FERNALD RI/FS HEALTH AND SAFETY PROCEDURES

XX/XX/XX

WMCO
128
PROCEDURES

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURES

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HS 002	SUR CON LIMITS
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HS 004	RADIATION WORK PERMITS
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FERNALD RI/FS
HEALTH AND SAFETY PROCEDURES

TITLE: MONITORING PERSONNEL FOR RADIOACTIVE CONTAMINATION

PROCEDURE #: HS 001 ISSUED: _____

1.0 PURPOSE

This procedure describes the methods to be used for monitoring personnel for radioactive contamination and the actions to be taken upon finding contamination.

2.0 SCOPE

This procedure applies to personnel contamination monitoring during the RI/FS at the Feed Materials Production Center.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the SHSO or his designee to ensure that all RI/FS personnel understand and follow this procedure.

3.2 It is the responsibility of all personnel to follow this procedure and to report any unusual findings to the SHSO.

4.0 REFERENCES

None

5.0 REQUIREMENTS

5.1 Equipment

5.1.1 Ludlum Model 12 Portable Survey Meter with Ludlum Model 44-9 Pancake G-M Probe.

5.1.2 Ludlum Model 12 Portable Survey Meter with Ludlum Model 43-5 Alpha Scintillation Probe.

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HEALTH AND SAFETY PROCEDURES

TITLE: MONITORING PERSONNEL FOR RADIOACTIVE CONTAMINATION

PROCEDURE #: HS 001 ISSUED: _____

6.0 PROCEDURE

6.1 Personnel Contamination Monitoring At Zone 1 Exit

6.1.1 All RI/FS personnel leaving Zone 1 through the visitor's locker room or through the men or women's change rooms are required to monitor themselves for contamination using the hand and foot monitors and/or friskers located at the exit points.

6.1.2 Visitors to Zone 1 who wear smocks and shoe covers over their personal clothes are required to monitor themselves with the hand and foot monitors and to perform a whole body frisk as described in this procedure.

6.1.3 Workers who undergo a complete clothing change and shower are required to monitor themselves for contamination using the hand and foot monitors.

6.1.4 Materials, such as log books, which are hand carried into Zone 1 must be monitored for contamination using the friskers located at the exit points.

6.1.5 If the hand and foot monitor or frisker alarms during the monitoring cycle, the count shall be repeated. If an alarm occurs a second time, the contaminated area shall be washed and the monitoring shall be repeated. If the monitor continues to alarm after washing, stay in the area and notify WMCO's Health Physics Department at ext. 6889 from the phone in the locker room.

6.1.6 Notify the SHSO of any contamination events.

6.2 Personnel Contamination Monitoring Within Zone 1

6.2.1 When exclusion zones are established within Zone 1, personnel will be monitored for contamination at the exclusion zone boundary using a pancake G-M detector (Ludlum 44-9 detector and Ludlum 12 survey meter or equivalent).

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6.2.2 If the background count rate as measured with a pancake G-M detector is less than 300 cpm, a whole body frisk will be performed by the SHSO or his designee as described in this procedure. In the event that frisking indicates greater than 250 cpm above background with the pancake G-M detector the individual shall be decontaminated as directed by the SHSO or his designee.

6.2.3 Complete a Personnel Radiation Contamination Survey form and deliver to the SHSO.

6.3 Personnel Contamination Monitoring For Zones 2 and 3

The following procedure will be followed when personnel contamination monitoring is required by the SHSO for work in Zones 2 and 3:

6.3.1 The team leader or his designee shall perform hand and foot frisks as described in this procedure if the background count rate, as measured with a Pancake G-M detector, is less than 300 cpm. In the event that frisking indicates greater than 100 cpm above background with a Pancake G-M detector, a whole body frisk shall be performed. All areas that exceed 100 cpm above background shall be decontaminated by washing or by applying a waterless hand cleaner to the contaminated area and removing with cotton or soft disposable towels.

6.3.2 In the event that the background count rate with the pancake G-M exceeds 300 cpm, smears shall be taken on the surfaces of concern and screened in a low background area (< 300 cpm) by placing the smears in a fixed geometry using the G-M probe sample holder. If smear counts exceed 100 cpm, decontaminate the effected areas as described above.

6.3.3 All contamination events shall be reported to the SHSO.

6.3.4 Complete a Personnel Radiation Contamination Survey form and deliver to the SHSO.

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HEALTH AND SAFETY PROCEDURES

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PROCEDURE #: HS 001 ISSUED:

6.4 Whole Body Frisk Procedure

6.4.1 Use of Frisker Stations

Frisker stations are located at the exit point from Zone 1.

6.4.1.1 Verify that range selector is set on "X1" scale.

6.4.1.2 Place hands within 1/2 inch of the probe and hold for approximately 3 seconds. If the alarm does not sound, pick up the probe to perform the whole body frisk.

6.4.1.3 If the alarm sounds, wash the contaminated area and repeat the count. Discontinue the frisk and notify WMCO's Health Physics personnel at ext. 6889 if the alarm occurs again.

6.4.1.4 To perform the frisk, hold the probe within 1/2 inch of the surface being monitored and move the probe over the surface at a rate of approximately 2 inches per second.

6.4.1.5 Frisk the head, trunk, seat, arms, legs, and feet. Pay particular attention to the pant cuffs and bottom of shoes or feet.

6.4.1.6 Frisk personnel belongings removed from the area (log book, clipboard, etc.).

6.4.1.7 If no alarm sounds, replace the probe in its allotted place and leave the area.

6.4.1.8 If the alarm sounds, wash the contaminated area and repeat the frisk. Notify the WMCO's Health Physics personnel at ext. 6889 if alarm occurs again.

6.4.2 Use of Pancake G-M Detector for Whole Body Frisking.

6.4.2.1 This instrument shall be operated in accordance with RI/FS HS Procedure 010, "Operation of the Ludlum Model 12 Portable Survey Meter".

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HEALTH AND SAFETY PROCEDURES

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6.4.2.2 Turn instrument to the "X1" range and verify that the background count rate is less than 300 cpm. If the background exceeds 300 cpm, the SHSO shall be notified and the frisk cannot be continued.

6.4.2.3 Hold the probe within 1/2 inch of the surface being monitored and move the probe over the surface at a rate of approximately 2 inches per second.

6.4.2.4 Frisk the hands, head, trunk, seat, arms, legs, and feet. Pay particular attention to the pant cuffs and bottom of shoes or feet.

6.4.2.5 Frisk personnel belongings removed from the area (log book, clipboard, etc.).

6.4.2.6 If the count rate stays below 100 cpm above background, turn the instrument off and leave the area.

6.4.2.7 If the count rate exceeds 100 cpm above background, wash the affected area and repeat the frisk. Notify the SHSO for assistance if washing does not decrease the count rate below 100 net cpm.

6.4.3 Use of Alpha Scintillation Detector For Whole Body Frisking.

6.4.3.1 This instrument shall be operated in accordance with RI/FS HS Procedure 010, "Operation of the Ludlum Model 12 Portable Survey Meter".

6.4.3.2 Turn instrument to the "X1" range and verify that the background count rate is less than 1 cpm. If the background exceeds 1 cpm, the instrument may be contaminated or is not working properly and should not be used.

6.4.3.3 Hold the probe within 1/4 inch of the surface being monitored being careful not to puncture the window or contaminate the probe. Move the probe over the surface at a rate of approximately 2 inches per second.

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6.4.3.4 Frisk the hands, head, trunk, seat, arms, legs, and feet. Pay particular attention to the pant cuffs and bottom of shoes or feet.

6.4.3.5 Frisk personnel belongings removed from the area (log book, clipboard, etc.).

6.4.3.6 If the count rate stays below 3 cpm above background, turn the instrument off and leave the area.

6.4.3.7 If the count rate exceeds 3 cpm above background, wash the contaminated area and repeat the frisk. Notify the SHSO for assistance if washing does not decrease the count rate below 3 net cpm.

6.5 Hand and Foot Frisk Procedure

6.5.1 The procedures to be followed for hand and foot frisking are found in 6.4.2 and 6.4.3 except that only the hands and feet are monitored.

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer shall perform periodic surveillance to determine compliance with this procedure by field personnel.

9.0 CALCULATIONS

None

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURES

TITLE: MONITORING PERSONNEL FOR RADIOACTIVE CONTAMINATION

PROCEDURE #: HS 001 ISSUED: _____

10.0 APPENDICES

10.1 Personnel Radiation Contamination Survey

FERNALD RI/FS
PERSONNEL RADIATION CONTAMINATION SURVEY

			Alpha	Beta/gamma
Date: _____	Meter Model #	_____	_____	
Location: _____	Serial Number	_____	_____	
Task: _____	Probe Model #	_____	_____	
	Serial Number	_____		

Time	Background (cpm) * alpha	Beta/gamma
_____	_____	_____
_____	_____	_____
_____	_____	_____

Personnel Surveyed	Time	alpha (cpm)**	Beta/gamma (cpm **)
_____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
_____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
_____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
_____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
_____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

Signature of Personnel

_____

_____

_____

_____

_____

* Do not use the instruments if alpha background exceeds 2 cpm or if beta/gamma background exceeds 300 cpm. Notify the SHSO.

** If alpha count rate exceeds 3 cpm above background or beta/gamma count rate exceeds 100 cpm above background, wash the affected area and notify the SHSO. Contamination events should be noted above.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: SURFACE CONTAMINATION LIMITS

PROCEDURE #: HS 002 ISSUED: _____

1.0 PURPOSE

To establish surface radioactive contamination limits for areas and material.

2.0 SCOPE

These limits apply to radioactive contamination levels on equipment, materials, or areas released for unrestricted use.

3.0 RESPONSIBILITY

It is the responsibility of the Site Health and Safety Officer or his designee to ensure that items or areas release for unrestricted use are below the levels given in this procedure.

4.0 REFERENCES

4.1 Feed Materials Production Center Procedures Manual, FMPC - 2084, "Radiation Control Manual", August 1987.

4.2 American National Standards Institute Draft Standard, ANSI N13. 12, "Surface Radioactivity Guides For Materials, Equipment, and Facilities To Be Released For Uncontrolled Use", May 3, 1982.

5.0 REQUIREMENTS

None

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: SURFACE CONTAMINATION LIMITS

PROCEDURE #: HS 002 ISSUED: _____

6.0 PROCEDURE

6.1 Any item or area may be released for unrestricted use if the total surface contamination as measured with a Ludlum Model 44-9 Pancake G-M detector held 1/2 inch from the surface is less than 100 cpm above background and less than 3 cpm above background as measured with a Ludlum Model 43-5 Alpha Scintillation detector held 1/4 inch from the surface.

Note: The above limit applies only if the background count rate is below 300 cpm for the Model 44-9 Pancake G-M detector. If the background is greater than 300 cpm, smear surveys will be performed as described in 6.2.

6.2 Any item or area may be released for unrestricted use if the removable contamination levels, as determined by smear survey, is less than 1000 dpm/100 cm^2 beta/gamma and less than 20 dpm/100 cm^2 alpha.

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility For Inspection

8.1.1 The Project Health and Safety Officer shall perform periodic surveillances to determine compliance with this procedure by field personnel.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: SURFACE CONTAMINATION LIMITS

PROCEDURE #: HS 002 ISSUED: _____

9.0 CALCULATIONS

None

10.0 APPENDICES

None

Fernald RI/FS
Health and Safety Procedure

Title: Entrance and Exit Requirements for Restricted Areas

Procedure #: HS 003 Issued: _____

1.0 PURPOSE

This procedure describes the method for entering or exiting an area that has been marked restricted by Health and Safety.

2.0 SCOPE

All areas that involve potential hazards to workers or passersby will be posted as a restricted area and all persons entering this are subject to the provisions of this directive.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Site Health and Safety Officer (SHSO), or his designee, to ensure that all persons entering and/or exiting a restricted area understands and follows this procedure.

3.2 It is the responsibility of all persons entering and/or exiting a restricted area to follow this procedure.

4.0 REFERENCES

None

5.0 REQUIREMENTS

None

Fernald RI/FS
Health and Safety Procedure

Title: Entrance and Exit Requirements for Restricted Areas

Procedure #: HS 003 Issued: _____

6.0 PROCEDURE

6.1 Entrance Procedure

6.1.1 Obtain authorization from the Health and Safety Officer to be placed on the "Restricted Area Access" list located at the entrance to the restricted area.

6.1.2 Sign the "Entrance Requirements" record located at the entrance to the restricted area.

6.1.3 Observe all requirements on the work permit or "Entrance Requirements" (ER) form posted at the restricted area entrance.

6.1.4 No food, beverage, or smoking is permitted in restricted areas.

6.1.5 Wear protective clothing as specified on the work permit or ER form. Minimum requirements include: hard hat, safety glasses, and safety shoes.

6.1.6 Visitors: a) Must obtain authorization;
b) Must be escorted.

6.2 Routine Exit Procedures

6.2.1 Sign out in the "sign out" area on the ER form.

6.2.2 Notify the SHSO of any unusual situations

6.3 Exit Procedure For Emergencies

6.3.1 If changes in the work environment, as indicated by Health and Safety monitoring, are detected, promptly move to the exit of the restricted area. Notify the SHSO and await assistance.

6.3.2 In the event that immediate evacuation of the restricted area is called for by local on site emergencies, promptly leave the restricted area and notify the SHSO.

Fernald RI/FS
Health and Safety Procedure

Title: Entrance and Exit Requirements for Restricted Areas

Procedure #: HS 003 Issued: _____

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer shall perform periodic surveillance to determine compliance with this procedure by field personnel.

9.0 CALCULATIONS

None

10.0 APPENDICES

10.1 Restricted Area Access Form

10.2 Entrance Requirements Form

Fernald RI/FS
Health and Safety Procedure

Title: Entrance and Exit Requirements for Restricted Areas

Procedure #: HS 003 Issued: _____

APPENDIX 10.1

RESTRICTED AREA ACCESS

AREA: _____ DURATION: _____

REQUIREMENTS: _____

The following personnel have been granted access to this restricted area and have authorization to escort visitors into the area:

NAME	TITLE

_____ _____
HEALTH AND SAFETY OFFICER DATE

Fernald RI/FS
Health and Safety Procedure

Title: Entrance and Exit Requirements for Restricted Areas

Procedure #: HS 003 Issued: _____

APPENDIX 10.2

E N T R A N C E R E Q U I R E M E N T S

Protective Equipment Required	Date	Signature In	Signature Out	Job Duty

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: WMCO ISSUED RADIATION WORK PERMITS

PROCEDURE # HS 004 ISSUED

1.0 PURPOSE

This procedure describes the method to be followed in obtaining WMCO issued Radiation Work Permits (RWP).

2.0 SCOPE

This procedure applies to all work within Zone 1 (the FMPC Process Area).

3.0 RESPONSIBILITY

3.1 Site Health and Safety Officer (SHSO), or his designee.

3.1.1 Maintain a supply of Radiation Work Permit Forms (FMPC-ES&H-1372).

3.1.2 Insure that all work performed inside the FMPC Process Area (Zone 1) is covered by a current Radiation Work Permit.

3.1.3 Provide forms to the Team Leaders upon request.

3.1.4 Turn in the RWP to the WMCO Environmental and Radiological Monitoring Technician (ERMT) for completion.

3.1.5 Review completed RWP's with the Team Leaders. Provide additional instructions if required.

3.1.6 Maintain copies of completed RWP's.

3.2 Team Leaders

3.2.1 Initiate RWP's for all work in the FMPC Process Area.

3.2.2 Review completed RWP's with team members and obtain their signatures on the RWP.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: WMCO ISSUED RADIATION WORK PERMITS

PROCEDURE # HS 004 ISSUED

3.2.3 Post completed RWP's at the work location or maintain at the work site.

3.2.4 Ensure that RWP requirements are followed.

3.3 Team Members

3.3.1 Read and sign the RWP.

3.3.2 Perform the work in accordance with the requirements specified in the RWP.

4.0 REFERENCES

4.1 Westinghouse Materials Company of Ohio Procedure, FMPC-515, Issuance and Implementation of Radiation Work Permits, Revision 0, 5/22/87.

5.0 REQUIREMENTS

5.1 Material

Radiation Work Permit Forms FMPC-ES&H-1372, (Appendix 10.1).

6.0 PROCEDURE

6.1 Team Leader

6.1.1 Obtain RWP Form from the SHSO.

6.1.2 Complete Section 1 which includes job location, issue date, shift, expiration date, brief job description, and signature. (See attached example, Appendix 10.2).

6.1.3 Return the form to the SHSO.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: WMCO ISSUED RADIATION WORK PERMITS

PROCEDURE # HS 004 ISSUED

6.2 Site Health and Safety Officer

6.2.1 Review Section 1 of the RWP to verify that the information is correct. Provide assistance to the Team Leader if necessary.

6.2.2 Turn in the RWP to the WMCO's Environmental and Radiological Monitoring Technician (ERMT) for completion (Phone 738-6889, Trailer 26).

6.2.3 Review completed RWP's with the Team Leaders. Provide additional instruction if required.

6.3 Team Members

6.3.1 Read and sign the completed RWP.

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer shall perform periodic surveillances to determine compliance with this procedure by field personnel.

8.2 Acceptance Criteria

None

9.0 CALCULATIONS

None

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: WMCO ISSUED RADIATION WORK PERMITS

PROCEDURE # HS 004 ISSUED

10.0 APPENDICES

Appendix 10 I

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RADIATION WORK PERMIT

SECTION I: TO BE COMPLETED BY THE JOB SUPERVISOR

(1) JOB LOCATION	(2) ISSUE DATE	(3) SHIFT	(4) EXPIRATION DATE*
BUILDING	DATE		

JOB DESCRIPTION

REQUESTING SUPERVISOR'S SIGNATURE

* Maximum 7 days from issuance

SECTION II: TO BE COMPLETED BY ERMT

(5) RADIATION LOCATION	INSTRUMENT READING (6) OW OPEN WINDOW mRad/hr	(7) CW CLOSED WINDOW mRad/hr	EXTREMITIES (8) OPEN WINDOW mRad/hr
1.			
2.			
3.			
4.			

INSTRUMENT TYPE	SERIAL NUMBER	CALIBRATION DATE

(9) STAY TIME CALCULATIONS

CP BETA DOSE CORRECTION FACTOR (OW-CW)*F = mRem/hr	SKIN DOSE WHOLE BODY	EXTREMITY TIME LIMIT
Side Window GM F = 8 mRem/hr		
CP Ion Chamber F = 1 mRem/hr		

(10) AMBIENT BACKGROUND _____ β/γ _____ mrem/hr

(11) RADIOLOGICAL SURVEY FORM ATTACHED ☐ YES ☐ NO

(12) SURVEY MAP ATTACHED ☐ YES ☐ NO

(13) MONITORING REQUIREMENTS

- ☐ At start of job
- ☐ Intermittent
- ☐ Continuous
- ☐ On completion of job
- ☐ Not required
- ☐ Personnel survey at completion
- ☐ Air monitoring

(14) DOSIMETRY REQUIREMENTS**

- ☐ Direct reading dosimeter
- ☐ Wrist dosimeter
- ☐ Ring dosimeter
- ☐ Other _____

** TLD required for all radiation work

(15) PROTECTIVE EQUIPMENT

WHOLE BODY
- ☐ None
- ☐ Cloth coveralls
- ☐ Disposable coveralls
- ☐ Lab coat
- ☐ Tape openings
- ☐ Other _____

BREATHING REQUIREMENTS
- ☐ Half face respirator
- ☐ Full face respirator
- ☐ Airline respirator
- ☐ Airline hood
- ☐ Combination canister
- ☐ SCBA
- ☐ Other _____

HEAD
- ☐ Safety glasses
- ☐ Goggles
- ☐ Face shield
- ☐ Cap
- ☐ Hood
- ☐ Hard hat

HANDS (GLOVES)
- ☐ Cotton
- ☐ Rubberized
- ☐ Surgical
- ☐ Gauntlet
- ☐ Other _____

SHIELDING
- ☐ Rubber Mat
- ☐ Aluminum
- ☐ Plywood
- ☐ Other _____

FEET AND LEGS
- ☐ Latex shoe covers
- ☐ Disposable shoe covers
- ☐ Safety shoes
- ☐ Safety boots
- ☐ Other _____

(16) SPECIAL HEALTH PHYSICS INSTRUCTIONS AND REQUIREMENTS

ERMT SIGNATURE: DATE: TIME ISSUED:

SECTION III: APPROVAL SIGNATURES (as required)

NO.	DISTRIBUTION OF COPIES
1	Posting
	ERM Supervisor
	Health Physics

SECTION IV: TO BE COMPLETED BY EMPLOYES ***

(17) NAME(S) OF EMPLOYE(S) (SIGNATURE)	(18) BADGE NUMBER	(19) RESPIRATOR FIT TEST	(20) RADIATION WORKER TRAINING
1.		☐ YES ☐ NO	☐ YES ☐ NO
2.		☐ YES ☐ NO	☐ YES ☐ NO
3.		☐ YES ☐ NO	☐ YES ☐ NO
4.		☐ YES ☐ NO	☐ YES ☐ NO
5.		☐ YES ☐ NO	☐ YES ☐ NO
6.		☐ YES ☐ NO	☐ YES ☐ NO

*** Signature indicates employe has read this RWP

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Appendix 10 2

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RADIATION WORK PERMIT

SECTION I: TO BE COMPLETED BY THE JOB SUPERVISOR

(1) JOB LOCATION	(2) ISSUE DATE	(3) SHIFT	(4) EXPIRATION DATE*
~~Prong~~ Waste Pit Area	7/14/87	1st	7/21/87

DESCRIPTION: Survey and grid layout for RTE's

REQUESTING SUPERVISOR'S SIGNATURE: [signature]

* Maximum 7 days from issuance

SECTION II: TO BE COMPLETED BY ERMT

(5) RADIATION LOCATION	INSTRUMENT READING (6) OW OPEN WINDOW mRad/hr	(7) CW CLOSED WINDOW mRad/hr	EXTREMETIES (8) OPEN WINDOW mRad/hr
1.			
2.			
3.			
4.			

INSTRUMENT TYPE	SERIAL NUMBER	CALIBRATION DATE

(9) STAY TIME CALCULATIONS

CP BETA DOSE	SKIN DOSE	EXTREMITY
CORRECTION FACTOR (OW:CW)*F = mRem/hr		
	WHOLE BODY	TIME LIMIT
Side Window GM F = 8 mRem/hr		
CP Ion Chamber F = 3 mRem/hr		

(10) AMBIENT BACKGROUND _____ β/γ _____ mrem/hr

(11) RADIOLOGICAL SURVEY FORM ATTACHED ☐ YES ☐ NO

(12) SURVEY MAP ATTACHED ☐ YES ☐ NO

(13) MONITORING REQUIREMENTS

- ☐ At start of job
- ☐ Intermittent
- ☐ Continuous
- ☐ On completion of job
- ☐ Not required
- ☐ Personnel survey at completion
- ☐ Air monitoring

(14) DOSIMETRY REQUIREMENTS**

- ☐ Direct reading dosimeter
- ☐ Wrist dosimeter
- ☐ Ring dosimeter
- ☐ Other _____

** TLD required for all radiation work

(15) PROTECTIVE EQUIPMENT

WHOLE BODY
- ☐ None
- ☐ Cloth coveralls
- ☐ Disposable coveralls
- ☐ Lab coat
- ☐ Tape openings
- ☐ Other _____

BREATHING REQUIREMENTS
- ☐ Half face respirator
- ☐ Full face respirator
- ☐ Airline respirator
- ☐ Airline hood
- ☐ Combination canister
- ☐ SCBA
- ☐ Other _____

HEAD
- ☐ Safety glasses
- ☐ Goggles
- ☐ Face shield
- ☐ Cap
- ☐ Hood
- ☐ Hard hat

HANDS (GLOVES)
- ☐ Cotton
- ☐ Rubberized
- ☐ Surgical
- ☐ Gauntlet
- ☐ Other _____

SHIELDING
- ☐ Rubber Mat
- ☐ Aluminum
- ☐ Plywood
- ☐ Other _____

FEET AND LEGS
- ☐ Latex shoe covers
- ☐ Disposable shoe covers
- ☐ Safety shoes
- ☐ Safety boots
- ☐ Other _____

(16) SPECIAL HEALTH PHYSICS INSTRUCTIONS AND REQUIREMENTS

ERMT SIGNATURE: DATE: TIME ISSUED:

SECTION III: APPROVAL SIGNATURES (as required)

NO.	DISTRIBUTION OF COPIES
	Posting
	ERM Supervisor
	Health Physics

SECTION IV: TO BE COMPLETED BY EMPLOYES ***

(17) NAME(S) OF EMPLOYE(S) (SIGNATURE)	(18) BADGE NUMBER	(19) RESPIRATOR FIT TEST	(20) RADIATION WORKER TRAINING
1.		☐ YES ☐ NO	☐ YES ☐ NO
2.		☐ YES ☐ NO	☐ YES ☐ NO
3.		☐ YES ☐ NO	☐ YES ☐ NO
4.		☐ YES ☐ NO	☐ YES ☐ NO
5.		☐ YES ☐ NO	☐ YES ☐ NO
6.		☐ YES ☐ NO	☐ YES ☐ NO

***** Signature indicates employe has read this RWP.

FMPC ESA-1372 (REV 5-18-87)

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FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: HANDLING, USE, AND STORAGE OF METHYL ALCOHOL

PROCEDURE # HS 005 ISSUED

1.0 PURPOSE

This procedure provides instructions for the safe use, storage, and transfer of methyl alcohol.

2.0 SCOPE

All operations which use, handle, store, or otherwise have an exposure to methyl alcohol are subject to the provisions of this directive.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Project Health and Safety Officer, or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee, immediately.

4.0 REFERENCES

4.1 ACGIH, Documentation of the Threshold Limit Values and Biological Exposure Indices, Fifth Edition, 1986.

4.2 ACGIH, Threshold Limit Values and Biological Exposure Indices for 1986-1987.

4.3 Proctor and Hughes, Chemical Hazards of the Workplace, J. B. Lippincott Company; Philadelphia, PA; 1978.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: HANDLING, USE, AND STORAGE OF METHYL ALCOHOL

PROCEDURE # HS 005 ISSUED

5.0 REQUIREMENTS

5.1 Equipment

5.1.1 Approved safety cans.

5.2 Material

5.2.1 Hazardous Material Identification System Labels.

6.0 PROCEDURE

6.1 General

6.1.1 Methyl alcohol is a clear, colorless liquid with a characteristic pungent odor. It is also known as methanol, wood alcohol, Columbian spirits, and Carbinol. It is irritating to the eyes, skin, and respiratory tract. Methyl alcohol poisoning can result from ingestion, inhalation, or skin absorption. Acute effects of poisoning can include headache, blurred vision, dizziness, blindness, and death. Repeated exposure to methyl alcohol vapor can result in headaches, dizziness, insomnia, gastric disturbances, and failure of vision. Repeated or prolonged skin contact will cause dermatitis, erythema, and scaling. Methyl alcohol also poses a flammable hazard and should not be exposed to heat, flame or oxidizers.

6.2 Permissible Exposure Levels

6.2.1 Regulations for permissible concentrations of airborne chemicals used by DOE facilities are found in current ACGIH TLV Handbooks. The threshold limit value-time weighted average (TLV-TWA) concentration for methyl alcohol from the 1986-1987 TLV Handbook is 200 ppm. The "skin" notation indicates that there is potential significant contribution to the overall exposure from absorption through the skin.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: HANDLING, USE, AND STORAGE OF METHYL ALCOHOL

PROCEDURE # HS 005 ISSUED

6.3 Use of Methyl Alcohol

6.3.1 When using small quantities of methyl alcohol, such as in squeeze bottles, goggles and polyethylene gloves shall be worn.

6.3.2 When using large quantities of methyl alcohol, such as when decontaminating large items with pressurized sprayers, goggles, polyethylene gloves, and splash protection garments such as polyethylene aprons or polyethylene coated Tyvek coveralls shall be worn.

6.3.3 If methyl alcohol is used in enclosed spaces, adequate ventilation shall be used to maintain airborne concentrations in the breathing zone below 200 ppm.

6.4 Transfer

6.4.1 When transferring methyl alcohol from large containers (such as 55 gal. drums) to safety cans, the containers shall be bonded together. If good electrical contact can be achieved and maintained by placing the nozzle of the dispensing container in contact with the opening of the receiving container, this method of bonding may be used.

6.4.2 Bonding is not required when transferring methyl alcohol from safety cans to squeeze bottles.

6.5 Storage

6.5.1 Dispensing containers for methyl alcohol shall be stored in a "Flammable Storage" area out of direct sunlight.

6.5.2 The storage area shall be posted as a "Flammable Storage" area and with "No Smoking, Matches, or Open Flames" signs.

6.5.3 Methyl alcohol shall only be stored in approved, labeled containers or safety cans.

7.0 PRECISION AND ACCURACY

None

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: HANDLING, USE, AND STORAGE OF METHYL ALCOHOL

PROCEDURE # HS 005 ISSUED

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer and Q.A. Staff shall perform periodic audits to verify that this procedure is being followed.

9.0 CALCULATIONS

None

10.0 APPENDICES

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: SURVEY OF RADIOACTIVE, LIMITED QUANTITY SAMPLES

PROCEDURE #: HS 006 ISSUED: _____

1.0 PURPOSE

This procedure provides instructions to ensure that samples classified as radioactive, limited quantity are properly surveyed and prepared for shipment.

2.0 SCOPE

The directives of this procedure apply to all samples collected during the RI/FS that are classified as radioactive, limited quantity for shipping purposes.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Project Health and Safety Officer, or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee, immediately.

4.0 REFERENCES

4.1 Code of Federal Regulations, Title 49, Part 173, Subpart I, "Shippers-General Requirements for Shipments and Packagings, Radioactive Materials".

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: SURVEY OF RADIOACTIVE, LIMITED QUANTITY SAMPLES

PROCEDURE #: HS 006 ISSUED: _____

5.0 REQUIREMENTS

5.1 Equipment

5.1.1 Ludlum Model 19 Micro-R Meter.

5.1.2 Eberline BC-4 Beta Counter.

5.1.3 Eberline SAC-4 Alpha Counter.

5.2 Material

5.2.1 Paper smears.

6.0 PROCEDURE

6.1 If it has been determined that a material can be shipped as "radioactive, limited quantity", the material must be packed in a strong, tight package that will not leak any of the radioactive material during conditions normally incident to transportation. The material must be braced so that shifting of the material inside the package will not occur during transportation.

6.2 The radiation level at all points on the external surface of the package (including the bottom of the package) shall be measured with a Ludlum Model 19 Micro-R Meter.

6.3 If the radiation level measured in 6.2 exceeds 500 microreontgens per hour (0.5 millireontgens per hour) at any location, notify the SHSO. The package cannot be shipped as "limited quantity".

6.4 The removable surface contamination on the package shall be determined by wiping the external surface of the package with a 40 mm paper filter applying moderate pressure. The paper filter or "smear" is then counted in an Eberline BC-4 Beta Counter and an Eberline SAC-4 Alpha Counter according to procedures HS 013 and HS 014.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: SURVEY OF RADIOACTIVE, LIMITED QUANTITY SAMPLES

PROCEDURE #: HS 006 ISSUED: _____

6.5 The removable surface contamination shall not exceed the limits given in Appendix 10.1. If the contamination levels exceed these limits the package cannot be shipped. Notify the SHSO for assistance.

6.6 Complete the checklist, Appendix 10.2. Maintain copies of the completed checklist in the shipping files.

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer and Q.A. Staff shall perform periodic audits to verify that this procedure is being followed.

9.0 CALCULATIONS

None

10.0 APPENDICES

10.1 Removable External Radioactive Contamination - Wipe Limits

10.2 Checklist for Limited Quantity Radioactive Material Shipment

APPENDIX 10.1

REMOVABLE EXTERNAL RADIOACTIVE CONTAMINATION WIPE LIMITS FOR SHIPPING

CONTAMINANT	MAXIMUM PERMISSIBLE LIMIT dpm/cm^2
Beta-gamma emitting radionuclides; all radionuclides with half-lives less than ten days; natural uranium; natural thorium; uranium-235; uranium-238; thorium-232; thorium-228 and thorium-230 when contained in ores or physical concentrates	22
All other alpha emitting radionuclides	2.2

APPENDIX 10.2

CHECKLIST FOR LIMITED QUANTITY RADIOACTIVE MATERIAL SHIPMENT

SHIPMENT ID:_____ DATE:_____ SHIPPER:_____

	YES	NO
1. IS THE ACTIVITY BELOW THE LIMITS PER PACKAGE AND, IF APPROPRIATE, PER INSTRUMENT OR ARTICLE (SEE 49 CFR 173.423)?	___	___
2. ARE THE MATERIALS PACKED IN STRONG, TIGHT PACKAGE THAT WILL NOT LEAK ANY OF THE RADIOACTIVE MATERIAL DURING CONDITIONS NORMALLY INCIDENT TO TRANSPORTATION?	___	___
3. IS THE RADIATION LEVEL AT ALL POINTS ON THE EXTERNAL SURFACE OF THE PACKAGE BELOW 0.5 MILLIREM PER HOUR?	___	___
4. IS THE EXTERNAL SURFACE OF THE PACKAGE FREE OF SIGNIFICANT REMOVABLE CONTAMINATION (SEE APPENDIX 10.1)?	___	___
5. FOR INSTRUMENTS AND ARTICLES, IS THE RADIATION LEVEL AT 4 INCHES FROM ALL POINTS ON THE SURFACE OF THE UN-PACKAGED INSTRUMENT OR ARTICLE LESS THAN 10 MREM PER HOUR?	___	___
6. IS A NOTICE ENCLOSED IN THE PACKAGE OR FORWARDED WITH IT WHICH STATES "THIS PACKAGE CONFORMS TO THE CONDITIONS AND LIMITATIONS SPECIFIED IN 49 CFR 173.21 FOR RADIOACTIVE MATERIAL, LIMITED QUANTITY, N.O.S. UN2910; 49 CFR 173.422 FOR EXCEPTED RADIOACTIVE MATERIAL, INSTRUMENTS AND ARTICLES, UN2911; 49 CFR 173.424 FOR EXCEPTED RADIOACTIVE MATERIAL, ARTICLES MANUFACTURED FROM NATURAL OR DEPLETED URANIUM OR NATURAL THORIUM, UN2909; OR 49 CFR 173.427 FOR EXCEPTED RADIOACTIVE MATERIAL, EMPTY PACKAGES, UN2908."?	___	___
7. IS THE OUTSIDE OF THE INNER PACKAGING OR IF THERE IS NO INNER PACKAGING, THE OUTSIDE OF THE PACKAGING ITSELF MARKED "RADIOACTIVE"?	___	___
8. DOES THE PACKAGE CONTAIN LESS THAN 15 GRAMS OF U-235?	___	___

Fernald RI/FS
Health and Safety Procedure

Title: Operation of the Ludlum Model 12 Portable Survey Meter

Procedure #: HS 010 Issued: _____

1.0 PURPOSE

This procedure provides instruction for the operation of the Ludlum Model 12 portable survey meter.

2.0 SCOPE

This procedure applies to the Ludlum Model 12 Portable Survey Meter using either, the Model 44-9 Pancake G-M detector or, the Model 43-5 alpha scintillation detector. Since these detectors are operated at different high voltage settings and are calibrated for a specific survey meter, they cannot be interchanged without re-calibration and readjustment of the high voltage settings.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Site Health and Safety Officer, or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure and with the Ludlum Model 12 survey meter.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee immediately.

4.0 REFERENCES

4.1 Ludlum Model 12 Survey Meter instruction manual.

Fernald RI/FS
Health and Safety Procedure

Title: Operation of the Ludlum Model 12 Portable Survey Meter

Procedure #: HS 010 Issued: _____

5.0 REQUIREMENTS

5.1 Equipment

5.1.1 Ludlum Model 12 Portable Survey Meter with Ludlum Model 44-9 Pancake G-M Detector or Model 43-5 alpha scintillation detector

5.2 Materials

5.2.2 Check Source (alpha, beta, gamma)

6.0 PROCEDURE

6.1 Turn Selector switch to "BAT".

6.2 Check needle to insure it is well into the "BAT" check scale.

6.3 Turn Selector switch to the "X1" range.

6.4 Turn Audio switch on.

6.5 Put check source next to detector and insure that the needle moves up and the audio frequency increases.

6.6 Switch Range selector to appropriate Range. Instrument Range selector should be placed on the lowest Range setting that will allow the needle to remain on scale. If the needle moves off scale (i.e., fullscale) on the range selected, switch range selector to the next highest range. The actual reading is equal to the scale reading times the Range selector value (e.g., Range selector X10, Meter reading 300 cpm, actual reading is 300 cpm X10 or 3000 cpm).

6.7 Switch "Fast - Slow Switch" to "Fast" for quick meter response when surveying or "Slow" for dampened meter response for accurate background readings.

Fernald RI/FS
Health and Safety Procedure

Title: Operation of the Ludlum Model 12 Portable Survey Meter

Procedure #: HS 010 Issued: _____

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The person performing this procedure shall ensure that all equipment is working properly and all instrument settings are set to the proper position.

8.1.2 Instrument calibration stickers shall be checked by Q.A. Staff periodically to ensure calibration dates have not expired.

8.2 Equipment Monitoring

8.2.1 The user shall check instrument calibration stickers before use to ensure calibration date has not expired and that the proper detector is connected to the instrument.

9.0 CALIBRATIONS

None

10.0 APPENDICES

None

5. CALIBRATION

Calibration controls are located on the instrument cover in line with the multiplier index of each scale. The controls may be adjusted with an 1/8-inch blade screwdriver.

The instrument may be calibrated to true reading; or, when used with a single source, geometry calibration may be used. Both methods are described below. Unless otherwise specified, the instrument is calibrated to true reading at the factory.

5.1 True Reading Calibration requires the following steps:

a. Connect the input of the instrument to a negative pulse generator.
CAUTION: The instrument input operates at a high potential. Connect the pulse generator through a 0.01 MFD, 2,000-volt capacitor unless the pulse generator is already protected.

b. Adjust the pulser frequency to correspond to the 3/4-scale value of the instrument. Increase the pulser output voltage until a stable meter reading is obtained. Adjust the calibration potentiometer for a 3/4-scale reading. Repeat for each range.

c. To correlate this calibration to detected radiation value, probe efficiency must be determined. Select the operating point for the probe used as outlined in the previous section. Then determine the count-rate with the probe exposed to a calibrated source. The ratio of the instrument count-rate versus the known source value is the probe efficiency. This degree will be different for various types of probes and sources. By using probe efficiency, one determines the actual emission rate of an unknown source.

NOTE: For proportional and scintillation detectors, changes in the HV and GAIN controls will change the apparent detector efficiency for many sources.

5.2 Geometry calibration is often used when the instrument is utilized to measure radiation with a limited spectrum, for example, a single isotope contamination. To calibrate the instrument using this technique, obtain calibration sources with a spectrum similar to the unknown radiation. Expose the probe to the source and adjust the calibration control until the meter reading corresponds to the source value. Repeat this procedure with scaled sources for each instrument range.

NOTE: In the event that only one source is available, calibrate the corresponding range to that source. Disconnect the probe and connect a pulse generator to the instrument. Determine the pulse rate for 3/4-scale deflection on the calibrated range. Using this reading as a reference, increase (or decrease) this rate by factors of ten for calibrating each succeeding range.

6. MAINTENANCE

NOTE: NEVER STORE THE INSTRUMENT OVER 30 DAYS WITHOUT REMOVING THE BATTERIES. ALTHOUGH THIS INSTRUMENT WILL OPERATE AT VERY HIGH AMBIENT TEMPERATURES, BATTERY SEAL FAILURE CAN OCCUR AT TEMPERATURES AS LOW AS 100°F. NEGLECTED BATTERY SEAL FAILURE WILL SURELY CAUSE ONE AWFUL MESS.

Instrument maintenance consists of keeping the instrument clean and periodically checking the batteries and calibration. It is recommended that automatic recalibration not be used with this instrument. The instrument design is quite redundant and once initial calibration is performed, recalibration should not be required if the batteries are maintained in good condition.

An instrument operational check should be performed prior to each use by exposing the detector to a known source and confirming the proper reading on each scale.

Under certain conditions, the NRC requires instrument recalibration every three months. Check the appropriate regulations to determine the recalibration schedule.

Also at three month intervals, the batteries should be removed and the battery contacts cleaned of any corrosion. If the instrument has been exposed to a very dusty or corrosive atmosphere, more frequent battery servicing should be used.

Use a spanner wrench to unscrew the battery contact insulators, exposing the internal contacts and the battery springs. Removing the handle will facilitate access to these contacts.

Fernald RI/FS
Health and Safety Procedures

Title: Operation of the Ludlum Model 19 Micro R Meter

Procedure #: HS 011 Issued: _____

1.0 PURPOSE

This procedure provides instruction for the use of the Ludlum Model 19 Micro R Meter.

2.0 SCOPE

This procedure applies to the use of Ludlum Model 19 Micro R Meter for making exposure rate measurements.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Project Health and Safety Officer or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure and the Ludlum Model 19 Micro R Meter.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee, immediately.

4.0 REFERENCES

4.1 Ludlum Model 19 Micro R Meter instruction manual.

5.0 REQUIREMENTS

5.1 Equipment

Fernald RI/FS
Health and Safety Procedures

Title: Operation of the Ludlum Model 19 Micro R Meter

Procedure #: HS 011 Issued: _____

5.1.1 Ludlum Model 19 Micro R Meter

5.2 Material

5.2.1 Check source (gamma)

6.0 PROCEDURE

6.1 Switch range selector to 25.

6.2 Press button marked BAT.

6.3 Check that meter reading is well into BAT OK range.

6.4 Switch Audio to on.

6.5 Move check source close to instrument

6.6 Check that needle moves up and audio frequency increases

6.7 Switch Audio off, unless needed, to extend battery life.

6.8 Switch response selector to F for quick meter response (90% of full scale meter deflection in 3 seconds or to S for damped meter response (90% of full scale meter deflection in 11 seconds) for accurate background readings.

6.10 Switch Range selector to appropriate range. Instrument range selector should be placed on the lowest range that will allow the needle to remain on scale. If full scale needle deflection occurs, move the range selector to the next highest range. Range selector gives the full scale meter value (i.e., Range selector on 500, full scale reading is 500 micro R/hr).

Fernald RI/FS
Health and Safety Procedures

Title: Operation of the Ludlum Model 19 Micro R Meter

Procedure #: HS 011 Issued: _____

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The persons performing this procedure shall ensure that the instrument is working properly and that all instrument settings are in the proper position.

8.1.2 The instruments calibration sticker shall be checked by Q.A. staff periodically to ensure calibration dates have not expired.

8.2 Equipment Monitoring

8.2.1 The technician shall check the instrument calibration sticker before use to ensure calibration date has not expired.

9.0 CALCULATIONS

None

10.0 APPENDICES

None

HV Adjustment provides a means to vary the high voltage from 400 to 1500 volts.

Range Calibration Adjustments are recessed potentimeters located on line with each multiplier position. These adjustment controls allow individual calibration for each range multiplier.

4. OPERATING PROCEDURES

The Model 19 is a simple instrument to operate. All controls and adjustments are located on the front panel along with the battery compartment. The 1" x 1" NaI(Tl) Scintillator is mounted internally, deleting external cords or cables.

4.1 Prior to Turn-on

a. Check the batteries -- type installed and condition.
b. Adjust the audio ON-OFF switch as desired.
c. Adjust the meter response switch as desired.

4.2 Turn-on

a. Range Selector Switch: Select the 0-5000 range.
b. BAT TEST Button: Depress. Check the BAT test on the appropriate scale. Replace the batteries if the meter pointer is below the battery CHK line.
c. Light Button: Depress. Check for light on the meter face.
d. Meter Response Switch: Check the response in the "F" and "S" positions.
e. Audio ON-OFF Switch: Check for audio indication.
f. Check the instrument for the proper scale indication with a known source. Check all the ranges for the appropriate scale indication.
g. Reset Button: Depress. Check to see that the meter pointer returns to the zero position.
h. The instrument is ready for monitoring.

5. CALIBRATION

The Model 19 radiation response is energy-sensitive. The detector plateau-characteristic must be determined for the anticipated radiation nuclide. The following is an example calibration:

5.1 Remove the instrument from its case.

5.2 With the instrument off, remove the HV jumper at the C19-R5 junction.

5.3 Connect a pulser to the C1-R5 junction.

a. Set the pulse height at 80 millivolts, negative.
b. Calibrate the scales as follows:

Scale	Reading	Pulses/Minute
25	20	3,200
50	40	6,400
250	200	32,000
500	400	64,000
5,000	4,000	640,000

5.4 Connect the jumper back to the C19-R5 junction.

5.5 Replace instrument can
Note: The detector is not light-tight outside of the can.

5.6 Plateau instrument using Americium-241 using H.V. adjust potentionmeter on front panel.

5.7 Determine the plateau center voltage.

a. Remove can
b. Measure H.V. at the detector plug on circuit board.

NOTE: The voltmeter must have a 20,000 ohm/volt, or greater input impedance.

5.8 Replace instrument can.

5.9 Take the Model 19 to a certified calibration range. Calibrate each scale for best fit at 1/5 and 4/5 scale. If the reading error exceeds 10% of reading, record the field versus the meter reading at 5 points on the scale. Place a copy of this meter correction on the instrument case.

5.10 If the calibration range background is too high for the Micro R scales, calibrate the 5000 scale as in Step 5.9.

a. Turn instrument off and remove instrument from can.
b. Remove H.V. Jumper
c. Turn instrument on
d. Connect pulser and determine pulse rate verses micro R/hr calibration point on 5000 scale.
e. Calibrate the lower scales with Pulser using information in step (c).
f. Turn instrument off and reconnect H.V. Jumper.
g. Replace can

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EXOTOX 50 PORTABLE GAS MONITOR

PROCEDURE #: HS 012 ISSUED:

1.0 PURPOSE

This procedure describes the proper use of the Exotox 50 Portable Gas Monitor.

2.0 SCOPE

This procedure applies to the use of the Exotox 50 Portable Gas Monitor for monitoring the working environment for the levels of oxygen, hydrogen sulfide, carbon monoxide, and explosive gases in the atmosphere.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Project Health and Safety Officer, or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee, immediately.

4.0 REFERENCES

4.1 Neotronics Exotox 50 Portable Gas Monitor User Manual, 1986.

5.0 REQUIREMENTS

None

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EXOTOX 50 PORTABLE GAS MONITOR

PROCEDURE #: HS 012 ISSUED:

6.0 PROCEDURE

6.1 Normal Operation

6.1.1 Turn the instrument on by firmly pressing the on button. The instrument display will flash eight times and the audio alarm tone will "bleep" ten times. A WATCHDOG bleep will be heard every 10 seconds to indicate that the instrument is operating properly in a safe environment.

6.1.2 Select the display mode by depressing the "SELECT" button. Momentary depression of this button causes the mode to change to the next in sequence. Repetitive depression of the "SELECT" button will cause the EXOTOX to step through the display modes.

WARNING: DO NOT HOLD THE "SELECT" BUTTON DOWN AS THIS WILL CAUSE THE INSTRUMENT TO ENTER ITS "STANDBY MODE".

6.2 Alarm Conditions

6.2.1 When an alarm condition is detected a pulsing audio bleep will sound and the display will switch to the parameter which is in the alarm condition.

It may be possible to cancel an alarm by depressing and holding the "SELECT" button for at least 3 seconds. The instrument will now return to its normal mode of operation except that a double bleep will be heard once every ten seconds. If the alarm condition is still present after 30 seconds the monitor will once again enter the alarm mode.

6.2.2 The Standard Alarm Tone is a continuous bleeping alarm. The Explosive Alarm Tone is a pulsing double-bleep alarm.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EXOTOX 50 PORTABLE GAS MONITOR

PROCEDURE #: HS 012 ISSUED:

6.2.3 A Battery Exhaustion Alarm, which is a constant audio tone, takes priority over all other alarms and CANNOT be cancelled.

WARNING: IN THE EVENT OF A BATTERY EXHAUSTION ALARM, SWITCH THE INSTRUMENT OFF AND LEAVE THE HAZARDOUS AREA IMMEDIATELY. RECHARGE OR REPLACE THE BATTERY IN A SAFE AREA.

6.3 Warnings

6.3.1 When there is approximately 10 minutes of battery life left, the BAT legend on the LCD will flash and the WATCHDOG bleep will be followed by a longer bleep. The operator shall change or charge the battery when this occurs.

6.3.2 If a gas level is measured in excess of the maximum display range the monitor goes into the Overflow Mode. The display will read "OFL" and the standard alarm signal will be heard.

CAUTION: A HIGH OFF-SCALE READING OR "OFL" IN THE EXPLOSIVE GAS MODE MAY INDICATE AN EXPLOSIVE CONCENTRATION.

6.3.3 For measured gas levels below the minimum range specification of the monitor, the display will indicate "UFL" for underflow.

6.3.4 Negative readings occur when the monitor measures one of the following conditions:

Carbon Monoxide	Less than - 10 ppm
Hydrogen Sulfide	Less than - 5 ppm
Explosive Gas	Less than - 5% LEL

The display will default to the relevant mode and the speaker sounds a Standard Alarm Tone or Explosive Alarm Tone.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EXOTOX 50 PORTABLE GAS MONITOR

PROCEDURE #: HS 012 ISSUED:

6.4 Faults

6.4.1 For a discharged battery, a Battery Exhaustion Alarm will sound.

WARNING: IN THE EVENT OF A BATTERY EXHAUSTION ALARM, SWITCH THE INSTRUMENT OFF AND LEAVE THE HAZARDOUS AREA IMMEDIATELY. RECHARGE OR REPLACE THE BATTERY IN A SAFE AREA.

6.4.2 An electronics fault in the oxygen circuit will cause the monitor to default to the oxygen fault mode. The display will read "FLT", the "OXY", and "LO" legends will illuminate and a continuous tone will be heard.

NOTE: ROUTINE SENSOR EXHAUSTION IS SIGNIFIED BY A STANDARD OXYGEN LOW ALARM WHICH CONTINUOUSLY RETURNS EVEN WHEN THE INSTRUMENT IS IN FRESH AIR.

6.4.3 An explosive gas sensor failure will cause the monitor to default to the explosive fault mode. The display will read "FLT", the "EXP" legend will illuminate and a continuous tone will be heard.

WARNING: AN EXPLOSIVE FAULT ALARM MAY INDICATE A HIGHLY EXPLOSIVE GAS CONCENTRATION. LEAVE THE AREA IMMEDIATELY.

6.4.4 An electronics failure will cause the monitor the default to the reference fault mode. The display will read "FLT" and a continuous tone will be heard.

NOTE: ANY FAULTS, FAILURES OR ALARMS SHOULD BE NOTED AND REPORTED TO THE SHSO.

6.5 Charging the Battery

6.5.1 Press the battery pack (with or without the monitor attached) firmly into the charging recess in the charger. The battery pack will only fit into the charger one way.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EXOTOX 50 PORTABLE GAS MONITOR

PROCEDURE #: HS 012 ISSUED:

6.5.2 When the battery pack is properly inserted into the charger, a red LED will illuminate indicating "fast charge". If this light does not come on, remove the battery pack and check that the contacts are clean. Wait 10 seconds before returning the battery pack to the charger.

6.5.3 When fully recharged, the red LED will extinguish and a green LED will illuminate.

6.5.4 To extend battery life the battery pack should be fully discharged from time to time.

6.6 Performance Checks and Calibration

6.6.1 Performance checks should be performed once every three months and recalibrated if necessary. The instrument must be calibrated once a year.

6.6.2 Performance checks and calibration adjustments shall be performed in accordance with the EXOTOX User Manual.

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The instruments calibration sticker shall be checked by Q.A. Staff periodically to ensure calibration dates have not expired.

8.2 Equipment Monitoring

8.2.1 The person using the instrument shall check the calibration sticker before use to ensure the calibration date has not expired.

CHAPTER 6 PERFORMANCE CHECKS & CALIBRATION ADJUSTMENTS

Neotronics recommend that the performance of the EXOTOX 50 is checked once every three months and recalibrated if necessary. The instrument must be calibrated once a year.

6.1 Performance Checks

To fully test the operation of the EXOTOX 50, the technician must perform two separate tasks. First, a functional test of the electronics and secondly a gas calibration check.

Gas calibration checks are performed using standard gas bottles. Neotronics supply a gas calibration kit which simplifies calibration checks and adjustments and use of this kit is recommended. Always check that the concentration of the test gas used is accurately known.

6.1.1 Equipment Requirements

The following equipment is needed for EXOTOX 50 performance checks & calibration.

Digital Voltmeter to read 4 to 6V DC
Resolution 0.05V

Aspirator Head Part No. 008-0065-05

- • Hex Wrench (Allen Key) 2mm
  (Supplied with EXOTOX)
- • Calibration Tool Supplied with EXOTOX
- •• Test Gas 1 (Carbon Monoxide) 725ppm
  ± 25ppm (in Air)
- •• Test Gas 2 (Methane) 1.15%
  ± 0.1% vol (in Air)
- •• Test Gas 3 (Hydrogen Sulphide) 80ppm
  ± 5ppm (in Nitrogen)

• denotes use for calibration only
•• denotes use for calibration & performance checks.

6.1.2 Functional Check

a Connect a fully charged battery to the EXOTOX 50.

b Switch the instrument on. The display will momentarily indicate a software code. The display will now flash all segments and legends seven times. The four LEDs will flash ten times. At the same time as the LEDs flash the speaker will emit a bleep. At the end of this "SELF-TEST" sequence, the display will default to the Oxygen Display Mode, the O_2 LED and the display 'OXY' legend will illuminate.

c Depress the 'SELECT' button once (momentarily), the speaker will emit a bleep as the button is pressed. The display legend 'TOX' will illuminate. The 'CO' LED will illuminate.

NOTE: The speaker will emit a bleep once every ten seconds as long as the instrument is switched on.

d Depress the 'SELECT' button once (momentarily), the speaker will emit a bleep as the button is pressed. The 'CO' LED will remain illuminated. The 'TWA' legend will illuminate.

e Depress the 'SELECT' button once (momentarily), the speaker will emit a bleep as the button is pressed. The 'CO' LED will remain illuminated. The 'STEL' legend will illuminate

f Depress the 'SELECT' button once (momentarily), the speaker will emit a bleep as the button is pressed' The display legend 'TOX' will illuminate. The 'H_2S' LED will illuminate.

g Depress the 'SELECT' button once (momentarily), the speaker will emit a bleep as the button is pressed. The 'H_2S' LED will remain illuminated. The 'TWA' legend will illuminate.

h Depress the 'SELECT' button once (momentarily), the speaker will emit a bleep as the button is pressed. The 'H_2S' LED will remain illuminated. The 'STEL' legend will illuminate.

i Depress the 'SELECT' button once (momentarily), the speaker will emit a bleep as the button is pressed. The 'EXP' LED and the display 'EXP' legend will illuminate.

j Depress the 'SELECT' button once (momentarily), the speaker will emit a bleep as the button is pressed. The display will alternate between an alphanumeric indication of "Hr". and indication of the time elapsed since the instrument was first switched on (eg. 0.2).

k Cover the display panel with a hand and depress (and hold) the 'BACKLIGHT' button. The display will be lit from a light at either end.

l Depress and hold the 'SELECT' button for three seconds (slow count). The display will indicate "HLd". The speaker will emit a bleep once every 60 seconds.

m Breathe into the sensor grill. The instrument will leave the hold mode and default to the Oxygen Display Mode. The display will indicate less than 19.0%. The 'OXY' and 'LO' legends will light, the speaker will emit the pulsing alarm tone and the 'O_2' LED will flash. Depress and hold down the 'SELECT' button for three seconds. The alarm tone will

cease the the 'LO' legend will extinguish. The speaker will now emit a double-bleep every ten seconds.

n Switch the EXOTOX off.

6.1.3 Gas Calibration Check Procedure

If any doubt about the performance of the EXOTOX 50 is raised while these checks are carried out, the recalibration procedure in chapter 6.2. must be performed.

The numbers in square brackets refer to the recalibration instructions covering the particular measurement. If a parameter is found to be out of tolerance, the technician must go to the section dealing with its re-calibration, perform the recalibration and return to the next calibration check in the sequence.

a Switch the EXOTOX on in fresh air (with a fully charged battery.

b Check that the display indicates 20.9% Oxygen ± 0.2%. (6.2.1).

c Connect the aspirator attachment, apply Test Gas 1 and start a stopwatch.

d In less than 90 seconds the instrument will have a Carbon Monoxide Real-Time Alarm. [6.2.2].

NOTE: When GAS 1 is applied to the EXOTOX a number of alarms other than those detailed above will occur. In many cases the H_2S Real-Time alarm will activate first. This must be cancelled and ignored. H_2S and CO STEL alarm may also occur and must also be cancelled and ignored. The H_2S alarms are caused by inherent sensor cross-sensitivites which may cause readings up to 108 ppm H_2S.

f Switch off Test Gas 1. Switch Off the EXOTOX 50. Remove the Aspirator Attachment from the instrument. Disconnect Test Gas 1 from the Calibration Setup and substitute Gas 3.

g Place the EXOTOX in a "Fresh Air" environment. Wait 3 minutes. Switch on the EXOTOX 50.

h Apply Test Gas 3 to the instrument through the Aspirator Attachment and start the stopwatch.

i The EXOTOX will first enter the Oxygen Low Alarm Mode.

j In less than 90 seconds the EXOTOX will also have a Hydrogen Sulphide Real-Time Alarm. [6.2.3]

NOTE: When GAS 3 is applied to the EXOTOX a number of alarms other than those detailed above will occur. CO STEL and/or CO Real-Time alarms may activate due to sensor cross-sensitivities. These alarms must be cancelled and ignored.

k Switch off Test Gas 3. Switch Off the EXOTOX 50. Remove the Aspirator Attachment. Disconnect Test Gas 3 from the Calibration Setup and substitute Test Gas 2.

l Place the EXOTOX in a "Fresh Air" environment. Wait 3 minutes. Switch on the EXOTOX 50.

m Apply Test Gas 2 to the instrument via the Aspirator Attachment and start the stopwatch.

n In less than 30 seconds the EXOTOX will enter the Explosive Test Gas Alarm mode. [6.2.4]

Switch of Test Gas 2. Switch Off the EXOTOX 50. Disconnect Test Gas 2.

6.2 Gas Calibration

This section must only be used in conjunction with chapter 6.1.2, the Gas Performance Checks. Each part of the following instructions is tied to a section of chapter 6.1.2.

ONLY AUTHORISED AND QUALIFIED PERSONNEL MUST ATTEMPT RE-CALIBRATION. ATTEMPTS AT CALIBRATION BY UNAUTHORISED STAFF WILL INVALIDATE SAFETY CERTIFICATIONS AND THE NEOTRONICS WARRANTY:

ALL GAS CALIBRATION MUST BE PERFORMED OUT-OF-DOORS OR IN A WELL VENTILATED ENVIRONMENT. (eg. FUME CUPBOARD).

EXOTOX 50 Instruments must not be calibrated in extreme environmental conditions.

WARNING: Humidity Effects

Oxygen sensor calibration is affected by relative humidity. Errors seen when the instrument is exposed to dry bottled gases may be due to humidity effects. Wherever possible the instrument must be calibrated in conditions similar to the workplace.

Remove the calibration panel from the top of the instrument using the 2mm Hex Wrench supplied with the EXOTOX.

6.2.1 Oxygen Calibration

a Switch the EXOTOX on in fresh air and allow the instrument to settle.

b Adjust the 'OXY SPAN' potentiometer (Fig

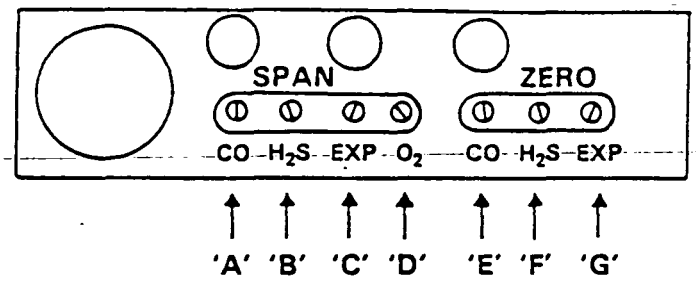

Figure 6.1: Gas Calibrations Potentiometer Location

6.1 'D') until the display indicates 20.9% ±0.1%. If this cannot be achieved, send the instrument for service.

c Return to the performance check 6.1.3b.

6.2.2 Carbon Monoxide Calibration

a Connect the Calibration Setup using Test Gas 1.

b Switch the EXOTOX on in fresh air. 'SELECT' the Carbon Monoxide Real-Time Display Mode. Slowly adjust the 'CO ZERO' potentiometer (Fig 6.1 'E') until the display reads 0 ppm ±1 ppm. If this cannot be achieved, return the instrument for service.

c Connect the Aspirator Attachment to the EXOTOX with the Polarisation Arrow pointing towards the rear of the instrument.

d Flow Test Gas 1 through the Calibration Setup for at least 5 minutes. The instrument may show Hydrogen Sulphide and Carbon Monoxide Alarms which must be cancelled. Once more 'SELECT' the CO Real-Time display and wait for the display to settle. (recancelling alarms when necessary)

e Slowly adjust the 'CO SPAN' potentiometer (Fig 6.1 'A') until the display reads the same as the CO value written on the Calibration Certificate (±1 ppm). If this cannot be achieved, send the instrument for service.

f Turn off the Test Gas, disconnect the Aspirator Attachment and return to the performance check 6.1.3e

6.2.3 Hydrogen Sulphide Calibration

a Connect the Calibration Setup with Test Gas 3.

b Switch the EXOTOX on in fresh air. 'SELECT' the Hydrogen Sulphide Real Time Display Mode. Slowly adjust the 'H_2S Zero' potentiometer Fig 6.1 'F') until the display reads 0 ppm ±1 ppm. If this cannot be achieved, send the instrument for service.

c Connect the Aspirator Attchment to the EXOTOX with the polarisation arrow pointing toward the front of the instrument.

d Flow Test Gas 3 through the Calibration Setup for at least 15 minutes. The instrument will show Oxygen & Hydrogen Sulphide Alarms which must be cancelled. After 15 minutes, cancel all alarms and 'SELECT' the Hydrogen Sulphide Real-Time Display Mode. Wait for the display to settle.

e Slowly adjust the 'H_2S SPAN' potentiometer (Fig 6.1 '8') until the display reads the same as the H_2S value written on the Calibration Certificate (±1 ppm). If this cannot be achieved, send the instrument for service.

f Turn off the Test Gas, Disconnect the Aspirator Attachment and return to performance check 6.1.3j.

6.2.4 Explosive Test Gas Calibration (Methane)

a Connect the Calibration Setup with Test Gas 2.

b Switch the EXOTOX on in fresh air. 'SELECT' the Explosive Test Gas Display Mode. Slowly adjust the 'EXP ZERO' potentiometer (Fig 6.1 'G') until the display reads 0% ±1% LEL. If this cannot be achieved, send the instrument for service.

c Connect the Aspirator Attachment to the EXOTOX with the polarisation arrow pointing toward the front of the instrument.

d Flow Test Gas 2 through the Calibration Setup for at least 5 minutes. The instrument will show and Explosive Gas Alarm which must be cancelled. After 5 minutes, cancel all alarms and 'SELECT' the Explosive Test Gas Display Mode. Wait for the display to settle.

e Slowly adjust the 'EX SPAN' potentiometer (Fig 6.1 'C') until the display reads the same as the calculated %LEL value written on the Calibration Certificate (±1% LEL). If this cannot be achieved, send the instrument for service.

f Turn off the Test Gas, disconnect the Aspirator Attachment and return to performance check 6.1.3o.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE BC-4 BETA COUNTER

PROCEDURE #: HS 013 ISSUED: _____

1.0 PURPOSE

This procedure provides instructions for the operation of the Eberline BC-4 Beta Counter.

2.0 SCOPE

This procedure applies to the routine use of the Eberline BC-4 Beta Counter to determine removable beta/gamma contamination by smear survey techniques.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Project Health and Safety Officer, or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee, immediately.

4.0 REFERENCES

4.1 Eberline BC-4 Beta Counter Instruction Manual.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE BC-4 BETA COUNTER

PROCEDURE #: HS 013 ISSUED: _____

5.0 REQUIREMENTS

5.1 Equipment

5.1.1 Eberline BC-4 Beta Counter.

5.2 Material

5.2.1 Beta/gamma calibration source.

6.0 PROCEDURE

6.1 Background Determination

6.1.1 Set the count time to 1 minute by placing the Timer switches to 1 and X1 and the Count Mode switch to "Timed".

6.1.2 Verify that the sample holder is empty by pulling the sample holder slide out until its stops. Reinsert the sample holder into the Counter.

6.1.3 Depress the "RESET-START" button to begin the count. The count will automatically stop at the end of 1 minute.

6.1.4 Record the Background counts per minute (cpm) from the scaler in the Counter Logbook.

6.2 Efficiency Determination

6.2.1 Verify that the count time is set for 1 minute as described in 6.1.1.

6.2.2 Fully extend the sample holder slide and place the beta/gamma calibration source into the center of the sample holder. Carefully reinsert the sample holder slide into the Counter.

6.2.3 Depress the "RESET-START" button to begin the count. The count will automatically stop at the end of 1 minute.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE BC-4 BETA COUNTER

PROCEDURE #: HS 013 ISSUED: _____

6.2.4 Record the Source counts per minute (cpm) from the scaler in the Counter Logbook. Remove the Calibration source.

6.2.5 Determine the Counter Efficiency as described in Appendix 10.1.

6.3 Sample Activity Determination

6.3.1 Verify that the count time is set for 1 minute as described in 6.1.1.

6.3.2 Fully extend the sample holder slide and place the Sample (smear) into the center of the sample holder. Carefully reinsert the sample holder slide into the Counter.

6.3.3 Depress the "RESET-START" button to begin the count. The count will automatically stop at the end of 1 minute.

6.3.4 Record the Sample counts per minute (cpm) from the scaler in the Counter Logbook. Remove the Sample from the Counter.

6.3.5 Determine the Sample Activity as described in Appendix 10.1.

6.3.6 Record the Sample ID Number and Activity on the Sample Log Sheet.

7.0 PRECISION AND ACCURACY

None

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE BC-4 BETA COUNTER

PROCEDURE #: HS 013 ISSUED: _____

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer and Q.A. Staff shall perform periodic audits to verify that this procedure is being followed.

9.0 CALCULATIONS

9.1 See Appendix 10.1

10.0 APPENDICES

10.1 Eberline BC-4 Beta Counter: Calculation of Counter Efficiency and Sample Activity.

10.2 Sample Log Sheet.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE BC-4 BETA COUNTER

PROCEDURE #: HS 013 ISSUED: _____

APPENDIX 10.1

EBERLINE BC-4 BETA COUNTER
CALCULATION OF COUNTER EFFICIENCY AND SAMPLE ACTIVITY

CALCULATION OF COUNTER EFFICIENCY

$$\frac{\text{(Calibration Source cpm - Background cpm)}}{\text{Source Activity dpm}} = \text{Counter Efficiency}$$

CALCULATION OF SAMPLE ACTIVITY

$$\frac{\text{(Sample cpm - Background cpm)}}{\text{Counter Efficiency}} = \text{Sample Activity (dpm)}$$

SECTION IV
MAINTENANCE

A. DISASSEMBLY

1. Cover: Remove one 10-32 screw from each side and lift the cover from the instrument.

2. Amplifier High Voltage Board: Remove the nuts that hold the board in place. Disconnect the high voltage lead and lift the board off the studs.

3. Timer: Remove the four 4-40 screws and slide the assembly back.

4. Scaler: Remove the three nuts that secure the assembly to the panel.

5. Detector

a. Access to tube and/or mylar window:

(1) Remove the four screws from the top of the detector assembly.

(2) Disconnect the high voltage lead.

(3) Lift the top shield toward the inside and lay it on its side exposing the G-M tube.

(4) The G-M tube and mylar window can now be removed.

NOTE

The pancake G-M tube used in this instrument has a very fragile window. Use extreme care in handling it to prevent permanent damage.

b. Slide removal

(1) Remove 8-32 screw on rear of slide.

(2) Remove slide from front.

c. Detector assembly removal

(1) Remove Amplifier-High Voltage Board. See Section IV. A. 2 above.

(2) Remove slide. See Section IV.A.5.b above.

(3) Remove the four 6-32 screws from the bottom of the instrument that hold the detector to the chassis floor.

(4) Remove the two 6-32 screws from the front panel.

(5) Lift the assembly out of the chassis.

B. REASSEMBLY

Reverse the procedures given in Section IV. A above. Always clean all parts before reassembly. Apply a light coat of silicon compound (Dow-Corning 4X) to the slide before re-installing to ensure smooth operation.

C. PREVENTIVE MAINTENANCE

The BC-4 has no components that require scheduled maintenance.

Keep the instrument clean and dry.

D. CALIBRATION AND SET-UP

1. Determine the counting efficiency by placing a source of known activity in the sample holder and counting it for a long enough period of time to satisfy statistical accuracy requirements. See Section II. E. Efficiency is the ratio of net counts obtained to the total source emissions in the counting time; or

$$\text{Eff} = \frac{\text{Total Counts Obtained} - \text{Background Counts}}{\text{Source Activity } \left(\frac{\text{counts}}{\text{min}}\right) \times \text{Count Time (min)}}$$

NOTE

Efficiency must be determined with the isotope of interest since different beta energies result in different efficiencies.

Removal of the mylar window will increase the efficiency for any energy; and for beta energies below about 300 keV, it should be removed.

2. Determine the background by removing all sources and counting for a period of time long enough to satisfy statistical requirements. See Section II. E.

3. Timer (See Section III.B.3)

The timer can be modified to run sychronized to a 50 Hz line or to run with no sync input at all. The following shows the changes to be made:

a. Synchronized with 50 Hz line: This modification may be accomplished by removing A203 from the timer board and replacing it with a type 7490 integrated circuit. If this interchange is made, you must check to see that pins 2 and 3 of XA203 are jumped to ground. For calibration of the oscillator for battery operation, see below.

b. No external sync signal: To modify the timer to run on its own oscillator with no external sync signal, remove the wire from tie point 6 of the timer board. The line sync feature is then disconnected.

c. Calibration of oscillator: Either of the two methods given below may be used.

(1) Using an oscilloscope and monitoring at tie point 7 of the timer board, adjust R205 for 60 Hz (16-2/3 ms period) if the timer board is not modified or if it is modified according to Section IV.D.3.b above.

If the timer board is modified for synchronization with a 50 Hz line, then adjust R205 for 50 Hz (20 ms period).

(2) Connect a pulse generator with an accurate base (such as Eberline Model MP-1 or MP-2) to the amplifier input. Preset a time and adjust R205 for the correct reading on the scaler.

E. DETECTOR MAINTENANCE

1. Decontamination

a. Remove slide per Section IV. A. 5.b above.

b. Remove sample holder from slide and wash the slide and sample holder thorougly in warm soapy water. Rinse and dry completely before reassembly.

c. Remove mylar window (Section IV.A.5.a above) and wash thoroughly in warm soapy water. Rinse and dry completely before reassembly.

F. TROUBLESHOOTING

Typical voltage and waveforms are given on the schematic. Use of the schematic, along with the "Theory of Operation" section and its waveforms and diagrams should help to isolate and pinpoint problems. Component locations are shown in Section VI.

Voltages, except the high voltage, are measured with a 20,000 ΩV, or greater, voltmeter. A voltmeter with an input impedance of 1000 MΩ, or higher, should be used to measure the high voltage.

If a high impedance voltmeter is not available for measuring high voltage, the voltmeter used for the other voltages may be used to give an indication of high voltage. It must be remembered, however, that this is an indication only.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE SAC-4 SCINTILLATION ALPHA COUNTER

PROCEDURE # HS 014 ISSUED

1.0 PURPOSE

This procedure provides instructions for the operation of the Eberline SAC-4 Scintillation Alpha Counter.

2.0 SCOPE

This procedure applies to the routine use of the Eberline SAC-4 Scintillation Alpha Counter to determine removable alpha contamination by smear survey techniques.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Project Health and Safety Officer, or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee, immediately.

4.0 REFERENCES

4.1 Eberline SAC-4 Scintillation Alpha Counter Instruction Manual.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE SAC-4 SCINTILLATION ALPHA COUNTER

PROCEDURE # HS 014 ISSUED

5.0 REQUIREMENTS

5.1 Equipment

5.1.1 Eberline SAC-4 Scintillation Alpha Counter.

5.2 Material

5.2.1 Alpha Calibration Source.

6.0 PROCEDURE

6.1 Background Determination

6.1.1 Set the count time to 1 minute by placing the Minute switch to 1, the Multiplier switch to X1 and the Count Mode switch to "Timed".

6.1.2 Verify that the sample holder is empty by pulling the sample holder slide out until its stops. Reinsert the sample holder into the Counter.

6.1.3 Depress the "RESET-START" button to begin the count. The count will automatically stop at the end of 1 minute.

6.1.4 Record the Background counts per minute (cpm) from the scaler in the Counter Logbook.

6.2 Efficiency Determination

6.2.1 Verify that the count time is set for 1 minute as described in 6.1.1.

6.2.2 Fully extend the sample holder slide and place the Alpha calibration source into the center of the sample holder. Carefully reinsert the sample holder slide into the Counter.

6.2.3 Depress the "RESET-START" button to begin the count. The count will automatically stop at the end of 1 minute.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE SAC-4 SCINTILLATION ALPHA COUNTER

PROCEDURE # HS 014 ISSUED

6.2.4 Record the Source counts per minute (cpm) from the scaler in the Counter Logbook. Remove the Calibration source.

6.2.5 Determine the Counter Efficiency as described in Appendix 10.1.

6.3 Sample Activity Determination

6.3.1 Verify that the count time is set for 1 minute as described in 6.1.1.

6.3.2 Fully extend the sample holder slide and place the Sample (smear) into the center of the sample holder. Carefully reinsert the sample holder slide into the Counter.

6.3.3 Depress the "RESET-START" button to begin the count. The count will automatically stop at the end of 1 minute.

6.3.4 Record the Sample counts per minute (cpm) from the scaler in the Counter Logbook. Remove the Sample from the Counter.

6.3.5 Determine the Sample Activity as described in Appendix 10.1.

6.3.6 Record the Sample ID Number and Activity on the Sample Log Sheet.

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer and Q.A. Staff shall perform periodic audits to verify that this procedure is being followed.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE SAC-4 SCINTILLATION ALPHA COUNTER

PROCEDURE # HS 014 ISSUED

9.0 CALCULATIONS

9.1 See Appendix 10.1

10.0 APPENDICES

10.1 Eberline SAC-4 Scintillation Alpha Counter: Calculation of Counter Efficiency and Sample Activity.

10.2 Sample Log Sheet.

FERNALD RI/FS
HEALTH AND SAFETY PROCEDURE

TITLE: OPERATION OF THE EBERLINE SAC-4 SCINTILLATION ALPHA COUNTER

PROCEDURE # HS 014 ISSUED

APPENDIX 10.1

EBERLINE SAC-4 SCINTILLATION ALPHA COUNTER
CALCULATION OF COUNTER EFFICIENCY AND SAMPLE ACTIVITY

CALCULATION OF COUNTER EFFICIENCY

$$\frac{\text{(Calibration Source cpm - Background cpm)}}{\text{Source Activity dpm}} = \text{Counter Efficiency}$$

CALCULATION OF SAMPLE ACTIVITY

$$\frac{\text{(Sample cpm - Background cpm)}}{\text{Counter Efficiency}} = \text{Sample Activity (dpm)}$$

APPENDIX 10.2

SAMPLE LOG SHEET

Smear & Sample Survey

Smear or Sample #	Location	Date	DPM Alpha	DPM Beta/Gamma

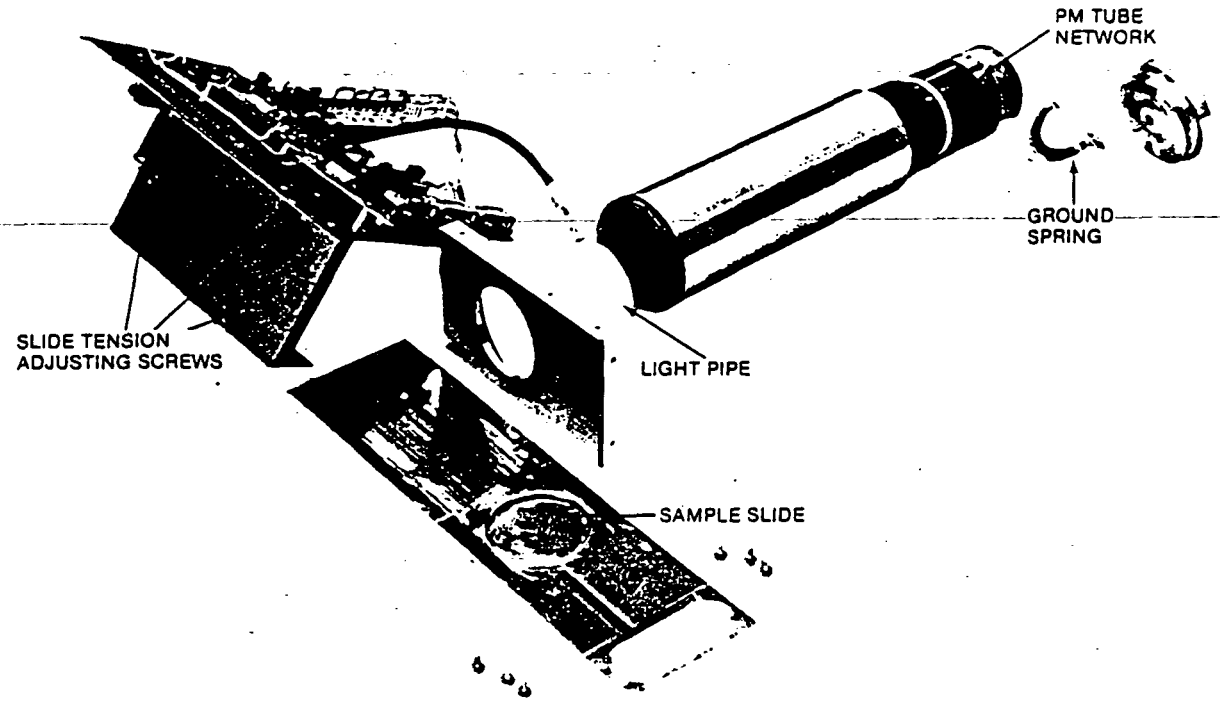

Figure 4-5. Detector Disassembled

D. CALIBRATION AND SET UP

1. Amplifier Gain

The gain of the amplifier is set at the factory for approximately 1.25 V output for 12.5 mV input. The high voltage also controls the overall gain, so the gain adjustment is arbitrary. Generally, the gain should be set toward maximum counterclockwise.

2. High Voltage Operating Point

NOTE

Use an electrostatic voltmeter for high voltage measurement.

a. Place a source of known activity in the sample holder and adjust its height so it is as high as possible, but not extending above the drawer surface.

b. Close the drawer and run a plateau of counts per minute (cpm) vs high voltage. (See Figure 4-6.)

c. Remove the source and repeat step b. for background.

d. Set the high voltage to a point on the plateau just below the upswing of the background.

e. Replace the source and determine the counting efficiency by dividing the observed counts per minute by the 2 π source value. This should be 0.8 (80 percent) or greater. If it is less than this, it indicates that the phosphor needs to be replaced.

f. Remove the source and check the background count rate. This should be less than three counts in ten minutes. If it is higher, it indicates that the slide and/or phosphor is contaminated.

3. Timer

The timer can be modified to run synced on a 50 Hz line or to run with no sync input at all. The following describes the changes to be made.

a. Synced with 50 Hz line: This modification may be accomplished by removing A203 from the timer board and replacing it with a type 7490 integrated circuit. If this exchange is made, you must check to see that pins 2 and 3 of XA203 are jumpered to ground.

b. No external sync signal: To modify the timer to run on its own oscillator with no external sync signal, remove the wire from tie point 6 of the timer board. The line sync feature is then disconnected.

c. Calibration of oscillator: Two methods.

(1) Using an oscilloscope and monitoring at tie point of the timer board, adjust R205 for 60 Hz (16⅔ ms period) if the timer board is not modified or if it is modified according to part b. above.

If the timer board is modified for syncing with a 50 Hz line, then adjust R205 for 50 Hz (20 ms period).

(2) An alternate method is to connect a pulse generator with an accurate base (such as Eberline Model MP-1) to the amplifier input. Preset a time and adjust R205 for the correct reading on the scaler.

E. DETECTOR MAINTENANCE

1. Decontamination

a. Remove the slide and PM tube housing as described in A.6.a. and A.6.b.

b. Remove the sample holder from the slide and wash both thoroughly in warm soapy water. Rinse and dry completely before reassembly.

c. Remove the light pipe and from the PM tube. Remove and discard the phosphor. Wash the light pipe thoroughly in warm soapy water. Rinse and dry completely before reassembly. See 2. below for rephosphor operation.

2. Changing Phosphor

The SAC-4 may use either a prepared ZnS(Ag) phosphor disk or it may have the ZnS(Ag) phosphor adhered to the light pipe. If the prepared disk is used, simply remove it from the detector top plate and replace it with a new disk. If the adhered phosphor is used, proceed as follows.

a. Remove the phosphor and tape from the light pipe. Apply double sticky tape to the light pipe starting at one edge and working across the surface to eliminate air bubbles.

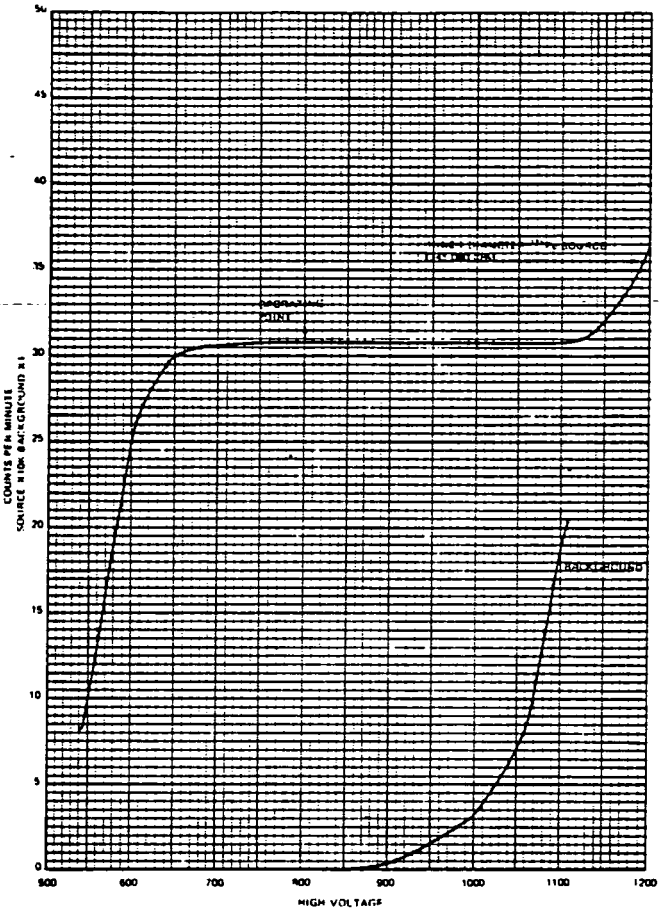

Figure 4-6. Plateau, CPM vs High Voltage

b. Remove the protective cover from the tape and sprinkle the phosphor powder evenly on the sticky surface. Press into the surface for a uniform coating. Brush off the excess phosphor and reassemble.

F. TROUBLESHOOTING

Typical voltage and waveforms are given on the schematic. Use of the schematic, along with the "Theory of Operation" section and its waveforms and diagrams should help to isolate and pinpoint problems. Component locations are shown in Section VI.

Voltages, except the high voltage, are measured with a 20,000 Ω/V, or greater, voltmeter. An electrostatic voltmeter should be used to measure the high voltage.

If an electrostatic voltmeter is not available for measuring high voltage, the voltmeter used for the other voltages may be used to give an indication of high voltage. It must be remembered, however, that this is an indication only.

Fernald RI/FS
Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

Procedure #: HS 015 Issued: _____

1.0 PURPOSE

To provide direction for the use, calibration, limitations, and maintenance of the HNU Photoionization Detector.

2.0 REFERENCES

2.1 HNU Systems, Inc., Instruction Manual for Model PI 101 Photoionization Analyzer, 1975.

2.2 E&E FIT Operation and Field Manual: HNU System PI 101 Photoionization Detector and Century Systems (Foxboro) Model OVA-128 Organic Vapor Analyzer.

3.0 RESPONSIBILITIES

3.1 Project Health and Safety Officer

3.1.1 Ensure that employees using the HNU are trained in use, limitations and interpretation of readings.

3.2 Instrument User

3.2.1 Before each use of the instrument, ensure that it is calibrated and operating properly.

4.0 DISCUSSION

4.1 Instrument Maintenance and Calibration

4.1.1 When the instrument is scheduled for or requires maintenance, these functions should be conducted only by qualified individuals. Maintenance responsibilities shall be restricted to one or two individuals, who will also bear responsibilities for logging the equipment in and out.

Fernald RI/FS
Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

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4.2 Operator Qualifications

4.2.1 The HNU, although a relatively simple instrument to use, can be incorrectly operated if the user is not thoroughly familiar with the instrument's operation. All users should be trained for HNU operation prior to using the instrument in the field.

5.0 REQUIREMENTS

None

6.0 PROCEDURES

6.1 Start-up/Shut Down Procedures

6.1.1 Start-up/Procedures

6.1.1.1 Attach the probe to the read out unit. Match the alignment key, then twist the connector clockwise until a distinct locking is felt.

6.1.1.2 Turn the FUNCTION switch to the battery check position. Check to ensure that the indicator reads within or beyond the green battery arc on the scale plate. If the indicator is below the green arc, or if the red LED comes on the battery must be charged prior to using.

6.1.1.3 To zero the instrument, turn the FUNCTION switch to the STANDBY position and rotate the ZERO POTENTIOMETER until the meter reads zero. Wait 15-20 seconds to ensure that the zero adjustment is stable. If not, then readjust.

6.1.1.4 Check to see that the SPAN POTENTIOMETER is set at the appropriate setting for the probe being used.

6.1.1.5 Set the FUNCTION switch to the desired ppm range.

Fernald RI/FS
Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

Procedure #: HS 015 Issued: _____

6.1.1.6 Listen for the fan operation to verify fan function.

6.1.1.7 Check instrument with an organic point source such as a magic marker prior to survey to verify instrument function.

6.1.1.8 Complete the "start-up" section on the HNU PI-101 checklist, Appendix 10.1.

6.1.2 Shut Down Procedures

6.1.2.1 Turn FUNCTION Switch to OFF.

6.1.2.2 Disconnect the probe connector.

6.1.2.3 Place the instrument on the charger.

6.1.2.4 Complete the "shut down" section on the HNU PI-101 checklist, Appendix 10.1. sign and deliver completed forms to the SHSO.

6.2 Maintenance and Calibration Schedule

Function	Frequency
Routine Calibration	Prior to each use*
Factory Check-out & Calibration	Yearly or when malfunctioning
Wipe Down Read-Out Unit	After each use
Clean UV Light Source Window	Every month or as use and site conditions dictate
Clean the Ionization Chamber	Monthly
Recharge Battery	After each use

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Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

Procedure #: HS 015 Issued: _____

* It is recommended that for activities where the HNU-PI-101 is in the field for extended periods of time that calibration gas be brought into the field to check calibration. However, if necessary a single calibration conducted prior to an activity will be considered acceptable for periods up to ten days.

6.3 Calibration Procedure 1

6.3.1 Run through start-up procedures as set forth in 6.1.1

6.3.2 Fill a sampling bag with HNU calibration gas (Analyzed).

6.3.3 Allow sample bag contents to be drawn into the probe and check response in ppm.

6.3.4 If the reading deviates ± 15% from the concentration of the calibration gas, the instrument requires maintenance.

6.3.5 Documentation of Calibration should include:

6.3.5.1 Date inspected.

6.3.5.2 Person who calibrated the instrument

6.3.5.3 The instrument number (Serial # or EPA ID#)

6.3.5.4 The results of the calibration (ppm, probe ev, span pot setting)

6.3.5.5 Identification of the calibration gas (source, type, concentration, lot #).

6.4 Calibration Procedure 2 - (For HNU Calibration Canisters Equipped with a Regulator)

6.4.1 Run through start-up procedures as set forth in 6.1.1

6.4.2 Connect a sampling hose to the regulator outlet and the other end to the sampling probe of the HNU.

Fernald RI/FS
Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

Procedure #: HS 015 Issued: _____

6.4.3 Crack the regulator valve.

6.4.4 Take reading after 5-10 seconds.

6.4.5 If the reading deviates ± 15% from the concentration of the calibration gas, the instrument requires maintenance.

6.4.6 Calibration documentation should be as in 6.3.5 above.

6.5 Cleaning the UV Light Source Window

6.5.1 Turn the FUNCTION switch to the OFF position and disconnect the sensor/probe for the Read Out/Control Unit.

6.5.2 Remove the exhaust screw located near the base of the probe. Grasp the end cap in one hand and the probe shell in the other. Separate the end cap and lamp housing form the shell.

6.5.3 Loosen the screws on the top of the end cap and separate the end cap and ion chamber from the lamp and lamp housing, taking care that the lamp does not fall out of the lamp housing.

6.5.4 Tilt the lamp housing with one hand over the opening such that the lamp slides out of the housing into your hand.

6.5.5 The lamp window may now be cleaned with any of the following compounds using lens paper;

6.5.5.1 HNU Cleaning Compound-All lamps except the 11.7 eV

6.5.5.2 Carbon tetrachloride-All lamps except the 11.7 eV

6.5.5.3 Methanol-All lamps

6.5.6 Following cleaning, reassemble by first sliding the lamp back into the lamp housing. Place the ion chamber on top of the housing making sure the contacts are properly aligned.

Title: Use, Calibration, and Maintenance of the HNU PI-101

Procedure #: HS 015 Issued: _____

6.5.7 Place the end cap on top of the ion chamber and replace the two screws. Tighten the screws only enough to seal the O-ring. Do Not Overtighten.

6.5.8 Line up the pins on the base of the lamp housing with pins inside the probe shell, and slide the housing assembly into the shell. It will only fit one way.

6.6 Cleaning The Ionization Chamber

6.6.1 Turn the FUNCTION switch to the OFF position and disconnect the sensor/probe from the Read Out/Control unit.

6.6.2 Remove the exhaust screws located near the base of the probes. Grasp the end cap in one hand and the probe shell in the other. Separate the end cap and lamp housing from the shell.

6.6.3 Loosen the screws on the top of the end cap and separate the end cap and ion chamber from the lamp and lamp housing, taking care that the lamp does not fall out of the lamp housing.

6.6.4 The ion chamber may now be cleaned according to the following sequence:

6.6.4.1 Acetone rinse with agitation (10 min.)

6.6.4.2 Dry (preferably with oven at 100^0C)

6.6.4.3 Methanol rinse with agitation (10 min.)

6.6.4.4 Dry (preferably with oven at 100^0C)

6.6.5 Place the ion chamber on top of the housing making sure the contacts are properly aligned.

6.6.6 Place the end cap on top of the ion chamber and replace the two screws. Tighten the screws only enough to seal the O-ring. Do Not Overtighten.

6.6.7 Line up the pins on the base of the lamp housing with pins inside the probe shell, and slide the housing assembly into the shell. It will only fit one way.

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Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

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6.7 Trouble Shooting

6.7.1 No meter response in any switch position (including BATT CHK)

6.7.1.1 Broken meter movement

Tip instrument rapidly from side to side. Meter needle should move freely, and return to zero.

6.7.1.2 Electrical connection to meter is broken

Check all wires leading to meter and clean the contacts of quick-disconnects.

6.7.1.3 Battery is completely dead

Disconnect battery and check voltage with volt-ohm meter.

6.7.1.4 If none of the above solves the problem, consult the factory.

6.7.2 Meter responds in BATT CHK position, but reads zero or near zero for all others.

6.7.2.1 Power supply defective

Check power supply voltages per Figure 11 of the HNU owners manual. If any voltage is out of specification, consult the factory.

6.7.2.2 Input transistor or amplifier has failed

(1) Rotate zero control; meter should reflect up/down as control is turned.

(2) Open probe. Both transistors should be fully seated in sockets.

6.7.3 Instrument responds correctly in BATT CHK. and STBY, but not in measuring mode.

Fernald RI/FS
Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

Procedure #: HS 015 Issued: _____

6.7.3.1 Check to see that light source is on.

6.7.3.2 Check high voltage power supply.

6.7.3.3 Open end of probe, remove lamp and check high voltage on lamp contact ring.

6.7.3.4 If high voltage is present at all above points, light source has most likely failed. Consult the factory.

6.7.4 Instrument responds correctly in all positions, but signal is lower than expected.

6.7.4.1 Check span setting for correct value.

6.7.4.2 Clean window of light source.

6.7.4.3 Double check preparation of standards.

6.7.4.4 Check power supply 180 V output.

6.7.4.5 Check for proper fan operation. Check fan voltage.

6.7.5 Instrument responds in all switch positions, but is noisy (erratic meter movement)

6.7.5.1 Open circuit in feedback circuit. Consult the factory.

6.7.5.2 Open circuit in cable shield or probe shield. Consult the factory.

6.7.6 Instrument response is slow and/or irreproducible.

6.7.6.1 Fan operating improperly. Check fan voltage.

6.7.6.2 Check calibration and operation. See sections 2 and 3.

6.8 Complete the Maintenance and Calibration Log, Appendix 10.2.

Fernald RI/FS
Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

Procedure #: HS 015 Issued: _____

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The person performing this procedure shall ensure that all equipment is working properly and all instrument settings are set to the proper position.

8.1.2 Instrument calibration stickers shall be checked by Q.A. staff periodically to ensure calibration dates have not expired.

8.2 Equipment Monitoring

8.2.1 The user shall check instrument calibration stickers before use to ensure calibration date has not expired.

9.0 CALCULATIONS

None

10.0 APPENDICES

10.1 Daily Checklist

10.2 Maintenance and Calibration log

Fernald RI/FS
Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

Procedure #: HS 015 Issued: _____

Appendix 10.1

HNU PI-101
Daily Check List

Serial Number:_____ Calibration Due Date:_____

Date:_____

Start-up

Probe attached to readout unit:_____

Battery check:_____

Instrument check:_____

SPAN POTENTIOMETER READING:_____

Fan operational:_____

Check source response:_____

Shut-down

Function switch off:_____

Probe disconnected:_____

Instrument on charges:_____

_____
Signature

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Health and Safety Procedure

Title: Use, Calibration, and Maintenance of the HNU PI-101

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APPENDIX 10.2

HNU PI-101
MAINTENANCE AND CALIBRATION LOG

Instrument Serial #:_____ Last Factory Calibration:_____

UV Light Source Cleaned*:_____
D A T E

Ionization Chamber Cleaned*:_____
D A T E

Calibration Procedure (1 or 2):_____

Inspected by:_____ Date:_____

-- Source:_____

-- Type:_____

-- Concentration:_____

-- Lot #:_____

Results of Calibration:

-- Span setting:_____

-- Probe:_____

-- Instrument reading (ppm):_____

Results within ± 15% of calibration gas concentration:_____

COMMENTS:_____

_____

_____

Calibrated by:_____ Date:_____

* Due monthly

Fernald RI/FS
Health and Safety Procedure

Title: Tailgate Safety Meetings

Procedure #: HS 020 Issued: _____

1.0 PURPOSE

To explain the concept and value of Tailgate Safety Meetings as a training tool, and provide guidelines on the proper use of the Tailgate Safety Meeting form.

2.0 SCOPE

Tailgate Safety Meetings are required in order to fulfill regulatory provisions for employee training and indoctrination on workplace hazards and as a means to minimize workplace incurred injuries and illnesses.

3.0 RESPONSIBILITY

3.1 Project Health and Safety Officer

3.1.1 It is the responsibility of the PHSO, or his designee, to ensure that all personnel understand and follow this procedure.

3.1.2 Maintain copies of completed TSM forms.

3.2 Site Health and Safety Officer, Team Leaders or Other Qualified Persons

3.2.1 It is the responsibility of the SHSO, team leader, or other qualified persons, to conduct these meetings.

3.2.2 It is the responsibility of the SHSO, team leader, or qualified person to document these meetings in writing on the Tailgate Safety Meeting form.

3.3 Team Members

3.3.1 It is the responsibility of the team members to attend the Tailgate Safety Meetings and acknowledge attendance by signing the Tailgate Safety Meeting form.

Fernald RI/FS
Health and Safety Procedure

Title: Tailgate Safety Meetings

Procedure #: HS 020 Issued: _____

4.0 REFERENCE

4.1 Title 8, California Administrative Code 3203

5.0 REQUIREMENTS

5.1 Material

Tailgate Safety Meeting Form

6.0 PROCEDURE

6.1 Tailgate Safety Meeting

A Tailgate Safety Meeting shall be conducted at the beginning of each shift or whenever new employees arrive at the job site by the SHSO, team leaders, or other designated qualified persons.

6.2 Tailgate Safety Meeting Form

The Tailgate Safety Meeting Form shall be properly completed in accordance with the following guidelines:

6.2.1 Date - date of meeting

6.2.2 Time - time at which meeting is held

6.2.3 Task - Sampling/measurement task

6.2.4 Location - specific location of the job at the site.

6.2.5 Type of Work - detailed description of the work to be performed, hazardous substances to be handled, etc.

6.2.6 Chemicals Used - specific name of chemicals introduced into the work area to facilitate the cleaning process.

Fernald RI/FS
Health and Safety Procedure

Title: Tailgate Safety Meetings

Procedure #: HS 020 Issued: _____

6.2.7 Safety Topics Presented -

6.2.7.1 Protective Clothing/Equipment - list all protective clothing and protective devices to be used by employees.

6.2.7.2 Chemical Hazards - specific chemical name and adverse properties of all chemicals to be encountered on the job. Indicate potential hazardous reactions. Original products and chemicals introduced during cleaning are to be included.

6.2.7.3 Physical Hazards - address hazards associated with the physical work site, such as, radiation, radioactive materials, slipping/tripping/falling hazards, elevated locations, weak structures,overhead hazards and nearby operations that could pose a hazard, etc.

6.2.7.4 Emergency Procedures - brief explanation of proper procedures should an employee injury, chemical spill, or other non-routine event occur.

6.2.7.5 Hospital/Clinic Phone Number, Paramedic Phone Number, Hospital Address - this information can be taken directly from the Emergency Phone List.

6.2.7.6 Special Equipment - indicate proper work techniques and any hazards associated with new or unfamiliar equipment.

6.2.7.7 Other - list any remaining safety topics pertinent to the potential hazards of the job.

6.2.8 Attendees -

6.2.8.1 NAME PRINTED - printed name and affiliation of all persons in attendance.

6.2.8.2 SIGNATURE - legible signature by all attendees.

6.2.9 Meeting Conducted By - printed name and legible signature of individual(s) conducting the Tailgate Safety Meeting.

Fernald RI/FS
Health and Safety Procedure

Title: Tailgate Safety Meetings

Procedure #: HS 020 Issued: _____

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

None

9.0 CALCULATIONS

None

10.0 APPENDICES

10.1 Completed Tailgate Safety Meeting form

10.2 Tailgate Safety Meeting form

FERNALD RI/FS
TAILGATE SAFETY MEETING

Date: 9/10/87 Time: 0700 Task: Well Drilling

Location: Zone 3 Northwest Corner of Site

Type of Work: Installation of Monitoring Wells and Core Sampling

Chemicals Used: Methanol

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment: Hard hats, Safety glasses, safety shoes in exclusion zone. Goggles, poly apron and gloves when handling methanol.

Chemical Hazards: Skin or eye contact with methanol.

Physical Hazards: Heavy equipment, slip, trip and fall hazards.

Emergency Procedures: Notify WMCO Energency, initiate first aid procedures.

Emergency Phone Numbers:

WMCO Emergency	(513) 738-6511
Hamilton County Emergency	(513) 825-2260
Butler County Emergency	(513) 867-5700

Hospital/Clinic: _____ Phone: _____

Hospital Address: _____

Special Equipment: _____

Other: _____

ATTENDEES

NAME PRINTED	SIGNATURE
U.R. Boss	U.R. Boss
Imma Worker	Imma Worker

Meeting conducted by: I.M. Safe (NAME PRINTED) _____ (SIGNATURE)

APPENDIX 10.2

FERNALD RI/FS
TAILGATE SAFETY MEETING

Date:_____ Time:_____ Task: _____

Location:_____

Type of Work:_____

Chemicals Used:_____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment:_____

_____

_____

Chemical Hazards:_____

_____

_____

Physical Hazards:_____

_____

_____

Emergency Procedures:_____

_____

Emergency Phone Numbers: WMCO Emergency _____ (513) 738-6511
Hamilton County Emergency (513) 825-2260
Butler County Emergency (513) 867-5700

Hospital/Clinic:_____ Phone:_____
Hospital Address:_____

Special Equipment:_____

_____

Other:_____

ATTENDEES

NAME PRINTED	SIGNATURE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting conducted by:_____ _____
NAME PRINTED SIGNATURE

Fernald RI/FS
Health and Safety Procedures

Title: Heat Stress

Procedure #: HS 021 Issued: _____

1.0 PURPOSE

To establish guidelines to protect all employees from the effects of heat stress (hyperthermia) when working in hot environments.

2.0 SCOPE

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal injury, increased accident probability, etc. to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment puts a worker at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at sites, regular monitoring and other preventive precautions are vital,

NOTE: Chemical protective clothing is defined as, but not limited to:

Polyethylene coated Tyvek;
Saranex coated Tyvek;
Medium weight polyvinylchloride (PVC);
Sigel suits (heavyweight PVC); and
fully encapsulating suits.

Fernald RI/FS
Health and Safety Procedures

Title: Heat Stress

Procedure #: HS 021 Issued: _____

3.0 RESPONSIBILITY

3.1 Project Health and Safety Officer

The PHSO will be responsible for initial on-site coordination of the heat stress policy. He shall establish work/rest regimens from the Wet Bulb Globe Thermometer (WBGT) readings and conduct physiological monitoring when on site.

3.2 Site Health and Safety Officer

The SHSO will be responsible for field implementation of the heat stress policy. This includes assurance that all personnel on-site comply with the policy. He shall be responsible for establishing and monitoring safe work practices. He will ensure that all personnel potentially exposed to heat have proper training and that on-site supervision implements the program in his absence.

3.3 Team Leaders

The Team Leaders will be responsible for ensuring that work crews comply with all site requirements, including the heat stress policy. In the absence of the SHSO, he shall also be responsible for physiological monitoring as outlined in Section 6 below and Appendix 10.1 to this procedure. Team members shall also observe their fellow workers for signs of heat stress.

3.4 Team Member

All Team Members will be responsible for understanding and complying with all site requirements, including the heat stress policy.

4.0 REFERENCES

4.1 Threshold Limit values and Biological Exposure Indices for 1985-1986, American Conference of Governmental Industrial Hygienists.

Title: Heat Stress

Procedure #: HS 021 Issued: _____

4.2 Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

4.3 Criteria for a Recommended Standard, Occupational Exposure to Hot Environments, Revised Criteria 1986, U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

5.0 REQUIREMENTS

5.1 Equipment

5.1.1 Clinical Thermometer

5.1.2 Wet Bulb Globe Thermometer

6.0 PROCEDURE

6.1 Recommended Guidelines

6.1.1 Note that the following guidelines discussed in this section (6.1) are only intended to be used as a means for initial establishment of a work-rest regimen. It will be the responsibility of the Project Health and Safety Officer to evaluate the conditions at a specific operation and make final determinations of the work-rest regimen. Physiological monitoring, as discussed in the following section, will be used to establish more stringent regiments.

6.1.2 Unacclimatized Workers - The total heat exposure to unacclimatized workers not wearing protective clothing shall not exceed the guidelines given in Appendix 10.1. Note that it generally takes an employee seven to ten days to become acclimated to heat.

Title: Heat Stress

Procedure #: HS 021 Issued: _____

6.1.3 Acclimatized Workers - The total heat exposure to acclimatized healthy workers not wearing protective clothing shall not exceed the guidelines given in Appendix 10.2.

6.1.4 The guidelines shown in Appendices 10.1 and 10.2 are for the worker not wearing chemical protective clothing. If the worker is wearing chemical protective clothing, the guidelines in Attachments 1 and 2 should be changed by 4°F. In other words, add 4°F to the WBGT reading and use this adjusted WBGT in Appendices 10.1 and 10.2.

6.1.5 The metabolic heat rate to use in Appendices 10.1 and 10.2 shall be estimated using Appendix 10.3.

6.2 Physiological Monitoring

6.2.1 For operations at which workers are wearing chemical protective clothing, physiological monitoring is necessary when the ambient temperature exceeds 78°F (25.5°C).

6.2.2 After the initial work-rest regimen is established, as discussed in 6.1, it is necessary to perform physiological monitoring to determine if the established work-rest regimen should be adjusted. The following guidelines will be used to adjust the regimen and should be recorded on a form similar to that shown in Appendix 10.4.

A. Baseline Information

Determine a baseline heart rate and oral temperature for each employee prior to on-site activities by counting the radial pulse and using a clinical thermometer to measure oral temperature.

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6.2.2.1 Increasing Work Rate

B. (1). If a worker's heart rate and oral temperature do not increase, or only increase slightly (10% or less for the heart rate and 0.5% or less for the oral temperature) from the baseline readings after the first work cycle, the work period (according to the established work-rest regimen) can be increased by 20%.

B. (2). The worker shall be monitored closely after the next work cycle period and if there are still no significant increases in heart rate and oral temperature, the work period can be increased by an additional 10% and the rest period remains the same.

B. (3). Increases in the work period can be made throughout the shift if there are no significant increases in the physiological monitoring indices.

B. (4). Note that the increases to the work period are made based on the work-rest regimen established from WBGT readings. These WBGT readings will change throughout the day as the temperature rises or falls.

6.2.2.3 Decreasing Work Rate

C. (1). Pulse

C. (1). (a). Count the radial pulse as early as possible in the rest period.

C. (1). (b). If a worker's heart rate exceeds 110 beats per-minute immediately after a work period, shorten the next work cycle by 30% and keep the rest period the same.

C. (1). (c). If the heart rate still exceeds the 110 beats per minute after the next work period, shorten the following work cycle by 30%.

C. (1). (d). Continue to shorten the employee's work cycle until the heart beat is below 110 beats per minute.

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C. (2). Temperature

C. (2). (a). Use a clinical thermometer or similar device to measure the oral temperature at the end of a work period (before drinking).

C. (2). (b). If the oral temperature exceeds 99.6°F (37.6°), shorten the next work cycle by 30% without changing the rest period.

C. (2). (c). If the oral temperature exceeds 99.6°F at the beginning of the next rest period, shorten the following work cycle by 30%.

C. (2). (d). Do not permit a worker to return to a work area when the oral temperature exceeds 100.6°F (38.1 C).

6.3 Prevention

6.3.1 Establish a work-rest regimen according to the guidelines given in 6.1 and 6.2 of this policy.

6.3.2 Adequate liquids must be provided to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

Replacement fluids can be a 0.1% salt water solution, a commercial mix, such as Gatorade or Quik Kick, or a combination of these with fresh water. Employees should be encouraged to salt their foods more heavily.

The replacement fluid temperature should be kept cool.

6.3.3 Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

6.3.4 All breaks are to be taken in a cool, shaded rest area (77°F is best).

Title: Heat Stress

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6.3.5 Employees shall remove chemical protective garments during rest periods.

6.3.6 Employees shall not be assigned other tasks during rest periods.

6.3.7 All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress.

6.3.8 Employees shall be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.

6.4 Training

Those personnel potentially exposed to heat stress conditions shall have the following training:

6.4.1 Sources of heat stress, influence of protective clothing, and importance of acclimatization;

6.4.2 How the body handles heat;

6.4.3 Heat related illness;

6.4.4 Preventative/Corrective measures; and

6.4.5 First Aid procedures.

7.0 PRECISION AND ACCURACY

None

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Health and Safety Procedures

Title: Heat Stress

Procedure #: HS 021 Issued: _____

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer shall perform periodic surveillances to determine compliance with this procedure by field personnel.

8.2 Acceptance Criteria

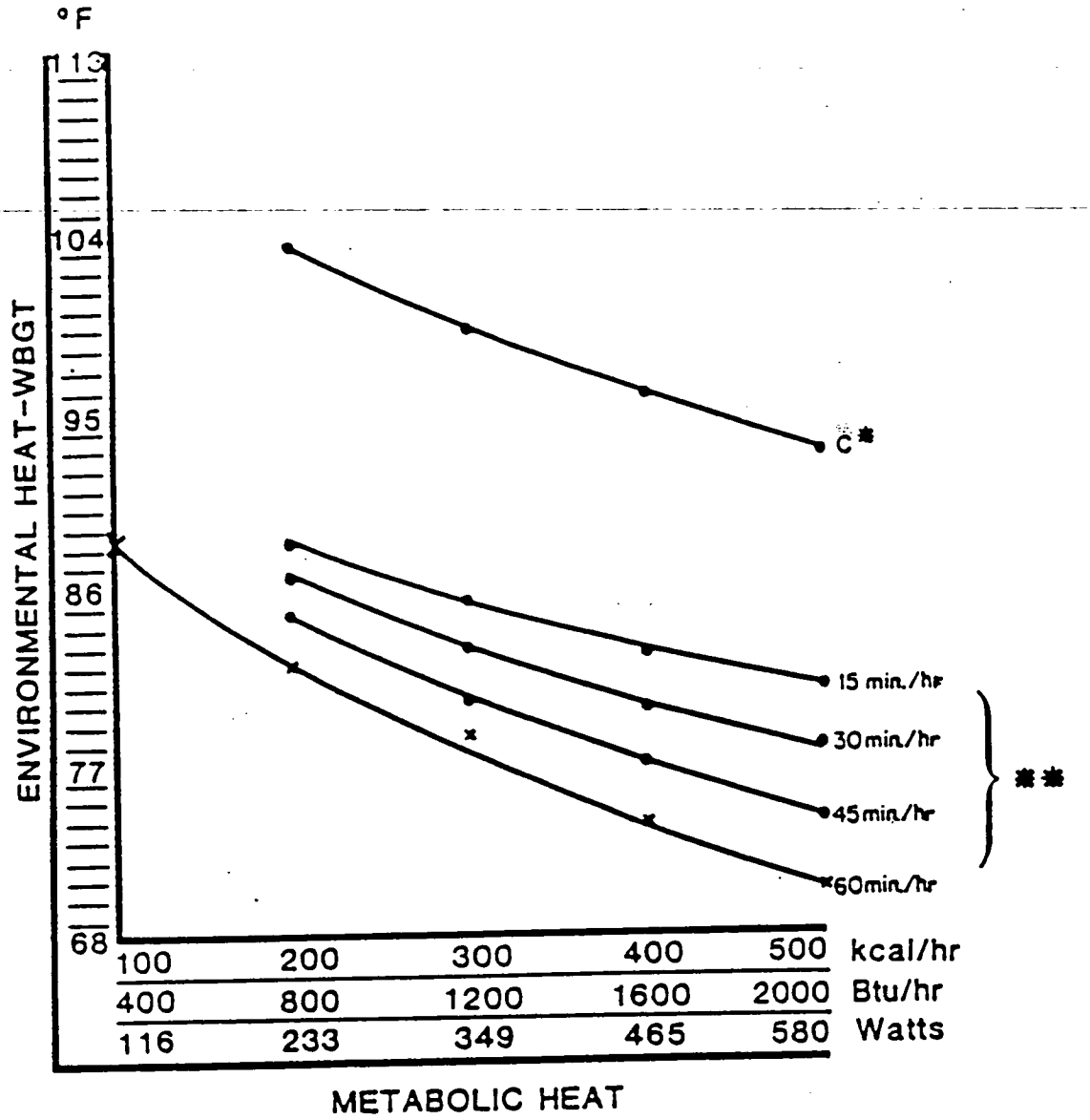
None

9.0 CALCULATIONS

9.1 See Appendix 10.3 for calculation of employee work load in hot environments.

10.0 APPENDICES

APPENDIX 10.1

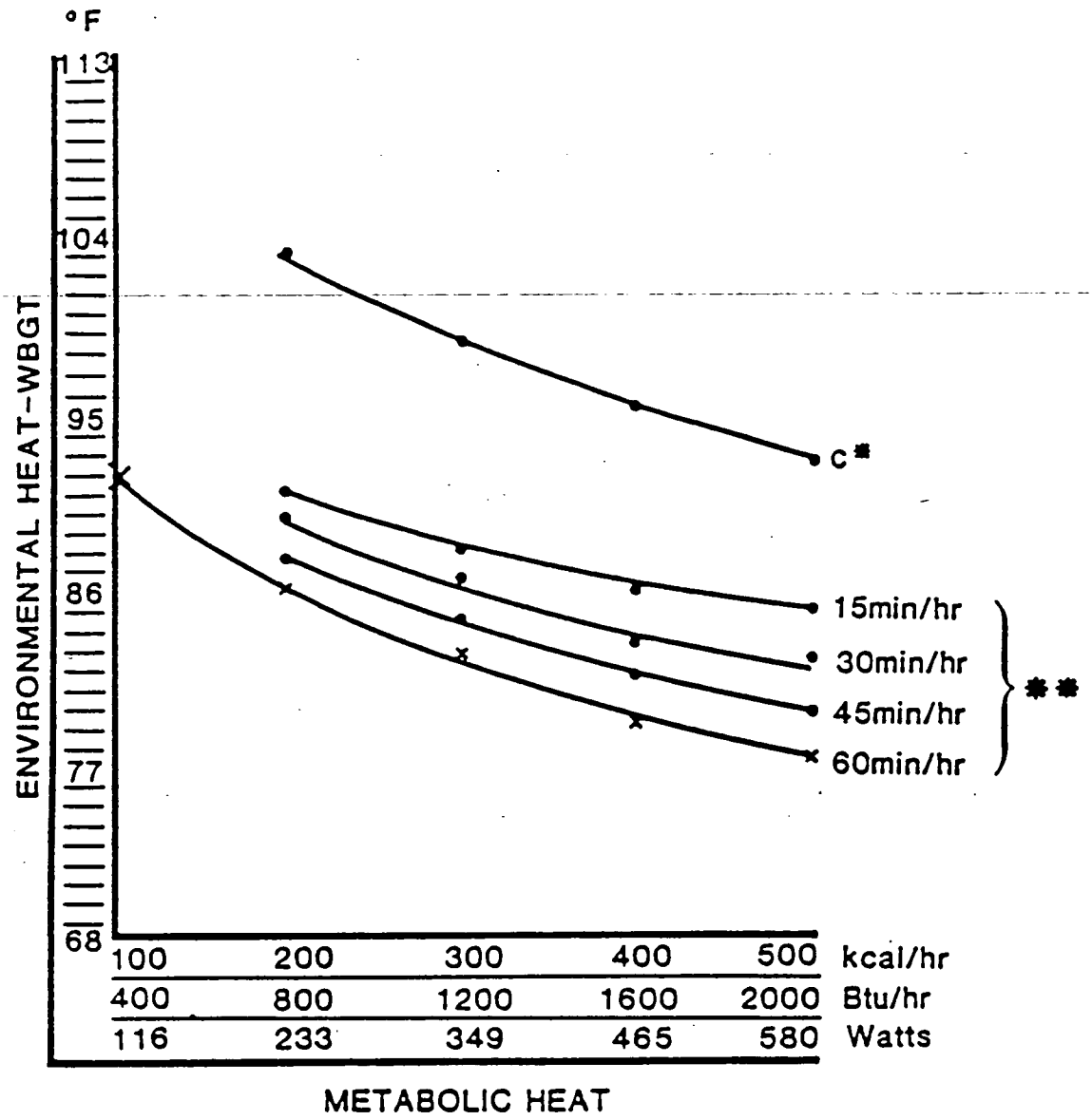


Recommended Heat Stress Guidelines for Unacclimated Workers in Hot Environments

- C= Ceiling Limit – No work should be performed without body cooling provided

** Work-Rest Regimen – Minutes worked per hour

APPENDIX 10.2



Recommended Heat Stress Guidelines for Acclimated Workers in Hot Environments

* C= Ceiling Limit – No work should be performed without body cooling provided.

** Work–Rest Regimen = Minutes worked per hour

APPENDIX 10.3

ASSESMENT OF EMPLOYEE WORK LOAD IN HOT ENVIRONMENTS

A. BODY POSITION AND MOVEMENT	kcal/min
Sitting	0.3
Standing	0.6
Walking	2.0–23.0
Walking uphill	add 0.8 per meter rise

B. TYPE OF WORK	Average kcal/min	Range kcal/min
Hand work		
Light	0.4	0.2–1.2
Heavy	0.9	
Work One Arm		
Light	1.0	0.7–2.5
Heavy	1.8	
Work Both Arms		
Light	1.5	1.0–3.5
Heavy	2.5	
Work Whole Body		
Light	3.5	2.5–9.0
Moderate	5.0	
Heavy	7.0	
Very Heavy	9.0	

C. BASAL METABOLISM	1.0

D. SAMPLE CALCULATION	Average kcal/min
Assembling work with heavy hand tools	
1. Standing	0.6
2. Two-arm work	3.5
3. Basal Metabolism	1.0
TOTAL	5.1 kcal/min x 60=306 kcal/hr

EMPLOYEE PHYSIOLOGICAL MONITORING RECORD FOR HEAT STRESS

Employee Name _____ Date _____ Employee SS# _____

Division _____ Start Time _____ Location _____

P.C.# _____ Stop Time _____ Job Number _____

Health & Safety Coordinator _____ Supervisor _____

TEMPERATURES

A. INITIAL READING
1. Ambient Air Temperature _____
2. Baseline Oral Temperature _____
3. WBGT _____

B. AFTER FIRST WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

C. AFTER SECOND WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

D. AFTER THIRD WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

E. AFTER FOURTH WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

F. AFTER FIFTH WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

HEART RATE

A. INITIAL READING
1. Baseline Heart Rate _____ B/min

B. AFTER FIRST WORK PERIOD
1. Heart Rate _____ B/min

C. AFTER SECOND WORK PERIOD
1. Heart Rate _____ B/min

D. AFTER THIRD WORK PERIOD
1. Heart Rate _____ B/min

E. AFTER FOURTH WORK PERIOD
1. Heart Rate _____ B/min

F. AFTER FIFTH WORK PERIOD
1. Heart Rate _____ B/min

APPENDIX 10.4

This completed form should be retained in project

B/min=Beats/ per minute

FERNALD RI/FS

Health and Safety Procedure

Title: Confined Spaces Industrial

Procedure #: HS 022 Issued: _____

1.0 PURPOSE

To set forth minimum requirements and procedures for the safety and health of employees who work in, about, and in connection with industrial confined spaces.

2.0 SCOPE

This directive prescribes minimum requirements for safe entry, continued work in, and exit from tanks and other confined spaces; and procedures for preventing employee exposure to dangerous air contamination and/or oxygen deficiency.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Project Health and Safety Officer or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee, immediately.

4.0 REFERENCES

4.1 Title 8, Article 108, California Administrative Code; Cal-OSHA

4.2 American National Standards Institute, ANSI Z117.1-1977

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Title: Confined Spaces Industrial

Procedure #: HS 022 Issued:

4.3 NIOSH Criteria Document, "Working in Confined Spaces", December, 1979.

4.4 American Petroleum Institute, API RP 2015, 11/76, "Recommended Practice for Cleaning Petroleum Storage Tanks"

5.0 DEFINITIONS - FOR THE PURPOSE OF THIS DIRECTIVE

5.1 Atmosphere - Refers to the gases, vapors, mists, fumes, and dusts within a confined space.

5.2 Confined Space - Enclosure having limited means for entry and exit, by reason of location, size, or number of openings; and unfavorable natural ventilation which could contain or produce dangerous air contaminants, flammable or explosive atmospheres, and/or oxygen deficiency.

Confined spaces include, but are not limited to, storage tanks, compartments of ships, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, bins, tubs, tank trucks, and pipelines.

5.3 Confined Space, Class "A" - A confined space in which the atmosphere is immediately dangerous to life and health, or poses an immediate threat of exposure that will probably cause delayed harm, and one from which a person cannot escape unprotected without irreversible health effects.

These include but are not limited to oxygen deficient atmospheres, flammable atmospheres, and/or atmospheres containing air concentrations of toxic substances.

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5.4 Confined Space, Class "B" - A confined space in which the atmosphere is not immediately dangerous to life and health but may cause immediate physical discomfort or irritation, produce harm after prolonged exposure, or cause chronic poisoning after repeated short exposures, but does not cause irreversible damage during a single exposure. Class "B" atmospheres may be further defined by the following:

5.4.1 Class "B-1" - Atmospheres containing toxic contaminants at concentrations greater than two times the TLV of the most toxic contaminant present and which require the use of air-line air-supplied respirators, lifelines and harnesses, and safety standby personnel.

5.4.2 Class "B-2" - Atmospheres with toxic contaminants in concentrations above the TLV for the most toxic contaminant present but not greater than two times that TLV and which require the use of air-purifying respirators such as the cartridge or canister type respirator.

5.5 Confined Space, Class "C" - A confined space in which the concentration of toxic contaminants can be maintained by ventilation below the TLV for the most toxic contaminant present, and does not require any special modification of the work procedure.

5.6 Contaminant - Any organic or inorganic substance, dust, fume, mist, vapor, or gas, the presence of which in air can be harmful or hazardous to human beings.

5.7 Hot Work - Any work involving burning, welding, riveting, or similar fire producing operations, as well as work which produces a source of ignition, such as drilling, abrasive blasting, and space heating.

5.8 Inerting - Displacement of the atmosphere by a nonreactive gas (such as nitrogen) to such an extent that the resulting atmosphere is nonflammable.

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5.9 Isolation - A process whereby the confined space is removed from service and completely protected against the inadvertent release of materials by the following means: inserting a suitable full pressure blank (skillet type metal blank between flanges) in all lines, misaligning sections of lines and pipes, or valve-chain lockout of lines; and lockout of all sources of electrical power and blocking or disconnecting all mechanical linkages.

5.10 Lead Hazard - Refers to the potential for exposure to organic (tetraethyl) lead in tanks which have been used for leaded petroleum products. Since these tanks will contain residual lead of varying concentrations, they must be regarded as dangerous to the extent that respiratory (supplied air respiratory protective equipment) and whole body skin protection must be used throughout the cleaning process. These tanks must not be considered lead-free until proven so by lead-in-air analysis.

5.11 LEL (lower explosive limit) - The minimum concentration of a flammable gas or vapor in air (usually expressed in percent by volume at sea level), which will ignite if an ignition source is present.

5.12 Oxygen Deficiency - Refers to an atmosphere with a partial pressure of oxygen of less than 132 mm Hg. Normal air contains approximately 21% oxygen. For the purpose of this directive, any atmosphere containing less than 20% oxygen shall be considered oxygen deficient and immediately dangerous to life and health. All requirements for work in Confined Space, Class "A", must be met.

5.13 Purging - The method by which gases, vapors, or other airborne impurities are displaced from a confined space. This may involve such measures as mechanical ventilation, steam ventilation, or introducing another gas such as nitrogen or carbon dioxide to control flammable vapors.

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Health and Safety Procedure

Title: Confined Spaces Industrial

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5.14 Qualified Person - A person designated by the PHSO, in writing, as capable (by education and/or specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space.

Training in the evaluation of employee exposure to toxic substances and in the use of atmospheric testing instruments is required, plus knowledge or experience in specifying the necessary precautions to be taken for the protection of employees under the applicable conditions.

5.15 Standby Employee - Individual physically capable of rescuing another employee by use of hoist, lifeline and harness, or entry into a confined space and who has had current training in:

(1) Cardiopulmonary resuscitation (CPR)

(2) First aid

(3) Air-supplied respiratory protective equipment

(4) Self-contained respiratory protective equipment

5.16 Threshold Limit Value (TLV) - Refers to airborne concentrations of substances and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

TLV's shall be used as guidelines only, and shall be considered as one of many contributing factors in evaluating the overall degree of hazard for confined space work.

For the purposes of this directive, TLV's and PEL's (Permissible Exposure Limits) have the same definition.

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Health and Safety Procedure

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Procedure #: HS 022 Issued: _____

6.0 PROCEDURE

6.1 Precautions Before Entry - Before employees are permitted to enter a confined space, the following requirements shall be met.

6.1.1 Inspections and Tests

6.1.1.1 Before work begins, a qualified person shall inform the WMCO emergency medical facility of the location of the confined space entry.

6.1.1.2 A qualified person shall determine the type of product which the confined space previously contained, as well as the indicated amount of sludge, residual product, or other contaminants within, and the physical condition of the confined space itself.

6.1.1.3 A qualified person shall make a survey of the surrounding area, including atmospheric testing if appropriate, to determine whether it is safe to enter the area to perform the assigned task.

6.1.1.4 Entry into a confined space is prohibited until initial testing of the atmosphere has been completed from the outside. Tests performed shall include, as a minimum, those for oxygen content, flammability, and toxic contaminants.

Additional tests shall be selected and performed to the satisfaction of the qualified person, based on consultation and recommendations of the Project Health and Safety Officer. Such additional tests shall be made in a location which will be representative of the worst-case conditions that might be anticipated. All tests shall be repeated as often as necessary to assure safety since changing conditions can result in changing atmospheric concentrations.

6.1.1.5 All test results shall be recorded on an "Inspections and Tests for Entry Into Confined Spaces" form, Appendix 10.1.

This form shall be clearly posted on the vessel as near as possible to the point where employees will enter the confined space.

After job completion, the form is to be retained indefinitely by the SHSO.

6.1.1.6 Entry into a confined space for any type of work is prohibited when tests indicate the concentration of flammable gases in the atmosphere is greater than 10% of the lower explosive limit (LEL).

6.1.1.7 Entry into a confined space for any type of work is prohibited when tests indicate the concentration of oxygen to be less than 20% or greater than 25%.

6.1.1.8 Entry into a confined space containing toxic contaminants in concentrations at or above the threshold limit value (TLV) shall be permitted only when personal protective equipment appropriate for the specific contaminants is provided to all affected employees, based on recommendations of the PHSO.

6.1.1.9 The confined space shall be tested as often as necessary to ensure the safety of employees, and whenever conditions in the confined space change, such as temporary stoppage of mechanical ventilation, agitation of tank product by workers, increase in ambient temperature, etc.

Required frequency of retesting shall be a decision of the qualified person, based on the ongoing evaluation of the degree of hazard and recommendations from the PHSO.

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Title: Confined Spaces Industrial

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6.1.1.10 In addition to atmospheric testing, a qualified person shall take positive steps to ensure that employees are protected from other physical hazards, ~~which would include, but are not limited to the~~ following:

(1) Discharge of steam, high-pressure air, water or oil into the confined space, or against personnel working outside.

(2) Structural failure of the tank shell, roof, roof support members, swing line cables or other tank members.

(3) Tools or other objects dropping from overhead.

(4) Falls through or from the roof, or from scaffolds, stairs or ladders.

(5) Tripping over hoses, pipes, tools, or equipment.

(6) Slipping on wet, oily surfaces or colliding with objects in adequately lighted interiors.

(7) Insufficient or faulty personal protective equipment.

(8) Insufficient or faulty operations equipment and tools.

(9) Noise in excess of acceptable levels.

(10) Temperature extremes which may require additional protection or shorter work periods.

6.1.1.11 If the confined space contains or has contained leaded products, and the vessel has not been certified lead-free by lead-in-air analysis, a qualified person shall take all additional steps necessary to ensure compliance with the provisions of HS 023, Confined Spaces, Leaded Products.

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6.1.2 Isolation

6.1.2.1 General: A qualified person shall the positive steps to:

(1) Depressurize the confined space.

(2) Prevent accidental introduction into the confined space of hazardous materials through interconnecting equipment such as piping, ducts, vents, drains, or other means.

(3) De-energize, lockout, and tagout machinery, mixers, agitators, or other equipment containing moving parts that are in a confined space.

Before a method of isolation is selected, a qualified person shall consider the hazards that may exist or develop from temperature, pressure, flammability, or toxicity of the material in the piping, including reactions with cleaning or purging agents.

6.1.2.2 Detail: Before employees are permitted to enter a confined space, the confined space shall be isolated to preclude the entry of hazardous materials by one or more of the following methods:

(1) Removing a valve, spool piece, or expansion joint in piping to, and as close as possible to, the confined space, and blanking or capping the open end of the pipe leading to the confined space.

(2) Inserting a suitable full-pressure blank in piping between the flanges nearest to the confined space.

(3) Closing, locking, and tagging at least two valves in the piping leading to the confined space, and locking or tagging open to atmosphere a drain valve between the two closed valves, which shall be checked to ensure that it is not plugged.

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In all cases, blanks or caps shall be of a material that is compatible with the liquid, vapor, or gas with which they are in contact.

The material shall also have sufficient strength to withstand the maximum operating pressure, including surges, which can be built up in the piping.

(4) In addition, all electrical and mechanical devices within or attached to the confined space shall be disconnected, or locked, and tagged to prevent accidental movement or energizing of such systems.

All employees who will be working in the confined space shall be informed of the isolation devices in use at the jobsite during Tailgate Safety Meetings.

6.1.3 Ventilation

6.1.3.1 Prior to ventilating a confined space, a qualified person shall take positive steps to ensure that no pyrophoric materials that will ignite flammable vapor in the presence of air are present in the confined space.

6.1.3.2 All confined spaces shall be mechanically ventilated to prevent accumulation of:

(1) Flammables in the atmosphere at concentrations above 10% of the LEL.

(2) Concentrations of combustible dusts.

(3) Toxic contaminants in the atmosphere above the TLV.

(4) Toxic and other contaminants having no rated TLV.

(5) Oxygen excess or deficient atmospheres.

6.1.3.3 Only air or steam driven air movers shall be used to ventilate confined spaces. Uses of electric powered ventilators is strictly prohibited.

6.1.3.4 Oxygen shall not be used to power air-driven ventilators.

6.1.3.5 A qualified person shall check periodically to ensure that contaminated air from a confined space is exhausted to a location where it presents no hazard.

6.1.3.6 Whenever possible, air movers shall be used with ducting to increase the efficiency of ventilation in the confined space and to prevent recirculation of contaminated air due to ventilation "short circuiting".

6.1.3.7 When two or more air movers are used for ventilation, all such units should be operated in the same flow direction to maximize efficiency, i.e., all in the exhaust mode or all in the supply mode.

6.1.4 Employee Training and Indoctrination

6.1.4.1 Employees assigned to work in a confined spaces shall have completed formal classroom and practical training which shall include the following:

(1) Types of confined spaces associated with the industrial activity;

(2) Chemical and physical hazards involved;

(3) Safe work practices and techniques;

(4) Testing requirements, evaluation, and test methods;

(5) Safety equipment, to include:

(a) Respiratory Protective Devices,

(b) Protective clothing, and other protection such as harnesses, lifelines, eye protection, etc.

(c) Explosion proof lighting, power cords, and connectors;

(6) Emergency first aid and rescue procedures for safety-standby personnel;

(7) Applicable federal, state, and local regulations;

(8) RI/FS confined space entry policies and procedures.

6.1.4.2 Tailgate Safety Meetings detailing specific hazards of the work to be performed and safety precautions and procedures specific for the job shall be conducted by a qualified person at the beginning of each shift, for each job, and shall be documented in writing by use of the Tailgate Safety Meeting form, Appendix 10.2, in accordance with HS 020 Tailgate Safety Meetings.

6.1.5 Illumination

When temporary lighting is used in confined spaces, the following requirements shall be met:

6.1.5.1 All lighting shall be approved for use in Class I, Division I, Groups A, B, C and D atmospheres.

6.1.5.2 Extension cords used for temporary lighting shall be equipped with connectors or switches approved for hazardous locations.

6.1.5.3 Temporary lighting shall be equipped with adequate guards to prevent accidental contact with the bulb.

6.1.5.4 The lighting shall not be suspended by the electric cords, unless they are designed for this method of suspension.

6.1.5.5 Electric cords shall be kept clear of working spaces and walkways or other locations in which they may be exposed to damage.

6.1.5.6 Temporary lighting and electric cords shall be inspected regularly for signs of damage to insulation and wiring.

6.2 Personal Protective Devices

6.2.1 Confined Space, Class "A" - Entry into class "A" confined spaces is prohibited.

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6.2.2 Confined Space, Class "B-1" - When the atmosphere of the confined space to be entered is found to contain contaminants at concentrations in the class B-1 range, as defined in Section 5.4.1 and the concentration cannot be reduced by mechanical ventilation, the following requirements shall be met:

6.2.2.1 Employees entering the confined space shall be equipped with positive pressure air-line air-supplied respirators with breathing air supplied from breathing air compressors or compressed breathing air cylinders manifolded to a "cascade" system.

6.2.2.2 Employees entering the confined space shall be equipped with body harness and lifelines as follows:

(1) A Class II chest harness may be used for side entry (opening not greater than three and one half feet from ground level) where there is not vertical free fall hazard. A quick release catch, which permits escape in case of lifeline fouling, shall be used.

(2) When entry must be made through a top opening, the harness shall be a Class III full-body parachute type that will suspend a person in an upright position. A man-rated hoisting device shall be provided for lifting employees out of the space.

6.2.2.3 At least one employee shall stand by on the outside of the confined space ready to give assistance in case of an emergency.

The employee shall have an approved, maintained, self-contained breathing apparatus ready for donning.

The standby person shall also have a lifeline and harness and all other protective gear required for entry.

6.2.2.4 All employees, including the standby person, shall use applicable protective equipment, such as head and eye protection, gloves, boots, and impervious clothing, as required by the nature of the residues to be removed and atmospheric contaminants.

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6.2.3 Confined Space, Class "B-2" - When the atmosphere of the confined space to be entered is found to contain contaminants at concentrations in the class B-2 range, as defined in Section 5.4.2, and the concentration cannot be reduced by mechanical ventilation, the following requirements shall be met:

6.2.3.1 Employees entering the confined space shall be equipped with approved air-purifying cartridge or canister respirators with appropriate cartridges or canisters, as required by the nature of the residues to be removed and atmospheric contaminants.

6.2.3.2 All employees shall use applicable protective equipment such as head and eye protection, gloves, boots, and impervious clothing,

6.2.4 Confined Space, Class "C" - When the atmosphere of the confined space is found to be free of contaminants at or above the TLV of the most toxic contaminant present, no special modification of the work procedure should be necessary, except as indicated below:

6.2.4.1 Nature of the residue and the proposed cleaning process, such as mechanical cleaning of the tank surfaces, may require the use of air-purifying dust masks, head and eye protection, gloves, boots, and impervious clothing.

6.2.4.2 Other physical stresses such as temperature extremes and excessive noise may require the use of specialized safety equipment in any confined space.

6.3 Confined Space - Rescue

6.3.1 General

6.3.1.1 When conditions in a confined space as determined by testing of atmosphere are such that supplied-air respiratory equipment, lifelines, and harnesses are required, standby employees shall be used. They shall have been trained and drilled in rescue procedures.

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6.3.1.2 Standby personnel shall be familiar with pertinent types of atmospheric testing, respiratory protection, rescue procedures, and the proper use of safety and rescue equipment.

6.3.1.3 Rescuers shall be instructed not to enter a confined space unless others are notified and standing by in case additional help is required.

6.3.1.4 Tanks, vessels, or other confined spaces with both side and top openings shall be entered from side openings when practical.

(1) A Class II chest harness may be used for side entry (not greater than three and one half feet from ground level) where there is not vertical free fall hazard. A quick-release catch, which permits escape in case of lifeline fouling, shall be used.

(2) When entry must be made through a top opening, the following requirements shall also apply.

(a) The safety belt shall be of the parachute harness type (Class III, full body) that suspends a person in an upright position.

(b) A man-rated hoisting device shall be provided for lifting employees out of the space.

6.3.1.5 An Emergency phone number list with numbers entered that are appropriate to the job shall be posted at the job site.

6.3.1.6 A Supervisors Employee Injury Report, when appropriate, shall be completed.

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6.3.2 Standby Personnel

6.3.2.1 Definition - Individuals physically capable of rescuing by use of hoist, lifeline & harness, or entry into a confined space who have current training in:

(1) Cardiopulmonary resuscitation (CPR)

(2) First aid

(3) Air-supplied respiratory protective equipment

(4) Self-contained supplied-air respiratory protective equipment.

6.3.2.2 Duties

(1) When conditions are such that air-supplied respiratory protective equipment and lifelines & harnesses are required, at least one employee shall stand by on the outside of the confined space ready to give assistance in case of an emergency.

(2) When conditions become immediately dangerous to life or health, at least one additional employee, who may have other duties, shall be within sight or call of the primary standby employee(s).

(3) The employee shall have an approved, maintained, self-contained respiratory protective device outside of the carrying case, ready for donning.

(4) If a lifeline & harness are required for work inside the confined space the standby shall wear the same.

(5) An effective means of communication between employees inside a confined space and a standby employee shall be provided and used whenever atmospheric conditions of the confined space require the use of air-supplied respiratory protective equipment, lifelines & harnesses, or whenever employees inside a confined space are out of sight of the standby employee(s).

All affected employees shall be trained in the use of such communications system and the system shall be tested before each use to confirm its effective operation.

(6) Prior to the worker entry into the confined space the standby employee shall have determined, and entered in the "Special Instructions" section of Appendix 10.1, the location of the nearest:

(a) Fire alarm

(b) Phone

(c) Fire extinguisher

(d) Eyewash and shower (tests shall be performed by the standby to be sure the equipment is in proper working order).

(7) The standby employee(s) will enter the vessel only after alerting at least one additional employee outside the confined space of the existence of an emergency and of the standby employee's intent to enter the confined space, and only in case of emergency such as:

(a) A worker inside suffers an injury

(b) A worker inside indicates breathing difficulties

(8) The standby shall call the worker(s) out of the vessel:

(a) If the standby employee(s) has to leave for any reason

(b) If an emergency signal or alarm is sounded

(c) If the standby employee(s) detects or suspects presence of any harmful substance.

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7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

None

9.0 CALCULATIONS

None

10.0 APPENDICES

10.1 Inspections and Tests for Entry Into confined spaces

10.2 Tailgate Safety Meeting form.

INSPECTIONS AND TESTS FOR ENTRY INTO CONFINED SPACES

Date _____
Job Number _____
Page _____ of _____

Division: _____ Division Location: _____
Customer: _____ Customer Address: _____
General Job Location: _____ Tank Or Vessel No. / Name: _____
Describe Material In Space: _____
Description Of Work Planned: _____ Chemicals Introduced Into Space: _____

	TESTS								OTHERS				
TIME	PERCENT LOWER EXPLOSION LIMIT	PERCENT OXYGEN	BENZENE (ppm)	TOLUENE (ppm)	XYLENE (ppm)	H_2S (ppm)	CO (ppm)	_____ (ppm)	_____ (ppm)	_____ (ppm)	ATMOSPHERE CLASS	INITIAL

CHECK LIST

	Initial: Yes	Initial: Does Not Apply
All lines leading to and from confined space have been blinded or disconnected.		
Electrical service disconnected or locked out.		
ll grounding and bonding cables in place.		
All lighting, fittings, and extension cords are approved explosion proof equipment.		
Ground Fault Circuit Indicator (GFCI) checked and functioning.		
All ignition sources have been isolated.		
Breathing supply and alarms checked and are in proper condition.		
The complete respiratory supply system has been checked and is in proper condition.		
All safety harnesses and life lines checked and in proper condition.		
Required protective clothing, gloves, boots, etc., being used.		
Employees have been trained in the use, care, and limitations of their respiratory protective equipment.		
Outside safety watch trained in emergency procedures and resuscitation.		
Vessel contains leaded product.		
All emergency systems such as air packs, fire extinguishers, backup breathing supply, alarms, etc., ready for use.		
Special warning / caution signs posted.		
Ventilation equipment in use.		
No employee with facial hair, eye glasses, or other gas tight seal obstructions will do work which requires a respirator, or act as emergency standby.		
Employees will not wear contact lenses in an atmosphere where a respirator is required.		

PERSONNEL PROTECTIVE EQUIPMENT

EYES
- ☐ Chemical Goggles
- ☐ Face Shield
- ☐ Safety Glasses

EXTREMITIES
- ☐ Hard Hat
- ☐ Gloves
- ☐ Boots ☐ PVC ☐ Neoprene
- ☐ Hoods ☐ PVC ☐ Neoprene
- ☐ Foot Coverings, Disposable ☐ Latex ☐ White Rubber

BODY
- ☐ Encapsulating Suit: ☐ PVC ☐ Butyl
- ☐ Heavy Suit: PVC Neoprene
- ☐ Intermediate Suit: ☐ PVC ☐ Other
- ☐ Light Suit: ☐ PVC ☐ Other
- ☐ Tyvek Suit: ☐ White, ☐ Yellow, ☐ Saranex

RESPIRATORY
- ☐ Self-Contained Respirator
- ☐ Air Line Respirator
- ☐ Air Line W/ Egress
- ☐ Cartridge Respirator

Cartridge Type _____

OTHER
- ☐ Hearing Protection
- ☐ Parachute Harness and Lifeline (Top Entry)
- ☐ Chest Harness and Lifeline (Side Entry)

Special Instructions: _____

ialified Person _____ (Name Printed) _____ (Signature) _____ (Date)

CONTINUED ON REVERSE

_____ (Manager) _____ (Date)

Diagram the Confined Space. Indicate the location of manways and ventilators. Indicate the locations where tests were conducted.

View From Top (Indicate North)	View From Side

-) (— MANWAYS (∞) VENTILATOR X- TEST LOCATION

THIS LOG OF INSPECTIONS AND TESTS FOR PERMIT TO ENTER A CONFINED SPACE IS APPLICABLE AND VALID **ONLY FOR ONE SHIFT AND ONLY FOR THE EMPLOYEES** DESIGNATED BELOW.

EMPLOYEES ASSIGNED (PRINT NAMES)

_____

_____

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_____

STANDBY PERSON(s) ASSIGNED (PRINT NAMES)

_____

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_____

QUALIFIED PERSON(s) (PRINT NAMES)

_____

_____

SUPERVISOR
PRINT NAME _____

SIGNATURE _____ **DATE** _____

SEE REVERSE

PRECAUTIONS

AGAINST THE LEAD HAZARDS INSIDE OF ANY TANK THAT HAS CONTAINED LEADED GASOLINE

The following precautions are necessary for those who enter tanks that have contained leaded gasoline, because such a tank still contains lead antiknock compounds. These compounds may be present in sufficient quantities to present a serious health hazard, even though the tank may be "gas free" and safe from explosion and asphyxiation hazards. The following precautions against the organic lead hazards are to be observed *in addition* to all safety rules issued by the refinery for the protection of personnel against other hazards of tank entry.

1 All persons entering a leaded gasoline tank that has not been thoroughly cleaned from a lead hazard standpoint, must wear an airline hose mask of positive pressure or blower type.

2 Should there be any odor, as of gasoline, through the mask, personnel should leave the tank at once and not re-enter until the cause has been corrected.

3 At the beginning of each day, dress from the skin outward in freshly laundered work clothing. In addition, wear rubber or neoprene gloves and boots. These articles should be inspected before each use to see that they are in good condition.

4 Should the work clothing become soaked with gasoline or sludge, bathe at once and put on clean work clothing.

5 At the end of each day's work, and upon completion of the job, hose line, air mask, boots, gloves, tools, and all other equipment which may have been contaminated by sludge, should be cleaned.

6 Also, at the end of each day's work and upon completion of the job, a bath must be taken.

7 The sludge may be dangerous to handle even after it has been removed from the tank. It should be weathered, buried or incinerated in accordance with accepted procedures.

8 Workers entering the tank to do cold repair work should in all cases follow the above precautions if the tank has not been pronounced free of the lead hazard.

CAUTION—*Even though the tank has been pronounced free of the lead hazard for cold work, it is not safe for hot work. When hot work such as welding is to be done, all areas that may get hot should be scraped down to bare metal to avoid volatilizing organic lead salts which may be present in the scale.*

FOR DETAILED INFORMATION CONSULT API BULLETIN

FERNALD RI/FS
Health and Safety Procedure

Title: Confined Space - Leaded Product

Procedure #: HS 023 Issued: _____

1.0 PURPOSE

To prescribe safe work practices for entry into confined spaces that contain or have contained leaded products, and have not been certified as lead free.

2.0 SCOPE

This directive prescribes respiratory and skin protection requirements, and safety precautions and procedures for tank entry and cleaning of petroleum storage tanks that contain or have contained leaded products. All requirements of HS 022, Confined Spaces, Industrial, shall also be met for confined space entry.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Project Health and Safety Officer or his designee, to ensure that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Site Health and Safety Officer, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure.

3.3 It is the responsibility of the person performing this procedure to follow it and report any abnormal occurrences or results to the Site Health and Safety Officer, or his designee, immediately.

4.0 REFERENCES

4.1 E.I. duPont deNemours & Co. (Inc.); "The Lead Hazard in Tank Entry", A-49577-2.

4.2 American Petroleum Institute; "A Guide For Controlling The Lead Hazard Associated With Tank Entry and Cleaning"; Publication 2015A.

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4.3 American Petroleum Institute; "Cleaning Petroleum Storage Tanks"; Publication 2015.

4.4 Cal-OSHA Regulation; Petroleum Safety Orders; Title 8, CAC, Section 6823.

5.0 DISCUSSION

5.1 Organic lead compounds, such as tetraethyl lead, are added to gasoline as anti-knock agents. These compounds present a potential industrial hazard because they may be toxic by inhalation and skin absorption. Leaded products can be hazardous to tank cleaning crews if proper safeguards and precautions are not used. The hazard in tank entry is twofold.

5.1.1 As gasoline stands in the tank over a period of time, small quantities of organic lead and gasoline are absorbed by the sludge. The lead in this sludge represents a hazard if it is contacted by the skin, or if its vapors are breathed.

5.1.2 The second source of hazard is caused by the partial decomposition of small quantities of organic lead compounds forming solid organic lead salts. The lead salts are deposited in the iron rust and scale on the side walls and the bottom of the tank. Work that disturbs this rust or scale, such as tank cleaning, or hot work such as burning or welding, may cause vaporization of the lead salts.

5.2 All tanks that have been used for leaded petroleum products will contain residual lead of varying concentrations. They must be regarded as dangerous to the extent that respiratory and skin protection must be used until the tank is thoroughly cleaned and determined to be lead-hazard free by use of a lead-in-air analyzer, as described in the references listed above.

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6.0 PROCEDURE

6.1 General

6.1.1 Any storage tank or vessel that contains or has contained leaded product, regardless of location, length of service, lead concentration of the product, or any other factor, shall be considered hazardous throughout the cleaning process until the vessel had been proven to be lead-hazard free by lead-in-air analysis. The following specific safety requirements shall be met:

6.2 Respiratory Protection

6.2.1 All employees who will enter the confined space shall be provided with approved, air-supplied respirators. Such respiratory protection shall continue to be used throughout the cleaning process until the space is lead free (less than the OSHA PEL, unless a lower value has been established by the client.)

6.2.2 Also, employees working outside of the vessel but at or near manways and other openings who may be exposed to gases and vapors from the vessel shall wear approved, air-supplied respirators when there is significant airborne lead as defined above. When airborne concentrations are minimal, approved, air-purifying respirators shall be used.

6.2.3 Emergency standby personnel shall be provided with self-contained breathing units for emergency tank entry, as prescribed in HS 022.

6.3 Protection Apparel

6.3.1 Employees who will enter the confined space shall wear, as a minimum, disposable paper coveralls (Tyvek type) as underclothes, light-weight protective clothing, boots, and gloves. Personal clothing items, other than underwear and socks, should not be worn in vessels that contain or have contained leaded petroleum products. Protective and personal clothing shall be changed daily.

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6.3.2 Employees working at or near manways and other openings, or otherwise exposed to lead contaminated sludge, residues, or liquids, shall be provided appropriate protective clothing, boots, gloves, and eye protection to prevent skin contact.

6.4 Safe Work Practices, Leaded Gasoline Tanks

6.4.1 Security

Before any work is done that might release flammable vapors, roads and other access routes shall be barricaded, posted, or otherwise marked to control inadvertent entry of vehicles or unauthorized personnel.

6.4.2 Ignition Sources

Any equipment that may provide a source of ignition shall not be permitted within the vicinity of the tank until the area has been tested by a Qualified Person and found to be flammable vapor-free. If equipment is used in the vicinity of the tank, it shall be placed well away from the tank, upwind if possible, to minimize the potential fire hazard.

6.4.3 Bonding

Vacuum trucks, if used to remove sludge from the tank, shall be properly bonded to the tank and located where tank vapors will not reach their internal combustion engines, preferably outside the dike upwind from the tank.

6.4.4 Drainage Before Opening

Before the tank is opened, all residual product shall be pumped or drained of to the lowest possible level through the water draw or pumpout connection.

6.4.5 Line Blinding

After all possible residual product has been removed, all piping connected to the tank shall be blinded as close as possible to the tank to prevent reentry of hydrocarbon vapors or liquids into the tank from the lines.

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6.4.6 Electrical

Electrical connections for machinery or equipment in the tank shall be disconnected and tagged out.

6.4.7 Roof and Adjacent Work

Work on the roof and adjacent to the tank, such as placement of mechanical ventilators, shall be limited to that which is essential, and shall be permitted only after testing by a Qualified Person has shown the areas to contain flammable gas and vapor concentrations below ten percent of the lower explosive limit. Texts for appropriate toxic contaminants shall also be performed. Personal protection devices appropriate for the hazard shall be used.

6.4.8 Preentry Tests and Inspections

Entry into any confined space is prohibited until all applicable tests and inspections as prescribed in HS 022 have been performed (See Appendix 10.1), Inspections and Tests for Entry Into Confined Spaces has been completed, reviewed with employees who will enter, and posted.

6.4.9 Preentry Instruction

All employees who will handle the lead-contaminated liquid or sludge, contaminated equipment, hoses, etc., or who will enter the tank for cleaning, shall be instructed in the safe work practices outlined in Appendix 10.2.

6.4.10 Personal Hygiene

Employees shall bathe daily, either at the end of the day's work or when the job is finished; provided, however, that if at any time clothing becomes soaked with gasoline or sludge, a shower shall be taken at once and clean clothing put on.

6.4.11 Equipment and Maintenance

At the end of each day, and after the job is completed, respirators, boots, gloves, and tools shall be cleaned, on site, when practicable.

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7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

None

9.0 CALCULATIONS

None

10.0 APPENDICES

10.1 Inspections and Tests for Entry Into Confined Spaces

10.2 Precautions notice

INSPECTIONS AND TESTS FOR ENTRY INTO CONFINED SPACES

Date _____
Job Number _____
Page _____ of _____

Division: _____ Division Location: _____
Customer: _____ Customer Address: _____
General Job Location: _____ Tank Or Vessel No. / Name: _____
Describe Material In Space: _____
Description Of Work Planned: _____ Chemicals Introduced Into Space: _____

TESTS

OTHERS

TIME	PERCENT LOWER EXPLOSION LIMIT	PERCENT OXYGEN	BENZENE (ppm)	TOLUENE (ppm)	XYLENE (ppm)	H_2S (ppm)	CO (ppm)	_____ (ppm)	_____ (ppm)	_____ (ppm)	ATMOSPHERE CLASS	INITIAL

CHECK LIST

	Initial: Yes	Initial: Does Not Apply
All lines leading to and from confined space have been blinded or disconnected.		
Electrical service disconnected or locked out.		
All grounding and bonding cables in place.		
All lighting, fittings, and extension cords are approved explosion proof equipment.		
Ground Fault Circuit Indicator (GFCI) checked and functioning.		
All ignition sources have been isolated.		
Breathing supply and alarms checked and are in proper condition.		
The complete respiratory supply system has been checked and is in proper condition.		
All safety harnesses and life lines checked and in proper condition.		
Required protective clothing, gloves, boots, etc., being used.		
Employees have been trained in the use, care, and limitations of their respiratory protective equipment.		
Outside safety watch trained in emergency procedures and resuscitation.		
Vessel contains leaded product.		
All emergency systems such as air packs, fire extinguishers, backup breathing supply, alarms, etc., ready for use.		
Special warning / caution signs posted.		
Ventilation equipment in use.		
No employee with facial hair, eye glasses, or other gas tight seal obstructions will do work which requires a respirator, or act as emergency standby.		
Employees will not wear contact lenses in an atmosphere where a respirator is required.		

PERSONNEL PROTECTIVE EQUIPMENT

EYES
- ☐ Chemical Goggles
- ☐ Face Shield
- ☐ Safety Glasses

EXTREMITIES
- ☐ Hard Hat
- ☐ Gloves
- ☐ Boots ☐ PVC ☐ Neoprene
- ☐ Hoods ☐ PVC ☐ Neoprene
- ☐ Foot Coverings, Disposable ☐ Latex ☐ White Rubber

BODY
- ☐ Encapsulating Suit: ☐ PVC ☐ Butyl
- ☐ Heavy Suit: ☐ PVC ☐ Neoprene
- ☐ Intermediate Suit: ☐ PVC ☐ Other
- ☐ Light Suit: ☐ PVC ☐ Other
- ☐ Tyvek Suit: ☐ White, ☐ Yellow, ☐ Saranex

RESPIRATORY
- ☐ Self-Contained Respirator
- ☐ Air Line Respirator
- ☐ Air Line W/ Egress
- ☐ Cartridge Respirator

Cartridge Type _____

OTHER
- ☐ Hearing Protection
- ☐ Parachute Harness and Lifeline (Top Entry)
- ☐ Chest Harness and Lifeline (Side Entry)

Special Instructions: _____

Qualified Person _____ (Name Printed) _____ (Signature) _____ (Date)

CONTINUED ON REVERSE

_____ (Manager) _____ (Date)

)iagram the Confined Space. Indicate the location of manways and ventilators. Jicate the locations where tests were conducted.

View From Top (Indicate North)	View From Side

—) (— MANWAYS (∞) VENTILATOR X- TEST LOCATION

THIS LOG OF INSPECTIONS AND TESTS FOR PERMIT TO ENTER A CONFINED SPACE IS APPLICABLE AND VALID **ONLY FOR ONE SHIFT AND ONLY FOR THE EMPLOYEES** DESIGNATED BELOW.

EMPLOYEES ASSIGNED (PRINT NAMES)

STANDBY PERSON(s) ASSIGNED (PRINT NAMES)

QUALIFIED PERSON(s) (PRINT NAMES)

SUPERVISOR PRINT NAME _____

GNATURE _____ DATE _____

SEE REVERSE

FERNALD RI/FS
Health and Safety Procedure

Title: Cold Stress

Procedure #: HS 024 Issued: _____

1.0 PURPOSE

To establish guidelines to protect workers from the effects of cold stress (hypothermia) and cold injury.

2.0 SCOPE

This procedure applies to all RI/FS activities where employees can be exposed to low environmental air temperatures or immersion in low temperature water.

Employees should be protected from exposure to cold so that the deep core temperature does not fall below 36° centigrade (C) (98.6 degrees Fahrenheit). Lower body temperature will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

3.0 RESPONSIBILITY

3.1 Project Health and Safety Officer

The PHSO will be responsible for initial on-site coordination of the cold stress policy. He will be assured that all personnel potentially exposed to cold have had proper training, that suitable warm clothing is available, and that the SHSO can implement the program in his absence.

3.2 Site Health and Safety Officer

The SHSO will be responsible for field implementation of the cold stress policy. This includes assurance that all personnel on site comply with the policy. He shall also be responsible for taking temperatures, selecting proper clothing, and establishing work practices in the absence of the PHSO.

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3.3 Task Managers

The Task Managers will be responsible for ensuring that work crews comply with all site requirements.

3.4 Team Member

All team Members will be responsible for understanding and complying with all site requirements.

4.0 REFERENCE

Threshold Limit Values and Biological Exposure Indices for 1986 - 1987, American Conference of Governmental Industrial Hygienists.

5.0 REQUIREMENTS

None

6.0 PROCEDURE

6.1 Workers shall be provided with warm clothing, such as mittens, heavy socks, etc., when the air temperature is below 40-45° Fahrenheit (F). Protective clothing may be used to protect the employees.

6.2 When the air temperature is below 30-40° F (depending upon employee comfort), clothing for warmth, in addition to chemical protective clothing, shall be provided. This will include:

6.2.1 Insulated suits, such as whole-body thermal underwear,

6.2.2 Wool socks or polypropylene socks to keep moisture off the feet if there is a potential of work activity which would cause sweating,

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6.2.3 Insulated gloves (when air temperatures are extremely low [less than 5-10° F], gloves with reflective surfaces, which reflect body heat back to the hand, should be used),

6.2.4 Boots, and

6.2.5 Insulated head cover, such as knit caps (ski caps).

6.3 At air temperature below 35° F, the following work practices must be followed:

6.3.1 If the clothing of an employee might become wet on a job site, the outer layer of the clothing must be impermeable to water.

6.3.2 If an employee's underclothing (socks, mittens, etc.) becomes wet in any way, the employee must change into dry clothing immediately. If the clothing becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.

6.3.3 Employees must be provided a warm area (65° F or above) to change from work clothing into street clothing.

6.3.4 Employees must be provided a warm break area (60° F or above).

6.3.5 If appropriate, space heaters may be provided in the work area to warm the hands, feet, etc.

6.3.6 Hot liquids, such as soups, warm, sweet drinks, etc. shall be provided in the break area. The intake of coffee shall be limited because of the attendant diuretic and circulatory effects.

6.3.7 The buddy system shall be practiced at all times. Any employee observed with severe shivering shall leave the cold area immediately.

6.3.8 Employees should layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing.

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Health and Safety Procedure

Title: Cold Stress

Procedure #: HS 024 Issued: _____

6.3.9 Avoid overdressing when going into warm areas or when performing activities which are strenuous. This could lead to heat stress problems.

6.3.10 Auxiliary heated versions of handwear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist.

6.3.11 Employees handling evaporatory liquids (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

6.3.12 Work shall be arranged in such a way that sitting still or standing for long periods is minimized.

6.4 All employees who may work in cold areas shall be trained in:

6.4.1 Proper first aid treatment,

6.4.2 Proper clothing practices,

6.4.3 Proper eating and drinking habits,

6.4.4 Recognition of impending adverse health effects, and

6.4.5 Safe work practices.

6.5 Clothing for warmth, which is worn under chemical protective clothing, can be laundered in normal fashion, without the wash water being collected as contaminated water. If there is a rip or tear in the chemical protective clothing in a contaminated area, the clothing-for-warmth must be handled as potentially contaminated, and the water in which it is washed must be collected as potentially contaminated water. More rigorous steps may be required if materials handled are extremely toxic (dioxin, etc.).

FERNALD RI/FS
Health and Safety Procedure

Title: Cold Stress

Procedure #: HS 024 Issued:

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsibility for Inspection

8.1.1 The Project Health and Safety Officer shall perform periodic surveillances to determine compliance with this procedure by field personnel.

8.2 Acceptance Criteria

None

9.0 CALCULATIONS

None

10.0 APPENDICES

None