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RMRS Rocky Mountain Remediation Services, L.L.C.
. . . protecting the environment

MEMORANDUM

DATE: April 28, 1997

TO: Distribution

FROM: M. E. Hickman, Project Management, T130F, X7145

SUBJECT: INTERNAL REVIEW OF THE D&D CHARACTERIZATION PROTOCOL MEH-004-97

Action: Return Comments by May 9, 1997

PURPOSE
The purpose of this memorandum is to distribute the above mentioned D&D Characterization Protocol for your review and comment.

DISCUSSION
Comments are due to Mark Zachary by Close of Business, May 9, 1997. Please submit comments on the attached Review and Comment Sheet via the site mail system or fax to Extension 8244 in T130F.

RESPONSE REQUIREMENTS
Please fill out a comment sheet even if you don't have any comments by marking the "No Comments" box and entering your name and signature on the form. If you have any questions or concerns, please call Mark Zachary at X5686. A meeting will be held on Wednesday, May 14, 1997, 10:00 a.m., T130F, Conference Room 68, to discuss the comments.

MZ:dlu

Attachments: (2)
As Stated

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REVIEW COMMENT SHEET

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Review comments for document: _____ (Number) _____ (Rev.) _____ (Draft)

TYPE G or M	PAGE	SECTION OR LINE #	COMMENT	DISPOSITION	Disposition Accepted INIT/DATE

POC/Reviewer: (Comments not signed by the POC/Reviewer will be considered as unofficial comments)

_____ (Name) _____ (Signature) _____ (Date)

Concurrence

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REVIEW COMMENT SHEET

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RMRS Rocky Mountain Remediation Services, L.L.C.
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D&D Characterization Protocols

April 28, 1997
Revision 0

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CHARACTERIZATION PLAN TO SUPPORT DECONTAMINATION & DECOMMISSIONING ACTIVITIES

1.0 INTRODUCTION

Over the next several years the facilities at the Rocky Flats Environmental Technology Site, RFETS, will be deactivated and decommissioned (including dismantlement). This effort will expose the workers at RFETS to new processes and different risks than those previously encountered. In order to properly plan the new decommissioning tasks and protect the workers while they complete these tasks, a method of identification and evaluation of the potential hazards needed to be developed.

This document was developed as an aid to perform characterization of buildings which will be decommissioned. The protocols provided in this procedure give the guidelines for a consistent and systematic approach to characterization. Characterization as identified in this procedure is the process of obtaining information about a site/facility (hereafter referred to as site) which identifies the chemical, physical, biological and radiological hazards within and around the site. The characterization information is obtained in 5 phases as defined in section 4. After the hazards have been identified (as discussed in section 5) they are evaluated for potential harm/risk to the decommissioning workers and potential release to the environment. Reconnaissance Level Characterization Report (RLCR) will be prepared which summarizes the information known about the hazards within the facility to be decommissioned. An RLCR is developed for each facility. Section 4.3 discusses how an RLCR is developed. The RLCR will be sent to the Lead Regulatory Agency for review and will be used issued as an information resource for input for developing the other decommissioning documents (i.e. Project Specific Health and Safety Plan and the projects Waste Management Plan).

The project Specific Health and Safety Plan utilizes the characterization information to complete an initial exposure assessment. As the projects decommissioning planning is completed and the decommissioning work packages are developed work exposure assessment are completed. This assessment is called a Job Hazard Analysis (JHA). The JHA is described in

more detail in the Project Job Hazard Analysis Overview as detailed in the DOP Plan.

4.0 CHARACTERIZATION PHASES

The following characterization phases have been identified for use at RFETS.

1. Safety characterization
2. Scoping characterization
3. Reconnaissance characterization
4. In Process characterization
5. Final Building Survey and characterization
6. Independent verification survey

A brief description of each of these phases is listed in the following paragraphs.

4.1 Safety Characterization :

Safety characterization involves gathering information about the safety of an area before anyone is permitted to enter, most often before entering older buildings that have been closed for substantional periods of time. For buildings currently in use, safety characterization is not required as the building environment is known and verified through routine surveys. Areas within a building which are not normally occupied are treated as confined spaces. Confined spaces require characterization prior to entry.

4.2 Scoping Characterization

The purpose of this characterization element is to gather information on the physical, hazardous, radiological and chemical condition of the facility. This includes reviewing historical records, interviews with building personnel, review of operational records, review of radiological deficiency reported (RDRs) and any other pertinent building information including historical survey reviews.

This information will provide a basis for preliminary evaluations of

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decommissioning efforts and aid in identifying the need for more extensive Reconnaissance Characterization and In-process Characterization surveys.

4.3 Reconnaissance Characterization

This phase of characterization is performed to establish a definitive baseline of information when planning for the decommissioning activities. This element includes reviewing all information from the scoping characterization, performing additional measurements and sampling if required, performance of walkdowns and evaluations to estimate waste generation volumes and decommissioning waste streams. The Reconnaissance characterization information feeds into the following documents: Reconnaissance Characterization Report, Waste Management Report, The Waste Stream and Residue Identification and Characterization Report, The Data Quality Management Plan and the Health and Safety Plan.

4.4 In-Process Characterization

This phase of the characterization process is utilized to verify daily pre-job conditions and evaluate the effectiveness of on-going decontamination decommissioning activities in preparation for final survey actions. The in-process characterization will aid in identifying new hazards which may be discovered during the facility decommissioning.

4.5 Final Building Survey And Characterization

As the decontamination process is completed and before the building or structure is dismantled, a final survey must be performed. The final survey will ensure that the building and/or structure meets all release criteria established by the Department of Energy and the Rocky Flats Site. The Final Survey will be conducted utilizing its own plan and protocol; and it is not included in this document.

4.6 Independant Verification Survey of the Final Survey

When all characterization and final survey activities are completed, an independent verification survey will be performed by an independent

survey team as designated by the Department of Energy. This will be conducted outside of this document and it will have its own protocol/plan.

5.0 Characterization Objectives

It is important to know, before implementing the actual characterization process, the objectives of the characterization. Before extensive survey packages or large scale surveys are performed, it must be decided just how much data is required to complete a solid evaluation of the existing and potential hazards in the facility, cluster or environs. in which decommissioning activities will be completed. The major objectives of the evaluation process can be identified by answering the following questions:

- What is the end use of the equipment facility or structure (free release, restricted use, low level waste, etc.)
- What type of chemical, hazardous, or radiological hazard are being evaluated?
- What level of worker protection is required to perform characterization in the facility, structure or environ?
- What type of instrumentation is required?
- Has the RLCR been reviewed?
- Has all facility structural data been reviewed?
- Have all suspect materials been identified ?
- Perform a review of all regulatory and statistical drivers for sampling frequency
- Ensure all data quality and quality assurance requirements for sampling have been reviewed before starting the characterization process

5.1 Preparation of a Sampling/ Survey Instructions

After the characterization objectives have been reviewed a set of sampling instructions are developed that defines the data quality objectives in the following manner :

- To what chemical hazards could the workers be exposed?
- To what physical hazards could the workers be exposed?
- To what biological hazards could the workers be exposed?
- To what radiological hazards could the workers be exposed?
- What types and kind of sampling measurements are required?
- What are the required instrumentation sensitivities?
- What sample size is necessary for the analysis being completed?
- What number of samples / measurements will provide the desired certainty?
- What sample / measurement locations (densities) are necessary to get the desired certainty?
- Are there special data reduction, validation and reporting requirements for the information being obtained?
- What QA program requirements are there for these samples (i.e.: blanks, duplicates)?

As data is acquired by qualitative and quantitative means, the results will be obtained, evaluated and recorded in accordance with the sampling instructions. The sampling analysis must support the on going characterization and decommissioning process and be flexible enough to

be stringent and detailed, but allow for professional judgement by the appropriate disciplines when required.

5.2 Conduct of Sampling Measurement Operations

When performing sampling operations unbiased, biased , affected and unaffected characterization schemes will be utilized to obtain sampling data. All methods will employ the same analytical techniques for determining the concentrations of the various constituents identified.

To implement the various characterization elements of the survey, one or more of the following method(s) will be utilized: Survey instructions, sampling procedures, IWCPs or survey plans. See figure 1 for an example of a typical characterization instruction.

Personnel performing sampling will be trained characterization specialists in their respective disciplines and maintain all of their qualifications current.

To aid in development of specific sampling/survey instructions, specific protocols have been written for:

- Beryllium sampling (Reference attachment 1)
- Metals and Lead sampling (Reference attachment 2)
- Asbestos (Reference attachment 3)
- Chemical, hazardous and liquid sampling (Reference attachement 4)
- Radiological sampling (Reference attachment 5)
- Polychlorinated Biphenyls (PCBs), Sampling (Reference attachment 6)

Figure 1

EXAMPLE
Characterization Instruction Sheet

Location/Room Building 779/Room 150

Item/Area Description	Radiological Survey		# Be Swipes	Special Instructions
	# of swipes (Alpha Beta)	# of Direct Measurements (Alpha/Beta)		
Work Table w/Hood	5	5	3	Obtain measurements on suspected contaminated surfaces.
Motor Generator Set	5	5	1	Obtain measurements on external equipment surfaces and points where contamination is potentially present.
EB Welder #5 HV Supply	5	5	1	Obtain measurements on external equipment surfaces and points where contamination is potentially present.
Floors/Walls Up To 8 Ft.	20	20	20	Obtain measurements throughout the room.
Overhead Area	20	20	20	Obtain measurements on overhead surfaces throughout the room.

Notes

1. See Attached Map of Room And Component Layout.
2. Surveys To Be Performed In Accordance With 4-K62-ROI-03.01, "Performance of Surface Contamination Surveys".
3. Large Area Wipe Technique May Be Used As Deemed Appropriate.
4. When Possible Use Radiological Swipes For Be Survey Requirements.

Review And Approval

Prepared By Date

Rad Engineer Date

5.3 Documentation

As characterization activities occur and data analysis are completed, survey results must be recorded in a quality manner. Documentation of this information can be done utilizing several methods. Copies of all characterization information are maintained in the project files. Because decommissioning activities at RFETS are being completed as CERCLA removal actions, the appropriate discussion documents are placed in the Administrative Record. All project surveys are considered to be quality records.

6.0 CHARACTERIZATION CHANGES

As the deactivation and decommissioning efforts are completed within a facility, the hazards within that facility are going to be reduced and therefore the facilities characterization will be changed. The changing characterization will be tracked using a characterization matrix similar to the example in Figure 2. The characterization matrix is initially completed when a facility has completed normal operations and the Scoping Characterization phase is completed. Then, as the Facility changes, the characterization matrix is updated with the new information. After the Reconnaissance Characterization phase is complete the characterization matrix continues to live with the project until the facility is ready to undergo it's Final Survey.

7.0 QUALITY ASSURANCE / QUALITY CONTROL REQUIREMENTS

7.1 Data Collection

The Site Quality Plan applies to the conduct of the characterization process. Samples and measurements per this document will be collected using accepted and proven techniques and methodologies as described in the applicable federal, state and site documents.

Figure 2

Example
779 Cluster
Characterization Survey And Work Summary Matrix

Room/ Area	Description	Sq. Feet	PU Holdup (grams)	Radiological Contamination	Asbestos	Beryllium	Work Description/Remarks
001	Basement sumps	728	None	- Moderate levels of loose and fixed surface contamination; Radioactive contaminated process waste water with hazardous chromium and lead.	Floor/Wall/Ceiling materials and piping insulation, possible ACM*. To be characterized.	Possibly present on sump surfaces and sludge	- Standard Work Practice (Section 3.2) will be used. Confirmed Space Entry may be required. - Aggressive decontaminational techniques are expected to be used.
Room 001 Total Grams			0				
100	Main Entry Vestibule	48	None	- No loose surface contamination on room surfaces. Possible isolated spots of fixed low-level contamination.	Floor/Wall/Ceiling materials and piping insulation, possible ACM*. To be characterized.	None	- Standard Work Practice (Section 3.2) will be used.
Room 100 Total Grams			0				
101	Hallway & Stairs	510	None	- No loose surface contamination on room surfaces. Possible isolated spots of fixed low-level contamination.	Floor/Wall/Ceiling materials and piping insulation, possible ACM*. To be characterized.	None	- Standard Work Practice (Section 3.2) will be used.
Room 101 Total Grams			0				
101A	Room In Hall	70	None				
Room 101A Total Grams			0				
103	Men's Locker Room	660	None	- No loose surface contamination on room surfaces. Possible isolated spots of fixed low-level contamination.	Floor/Wall/Ceiling materials and piping insulation, possible ACM*. To be characterized.	None	- Standard Work Practice (Section 3.2) will be used.
Room 103 Total Grams			0				
103A	Men's Locker Room	120	None	- No loose surface contamination on room surfaces. Possible isolated spots of fixed low-level contamination.	Floor/Wall/Ceiling materials and piping insulation, possible ACM*. To be characterized.	None	- Standard Work Practice (Section 3.2) will be used.
Room 103A Total Grams			0				

14 * ACM = Asbestos Containing Material.

References

Berger, J.D. NUREG/CR-5849 "Manual for Conducting Radiological Surveys in Support Of License Termination" (June 1992).

E.H. & E.M. "Handbook for Occupational Health and Safety During Hazardous Waste Activities" (June1996).

U.S. Department of Energy. "Decommissioning Resource Manual" (Aug 1996).

Attachment 1
Beryllium Characterization Protocol

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BERYLLIUM CHARACTERIZATION PROTOCOL

This is a protocol for describing a room by room beryllium survey. The approach used is consistent with the most conservative information available.

The survey practices outlined are specifically designed to provide occupational hazard assessment information in support of decommissioning activities within a facility being decommissioned. However, in some cases the results, particularly those from locations not affected by beryllium operations, may be used as final status results or to support a final survey.

This protocol serves as a guide in the preparation of specific instructions to obtain the desired characterization information. The instructions should contain:

- Specific instructions, including sample location maps.
- Beryllium Surface Sample procedure.
- Beryllium Smear Sample log.
- Chain of Custody.
- Beryllium Surface.
- Sample Briefing.

Initial Classification

Divide the rooms into two categories, affected and unaffected:
Affected areas: Areas that have been associated with the processing, handling and/or storage of beryllium materials.

Unaffected areas: All areas not classified as affected. These areas are not suspected of ever processing beryllium in any form and are not

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expected to contain residual beryllium.

The initial classifications are to be assigned based on building operating history, personnel process knowledge and past beryllium surveys. Areas should be reclassified if additional information or survey data does not support the initial classification status.

All affected areas are considered a potential health risk. No activity that may cause beryllium to become airborne will be authorized without the proper personnel, protective equipment(PPE) and controls, until smear sampling demonstrates that the area of beryllium contamination levels are below the point which requires PPE.

Suggested Survey Requirements

Affected areas: Typically beryllium smears are taken in conjunction with the radiological contamination smears. As a minimum, one smear should be analyzed for beryllium for every four smears obtained for radiological. Additional samples should be considered based on the experience of the RCT performing the sureveys.

Affected area sample locations will be chosen based on a worse case, biased, approach. Areas with the highest potential for beryllium dust accumulation will be sampled (see list of probable sample areas). A minimum of 20 samples should be obtained as a baseline for each affected area. Additional samples will be considered based on the experience and judgment of the industrial hygienist and RCT conducting this work.

Sampling of equipment in the affected areas should be performed in accordance with Appenidx 1 as outlined. An instruction sheet will be developed for each room, and inserted into the work package before the equipment is sampled. Sample locations will be chosen based on a worse case, biased, approach. Areas with the highest potential for beryllium dust accumulation will be sampled as follows:

Affected areas having no results above the plant release limit, will be released from the beryllium control requirements.

Each sample location will be plotted on a room diagram. All sample results will be provided to industrial hygiene for review and will be included in the project files.

Unaffected areas: These areas should have a minimum of 6 swipes taken from high probability accumulation points. If the area is connected to an affected area, additional swipes should be collected at boundary points.

Any unaffected area that tests positive for beryllium (25ug/ft^2) will be reclassified as affected and sampled under the affected area requirements. In addition the area will require beryllium cleanup with follow up sampling performed after cleanup completion.

Each sample location will be plotted on a room diagram. All sample results will be provided to industrial hygiene for review and will be included in the project files.

Analysis Requirements

The beryllium smears will be obtained by a trained / qualified individual. All smears will be identified and tracked using a chain of custody form.

The smears will be sent to a laboratory capable of a standardized analysis to a detection limit of 1 microgram per square foot or lower. The laboratory will have a valid quality control (QC) program and will report the results of the QC testing with each requested analysis set.

- Floor sumps
- Equipment foot prints
- Return air vent grills
- Horizontal pipe and duct runs
- Local exhaust duct work
- General area exhaust ventilation
- Light fixtures
- Machine working surfaces
- Machine interior surfaces
- Wall ledges and shelves

The first 2-3 feet inside exhaust intake ducts should be sampled. Areas that would not be easily cleaned during routine house keeping should be sampled.

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Appendix 1

EXAMPLE
Characterization Instruction Sheet

Location/Room Building 779/Room 150

Item/Area Description	Radiological Survey		# Be Swipes	Special Instructions
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Notes

1. See Attached Map of Room And Component Layout.
2. Surveys To Be Performed In Accordance With 4-K62-ROI-03.01, "Performance of Surface Contamination Surveys".
3. Large Area Wipe Technique May Be Used As Deemed Appropriate.
4. When Possible Use Radiological Swipes For Be Survey Requirements.

Review And Approval

Prepared By _____ Date _____

Rad Engineer _____ Date _____

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Appendix 2

Beryllium Surface Sampling Briefing

The following are general guidelines for collection of beryllium surface samples:

- The supplies necessary to perform the sampling include:
  - Whatman 4 Smear Tabs or equivalent.
  - Glassine Bags
  - Beryllium Smear Sample Log
  - Chain of Custody Form
  - Tamper Proof Seals
  - Labels (optional)
  - Sharpie (optional)

- Dry wipe an area of 100 cm2 or 1 ft2 using Whatman 4 Smear Tabs. The determination of the area that is to be surveyed should be made by the IH&S representative on the job.

- Fold smear tab in half, with the potentially contaminated side in, place in a glassine bag, and place smear number on the bag. CAUTION: do not place more than one sample in a glassine bag.

- Collect the sample in a manner that your hands will not come in contact with surface being sampled. If contact is made, the sampler shall wash hands or change gloves before collecting the next sample.

- The sample number and a detailed description of the sample collected is to be entered on the Beryllium Smear Sample Log.

- The sample number consists of the Building number - Year, Month, Day - Industrial Hygienist number - Sequence number, e.g. 779 - 961120 - 00 - 01. The Industrial Hygienist number that will be used for RCTs is 00.

- Once samples have been collected, they should be counted on the

SAC-4 and the BC-4 to assess radiological contamination on the samples. This will assist IH&S in determining which analytical method and which laboratory will be utilized, and if additional packaging will be required to transport samples.

- At minimum the packaging required to transport the samples is to place the glassine bags inside of a zip lock bag, and place a tamper proof seal over the opening.

- Complete the Chain of Custody Form. If samples are to be transported to the laboratory by someone other than the sampler, then the sampler must relinquish the samples by signing the chain of custody form and the person receiving the samples must sign for the samples. Samples must be under chain of custody at all times.

- Transport samples to the laboratory identified by the IH&S representative for the job. Formally relinquish custody for the samples to the laboratory.

- Give the IH&S representative the Beryllium Smear Sample Log, associated maps and other documentation relevant to the samples collected.

- The Beryllium housecleaning surface contamination standard is 25 ug/ft2 (2.7 ug/cm2).

Appendix 3

BERYLLIUM
SMEAR SAMPLE LOG

NAME _____
EMPLOYEE# _____
DATE _____

LABORATORY _____
DATE OF ANALYSIS _____

SAMPLE NUMBER	ROOM	DESCRIPTION	AREA SURVEYED	UG/SAMPLE	UG/FT2 ORUG/ /100 CM2	ALPHA	BETA

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Attachment 2
Metals And Lead Characterization Protocol

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METALS AND LEAD CHARACTERIZATION PROTOCOL

This protocol establishes the framework for the characterization of lead and specific metals such as chromium and zinc oxide in facilities to be decommissioned. The approach utilized conforms with OSHA requirements 1926, subpart D and Z. Additionally the approach ensures conformance with the site specific HSPs in regards to the handling and sampling of carcinogenic waste.

Sampling is performed to address four key issues:

1. To determine the need for personnel protection equipment (PPE).
2. To determine the need for personnel monitoring.
3. To determine the need for other types of controls during the decommissioning process.
4. To determine the waste disposal requirements for the waste which may be generated.

Classification

Areas will be classified for characterization by utilizing the following criteria:

Suspect: These are components where lead and/or the aforementioned metals have been identified, through historical research of building records or by visual inspection techniques, to exist in paint, chips, fragments, dust or other material forms.

High-Probability Locations For Lead And Metals

- Wall and ceiling paint
- Paint on components (i.e, guard rails, tanks, machine guards)
- Gloveboxes and associated shielding equipment
- Piping
- Roof jacks
- Mounting plates and bracket bars

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- Stationary shields
- Lead fill in walls
- Plaster additives

Non Suspect: These are areas where there is a high level of certainty that lead and / or the aforementioned metals do not exist due to there absence in paint, chips, dust, fragments or other material forms.

Survey Procedure

Sampling for lead and metals will be primarily performed utilizing a dust sampling technique and a paint scraping technique. Each sample will be acquired with the intent of assuring the quality of the sample, representativeness of the sample and safety of the sampler. Note that an RCT will complete pre-job surveys in the area and at the location of the sample prior to obtaining the sample.

Settled Dust Sampling

Settled dust sampling is used as an aid to assessment of Industrial Hygiene issues such as work practices, engineering controls and P.P.E. selection. Settled dust on horizontal surfaces will be sampled using a micro-vac technique. The sampling tool is a low volume battery powered air sampling pump calibrated at 2 l.p.m. with a 25 m.m. MCE cassette attached. A 2 in. section of tygon tubing is attached to the upstream side of the cassette and aids in the pickup of all loose dust in the grid area. Each sample will be documented as to location and the cassette labeled with an identifying number, and sealed. The sample number is documented on the chain of custody form. The sample location is photographed with a sample photo identification card in the focus area documenting the sample number and date, and orienting the viewer to the sample location with an arrow.

Paint Chip Sampling

Paint chip sampling is used as an aid to assessment of Industrial Hygiene issues such as work practices, engineering controls and P.P.E. selection.

Ensure that the location of paint sampling is cleaned before samples are obtained to minimize the prospect of cross-contamination. Paint chip sampling is a destructive method that may release a small quantity of lead dust. Therefore, proper safety precautions must be taken to ensure protection of the sampler and prevent the spread of suspect materials.

Paint Chip Sampling Tools and Materials

- Sharp stainless steel paint scraper
- Disposable wipes for cleaning paint scraper
- Non-sterilized non-powder disposable gloves
- Hard-shelled containers, that can be rinsed, for paint chip samples if results are to be reported in ug/g or percent by weight
- Collection device (clean creased piece of paper or cleanable tray)
- Field sampling and laboratory submittal forms
- Tape measure or template (if results are reported in mg/cm^2)
- Ladder
- Plastic trash bags
- Flashlight
- Adhesive tape

Containment

a. Method One: Plastic Sheeting Underneath Sampling Area

A clean sheet of plastic, large enough to capture all the sample material, should be placed under the area to be sampled to capture the paint chips. Any visible paint chips falling to the plastic shall be included in the

sample. Thoroughly clean or dispose of the plastic after each sample is collected by placing the sheeting in a trash bag.

Method Two: "Glovebag" Approach

If further containment is deemed necessary, a "glovebag" approach may be used. A durable sheet of plastic is loosely taped to the surface to be sampled, with a paint scraper, collection device, and shipment container housed inside the plastic. There should be enough "play" in the plastic to permit a scraping motion without dislodging the tape holding the plastic to the surface. Large plastic baggies can be used in lieu of the sheet of plastic if paint chips are to be shipped to the lab in plastic baggies. Properly conducted, this method completely seals the surface during the actual scraping operation. A sheet of plastic is recommended for use under the glove bag to capture any debris that falls to the ground during the glove bag removal. The tape should be slowly removed from the surface to avoid lifting any additional paint off of the surface.

Paint Sample Collection

The paint chip sample should be 2 square inches in size. To obtain the minimum weight of 0.2 grams. Sample size may be adjusted accordingly. Persons collecting paint chips shall wear latex gloves for each sample.

The most common paint sampling method is to scrape paint directly off the substrate. The goal is to remove all layers of paint equally, but none of the substrate.

Measure the sample area precisely. Then use a razor-sharp chisel or scraper and a hammer to remove all the paint within the sample area from the substrate. Put all of the sample in a hard-shelled container for shipment to the laboratory. The hard-shelled container is used since the laboratory will analyze the entire sample submitted. The exact location, dimension, description of paint color and substrate component must be recorded on the field sampling form. For analysis results reported in mg/cm^2, including a small amount of substrate in the sample is permitted.

Composite Paint Chip Sample Collection

Paint chip samples many be composited by collecting individual subsamples from different surfaces. Each subsample should be the same size and weight. No more than 5 subsamples shall be included in the same sample container or ziplock baggie.

Cleanup and Repair

a. All settled dust generated should be cleaned up using wet wipes.

b. The surface may be resealed with new paint if necessary. If desired, apply spackling and/or new paint to repair the area where paint was removed.

c. Personnel conducting paint sampling shall avoid hand-to-mouth contact (specifically, smoking, eating, drinking, and applying cosmetics) and shall wash their hands with running water immediately after sampling.

Preparing Sample for Transfer to Lab

The samples shall be submitted to a laboratory recognized by the EPA National Lead Laboratory Accreditation Program. Appropriate sample submittal forms shall be used. The field sample number shall appear on the field sampling form, the laboratory submittal form, and the container label. The name of the laboratory, the date the samples were sent to the lab, and all personnel handling the sample from the time of collection to the time of arrival at the laboratory should be recorded on a chain of custody form.

Appendix 1
Bulk Sample Data Sheet

Job# _____ Name _____ Date_____

General Description of building/area:

_____

_____

Sample Number	Sample Description And Location	Lab

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Appendix 2

SAMPLE PHOTO DATA CARD

BUILDING _____ **ROOM** _____ **DATE**___

SAMPLE NUMBER:

_____

Appendix 3

LABELS

779-970108-MS-001	779-970108-MS-0023	779-970108-MS-0045
779-970108-MS-002	779-970108-MS-0024	779-970108-MS-0046
779-970108-MS-003	779-970108-MS-0025	779-970108-MS-0047
779-970108-MS-004	779-970108-MS-0026	779-970108-MS-0048
779-970108-MS-005	779-970108-MS-0027	779-970108-MS-0049
779-970108-MS-006	779-970108-MS-0028	779-970108-MS-0050
779-970108-MS-007	779-970108-MS-0029	779-970108-MS-0051
779-970108-MS-008	779-970108-MS-0030	779-970108-MS-0052
779-970108-MS-009	779-970108-MS-0031	779-970108-MS-0053
779-970108-MS-0010	779-970108-MS-0032	779-970108-MS-0054
779-970108-MS-0011	779-970108-MS-0033	779-970108-MS-0055
779-970108-MS-0012	779-970108-MS-0034	779-970108-MS-0056
779-970108-MS-0013	779-970108-MS-0035	779-970108-MS-0057
779-970108-MS-0014	779-970108-MS-0036	779-970108-MS-0058
779-970108-MS-0015	779-970108-MS-0037	779-970108-MS-0059
779-970108-MS-0016	779-970108-MS-0038	779-970108-MS-0060
779-970108-MS-0017	779-970108-MS-0039	779-970108-MS-0061
779-970108-MS-0018	779-970108-MS-0040	779-970108-MS-0062
779-970108-MS-0019	779-970108-MS-0041	779-970108-MS-0062
779-970108-MS-0020	779-970108-MS-0042	779-970108-MS-0063
779-970108-MS-0021	779-970108-MS-0043	779-970108-MS-0064
779-970108-MS-0022	779-970108-MS-0044	779-970108-MS-0065

Attachment 3
Asbestos Characterization Protocol

ASBESTOS CHARACTERIZATION PROTOCOL

This is a protocol for describing asbestos sampling of facilities identified for decommissioning. This approach is consistent with the most conservative information available, and ensures compliance with applicable federal and state regulations. All asbestos sampling will be completed by a Colorado state certified inspector.

The survey practices outlined in this protocol are specifically designed to provide occupational hazard assessment information in support of decommissioning activities within buildings. However, the information may be used to provide support for a comprehensive operation and maintenance program during normal building activities.

This protocol serves as a guide in the preparation of specific instructions to obtain the desired characterization information.

Initial Classification

The first step in sampling for asbestos in a building is to research the building records such as blueprints and specifications for documentation of the use of asbestos. Dates of construction are considered in this process. In addition to building materials, certain process equipment may have used asbestos as an insulator or protective covering, and this use must be verified through research.

The second step in this process is to physically tour the building, entering every accessible area and room, looking for affected materials that may indicate through historical data, or based on the inspector's experience, the presence of asbestos. A suspect list is generated, along with estimated quantities. Non-suspect (or unaffected) materials are those traditionally made of wood, glass or metal. However, the inspector will suspect the adhesives applied to secure non-suspect materials to the substrate. Suspect, or affected materials are separated into three general categories: Thermal Systems Insulation, Surfacing Materials, and Miscellaneous Materials.

Data compilation will separate the materials into homogeneous areas within these three general categories, which will lead to the number of samples necessary for regulatory compliance and statistical reliability of the outcome. Any homogeneous area may be assumed to contain asbestos, negating the need for samples. Each building is sampled as a single entity.

Survey Procedures

The number of samples for each homogeneous area is decided first by it's physical condition of friability, then by it's general category. Friable materials are those that are capable of being crumbled or reduced to powder by hand pressure. Thermal systems insulation, such as that found on pipes or ducts, friable or non-friable, require a minimum of three samples per homogeneous area, one sample from patches less than six linear or square feet, and one from cementitious or "mudded" fittings. Each mechanical system, such as hot and cold domestic water, may have several homogeneous areas. Each must be sampled accordingly. Friable surfacing materials, such as fireproofing or ceiling texture, must have a nine section grid applied to a blueprint of the area and samples must be acquired from the center of randomly selected grids. If the homogeneous area of friable surfacing material is less than 1000 square feet, three samples are needed; if between 1000 and 5000 square feet, five samples are needed; if the area is over 5000 square feet, seven samples are needed. Miscellaneous materials, such as floor and ceiling tiles, are sampled according to the inspector's discretion. A minimum of one sample of each suspected material in this category should be acquired.

Sample locations are selected randomly according to how each represents a homogeneous material. Since homogeneous areas are located throughout the building, the representativeness and number of samples are the driving factors rather than exact location of the sample in each room. Exact locations are directly affected by the radiological concerns. A Radiological Control Technician will accompany the inspector. If a selected location is determined to exceed acceptable parameters, a second location is selected. Should no radiologically acceptable location be found, a contaminated sample is acquired and treated accordingly.

Sampling Methodology

Each sample is acquired with the intent of assuring the quality of the sample, representativeness of the sample, and safety of the sampler. The following steps will be performed for each sample acquired. Note that a RCT will be present as necessary to survey the area and location of the sample prior to obtaining the sample.

- The location of the sample is visually verified against written descriptions.
- A polyethylene drop cloth is placed below the elevated sample areas.
- The immediate sample area is wetted with a mist of water and surfactant.
- A sampling tool, such as a hammer and chisel, razor knife, "Wondermaker" or hole saw is selected and the sample is acquired, making sure to take a complete sample to the substrate. Each sample must be a minimum of one cubic centimeter and no more than that necessary to be representative of the suspect material. During this process, the immediate surface is misted as necessary.
- The acquired sample is placed in a sealable container, such as a plastic bag or vial.
- The container is sealed and a pre-numbered label is placed on the container. The sample number label is placed on chain of custody papers and the container is verified to be sealed.
- The sampling tool is thoroughly cleaned using mister and wipes.
- The sample area is patched as needed.
- The description and location is documented on a form, a sample label is placed on the form, and the location is documented on a blueprint or other suitable drawing.

- The sample container, drop cloth and immediate sample area is wet wiped and the drop cloth is carefully folded in to the center and placed in a sealable bag and the bag is sealed.

- In the case of routine maintenance areas, a pre-numbered label is placed at the sample location. With permission of the Building Manager, labels will be placed on all sample locations.

- The sample location is photographed with a sample photo identification card in the focus area documenting the sample number and date, and orienting the viewer to the location with an arrow.

- All spent wipes, drop cloths, and PPE will be added to the appropriate waste stream.

Appendix 1
ACM Inventory Worksheet

Building Number _____ Room Number _____ Date_____

TSI INVENTORY:

Pipe: Type: _____ Linear/sq. ft. _____ Fitting count: _____
Type: _____ Linear/sq. ft. _____ Fitting count: _____
Type: _____ Linear/sq. ft. _____ Fitting count: _____
Type: _____ Linear/sq. ft. _____ Fitting count: _____
Type: _____ Linear/sq. ft. _____ Fitting count: _____
Duct: Type: _____ Duct Size/app. _____ Sq. ft. _____
Type: _____ Duct Size/app. _____ Sq. ft. _____
Other: _____
_____

SURFACE INVENTORY:

Location:_____ Description:_____ Sq. ft._____
Location:_____ Description:_____ Sq. ft._____
Location:_____ Description:_____ Sq. ft._____
Location:_____ Description:_____ Sq. ft._____

MISCELLANEOUS INVENTORY:

Location:_____ Description:_____ Sq./lin ft._____
Location:_____ Description:_____ Sq./lin ft._____
Location:_____ Description:_____ Sq./lin ft._____
Location:_____ Description:_____ Sq./lin ft._____
Location:_____ Description:_____ Sq./lin ft._____
Location:_____ Description:_____ Sq./lin ft._____

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Appendix 2
Rocky Flats Plant, Asbestos Containing Material
INSPECTION CHECK LIST

1. Inspector _____ Signature _____ Accreditation# _____ State _____
Date _____

2. BUILDING NO.: _____
BLDG. AREA CODE: _____

- ☐ 1. 1st Floor
- ☐ 2. 2nd Floor
- ☐ 3. 3rd Floor
- ☐ 4. 4th Floor
- ☐ 5. Basement
- ☐ 6. Crawl Space
- ☐ 7. Roof
- ☐ 8. Exterior of BLDG.
- ☐ 9. Plenum
- ☐ 10. Other

3. ROOM NUMBER: _____
COLUMN NUMBERS _____

4. SPECIFIC LOCATION _____

5. % FUNCTIONAL SPACE _____

6. FUNCTIONAL SPACE I.D. _____
HOMOGENEOUS AREA I.D. _____

7. MATERIAL TYPE CATEGORY:
- ☐ T. Thermal System Insulation
- ☐ S. Surfacing Material
- ☐ M. Miscellaneous Material

8.1 TSI ACM:
PIPE LENGTH (FT) _____
8.2 TSI ACM:
PIPE LENGTH (IN) _____
8.3 TSI ACM:
PIPE WITH INSULATION DIAMETER (IN)
_____
8.4 SURFACING MISC. ACM:
8.5 TOTAL SURFACE MATERIAL (SQ. FT.)
_____
8.6 SURFACING/MISC. ACM:
DEPTH OF SURFACE MATERIAL (IN)
_____

9.1 FUNCTION CODE:

- ☐ 1.Acoustic Insulation
- ☐ 2.Baseboard
- ☐ 3.Boiler/Furnace Insulation
- ☐ 4.Caulking Mat'l
- ☐ 5.Ceiling Tile
- ☐ 6.Chilled Water Pipe
- ☐ 7.Chilled Water Pipe Fitting
- ☐ 8.Cold Water Piping
- ☐ 9.Cold Water Pipe Fitting
- ☐10.Condensate Pipe
- ☐11.Condensate Pipe Fitting
- ☐12.Cooling Tower Baffles
- ☐13.Debris/Settled Dust
- ☐14.Domestic Cold Water Pipe
- ☐15.Domestic Cold Water Fitting
- ☐16.Door
- ☐17.Drain Pipe
- ☐18.Drain Insulation
- ☐19.Exterior Construction
- ☐20.Floor Tile
- ☐21.Fire Stop
- ☐22.fire Proofing Insulation
- ☐23.High Temp. Water Pipe
- ☐24.High Temp Water Pipe Fitting
- ☐25.Mastic Adhesive
- ☐26.Roofing
- ☐27.Steam Pipe
- ☐28.Steam Pipe Fitting
- ☐29.Tank Insulation
- ☐30.Transite Board
- ☐31.Vibration Damper
- ☐32.Wall Board
- ☐33.Wall Insulation
- ☐34.Wall Plaster/Spackle
- ☐35.Other: _____

9.2 ASBESTOS FORM CODE:

- ☐ 1. Air Cell
- ☐ 2. Blanket
- ☐ 3. Block
- ☐ 4. Cloth
- ☐ 5. Loose Fill
- ☐ 6. Pre-formed
- ☐ 7. Sheet
- ☐ 8. Sprayed On
- ☐ 9. Troweled On
- ☐ 10. Other: _____

9.3 COLOR CODE:

- ☐ 1. B Blue
- ☐ 2. BL Black
- ☐ 3. BR Brown
- ☐ 4. G Green
- ☐ 5. GR Gray
- ☐ 6. O Orange
- ☐ 7. W White
- ☐ 8. Y Yellow
- ☐ 9. Other: _____

10. CONSISTENCY:

- ☐ Brittle - hard
- ☐ Semi - Solid
- ☐ Fibrouse - loose
- ☐ Granular - Pliable

11. CURRENTLY FRIABLE:

☐ Yes ☐ No

12. CAUSE OF DAMAGE:

- ☐ 1. Area Usage
- ☐ 2. Vibration
- ☐ 3. Air Flow
- ☐ 4. Water Damage
- ☐ 5. Service Activity
- ☐ 6. Usual Aging
- ☐ 7. Other: _____

13. CONTAMINANT PRESENT:

- ☐ 0 None
- ☐ 1. Spotty
- ☐ 2. Widely Scattered
- ☐ 3. Entire Area

14. DISPERSAL FACTOR:

- ☐ 1. Water
- ☐ 2. Air
- ☐ 3. Occupant
- ☐ 4. Machinery

15. AREA USED BY:

- ☐ Maintenance Workers
- ☐ Operations Workers
- ☐ Administrative Personnel
- ☐ Visiting Public

Appendix 3

Bulk Sample Data Sheet

Job# _____ Name_____ Date_____

General Description of building/area:

_____

_____

Sample Number	Sample Description And Location	Lab

Appendix 4

SAMPLE PHOTO DATA CARD

BUILDING _____ **ROOM** _____ **DATE**___

SAMPLE NUMBER:

_____

Appendix 5

LABELS

779-970108-MS-001	779-970108-MS-0023	779-970108-MS-0045
779-970108-MS-002	779-970108-MS-0024	779-970108-MS-0046
779-970108-MS-003	779-970108-MS-0025	779-970108-MS-0047
779-970108-MS-004	779-970108-MS-0026	779-970108-MS-0048
779-970108-MS-005	779-970108-MS-0027	779-970108-MS-0049
779-970108-MS-006	779-970108-MS-0028	779-970108-MS-0050
779-970108-MS-007	779-970108-MS-0029	779-970108-MS-0051
779-970108-MS-008	779-970108-MS-0030	779-970108-MS-0052
779-970108-MS-009	779-970108-MS-0031	779-970108-MS-0053
779-970108-MS-0010	779-970108-MS-0032	779-970108-MS-0054
779-970108-MS-0011	779-970108-MS-0033	779-970108-MS-0055
779-970108-MS-0012	779-970108-MS-0034	779-970108-MS-0056
779-970108-MS-0013	779-970108-MS-0035	779-970108-MS-0057
779-970108-MS-0014	779-970108-MS-0036	779-970108-MS-0058
779-970108-MS-0015	779-970108-MS-0037	779-970108-MS-0059
779-970108-MS-0016	779-970108-MS-0038	779-970108-MS-0060
779-970108-MS-0017	779-970108-MS-0039	779-970108-MS-0061
779-970108-MS-0018	779-970108-MS-0040	779-970108-MS-0062
779-970108-MS-0019	779-970108-MS-0041	779-970108-MS-0062
779-970108-MS-0020	779-970108-MS-0042	779-970108-MS-0063
779-970108-MS-0021	779-970108-MS-0043	779-970108-MS-0064
779-970108-MS-0022	779-970108-MS-0044	779-970108-MS-0065

Attachment 4
Chemical And Liquids Characterization Protocol

CHEMICAL AND LIQUIDS CHARACTERIZATION PROTOCOL

The purpose of this document is to describe the protocol for sampling of chemicals and liquids within the facility to be decommissioned.

In an effort to provide an organized approach to the characterization activities, rooms will be classified in two categories, affected and unaffected. These classifications aid in focusing the sampling effort to the areas with a higher potential of undesirable contaminants.

The purpose of the proposed sampling activities are:

- to quantify the physical and chemical characteristics of radiological and hazardous material contamination and determine the extent of contaminant distribution

- to quantify and qualify environmental parameters that effect potential human exposure from existing and residual radiological or hazardous material contamination

- to support evaluation of detailed planning of a preferred approach for decontamination, equipment removal and waste disposal

- to support required project plan considerations of dose assessments and ALARA analyses to support selection of cleanup criteria and approach

Affected areas for the purpose of liquids sampling are defined as those rooms that have had a history of containing liquids and chemicals to include the presence of equipment containing reservoirs (i.e. machining lathes, etc.), process lines, piping, containers, sinks, sumps and any other item likely to contain liquids or chemicals. Facility drawings, photographs and facility walk-downs provide detailed information to assist the project engineer in making determinations for where sampling should be conducted.

Unaffected areas are those defined as areas or rooms where there is no history or process knowledge of liquids or chemicals being present, or verified through visual inspection as being empty, containing no visible residues of chemicals or liquids. Examples of such rooms would include hallways, closets and office areas which have no visible reservoirs or piping systems associated with them, and have no container storage facilities. In some cases, rooms may be classified as unaffected based on visual inspections revealing all liquid sources to be empty.

Prior to scheduling liquid sampling, facility drawings are reviewed for the presence of facility equipment and piping systems which could contain liquids. Upon initial classification as an affected area, a facility walk-down of the area or room is conducted in an effort to visually identify those items that require sampling. A request is then completed and forwarded to the Analytical Projects Office (APO) for each room and equipment item to be sampled. The APO coordinates with the project engineer to arrange for the sampling schedule.

Data collected during the characterization activities will consist of two types (1) field measurements using portable instruments or test kits (i.e. pH paper) and (2) sample analyses of media using fixed laboratory equipment or systems. Radiological surveys will be performed by trained Radiological Control Technicians (RCTs) using field instrumentation in accordance with Radiological Operations Instructions during sampling activities, as necessary. Radiation protection for the sampling event and the sampling team will be addressed under a Radiological Work Permit (RWP). Additional personal protective equipment for the sampling activity, if required, will be as specified by Industrial Hygiene support personnel.

A trained sampling team is used to perform the sampling activities required for characterization purposes. Analysis for characterization purposes will be performed using Environmental Protection Agency (EPA) approved procedures, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, U.S. EPA SW-846, 1986, Third Edition" using laboratory facilities located on-site.

During characterization activities, several direct, indirect and sample media samples will be measured, obtained and analyzed for radiological and hazardous material contaminants. The results will be used to determine the extent and magnitude of the contaminants and the basis for estimating waste quantities and decontamination options. Sample collection, analysis, and the associated documentation will follow standard written procedures which meet the recommendations and requirements of applicable regulatory agencies. A "chain of custody" sample tracking form is used for each sample collected to account for the sample from collection to the point of analysis. Samples will be collected and documented in accordance with Laboratory Procedure No. E-6284-A "Sampling Within an RBA/CA".

Attachment 5
Radiological Characterization Protocol

RADIOLOGICAL CHARACTERIZATION PROTOCOL FOR BUILDING AND STRUCTURES

Introduction

This protocol establishes the framework for performance of radiological characterization activities to support planning for decontamination and decommissioning activities. This process will be consistent with the most conservative information available and ensure that characterization activities are compatible an in compliance with federal and state regulations.

Objective

As characterization activities are performed, the objectives must support an understanding of the facility or building radiological conditions. These objectives are: (1) Initiate detailed decommissioning planning (2) Establish the type and volume of waste to be generated (3) Ensure protection of the workers and environment during decommissioning operations (4) Determine the nature and extent of radiological contamination present in remaining equipment, systems and building surfaces.

Background, History And Evaluation

Before starting the actual characterization activities a historical profile must be developed to support the characterization process. This process will include: (1) A review of operating history of the facility or building with respect to use, spills, releases and any other significant radiological events. (2) Review of radiological data from past scoping and characterization surveys. (3) Identify radionuclides of concern and determine guideline. (4) Classify areas as to "affected" and "unaffected".

Initital Classification

All areas of facilities or buildings do not have the same potential for residual contamination and therefore do not require the same level of characterization survey coverage to determine the initial classification. By combining historical data with initial classification surveys, an effective and efficient characterization process will be used.

Two classifications of survey areas will be used when determining survey requirements : These are affected and unaffected areas. These are defined as follows:

- **Affected areas:** These are areas that have potential radioactive contamination (based on historical reviews) or known radioactive contamination (based on past or preliminary radiological surveillance). This would normally include areas where radioactive materials were used and stored, where records indicate spills or other unusual occurrences that could have resulted in spread of contamination and where radioactive materials were buried. Areas immediately surrounding or adjacent to locations where radioactive materials were used or stored, spilled, or buried are included in this classification because of the potential for inadvertent spread of contamination.

- **Unaffected areas:** All areas not classified as affected. These areas are not expected to contain residual radioactivity , based on a knowledge of site history and previous survey information.

Suggested Survey Requirements

When performing characterization surveys in affected and unaffected areas the surveys will be directed toward biased locations identified during the historical review phase. Additionally random points will also be selected in non biased areas to validate previous survey data.

Normally when performing characterization activities the surveys will consist of surveying structures (which consist of equipment, ceilings, walls, floors, etc.), environs (surface and subsurface) and liquid pathways, if applicable. Sampling guidance from NUREG/CR-5849 "Manual

for Conducting Radiation Surveys In Support of License Termination" will be utilized as deemed appropriate.

Survey Techniques And Plans

When performing radiological surveys three main techniques will be utilized to acquire the survey data. The characterization will be conducted in accordance with documented plans, instructions or procedures. The survey plan or instruction will define the general approach to performing measurements and sampling. Reference **Figure 1** to review an example of a survey instruction. The quality assurance plan establishes the basis for assuring the adequacy and quality of the survey data. Specific survey techniques are detailed in procedures, which may be included in the instruction or plan or incorporated by reference. Personnel conducting the surveys will be trained and qualified in the procedures they use. Changes in plans and procedures will on occasion be necessary, based on unanticipated findings or conditions encountered as the survey progresses. These changes will be reviewed and/or documented by the supervision in charge of the survey(s).

Surveys will consist of alpha, beta and gamma surveys. Various types of instrumentation will be utilized, however, the instrumentation normally falls into (3) categories. These categories are: (1) Gas filled detectors, (2) Scintillation detectors and (3) Solid state detectors.

The design and the conditions under which a specific detector is operated determines the types of radiations (alpha, beta and/or gamma) that can measured, the sensitivity level for measurements and the ability of the detector both to differenate between different types of radiation and distinguish the energies of the interacting radiations. The particular capabilities of a radiation detector will, in turn, establish its potential applications in conducting a survey for final site release. A listing of alpha and beta and gamma radiation detector types along with their usual applications are listed in **Figures 2 and 3.**

Survey techniques to be utilized include (3) major techniques. These techniques include:

Scan surveys: Scan surveys are conducted by holding the detector as close as possible to the surface being scanned and moving across the surface at a slow speed. Nominally the distance between the detector and the surface is maintained at less than 2 centimeters with the exception of alpha scanning for which the distance should be less than 1 centimeter.

Fixed point surveys or Direct measurements: To conduct direct measurements of surface alpha and beta activity, instruments and techniques providing the required detection sensitivity are selected. Experience has shown that a minute integrated count, using a large area (100 cm2) detector, is a practical field survey procedure and will provide detection sensitivities that are below most guideline values.

Removable contamination measurements : Smears for removable surface activity are obtained by wiping an area of approximately 100 cm2 using a dry filter paper, such as a Whatman 50 or equivalent, while applying a moderate pressure. Normally a smear is taken at each direct measurement location, although for characterization purposes it is not always required.

Additional sampling for soil, water or other liquids can also be required depending on the structure being characterized, however, specific requirements for these types of samples will be detailed in a procedure, plan or instruction.

Sample Analysis

Samples collected during surveys for characterization purposes will be analyzed by trained individuals using the appropriate equipment and procedures. Samples can be analyzed on or off site, however, there must be written procedures that document the laboratory's analytical capabilities for the radionuclides of interest and a QA/QC program which assures validity of the analytical results. An example of equipment sensitivities for laboratory radiometric equipment / procedures to anaylze characterization surveys is found in **Figure 4.**

Survey Documentation And Reports

Documentation for characterization will provide a thumbprint of the current status of the facility, structure or room. Surveys will be documented in accordance with existing radiation protection procedures, Quality Assurance and Quality Control requirements.

Figure 1

EXAMPLE
Characterization Instruction Sheet

Location/Room Building 779/Room 150

Item/Area Description	Radiological Survey		# Be Swipes	Special Instructions
	# of swipes (Alpha Beta)	# of Direct Measurements (Alpha/Beta)		
Work Table w/Hood	5	5	3	Obtain measurements on suspected contaminated surfaces.
Motor Generator Set	5	5	1	Obtain measurements on external equipment surfaces and points where contamination is potentially present.
EB Welder #5 HV Supply	5	5	1	Obtain measurements on external equipment surfaces and points where contamination is potentially present.
Floors/Walls Up To 8 Ft.	20	20	20	Obtain measurements throughout the room.
Overhead Area	20	20	20	Obtain measurements on overhead surfaces throughout the room.

Notes

1. See Attached Map of Room And Component Layout.
2. Surveys To Be Performed In Accordance With 4-K62-ROI-03.01, "Performance of Surface Contamination Surveys".
3. Large Area Wipe Technique May Be Used As Deemed Appropriate.
4. When Possible Use Radiological Swipes For Be Survey Requirements.

Review And Approval

Prepared By _____ Date _____

Rad Engineer _____ Date _____

Figure 2

Radiation Detectors With Applications To Alpha Surveys

Detector Type	Detector Description	Application	Remarks
gas proportional	< 1mg/cm^2 window; probe face area 50 to 100cm^2.	surface scanning; surface activity measurement; field evaluation of smears	
	< 0.1 mg/cm^2 window; probe face area 10 to 20 cm^2.	laboratory measurement of water, air and smear samples	
	no window (internal proportional); Probe face area 10 to 20 cm^2.	laboratory measurement of water, air and smear samples	
scintillation	ZnS(Ag) scintillator; probe face area 50 to 100 cm^2.	surface scanning; surface activity measurement; field evaluation of smears	
	ZnS(Ag) scintillator; probe face area 10 to 20 cm^2.	laboratory measurement of water, air and smear samples	
	Lucas scintillation flask	laboratory measurement for low levels of radium	
solids state	silicon surface barrier detector	laboratory analysis by alpha spectrometry	

Figure 3

Radiation Detectors With Applications To Beta/Gamma Surveys

Detector Type	Detector Description	Application	Remarks
gas proportional	< 1mg/cm^2 window; probe face area 50 to 1000 cm^2.	surface scanning; surface activity measurement; field evaluation of smears	
	< 0.1 mg/cm^2 window; probe face area 10 to 20 cm^2.	laboratory measurement of water, air and smear samples	better measurement sensitivity for low energy beta particles than detectors with windows
	no window (internal proportional); Probe face area 10 to 20 cm^2.	laboratory measurement of water, air and smear samples	
Geiger-Mueller	1.4 mg/cm^2 window; probe area 10 to 100cm^2	surface scanning; surface activity measurement; laboratory measurement of samples	
	various window thickness; few cm^2 probe face	special scanning applications laboratory	

Figure 3 Continued

Radiation Detectors With Applications To Beta Surveys

Detector Type	Detector Description	Application	Remarks
scintillation	liquid scintillation cocktail containing sample	laboratory analysis; spectrometry capabilities	

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Figure 4

Typical Measurement Sensitivities For Laboratory Radiometric Procedures Associated With Characterization Surveys

Sample Type	Radionuclides or Radiation Measured	Procedure	Approximate Measurement Sensitivity
Smears (filter paper)	Gross Alpha	Low background gas proportional counter; 5-min. count	5 dpm
		Alpha scintillation detector with scaler; 5-min. count	20 dpm
	Gross Beta	Low background gas proportional counter; 5-min. count	10 dpm
		End window GM with scaler; 5-min. in count (unshielded detector)	80 dpm
	Low Energy Beta (H-3, C-14, Ni-63)	Liquid scintillation spectrometer; 5-min count	30 dpm

Figure 4 Continued

Typical Measurement Sensitivities For Laboratory Radiometric Procedures Associated With Characterization Surveys

Soil Sediment	Cs-137, Co-60, Ra-226, (Bi-214)*, TH-232 (Ac-228)*, U-235	Gamma Spectrometry - Intrinsic germanium detector (25% relative efficiency); pulse height analyzer; 500-g sample; 15-min. analysis.	1-3 pCi/g
	U-234, 235, 238; Pu-328, 239/240; Th-228, 230, 232; other alpha emitters	Alpha spectrometry - pyrosulfate fusion and solvent extraction; surface barrier detector; pulse height analyzer; 1-g sample; 16-hour count	0.1-0.5 pCi/g
Water	Gross alpha	Low-background gas proportional counter; 100-ml sample, 200-min. count	1 pCi/l
	Gross beta	Low background gas proportional counter; 100-ml sample, 200-min. count	1 pCi/l
	Miscellaneous gamma emitter	Gamma spectrometry - 3.5-ml sample 16-hour count	10 pCi/l
	Miscellaneous alpha emitter	Alpha spectrometry - 100-ml sample; 16-hour count	0.1-0.5 pCi/l
	H-3	Liquid scintillation spectrometry; 5-ml sample; 30 min. count	300 pCi/l

Attachment 6
Decommissioning
Polychlorinated Biphenyls (PCBs)
Protocol

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Sampling Protocol for Polychlorinated Biphenyls (PCBs)

The purpose of this document is to describe the protocol for building characterization for the presence of PCBs within the facility to be decommissioned.

Initial Classification

In an effort to provide an organized approach to the characterization activities, rooms and/or equipment items will be classified in two categories, "PCB-suspect" and "unaffected". These classifications aid in focusing the sampling effort to the areas/equipment with a higher potential for containing PCB contaminants.

The purpose of the proposed sampling activities are:

(1) to determine the presence and extent of PCB contaminant distribution;

(2) to quantify and qualify environmental parameters that effect potential human exposure from existing and residual PCB material contamination;

(3) to support evaluation of detailed planning of a preferred approach for decontamination, equipment removal and waste disposal;

(4) to support required project plan considerations of exposure assessments to support selection of cleanup criteria and approach.

PCB-Suspect Areas/Equipment

"PCB-suspect areas/equipment" for the purpose of PCB sampling are defined as those areas/ equipment items that have the potential to contain PCBs. The following is a brief list of items that have been determined from EPA guidance to potentially contain PCBs:

- Oil-based paints manufactured prior to 1982 (most prevalent in 1950's and 1960's)

- Premium grades of paint used for military specifications or special

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purposes

- Flexible coatings in high thermal heat environments or where thermal cycling or fluctuations were a concern ((waterproofing, fire resistance, extreme chemical resistance)
- concrete paints in general
- structural steel
- stucco/masonry materials and asbestos surfaces such as siding, roofing and wallboard
- military specification paint used in system piping, system piping, system components ans associated equipment (e.g. valves, heat exchangers, pumps, electrical cabinets, etc.)
- Processing /holding tanks
- electrical cable insulation in applications where fire resistance was required
- soft rubber items such as gaskets, O-rings used in assembly of electrical components
- adhesive coating on ventilation gaskets in HVAC systems (adhesives, lagging cloth/paste)
- sheet rubber and rubber channel banding material used in cable ways, pipe hanger liners and isolation mounts
- double-sided adhesive tape
- multilayered steel siding materials consisting of steel, asphalt, or zinc; asphalt-impregnated asbestos felt; and alsphaltic waterproofing coating
- Wool felt for sound dampening

Facility drawings, photographs and facility walk-downs provide detailed information to assist the project engineer in making determinations for where sampling should be conducted.

Unaffected Areas

Unaffected areas are those defined as areas or equipment where there is no history or process knowledge of PCBs being present, or verified through the review of specifications which can be traced to the area or item, or verified to have been previously tested as negative. Examples of such rooms would include hallways, closets and office areas which have no visible signs of oil based paints, or contain paints manufactured after the year 1982. In addition, electrical equipment items which have been removed from service under the RFETS TSCA Program, or the IDLE Equipment Program are not PCB-Suspect. In general, areas or equipment that are unaffected do not meet any of the criteria listed as "PCB-suspect" above.

Methods

Prior to scheduling liquid or solid paint /media sampling, facility drawings are reviewed for the presence of facility equipment and systems which would be classified as PCB-Suspect. Upon initial classification as a PCB-suspect area or item, a facility walk-down of the area or equipment is conducted in an effort to visually identify those items that require sampling. A request is then completed and forwarded to the Analytical Projects Office (APO) for each room and equipment item to be sampled. APO coordinates with the project engineer to arrange for the sampling schedule.

Sampling Methodology

Data collected during the characterization activities will consist of two types (1) field swipes taken from PCB-suspect items and (2) sample analyses of media (paint chips, etc.) using fixed laboratory equipment or systems. A minimum of 5 grams of media is required to perform the PCB solids analysis. Radiological surveys will be performed by trained Radiological Control Technicians (RCTs) using field instrumentation in

accordance with Radiological Operations Instructions during sampling activities, as necessary. Radiation protection for the sampling event and the sampling team will be addressed under a Radiological Work Permit (RWP). Additional personal protective equipment for the sampling activity, if required, will be as specified by Industrial Hygiene support personnel.

A trained sampling team is used to perform the sampling activities required for characterization purposes. Analysis for characterization purposes will be performed using Environmental Protection Agency (EPA) approved procedures, "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, U.S. EPA SW-846, 1986, Third Edition" using laboratory facilities located on-site and off site. Onsite methods for analysis of PCBs includes SW-846 Method 8081 "GC Analysis for PCBs in Oils and Solids. Offsite methods include SW-846 Method 8080A. A Table describing the differences in these methods is included as Attachment A. Data Quality Objectives (DQOs) are established for the analytical methods referenced and are available through the on-site Kaiser-Hill APO office in B-881. DQOs for Offiste laboratories are established under individual QA/QC Programs which meet the language and intent of EPA SW-846 requirements.

During characterization activities, several direct, indirect and sample media samples will be measured, obtained and analyzed for radiological(as needed) and PCB material contaminants. The results will be used to determine the extent and magnitude of the contaminants and the basis for estimating waste quantities and decontamination options. Sample collection, analysis, and the associated documentation will follow standard written procedures which meet the recommendations and requirements of applicable regulatory agencies. A "chain of custody" sample tracking form is used for each sample collected to account for the sample from collection to the point of analysis. Samples will be collected and documented in accordance with Laboratory Procedure No. L-6294-A "Sampling Within an RBA/CA".

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Analysis Methodology

Specialized procedures have been developed at RFETS to meet technical requirements for analyzing certain substances, such as those containing radionuclides or compounds which interfere with the accuracy and precision of the analysis. These test methods are entitled the "L-Procedures" L- Procedures are based on test methods found in 6CCR, 1007-3, Part 261; , "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", U.S. EPA SW-846, 1986, Third Edition, " as amended by Updates I (July 1992), II (September, 1994), and IIA (August 1993); "Methods for Chemical Analysis of Water and Wastes," EPA Publication No. 600/4-79-020 (1979); and various other EPA approved protocols such as those from the American Society of Testing and Materials (ASTM).

Analysis for hazardous waste determination is conducted in accordance with Rocky Flats Plant Procedure 1-C75-HWRM-03 "Waste Identification and Analysis". This procedure also outlines and references other requirements for waste management for liquids which will be handled as waste material.

Quality Assurance

The Quality Assurance Program for characterization activities follows the same program for management of hazardous wastes on-site and meets the minimum requirements established by "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", U.S. EPA SW-846, 1986, Third Edition. QA/QC procedures addressing waste characterization are maintained at the site.

Waste Management

Materials from removal activities will be generated as waste and must be characterized prior to disposition. Procedures must be in place to insure sampling and analysis of wastes to be generated that are in accordance with EPA and State regulations. The information is required involves acquisition of data for hazardous and radioactive contaminants, to a level consistent with regulatory and procedural requirements, for wastes that

will be generated as a result of a particular activity. The requirements for characterization of hazardous waste is specified in several RFETS waste management procedures that are based on the requirements established primarily by 40 CFR 261 and 6 CCR 1007-3, 261. If the waste materials tested demonstrate hazardous or radioactive characteristics, then they will be managed as such in accordance with the Low-Level or Hazardous Waste Requirements Manual.

Industrial Hygiene

Some removal activities involve the potential to generate hazardous dusts and fumes. These activities could create potential exposures of personnel to hazardous materials or constituents (i.e. lead paint that is being welded) if mitigation measures are not taken. To determine the protective actions which need to be taken, the level of contaminant must be measured and quantified prior to conducting the operation. This requirement is driven by OSHA 1926.61 for lead and other sections of OSHA for other constituents. In accordance with OSHA and NIOSH requirements procedures must be in place to assess the workplace activities for hazardous materials, which could create an exposure to employees, prior to execution of the work. The information that needs to be learned involves the acquisition of data for levels of hazardous contaminants associated with equipment, building materials, or residuals within construction areas, that could be associated with exposures of the workers to hazardous substances. Preliminary screening and sampling in accordance with OSHA requirements is required for materials such as beryllium, lead, cadmium, chrome, asbestos and other hazardous constituents. If the materials to be decommissioned demonstrate hazardous contaminants above the OSHA Action Levels, then appropriate steps such as Engineering and Administrative Controls, Decontamination, or the use of PPE will be implemented under appropriate plans and procedures to meet OSHA requirements.

Data Analysis And Review

As specified in 40 CFR 761.60(4), disposal of solid PCBs is regulated at concentrations of 50 ppm or greater in the form of contaminated soil, rags or other debris. Processing or distribution in commerce of any PCB or PCB

item, regardless of concentration, that is not specifically authorized is prohibited. The limit of detection for distribution in commerce is 2 ppm. This applies to the resale, reuse, or recycling of materials such as equipment that have painted surfaces with PCBs.

Results of all characterization activities will be documented in applicable field notebooks and summarized in a brief characterization report. This report will be distributed to appropriate project personnel to support decisions made for waste management, industrial hygiene, decontamination and other activities which may involve hazardous and radiological contaminants. The inventory of materials and the characterization results will be provided to the Industrial Hygiene and Safety group for the required hazard review. IH&S will determine if controls or personal protective equipment will be required during Decommissioning activities and provide recommendations during work package development.

Sample results for liquid wastes generated are submitted to the building Environmental Coordinator (EC) and/or the project Waste Specialists in order to prepare necessary waste disposal documentation.

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Appendix 1
Summary of the Major Differences Between Method 8080A And 8081

	8080A	8081
Compund List		The compound list is considerably longer in 8081. However, it is important to note that the method does not define the compound list. i.e., we do not have to analyze for all compounds on th 8081 list.
MDL	Method MDLs are generally lower in 8080A than in 8081.	These MDLs should not present any problem, except for the aqueous Aroclor at 0.054 ug/L which may be a typo.
Extraction solvent	CH_2CL_2/Acetone is the extraction solvent for soils.	Hexane/Acetone is listed as an optional extraction solvent for soild. CH_2CL_2/Acetone is also OK.
Columns	Packed Columns listed.	Capillary columns listed.
Standards	Stock standards expire in one years, cal standards in six months.	All standards expire in six months.
Surrogates	TCMX and Decachlorobiphenyl *recommended.*	TCMX and Decachlorobiphenyl *recommended*, single column technique, 4-chloro-3 nitrobenzotrifluoride *recommended*, dual column technique. (Quanterra will use the TCMX/DCB combo for all tests).
Aroclors, calibration	No additional guidance for calibration of Aroclors	Use 5 points of1016/1260, sinlge point of other Aroclors. Use 5 points of other Aroclors if present in samples.
Multicomponents, quantitation	The two methods have different guidance for quantitation of multicomponents Arocolors - total area	Arocolars - total area or 3-5 characteristic peaks
LCS		LCS (called QC reference sample in the method) limits are set at 80-120%.
Calibration verification	Every 10 samples. Reinject any samples injected after a failed cal verif.	Every 20 samples (every 10 recommended). Samples must be *bracketed* with acceptable cal. verif. (7.5.3.1).
Endrin/DDT Breakdown	≤ 20% each compound.	≤ 15% each compound.