If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

13.24 OJT Document - Monitoring Personal Noise Exposure Using EXTECH 407355 Noise Dosimeter

(C-A-ESSHQ Group Procedure C-A-ESSHQ-004)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials
_____	_____	_____	_____
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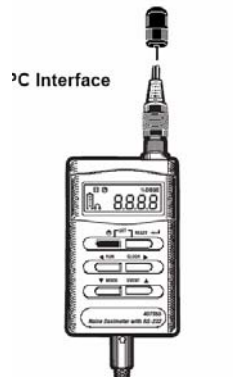
Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

P. Cirnigliaro

ESSHQ Group Procedure C-A-ESSHQ-004
Original Issue Date: 02/06/04
Revision 00

Contents

EXTECH
407355 Noise Dosimeter



1. Purpose/Scope

This procedure provides a standardized method for the operation of the EXTECH 407355 Personnel Noise Dosimeter. It should be used in conjunction with the SBMS Subject Area Noise and Hearing Conservation and IH SOP IH96300: *Noise Measurement Principles: Noise Dosimetry.*

Employee exposure assessments for regulatory compliance should be made with a noise dosimeter, such as the EXTECH. Employees wear dosimeters as they move through the work area. The dosimeter logs a close representation to the actual noise exposure of the ear as the distance from the source changes with employee movements. The logged exposure data is compared to occupational exposure limits to determine compliance with hearing conservation regulations. The logged data provides both OSHA and ACGIH records by pre-determined settings.

The EXTECH Noise Logging Dosimeter is a microcomputer-based sound analyzing instrument for accumulating, displaying, and sending data to serial or parallel printers or computers. The EXTECH can function as a personal noise dosimeter, an area monitor or a survey event monitor. While the EXTECH can be used as a survey meter, other SPL meters designed as precision area survey meters offer more features (such as impact/ impulse capturing) and should be used for area surveys.

2. Responsibilities

2.20 Use of the EXTECH 407355 shall be limited to persons who act under the direction of a competent hazard assessment person and have demonstrated the competency to satisfactorily use the meter, as evidenced by experience and training, to the satisfaction of their supervision or existing qualification criteria set by their organization.

2.21 Personnel that perform exposure monitoring with this instrument are responsible to follow all steps in this procedure.

2.22 The data collected using this meter must have an appropriate evaluation of the hazard and risk by a knowledgeable Industrial Hygiene professional.

3 Definitions

CL: Criterion Level; The constant sound level in dB that, if applied for 8 hours, would accumulate a DOSE of 100%. (Used in Dose measurements.)

dB: Decibel: A non-dimensional unit used to express sound pressure levels. It is the log of the ratio of the measured sound pressure level to a reference level.

dBA: A sound pressure level in decibels made on the A-scale of a sound level meter. This unit of measure approximates the response of the human ear.

dBC: Sound pressure based on a nearly flat, non-weighted scale.

DOSE: A percentage of the maximum allowable noise that a worker can be exposed to per day. This is a computation that is based on the following variables: Criterion Level (CL), Lower Threshold (LT), and Exchange Rate (ER).

ER: Exchange Rate; The number of decibels that a sound must change to either halve or double the rate of dose accumulation. (3, 4, 5 or 6 dB exchange rates are common.)

LAVG: The average sound level, in decibels, for the measurement period based on a 4, 5, or 6 dB Exchange Rate (ER). If the ER is 3 dB, then LAVG becomes LEQ.

LEQ: Equivalent Continuous Sound Level; The average sound level for the measurement period based on a 3 dB ER. If the ER is 4, 5, or 6 dB, then LEQ becomes LAVG.

Occupational Exposure Limit: The maximum time weighted average (TWA) exposure permitted for employee exposure, based on the lesser of the OSHA Permissible Exposure Limit (PEL) or ACGIH Threshold Limit Value (TLV). See IH96300.

SEL: Sound Exposure Level; The constant sound level in decibels which, if lasting for one second, would deliver the same amount of acoustical energy as that delivered over the entire measurement period.

TL: Threshold Level; A preset level in decibels below which sound is not accumulated or averaged into LAVG, LEQ or DOSE.

4. Prerequisites

3.20 Area Access:

4.2.1 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas, if applicable. Verify with the appropriate Facility Support Representative or Technician if a Work Permit or Radiological Permit is needed or is in effect. If so, review and sign the permit.

4.2.2 Use appropriate PPE for area, including hear protection if the area has not been characterized for noise exposure. Required training and medical approval must be completed prior to wearing PPE.

5.0 Precautions

5.1 **Hazard Determination:**

5.1.1 The operation of this dosimeter does not cause exposure to any chemical, physical, or radiological hazards. The meter design does not cause significant ergonomic concerns in routine use.
5.1.2 The dosimeters do not generate Hazardous Waste.
5.1.3 By its very nature, noise dosimeters may be used in areas where excessive noise levels exist or are suspected to be present. Exposures to noise levels above the PEL and/or TLV may cause temporary or permanent hearing loss.

5.2 **Personal Protective Equipment:**

5.2.1 In areas where noise levels exceed the *Occupational Exposure Limit (OEL),* hearing protection must be worn. The hearing protection should be able to reduce the noise levels below the OEL. See IH96300 for guidance on PPE selection.
5.2.2 Additional PPE: Other appropriate PPE for the area being entered. Check with your FS representative.

5.3 **Dosimeter Calibration:** Failure to calibrate the EXTECH 407355 prior to and post use may result in an increased margin of error in the results. All field testers must verify a valid calibration status in accordance with Section 6.0.

6.0 Procedure

Windscreen on the Microphone

6.1 **Equipment:** (Pictured in Appendix 9.1)

6.1.1 Meter Body
6.1.2 Microphone and windscreen (foam cylinder)
6.1.3 Calibrator (Model 407766)

6.2 **Start and warming up the** EXTECH 407355 (picture of meter and description of controls and displays is contained in Appendix 9.1.)

6.2.1 **Turning the meter on:** Press ***Green*** ⏻
6.2.2 **LO-BATTERY:** Check icon, replace the batteries if less than ½ charge.
6.2.3 **Warm-up:** A warm-up is not required for this meter.

6.3 **Clearing Data from the Memory:** To calibrate and store the calibration data, the instrument must be cleared of data. There are memory banks **E1 – E5** To clear the memory;

6.3.1 Press ***Event*** button so **E1** shows in the display.
6.3.2 If **E1** blinking this indicates data in this memory.
6.3.3 Press and hold the ***Reset*** key until the display stops blinking. Repeat for each of the four remaining memory banks as required.

6.4 **Calibration of the** EXTECH 407355 (picture of meter and description of controls and displays is contained in Appendix 9.1.)

6.4.1 **Calibration:** Slide the calibrator *Power Switch* to ***On (94 dB)***. Check the battery indicator and replace batteries if necessary. Listen to hear if Calibrator is producing a tone.

6.4.2 Remove the windscreen from the microphone. Insert the dosimeter microphone into the calibrator adaptor.

Microphone inserted into calibrator

6.4.3 Press ***Mode*** key set the EXTECH 407355 to read dBA, the **S** (slow) should be indicated on the display.

6.4.4 Observe the meter reading in dB. The reading should be the proper level = **94.0** +/- 0.5 dB. If not adjust the cal screw.

6.4.5 Place the claibrator switch to **114dB**. The reading should be the proper level = **114** +/- 0.5 dB. If not adjust the cal screw.

6.4.6 Repeat 6.4.4 and 6.4.5 until both readings are within proper level.

6.4.7 If the reading is not within calibration return the dosimeter to the IH lab and do not use.

6.4.8 **Turning the meter off:** Press ***Green*** ⏻ hold until display shuts off.

6.5 Meter Operation:

6.5.1 Install the windscreen (foam cylinder) over the microphone.

6.5.2 Attach the microphone to the workers collar near the ear. Clip the meter to belt or place in a coat, suit, or pant's pocket.

6.5.3 **Turning the meter on:** Press ***Green*** ⏻ If **LOBAT** is displayed, replace the battery and continue.

6.5.4 Use the **Mode** button to select **% DOSE**

6.5.5 Select an unused **E**vent memory i.e. usually **E1** (not blinking).

6.5.6 When work is ready to begin, press ***RUN*** to begin logging noise exposure. The **Clock** icon (🕑) will be displayed.

6.5.7 Press the **RUN** button momentarily to PAUSE the test (**PAUSE** will be displayed). This is used during breaks and lunch or when removing or attaching the monitor. Press the **RUN** button again to resume the test (the PAUSE display will switch off).

6.5.8 To END the noise survey, press and hold the RUN key for 3 seconds, the Event icon will blink, record the noise exposure value.

6.5.9 You can separate the logging into "events" (such as separate tasks) by pressing the ***RUN*** key for 3 seconds. This will cause the **E**vent memory to blink. Press the **Event** key and select the next **E**vent memory. There are five memories available.

6.5.10 pause the instrument for events such as leaving for lunch. Press ***RUN/PAUSE*** again to begin a new event upon return to work. If taking the instrument off the worker, pause the monitor before removing it and start the monitor after repositioning the instrument on the worker. All events will be averaged together at the end to calculate a daily average and dose.

6.5.11 You can separate the logging into "events" (such as separate tasks) by pressing the ***RUN*** key for 3 seconds. This will cause the **E**vent memory to blink. Press the **Event** key and select the next **E**vent memory. There are five memories available. Press the **RUN** key to start the measurement. To

END the noise survey, press and hold the **RUN** key for 3 seconds, the Event icon will blink, record the noise exposure value.

6.5.12 Return the instrument to the IH representative. Post-calibrate the meter as per step 6.4. Record Cal data on ***BNL Noise Dosimeter Form.***.

6.5.13 Record all data on the ***BNL Noise Dosimeter Form.*** (Attachment 9.4). It is important to record what the worker was doing throughout the day with enough detail to correlate with the logged data.

6.5.14 **Turning the meter off:** Press ***Green*** ⏻ hold until display shuts off.

6.6 **Printing of Logged Data:**

6.6.1 The IH representative will print data directly from the instrument.

6.7 **Documenting Sampling Data and Work Conditions readings:**

6.7.1 Use the ***BNL Noise Dosimeter Form*** to record field events and information (Attachment (9.4).

6.7.2 The IH representative shall complete ***Employee Notification Form*** (Attachment 9.5) and send a copy to the worker, the supervisor and the IH lab.

6.7.3 The IH representative shall enter data into the IH Noise Database.

6.7.4 The IH representative shall provide a copy of the printed data, the original *BNL Noise Dosimeter Form,* and the *Employee Notification Form* to the SHSD IH Laboratory Technician.

6.8 **Results interpretation**:

6.8.1 A competent person should write a hazard evaluation report that evaluates the survey data and summarizes the potential for occupational exposure and compliance with OSHA and ACGIH Occupational Exposure Limits.

6.8.2 Ensure that a copy of the hazard evaluation report is sent to the IH Laboratory and is included in the ESHQ Directorate Recordkeeping system.

6.8.3 Ensure that a copy of the written hazard evaluation report is sent to the Occupational Medicine Clinic with the worker's BNL Life Number noted.

Note: The hazard evaluation report and/or an *Employee Notification Form* (Attachment 9.5) must be used to inform all monitored employees of the results of the monitoring and the implication to compliance with OELs. Reporting to employees should be within 15 days of monitoring.

7.0 Implementation and Training

Prior to using this meter, the operator of the dosimeter:

7.1 Demonstration of proper operation of this instrument to the satisfaction of the employee's supervision.

7.2 Other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).

7.3 BNL Noise and Hearing Conservation OT&Q Training and a Baseline audiogram may be needed if the duration of exposure to the person performing the survey will

be in excess of the OSHA Permissible Exposure Limit (PEL) or ACGIH Threshold Limit Value (TLV) (which ever is less). See IH96300.

8.0 References

8.1 EXTECH 407355 Instruction Manual
8.2 BNL SBMS Subject Area Noise and Hearing Conservation
8.3 OSHA Noise/Hearing Conservation 29CFR1910.95.
8.4 NIOSH Criteria for a Recommended Standard-Occupational Noise Exposure, 1998.
8.5 ACGIH American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

9.0 Attachments

9.1 Photo of meter and parts
9.2 Control Keys
9.3 Short List of Operating Instructions
9.4 Noise Dosimeter Field Data Form for
9.5 Employee Notification Form
9.6 Dosimeter Qualification record

10.0 Documentation

None

Attachment 9.1
Meter and Parts

Meter Description

1. Microphone (lapel clip not shown)
2. Microphone cable
3. Microphone connector
4. LCD display
5. Push-buttons:

   ON-OFF ⏻ Press to turn the meter ON; Press and hold to turn the meter OFF.

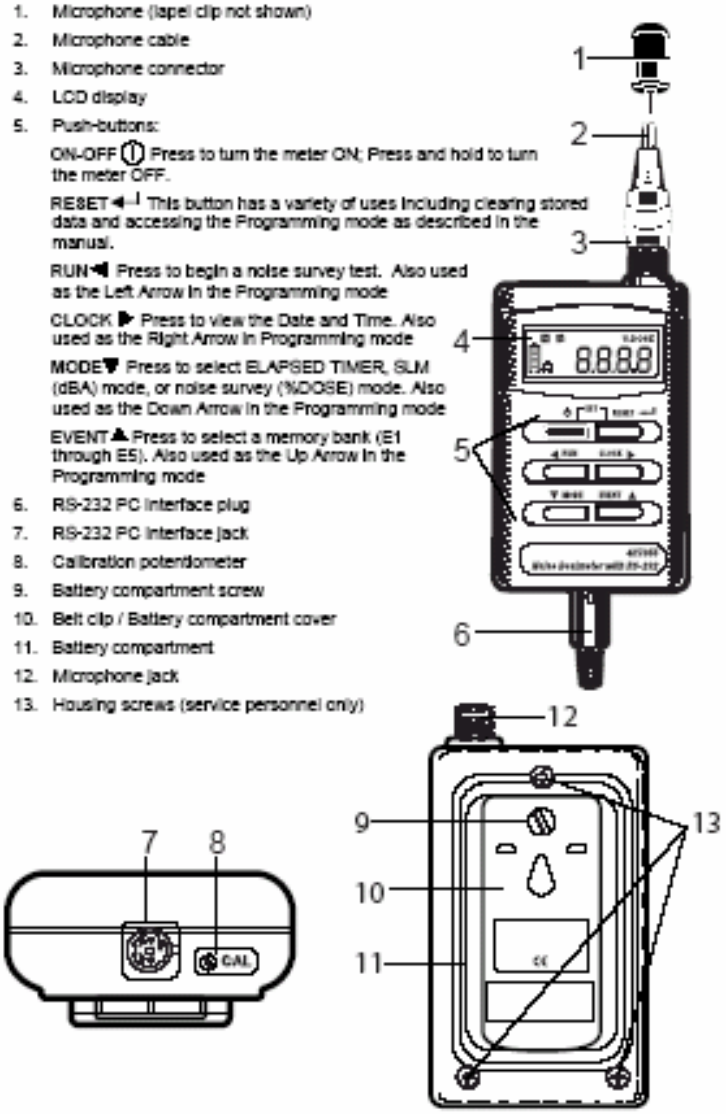
   RESET ↵ This button has a variety of uses including clearing stored data and accessing the Programming mode as described in the manual.

   RUN ◀ Press to begin a noise survey test. Also used as the Left Arrow in the Programming mode

   CLOCK ▶ Press to view the Date and Time. Also used as the Right Arrow in Programming mode

   MODE ▼ Press to select ELAPSED TIMER, SLM (dBA) mode, or noise survey (%DOSE) mode. Also used as the Down Arrow in the Programming mode

   EVENT ▲ Press to select a memory bank (E1 through E5). Also used as the Up Arrow in the Programming mode
6. RS-232 PC interface plug
7. RS-232 PC interface jack
8. Calibration potentiometer
9. Battery compartment screw
10. Belt clip / Battery compartment cover
11. Battery compartment
12. Microphone jack
13. Housing screws (service personnel only)



Attachment 9.2

Control Keys

ON-OFF ⏻ Press to turn the meter ON; Press and hold to turn the meter OFF.

RESET◄┘ This button has a variety of uses including clearing stored data and accessing the Programming mode as described in the manual.

RUN◄ Press to begin a noise survey test. Also used as the Left Arrow in the Programming mode

CLOCK ► Press to view the Date and Time. Also used as the Right Arrow in Programming mode

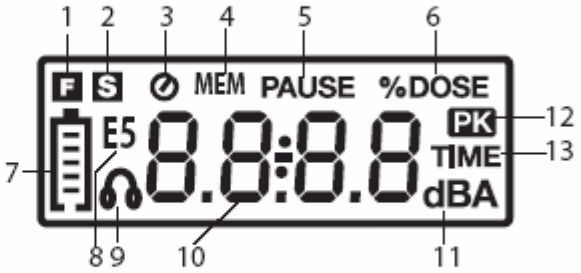
MODE▼ Press to select ELAPSED TIMER, SLM (dBA) mode, or noise survey (%DOSE) mode. Also used as the Down Arrow in the Programming mode

EVENT▲ Press to select a memory bank (E1 through E5). Also used as the Up Arrow in the Programming mode

DISPLAY

Descriptions

Display Description



1. FAST Response Time mode
2. SLOW Response Time mode
3. Noise Exposure test active
4. Memory mode alert
5. Noise Exposure test paused
6. Unit of measure for Noise Exposure test
7. Battery Status Indicator
8. Event memory banks (E1-E5)
9. 115dB limit (headphone) indicator
10. Numerical display digits
11. Unit of measure for sound level readings
12. 140dB PEAK indicator
13. Elapsed time mode for noise exposure tests

Event Data Logger

	E1	E2	E3	E4	E5
Used or not	Used				
Criterion level	85dB				
Threshold level	80dB				
Exchange Rate	3dB				
Time Weighting	Slow				
115 dBRMS	No				
Exceed 140dB	No				
Start Date(mm:dd)	07-28				
Start Time(hh:mm)	11:32				
Stop Time(hh:mm)	13:57				
Exposure Time(hh:mm)	04:45				
Dose Value(%)	00				
TWA(8hr %Dose)					
PEAK FLAG TIME(hh:mm)					
PEAK DURATION(mm:ss)					

Attachment 9.3
Short Operating Instructions

Step		User Action
1	**Power On**	Press ***Green*** ⏻ key
2	**Battery Check**	Observe screen for warning *low battery icon*
3	**Warm-Up**	A warm-up is not required for this meter.
4	**Pre- Calibration**	To clear the stored calibration data: • Press ***EVENT*** *the* key so **E1** is blinking in display, press and hold **RESET** key until display stops blinking.
		Calibration: • Slide the calibrator *Power Switch* to **On (94 dB)**. • Remove the windscreen from the microphone. Insert the dosimeter microphone into the calibrator adaptor. • Press the ***MODE*** key to read ***dBA*** and **S (slow)** in the display. • Using cal screw adjust to 94.0 +/- 0.5. • Slide calibrator to **114 dB** • Using cal screw adjust to 114.0 +/- 0.5. • Repeat above cal adjustments until both values are in range.
		Power off. Press ***Green*** ⏻ key
5	**Dosimeter Set-up**	Attach the microphone to the workers collar near the ear. Clip meter to belt. (Note: Unit should be OFF).
6	**Operation**	• To turn on: Press ***Green*** ⏻ key • Press **MODE** key until *% DOSE* is displayed. • Select a memory E1-E5 (non blinking) by pressing the **EVENT** key • Press **RUN** to start logging.
		If you need to pause the event: Press the ***RUN*** key so *PAUSE* is displayed. Press **RUN** again to re-start.
7	**Stop Logging**	Press ***RUN*** and hold (3 sec) until Event display E blinks.
	Select a New Memory	Press **EVENT** key and select next Event memory E1-E5 that is not blinking. Press **RUN** to start logging.
8	**Power Off**	Turn off the unit by Press ***Green*** ⏻ key

IH 96650 Attachment 9.4
Noise Dosimeter Data Form

(see next two page,
form is a two sided copy)

BROOKHAVEN NATIONAL LABORATORY Environmental, Safety, Health and Quality Directorate - Industrial Hygiene FORM	EMPLOYEE NOISE DOSIMETER NOISE MEASUREMENT
DATE:	SURVEYOR(S):

I. AREA INFORMATION		
DEPT:	BLDG:	ROOM:
NOISE SOURCE:		
ENGINEERING CONTROLS:		

II. EMPLOYEE INFORMATION		
FIRST NAME:	LAST NAME:	BNL #:
DEPT:	BLDG:	JOB TITLE:
EXPOSURE DURATION (HRS):	EXPOSURE (TIMES PER DAY):	EXPOSURE (DAYS PER YR):
JOB PERFORMED:		
PPE USED:		

III. SURVEY INSTRUMENT PREPARATION INFORMATION		
INSTRUMENT:	MODEL:	SERIAL#:
CALIBRATOR SERIAL #:	PRE-CAL: BY:	POST CAL: BY:
BATTERY CHECK (Y/N):		

IV. SAMPLING INFORMATION & RESULTS ____Record Below or _____See Printed Data Log Report

TOTAL TIME (hh.mm)	DOSIMETER I			DOSIMETER II			DOSIMETER III		
OVER-EXPOSURE Y / N	% Dose	LAVG	LMAX	% Dose	LAVG	LMAX	% Dose	LAVG	LMAX

V. WORKER ACTIVITY INFORMATION		
TIME		COMMENTS- DETAILS ON THE ACTIVITY
ON	OFF	

Optional sketch of the Area

Additional Comments on the Job, Task, Hazard, etc.

V. CONCLUSIONS & RECOMMENDATIONS

Return completed form to: IH Lab, Building 120 FILE CODE: IH96SR.04 FORM IH96650 9.4 (03/04)

IH 96650

Attachment 9.5

Employee Notification Form

(see next page)

BROOKHAVEN NATIONAL LABORATORY

Employee Notification Form
Occupational Noise Exposure

Environment, Safety Health & Quality Directorate - Industrial Hygiene Services

This Section to be completed by **Sample Submitter**			
Send results to **Responsible Party:**	Name: Building: Responsible Party will be expected to notify workers of monitoring results within 15 working days		
Send copy to:	Name:		Building:
Send copy to:	Name:		Building:
Send copy to:	Name:		Building:
Copy to IHG:	Name:		Building:

Notification to employee must be made by:	Date

This Section to be completed by the **Responsible Party** before date above (within regulatory set time periods).

Exposure in Compliance with Standards (ACGIH & OSHA)	**or**	**Exposure exceeds Standards (ACGIH or OSHA)**
Employee Notification Review of this data indicates exposure levels were **IN COMPLIANCE** with regulatory limits. The employees represented by this exposure monitoring were informed of the results by: Name:_____ Date:_____		Employee Notification Review of this data indicates exposure levels were **ABOVE** a regulatory limit. The employees represented by this exposure monitoring were informed of the results and corrective actions by: Name:_____ Date:_____

Note: When a formal BNL Memorandum is written, send a copy to the SHSD Industrial Hygiene Group (Building 120) and the Occupational Medicine Clinic (Building 490).

Return this form to the **Industrial Hygiene Group (Building 120)** as soon as employee notification is made.

IH 96650

Attachment 9.6

Noise Dosimeter EXTECH 407355 Qualification Form

(see next page)

Noise Dosimetry with the EXTECH 407355
Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:

Knowledge of the Principles of Noise Dosimetry

Criteria	Qualifying Standard	Unsatis-factory	Recov-ered	Satisf-.actory
Hazard Analysis	Understands the need to perform a hazard analysis of the sampling area and potential exposure to the sampler.			
Personal Protective Equipment	Understands the need to be aware of the potential hearing loss to sampler and knows how to determine the need for PPE.			
Sampling Protocol	Understands the exposure monitoring logic necessary to appropriately select sampling locations to accurately measure worker, public and environmental exposure potential.			
Analysis of data	Understands the need to perform analysis on the sampling data to assess potential exposure to the sampler, worker, public and environment, and to recommend corrective actions as necessary, and employee notification.			

Practical Skill Evaluation: Demonstration of Surface Wipe Methodology

Criteria	Qualifying Performance Standard	Unsatis-factory	Recov-ered	Satisf-.actory
Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
Handling of Microphone	Understands the importance of "pausing the meter during microphone handling.			
Placement of Microphone	Demonstrates the proper location of the microphone and meter on the workers.			
Record forms	Shows how to correctly and completely fill all forms associated with this SOP.			
Data Analysis	Shows how to correctly have the data analyzed and compared to occupational exposure limits. Knows the correct OELs.			
Employee Notification	Knows how to timely and properly notify workers and management of over exposure. Knows how to inform workers and management of exposure that is within OEL.			

Employee: I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:

Evaluator: I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date: