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INACTIVE WASTE TANKS SAMPLING PROJECT

HEALTH AND SAFETY PLAN

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TSD
3/20/88



ADVANCED SCIENCES, INC.
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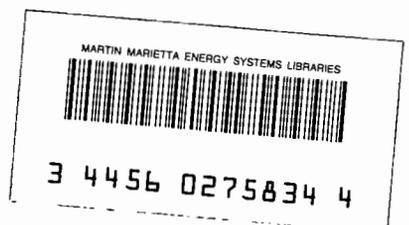
INACTIVE WASTE TANKS
SAMPLING PROJECT
HEALTH AND SAFETY PLAN

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Prepared for
OAK RIDGE NATIONAL LABORATORY
MARTIN MARIETTA ENERGY SYSTEMS, INC.

Prepared by
ASI
Advanced Sciences, Inc.
Oak Ridge, Tennessee 37830



INACTIVE WASTE TANKS
SAMPLING PROJECT
HEALTH AND SAFETY PLAN

Approved by:

Sam D. Bots

1/26/88

Remedial Action Section Head

W. Swank

3/29/88

Operations Division Director

A. L. ...

Health Division Director

Henry B. Popen

3/31/87

Manager for Office of Operational Safety

P. S. ...

2-16-88

Environmental Monitoring & Compliance Department Head

D. ...

2/18/88

Environmental Compliance & Health Protection Division Director

L. E. Mc Nease

3/30/88

Manager for Nuclear & Chemical Waste Programs

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1. INTRODUCTION

This health and safety plan presents the requirements to be followed during the sampling of 34 inactive underground waste storage tanks by Oak Ridge National Laboratory (ORNL) personnel at the Department of Energy's X-10 site on the Oak Ridge Reservation. The purpose of the plan is to ensure the health and safety of the workers and general public and to comply with all federal, state, local, and ORNL regulations and guidelines.

This plan includes a discussion of the possible hazards that may be encountered by the sampling personnel, training requirements, protective equipment requirements, and monitoring and engineering controls that will be used to reduce to as low as reasonably achievable (ALARA) worker and environmental exposure to hazardous and radioactive materials. The health and safety plan also includes personnel decontamination requirements, general site safety requirements, and emergency response action. The requirements of the procedures may change as work progresses due to changing conditions, but no reduction in requirements will be made without prior approval by the Project Manager for the Inactive Waste Tanks Sampling Project.

2. SITE BACKGROUND

2.1 Facility Description

The 34 inactive underground waste storage tanks, as listed in Table 1, have been used as collection facilities for by-products and waste from projects conducted at ORNL since its development that have resulted in the generation of a large number of radionuclides, which have been deposited in these waste tanks. Some sludge and liquid waste remain in some of the inactive storage tanks. This health and safety plan addresses the sampling of these tanks to determine the radionuclides and chemical constituents contained in the tanks.

Table 1. Inactive waste tanks

Tank	Priority group	Description of waste source	Location
W-1A	1	LLW waste tank	N. Tank Farm
W-11	1	LLW waste tank	S. Tank Farm
W-1	1	LLW waste tank	N. Tank Farm
W-2	1	Overflow from W-1	N. Tank Farm
W-3	1	Plutonium & metal waste from 3019	N. Tank Farm
W-4	1	Metal waste from 3019	N. Tank Farm
W-13	1	LLW waste from Chemistry Division	N. Tank Farm
W-14	1	LLW waste from Operations Division	N. Tank Farm
T-1	1	LLW waste prior to blending	Old Hydrofracture
T-2	1	LLW waste prior to blending	Old Hydrofracture
T-3	1	LLW waste prior to blending	Old Hydrofracture
T-4	1	LLW waste prior to blending	Old Hydrofracture
T-9	1	LLW waste prior to blending	Old Hydrofracture
TH-1	1	Thorium waste from 3503	S. of Bldg. 3503
TH-3	1	Thorium waste from 3503	S. of Bldg. 3500
TH-4	1	Thorium waste from 3550	S. W. of Bldg 3500
W-19	2	Fission product waste from Metal Recovery Facility	E. of Bldg. 3505
W-20	2	Fission product waste from Metal Recovery Facility	E. of Bldg. 3505
7560	2	LLW waste tank	HRE Area
7562	2	LLW waste tank	HRE Area
T-25	2	Metal waste from 4507	Bldg. 4507
T-30	2	Metal waste from 4507	Bldg. 4507
W-5	2	LLW waste tank	S. Tank Farm
W-6	2	LLW waste tank	S. Tank Farm
W-7	2	LLW waste tank	S. Tank Farm
W-8	2	LLW waste tank	S. Tank Farm
W-9	2	LLW waste tank	S. Tank Farm
W-10	2	LLW waste tank	S. Tank Farm
7860A	2	Waste oil storage tank	New Hydrofracture
W-15	2	LLW waste from Operation Division	N. Tank Farm
WC-1	2	LLW waste tank	E. of Bldg. 3038
WC-15	2	LLW waste tank	S. of Bldg. 3507
WC-17	2	LLW waste tank	S. of Bldg. 3507
TH-2	2	Thorium waste from 3503	S. of Bldg. 3503
OGR Canal	2	Sludge resulting from experimental operations	Bldg. 3001

2.2 Hazard Evaluation

Specific discussions on the hazards anticipated from tank-sampling activities and on ways of minimizing them are contained in the Inactive Waste Storage Tanks Safety Assessment. In general, the primary hazard from sampling these tanks is from the radioactive materials contained in them. The tanks are contaminated with various combinations and levels of ^{137}Cs , ^{90}Sr , uranium, plutonium, other transuranics, and other isotopes in lesser quantities. Estimated activities of single tanks range from 0.25 mCi to 8.9 kCi. Known radiation fields at the tank access points range from 1 mrad/h to 6 rad/h. Most of the safety planning for tank-sampling activities is focused on protection of the workers and the public from radiation and radioactive contamination.

Historical records show that small amounts of organic liquids were added to these tanks at various times. Although in most cases these organics are expected to have been previously removed during normal liquid removal operations, the possibility exists that small amounts remain. At least two of the tanks contain oil. Many of the tanks contain liquid waste that is very caustic because of the normal operating procedure of adding caustic to the tanks to neutralize process acids and thus prevent tank deterioration. Hazards due to hazardous chemicals are expected to be very low. Hazardous chemicals are not expected to be found in most of the tanks, and if hazardous chemicals are found the quantities are expected to be small.

Some of the tanks have been out of service for many years and the tank access has been covered with soil that has become contaminated. Protection of the workers, the public, and the environment while contaminated soil is excavated will also be necessary.

3. ORGANIZATION AND RESPONSIBILITIES

For a description of the project organization responsibilities and lines of authority, refer to the Inactive Waste Storage Tank Sampling Project Management Plan.

4. MEDICAL PROGRAM

All personnel, including supervision, who will participate in the sample collection must be identified to the ORNL Medical Director as waste workers at least two weeks prior to the sample collection. The Health Division will then verify that all necessary medical surveillance requirements for waste workers are met.

All personnel, including supervision, who will participate in sample collection must be currently certified by ORNL to wear respirators. This is both an ORNL and OSHA 1910.120 requirement. Certification to wear a respirator includes medical approval, a test to determine the adequacy of the fit of the respirator facepiece(s) to the worker's face, and training in the proper use of respirators. At ORNL, the medical approval is provided by the Health Division and the fit test and training are provided by the Industrial Hygiene Department.

Documentation of this certification shall be on file with the Operations Division Safety Officer and the Industrial Hygiene Department prior to the employee's participation in the sample collection activities.

In the event of any personnel injury or accident, the ORNL Health Division shall be notified and will determine the proper treatment. The Operations Division Safety Officer must also be notified and a report shall be completed by the injured person's supervisor as soon as practical after the event. This shall be reviewed by the project manager and the Operations Division Safety Officer. The worker must be cleared through the ORNL Health Division prior to returning to work. If appropriate, a "physical activity restriction" report shall be included.

5. CRITICALITY

The possibility of a criticality accident resulting from the sampling activities to be conducted is minimal due to the small sample volumes to be obtained and the minimal disturbance of the tank contents during sampling. An evaluation of the potential for criticality is contained in the Safety Assessment for this project.

6. PERMISSIBLE EXPOSURE LIMIT GUIDELINES

The control of personnel exposures shall be established in accordance with the following procedures:

- o For chemical exposures, the current edition of the Threshold Limit Values (TLVs) adopted by the American Conference of Governmental Industrial Hygienists (ACGIH)
- o OSHA Standards for Specific Chemical/Physical Stresses
- o Radiation exposures maintained at the ALARA level by methods described in ORNL Radiation Protection Procedure 6.2
- o Radiation protection standards for occupationally exposed persons per Radiation Protection Procedure 2.5 and 3.1

7. EMPLOYEE TRAINING

A formal training program has been established at ORNL for all nonreactor nuclear facility employees in accordance with DOE Order 5480.5. The training program includes instruction on the requirements of the following manuals:

- o Industrial Hygiene Manual
- o Safety Manual
- o Health Physics Procedure Manual
- o Quality Assurance Manual
- o Waste Management Group Operations and Procedures
- o Environmental Protection Manual

Only experienced, certified personnel from the Operations Division shall be used in the sampling efforts because of the potential for high radiation exposures. These personnel will be fully qualified to wear respiratory protection. In addition to the normal training received by these personnel, special training shall be conducted for the personnel who will be performing sampling. This training shall cover the pertinent health and safety aspects of this project, the sampling procedures, and the Activities Description Memorandum (AcDM) for the project. This project-specific training will be documented using the form in Fig. 1. In addition, personnel supporting the tank-sampling activities must, at a minimum, complete the 24 hours of Superfund Amendments and Reauthorization Act (SARA) training offered by ORNL for workers involved in activities supporting 3004(u) Resource Conservation and Recovery Act (RCRA) sites. Supervisory personnel must complete the training prior to the start of sampling operations. Other personnel should complete the training as the availability of course openings allows. Documentation that the general and project-specific training has been completed will be placed in each person's training file. Documentation that the project-specific training has been completed will also be placed in the project document file.

8. ENGINEERING CONTROLS

Engineering controls for radiation protection during tank sampling may include, but will not be limited to:

- o addition of shielding around the tank access
- o use of the tank off-gas ventilation system during sampling for those tanks that have such a system
- o containment tents or plastic sleeves to contain airborne contamination may be used in conjunction with portable cell ventilation unit
- o modification of standard procedures to allow handling of samples in a special manner if radiation levels are high; this may include use of special tools or shielding devices, or simply modifying

handling procedures so that the handling can be done as expeditiously as possible.

Engineering controls will be used to some extent on all of the tanks to keep the total exposure from the tank-sampling task as a whole to a minimum. In some cases, this will consist merely of handling the samples with tools and lead gloves whenever practical. Other cases may require all of the above controls. Specific guidelines for determining the necessity for these controls are provided in the Inactive Waste Tanks Project Safety Assessment. Specific controls for each tank will be identified in the procedures for that tank. General guidelines for identifying necessary controls are as follows.

- (1) Tanks with a high potential for airborne contamination will require a tent or plastic sleeves arranged to completely contain contamination. Guidelines are provided in the Safety Assessment.
- (2) Tanks that will have anticipated total exposure from sampling activities above the daily limit for workers will require additional shielding and procedure modification. In the interest of ALARA, shielding may be used at tanks where exposures are not expected to exceed the limits. Whenever possible, procedures for all tanks will be designed to keep radiation exposures at a minimum.
- (3) Lead gloves and long-handled tools will be used whenever practical to reduce the total exposure to personnel from sampling the tanks.

9. REGULATED ZONES/AREAS

ORNL Radiation Protection Procedure (RPP) 2.7 establishes a program of continuous effort to reduce the spread of contamination by confining it to the smallest possible space and to establish zoned areas as necessary. These zones are defined in RPP 2.7 of the ORNL Health Physics Manual. The posting and surveillance of these zones are the responsibility of the supervision of the group conducting operations.

The Radiation Protection Department will provide guidance and assistance in establishing these zones.

10. PROTECTIVE EQUIPMENT

General protective clothing requirements are listed in the ORNL Radiation Procedure 2.11. Specific protective equipment for this project shall be listed on the Radiation Work Permit required in accordance with RPP 3.6. Protective equipment may also be specified on the Safety Work Permit, which may be required for some tank sampling activities.

11. MONITORING

A health physics (HP) technician shall be present at all times during sample collection activities to monitor for the presence of radiation and assist in preventing the spread of contamination. The HP technician has the authority to limit the amount of time workers may spend in a particular area or to stop work until new procedures can be prepared if the health and safety of personnel are endangered. A representative from Industrial Hygiene shall be present whenever a tank is opened to check for hazardous vapors. If hazardous vapors are present, the Industrial Hygiene representative will provide advice and monitoring as necessary to protect personnel. The Industrial Hygiene Department also has the authority to stop work until new procedures can be prepared if the health and safety of personnel are endangered. Specifics on hazardous chemical monitoring are contained in the Safety Assessment.

All tank sampling personnel shall be issued radiation worker badge containing thermoluminescent dosimeters TLDs and shall have them read at least quarterly. The Radiation Monitoring Department shall maintain copies of the results. Working dosimeters (when not in use) shall be stored in a low-background area in accordance with RPP 3.4. In addition, the HP technician may recommend additional whole-body and extremity dosimeters to adequately monitor individual exposures in

accordance with RPP 3.4. Self-reading ionization dosimeters ("pencils"), available through the Radiation Protection Department, shall be required during the sampling of tanks.

A gamma exposure rate survey shall be required in the vicinity of each tank prior to beginning sampling activities in the area. The survey will consist of one waist-high measurement taken with an ionization chamber survey instrument or scintillation counter. If exposure rates exceed 2.5 mR/hr at any location, the Radiation Protection Department shall limit personnel exposure time, recommend shielding, or increase the source-to-exposure distance to limit personnel exposures. A copy of these survey records shall be kept on file.

12. ALARA CONSIDERATIONS

All reasonable efforts shall be made to keep radiation exposures, as well as releases of radioactive material, at ALARA levels. Several ALARA principles shall be used:

- o The HP technician assigned to this project shall have authority to enforce requirements and administrative practices contained in this plan concerning any aspect of the radiological safety program. The Radiation Protection Department has the authority to stop work when, in their judgment, the health and safety of the workers are in imminent danger or when exposure reduction measures are being ignored.
- o Personnel shall be trained in radiation safety procedures and ALARA philosophies to a level commensurate with their work scope.
- o Safety audits shall be required, as indicated in the Project Management Plan.
- o Radiation Work Permits are required, as described in RPP 3.6. Safety Work Permits may be required for certain tasks. The necessity for a Safety Work Permit is determined by the sampling

crew supervisor in consultation with the Operations Division Safety Officer.

- o Radiation exposures shall be reduced where practical by the use of time, distance, shielding, and administrative controls. While it is not practical to reduce radiation exposures to zero, radiation exposures can be reduced by a carefully planned effort. In no instance will exposures to individuals exceed the limits discussed in Section 6 of this plan.

13. RADIATION WORK PERMIT (RWP) AND SAFETY WORK PERMITS

The RWP is used as a guide to establish control of and limit personnel exposures to radiation. An RWP shall be obtained before sampling is performed and shall identify the administrative steps, personnel protective equipment, personnel monitoring equipment, and clothing required to perform sampling of a specific tank or group of tanks. RWPs shall be prepared, reviewed, approved, and issued in accordance with RPP 3.6. A copy of a RWP is shown in Figs. 2 and 3.

The Radiation Protection Department shall review all existing data to determine the current radiological status of the area prior to issuance of an RWP. Tanks or groups of tanks not previously surveyed or with inadequate radiation data, as determined by the Radiation Protection Department, shall be surveyed and appropriate monitoring and protection shall be specified in the RWP.

It is the policy of ORNL to require that suitable protection be provided for the health and safety of all employees and that the application and maintenance of special safeguards for employees be provided during the performance of work under hazardous conditions. A Safety Work Permit shall be issued in accordance with safety standard IS-6.1 of the ORNL Safety Manual. The need for a Safety Work Permit for a specific task will be determined by the sampling crew supervisor in consultation with the Operations Division Safety Officer. A copy of the Safety Work Permit is shown in Figs. 4 and 5.

RADIATION WORK PERMIT (RWP)

DATE AND TIME

FROM _____ AM _____ PM TO _____ AM _____ PM

EXTENDED BY _____

WORK PERMIT NO. _____

R-

LOCATION & JOB DESCRIPTION _____

RADIATION SURVEY DATA (To be filled in by Health Physics)

LOC. CODE	SPECIFIC LOCATION AND DISTANCE FROM SOURCE	TYPE OF RADIATION	mrem/hr.	WORKING TIME FOR _____ mrem	CONTAMINATION		RADIATION SURVEY	
					TYPE	MEASUREMENT	BY	DATE AND TIME
A								
B								
C								
D								

INSTRUCTIONS*

HEALTH PHYSICS MONITORING REQUIRED: START OF JOB INTERMITTENT CONTINUOUS END OF JOB

CONTACT HP FOR SURVEY BEFORE STARTING WORK IN A NEW LOCATION
TAPE COVERALLS TO GLOVES AND FOOTWEAR

CHECK TOOLS AT END OF JOB

CHECK PERSONNEL AT END OF JOB

TIMEKEEPING REQUIRED

REMARKS

PROVIDE ASSISTANCE FOR REMOVAL OF PROTECTIVE CLOTHING

MONITOR BREATHING ZONE

NASAL SMEAR REQUIRED

BIOASSAY SAMPLE REQUIRED

DO NOT WORK ALONE - STANDBY OBSERVER REQUIRED

PROTECTIVE EQUIPMENT AND MONITORING INSTRUMENTS

CAP	GLOVES	COVERALLS (1 PR.)	SHOE COVERS	POCKET METERS
CANVAS HOOD		COVERALLS (2 PR.)	C-ZONE SHOES	DOSIMETER
SAFETY GLASSES		CANVAS	RUBBERS	FILM RING
EYE SHIELD		LEATHER	RUBBER BOOTS	DOSE-RATE ALARM
HALF MASK		SURGEON'S	PLASTIC BOOTIES	DOSE ALARM
ASSAULT MASK		PLASTIC	LAB COAT	CUTIE PIE
CHEMOX MASK		RUBBERIZED CANVAS	SPECIAL FILM METER	GMS METER
AIR-LINE HOOD		HOUSEHOLD RUBBER		
AIR-LINE SUIT				

REGULAR APPROVALS

SPECIAL APPROVALS

HEALTH PHYSICS CERTIFICATION	DIVISION DIRECTOR
SUPERVISION	N.P. DIVISION DIRECTOR
SUPERVISION	DEPUTY LAB DIRECTOR

UCN-2770
13 7.611

*Only items checked (✓) apply.

(OVER)

FIGURE 2

1. Health Physics shall be present for line breaks or removal of shielding.
 2. Notify Health Physics of any deviations from instructions and changes in working conditions.
 3. Personnel survey is required when leaving contamination zones.
 4. Return work permit to Health Physicist upon completion of job or expiration of permit.
- TIMEKEEPING BY _____
DEPT. _____

PERSONNEL AND EXTERNAL EXPOSURE CONTROLS						PLANNED EXPOSURE (mrem)	TIME RECORD						ESTIMATED EXPOSURE (mrem)
NAME	DEPT.	P.R. NO.	LOCATION CODE	DOSE RATE USED	WORKING TIME		BEGIN	END	BEGIN	END	BEGIN	END	

1. Radiation Work Permit is required* when:
 - (a) expected dose is > 20 mrem to the body or 300 mrem to extremities for an individual during a single work assignment;
 - (b) dose rate > 5 rem/hr (total body);
 - (c) airborne radioactivity is > (MPC)_a for a 40-hr week;
 - (d) specified by divisional operating rules and procedures or by posted regulations.
 2. Supplementary Time Sheet
To be used if extra space is needed for the timing of individuals into and out of an area, etc.
 3. Special Approvals
 - (a) Dose Rate rem/hr (total body)
 - > 5 Division Director in charge of work area Oral or written; noted and initialed on the permit by the person obtaining the approvals.
 4. Copies
 - (a) > 20 Above and Health Physics Division Director.
 - (b) > 50 Above and Laboratory Deputy Director.
 - (b) Dose (total body)
 - > 60 mrem/day for nonoperating personnel, or > 300 mrem/wk for operating personnel Division Director in charge of individual
 - > 1 rem Above and Laboratory Deputy Director
- *Posted regulations may be used in lieu of an RWP for operating personnel under specified conditions. (See Regulation 3, Procedure No. 26, ORNL Health Physics Manual.)

**FIGURE 3
RADIATION WORK PERMIT FORM (Back)**

SAFETY WORK PERMIT

UCN-3694A (3-87)

PERMIT NUMBER
5

ISSUED TO: (Supervisor in charge)	EMPLOYEE NO.	DEPARTMENT	PHONE	WORK ORDER NUMBER
-----------------------------------	--------------	------------	-------	-------------------

GOOD FOR DATE AND TIME SPECIFIED

FROM: (Date and Time)	TO: (Date and Time)	BUILDING	ROOM
-----------------------	---------------------	----------	------

DESCRIPTION OF WORK:

THE FOLLOWING PREPARATIONS HAVE BEEN COMPLETED IN CONNECTION WITH THIS WORK

<p>EQUIPMENT CONDITIONS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>DNA</th> <th>YES</th> <th>NO</th> </tr> </thead> <tbody> <tr><td>1. Valves closed, tagged and locked</td><td></td><td></td><td></td></tr> <tr><td>2. Pipelines under pressure PSIA</td><td></td><td></td><td></td></tr> <tr><td>3. Pipelines drained or blanked</td><td></td><td></td><td></td></tr> <tr><td>4. Pressure vessels checked and cleaned</td><td></td><td></td><td></td></tr> <tr><td>5. Pipelines and equipment purged</td><td></td><td></td><td></td></tr> <tr><td>6. Machinery and equipment safe for work to proceed</td><td></td><td></td><td></td></tr> <tr><td>7. Other (Specify)</td><td></td><td></td><td></td></tr> </tbody> </table> <p>FIRE PREVENTION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>DNA</th> <th>YES</th> <th>NO</th> </tr> </thead> <tbody> <tr><td>1. 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Pipelines under pressure PSIA				3. Pipelines drained or blanked				4. Pressure vessels checked and cleaned				5. Pipelines and equipment purged				6. Machinery and equipment safe for work to proceed				7. Other (Specify)					DNA	YES	NO	1. Welding or Burning Required				2. Non-Sparking Tools Required				3. Explosive Atmosphere Test Required					YES	NO	4. Area Personally Inspected			5. Floor Area Swept Clean and Wet Down if Necessary			6. All Combustibles Moved to a Safe Location			7. Ample Fire Extinguishing Equipment at Hand			8. Monitor Required				DNA	YES	NO	1. Circuits have been de-energized				2. 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Protection Applied and Location:	No. of Stop Tags Placed (UCN-4954) Date _____ Time _____ By (Signature) _____
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I have personally inspected site and certify that the work area has been properly cleared for work and that conditions are safe for the work indicated. This Safety Work Permit is therefore approved for the class of work indicated.

Permit Issued By (Signature)	Time	Date	Permit Received By (Signature)	Date	Logged By
Wk. Comp. & Permit Release	Division		Title		Signature
TIME	DATE	BY:			
No. Stop Tags Removed (UCN-4954)	Time		Date		By (Signature)
Permit Closed By (Signature)	Time		Date		Logged By

AT START OF WORK: The original copy is issued by requesting supervisor and goes to the supervisor-in-charge, and duplicate is retained by the requesting supervisor. Upon completion of work: (1) Supervisor-in-charge releases the original copy, returns to the requesting supervisor; (2) the requesting supervisor closes and logs the permit as required; (3) the original copy goes to the requesting supervisor's Division Safety Officer for distribution of xerox copies to: Industrial Hygiene Department, Fire Department, Safety Department, and supervisor-in-charge's Division Safety Officer; and (4) the canary copy will be destroyed by the requesting supervisor after the original copy has been closed by requesting supervisor.

**FIGURE 4
SAFETY WORK PERMIT FORM (Front)**

14. AIR MONITORING

Guidance on air monitoring is provided in RPP 3.5, Regulation 3. If airborne contamination is suspected, the HP technician may require respiratory protection rather than air monitoring.

15. MONITORING EQUIPMENT

All air samplers and radiation-detection instruments shall be calibrated at least every quarter in accordance with the Radiation and Safety Surveys and Health Physics (R&SS & HP) Internal Procedures Manual. Prior to each use of a sampler or instrument, a functional check will be performed, using rotometers for air samplers, and using check sources for instruments. The secondary calibration ensures that the sampler or instrument is working. Records shall be maintained for all primary calibrations by the Radiation Protection Department. Allowable exposure to airborne radioactive materials shall be determined in accordance with the procedure presented in RPP 3.2 to demonstrate compliance with DOE Order 5480.1.A.

16. CONTAMINATION MONITORING

All personnel leaving the controlled areas shall be monitored with an appropriate detection instrument. The appropriate instrument shall be determined by the HP technician by considering the nature of the anticipated materials specified in the RWP. Personnel contamination shall, to the extent possible, be removed before the worker leaves the controlled area. Hand-held alpha and beta-gamma monitors will be used to detect contamination on personnel and their clothing. The monitoring instrument must be able to reliably detect the limits as specified in RPP 2.5 and Tables 2 and 3 of this health and safety plan. Sampling personnel shall be trained in the proper operation and use of the contamination monitors.

Table 2. Recommended maximum^a contamination guide for shoes and clothing

<u>Item</u>	<u>Direct survey</u>		<u>Transferable (smear)</u>	
	alpha (d/m/100 cm ²)	beta,gamma (mrad/h)	alpha (d/m/100 cm ²)	beta,gamma
Shoes, contamination zone	300	2.5	20	1000
Shoes, personal	300	0.3	20	1000 ^b
Clothing, contamination zone	300	0.75	Not applicable	
Clothing, other company-issued, and personal	150	0.25	Not applicable	

^aNo 100-cm² area to average greater than this value.

^bExcept ¹²⁶I, ¹³¹I, and ¹³³I for which the guide is 200 d/m/100 cm² and ¹²⁵I, ¹²⁹I, and ²²⁷Ac for which the guide is 20 d/m/100 cm².

Table 3. Recommended maximum contamination guide for skin surfaces

Surface	<u>Direct survey</u>		<u>Transferable (smear)</u>
	alpha (d/m/100 cm ²)	beta,gamma (mrad/h)	alpha, beta,gamma
General body	150	0.05	None detectable ^a
Hands	300	0.2	None detectable ^a

^aDetection limit is related to the instrumentation used.

Reference: RPP 2.5, page 8 of 11.

All potentially contaminated tools and equipment to be released from a controlled area for unconditional use shall be monitored and decontaminated, if necessary, to levels as specified in RPP 2.5. If hazardous materials are encountered, the decontamination procedures and waste disposal will be modified for equipment used at that tank. In some cases tools and equipment will be wrapped in plastic and transported to another area for decontamination.

Personnel and equipment found to be contaminated above the limits specified in RPP 2.5 shall be decontaminated to levels below these limits and acceptable to the HP technician in charge. In the event of medical emergencies, the extent of decontamination performed will be dependent on the seriousness of the injury.

17. WORKSITE EFFECTIVENESS OF DECONTAMINATION

The method of determining effectiveness of surface decontamination of removable contamination is swipe testing. Cloth or paper patches are used to wipe an estimated 100 cm² of the contaminated surface to test for removable contaminants. The results are compared with the limits for removable radionuclides specified in RPP 2.5. In addition, alpha or beta-gamma survey meters are used to detect the combination of removable and fixed contamination on equipment, clothing, or personnel.

18. DECONTAMINATION DURING MEDICAL EMERGENCIES

Basic Considerations - Part of the overall planning for incident response is managing medical emergencies.

- o Some ORNL response team members are fully trained in first aid and CPR. Emergency medical technicians (EMTs) and, during day shifts, physicians are available. During the day shift, ORNL physicians control medical treatment. During off-shift hours the EMT will provide immediate, life-saving treatment. Further treatment will be determined in consultation with the ORNL on-call physician.

- o The Radiation Emergency Assistance Center and Training Site (REAC/TS) in Oak Ridge is considered to be the backup facility for treatment of contaminated, injured personnel.
- o Consultation services with a health physicist are available.
- o Emergency eye washes, showers, and/or wash solutions are available at various locations throughout ORNL.
- o First aid kits, blankets, and stretcher are available at various locations throughout ORNL.

In addition, established methods will be used to decontaminate personnel with medical problems and injuries. Decontamination may aggravate or cause more serious health effects. If prompt life-saving first aid and/or medical treatment is required, decontamination procedures should not restrict administration of life-saving measures. Whenever possible, response personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination in accordance with ORNL emergency procedures.

Physical Injury - Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. All injuries must be treated by and reported to the ORNL Health Division. Immediate life-saving treatment may be administered at the site. All other treatment, including treatment for minor injuries, must be administered at the ORNL Health Division facilities unless otherwise determined by an ORNL physician.

Life-saving care should be instituted immediately, having priority over any decontamination efforts. Outside garments can be removed (depending on the weather) if they do not cause delays, interfere with the treatment, or aggravate the problem. When the possibility of spine, neck, or head injuries exists, outer clothing or respiratory equipment should not be removed or should only be removed by trained

medical personnel if removal is absolutely necessary. Respiratory facepieces and backpack assemblies should be removed if there is no possibility of spine, neck, or head injuries. Fully encapsulating suits or chemical resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in blankets to help prevent spread of contamination to the inside of the ambulance and/or medical personnel. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material which would also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

Heat Stress - Heat related illness ranges from fatigue to heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to a heat stroke. Unless the victim is obviously contaminated, treatment should begin immediately (see the ACGIH TLVs for 86-87).

Chemical Exposure - Exposure to chemicals can be divided into two categories:

- o Injuries resulting from direct skin or eye contact with chemicals that cause tissue damage, such as acid burns or other corrosive effects; and
- o Toxic effects resulting from absorption of chemicals via inhalation, ingestion, or skin.

For inhaling a contaminant, treatment can only be by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect. First aid treatment usually is flooding the affected area with water.

When protective clothing is grossly contaminated, skin contact is inevitable and injury may result. Contamination may be transferred to treatment personnel. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed.

19.0 GENERAL SAFETY REQUIREMENTS

Personnel working at sites involving radioactive materials or chemical hazards may encounter conditions that are unsafe or potentially unsafe. In addition to the danger due to the physical, chemical, and toxicological properties of the material(s) present, other types of hazards, such as electricity, water, heavy equipment, falling objects, loss of balance, or tripping, can result in injury to personnel.

The following requirements will be implemented to reduce the risk of adverse effects and shall be followed during the tank sampling program:

- o Prior to beginning sampling operations, an Operational Readiness Review will be conducted to evaluate the Inactive Tank Sampling Project. The scope of the review will include, but will not be limited to, data management, industrial and radiological safety, quality assurance practices and procedures, training status, safety plans and assessments, sampling procedures, and environmental protection. The review team will include a chairperson of group leader status or higher, the Division QA Specialist, Safety and Radiation Control Officer, Environmental Protection Officer, Training Coordinator, and RAP Program Manager. A representative of the Office of Operational Safety and an individual with emergency response training will be included in the review team. In addition, staff with appropriate technical expertise will be added as necessary.

- o Contaminated protective equipment, such as respirators, hoses, boots, etc., shall not be removed from the regulated area unless they are properly packaged and labeled.
- o Legible and understandable precautionary labels shall be affixed to equipment and sample bottles in accordance with RPP 2.3.
- o Guidelines on surface contamination control and radiation levels are provided in RPP 2.3 and RPP 2.5.
- o Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport in accordance with RPP 4.1.
- o Removal of contaminated particulates from clothing or equipment by blowing, shaking, or any other means which disperses contaminants into the air is prohibited.
- o No food or beverages shall be present or consumed in contamination zones.
- o No tobacco products shall be present or used, and cosmetics shall not be applied in contamination zones.
- o Emergency equipment shall be located in areas which are readily accessible and which shall remain minimally contaminated in an emergency.
- o Tank-sampling team members shall periodically observe each other for signs of toxic exposure. Indications of adverse effects include, but are not limited to:
 1. Changes in complexion and skin discoloration.
 2. Changes in coordination.
 3. Changes in demeanor.

4. Excessive salivation and pupillary response.
 5. Changes in speech pattern.
- o Tank-sampling personnel shall inform each other of non-visible effects of toxic exposure such as:
 1. Headaches
 2. Dizziness
 3. Nausea
 4. Blurred vision
 5. Cramps
 6. Irritation of eyes, skin or respiratory tract.
 - o Any worker exhibiting or reporting symptoms that may indicate toxic exposure to chemical hazards shall be examined by the ORNL Health Division.
 - o Prompt remedial action shall be taken whenever an inadvertent release of a hazardous material occurs.
 - o Appropriate action to provide secure footing shall be taken at all locations where personnel will be working.
 - o As appropriate, equipment on site shall be bonded and grounded, spark proof, and explosion resistant in accordance with ORNL Safety Manual, Procedures 5.1 through 5.4.
 - o All personnel shall avoid contact with potentially contaminated substances. Walking through puddles or mud, kneeling on the ground, or leaning against drums should be avoided whenever possible.
 - o Monitoring equipment shall not be placed on potentially contaminated surfaces.

20.0 HEAT STRESS

Guidelines have been developed by the National Institute for Occupational Safety and Health (NIOSH) for monitoring heat stress and other physiological factors and are published in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH, 1986). These guidelines are contained in the ACGIH TLVs 86-87 Guidelines.

21.0 EMERGENCIES

Any emergency situation that occurs at the sampling site shall be handled in accordance with ORNL and Operations Division procedures currently in place. Unplanned or unusual radiation exposures or contamination spread must be reported in accordance with RPP 2.6. Unusual occurrences will be reported in accordance with IS 1.2.

22.0 ACTIVITIES DESCRIPTION MEMORANDUM (AcDM)

An AcDM has been prepared by the Environmental Monitoring & Compliance Department to outline precautions necessary to protect the environment and human health. These precautions have been included in preparation of the tank-sampling procedures.

23.0 REFERENCES

ORNL Safety Manual
ORNL Industrial Hygiene Manual
ORNL Health Physics Procedure Manual
DOE Order 5480.5
OSHA 29 CFR 1910
ORNL Environmental Protection Manual

APPENDIX A

Table of Required Documentation

Document	Ref Para.	Training File	Project File
Training Record	7.0	X	
Medical Fitness	4.0	X	
Radiation Surveys	11.0		X



INTERNAL DISTRIBUTION

1. J. F. Alexander
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