APPENDIX XI
External Support Specialists

Nuclear Regulatory Commission
Region 2
Atlanta Federal Center
61 Forthsyth Street N.W., Ste 23-T85
Atlanta, GA 30303
1-800-577-8510
(404)562-4400 or (301)816-5100
Fax (404) 562-4900

U.S. Department of Energy Regional Office
Radiation Emergency Assistance Center (REAC/TS)
P.O. Box 117
Oak Ridge, TN 37831-0117
24 hour Emergency # (423)481-1000 or (423)576-3131 (Ask for REAC Dept.)

Virginia State Department of Health
Radiologic Health Section
1500 E. Main Street
Room 240
Richmond, VA 23218
(804)786-5932

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