

10 VCA 11/19/96
EMP-8 RADON/THORON DAUGHTER WORKING LEVEL
MEASUREMENTS

MANUAL/PROCEDURE: RN/TN DAUGHTER WORKING LEVEL
MEASUREMENTS

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PURPOSE:

NEW PROCEDURE

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CONCURRENCE:

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REVIEW:

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APPROVAL:

Project Manager/Operations Director

Date

EMP-10 RADON/THORON DAUGHTER WORKING LEVEL MEASUREMENTS**A. PURPOSE:**

This procedure describes the process of sample collection and data analysis to determine the radon (Rn-222) and thoron (Rn-220) daughter working levels in the workplace and to serve as the basis for estimating the degree of equilibrium between the radon isotopes and their respective daughters.

B. REFERENCES OR AUTHORITY:

1. 11e.(2) Radioactive Material License SMC-1559, dated 11/19/93
2. Application for 11e.(2) Radioactive Material License SMC-1559, dated 12/31/91, as amended, Section 7.
3. Ogden, T.L.; *Radon and Thoron Working Levels from Ordinary Industrial-Hygiene Dust Samples*; Ann. Occup. Hyg.; Vol. 20, Pergamon Press, 1977

C. PRECAUTIONS AND LIMITATIONS:

1. Assure that an alpha counter, properly calibrated and checked for constancy with a current background, will be available when needed.
2. Calibrate lapel sampler according to PMP-3.

D. GENERAL INSTRUCTIONS:

1. This procedure applies to the collection of samples and analysis of count data to measure radon and thoron daughter working levels in the restricted area.
2. Samples are collected on membrane filters using lapel samplers which may be placed on an individual working on the disposal cell or at the downwind edge of the disposal cell.
3. Refer to Table 1 for required sample times. If sampler is to be placed on a worker, make sure that the person will be working in that area for the necessary sample collection time.
4. The minimum time required for sample collection and counting using this method is 6 hours. Sample collection must be started in time to allow completion of counting. If sample collection times longer than 2.5 hours are to be used, the extra time must be considered in the total time required.

E. OPERATING INSTRUCTIONS

1. Select sampling location, either stationary downwind location at downwind edge of disposal cell or breathing zone sample on worker in the cell.

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2. Follow Operating Procedure PMP-3 to calibrate the sampler and collect the sample.
3. Collect sample continuously for sampling period selected. The sample will be invalid if collection is stopped during the prescribed sampling period.
4. The first sample count should start at 20 minutes after the end of the sampling to achieve the maximum sensitivity. If it cannot be started at that time, the sample can be started at five minute intervals after the initial 20-minute wait time.
5. The sample is counted for two successive counts. The first count is of 85 minutes duration. The second count starts immediately after the first count and is of 105 minutes duration. Thus, the total count period is 190 minutes or 3 hours, 10 minutes.
6. The radon daughter working level W_R is calculated as:

$$W_R = 4.736 \times 10^{-9} a(bA_1 - A_2)/V$$

The thoron daughter working level W_T is calculated as:

$$W_T = 4.736 \times 10^{-9} c(dA_2 - A_1)/V$$

Where: a , b , c , and d are given in Table 1 for sampling time of T and wait time

t_Q .

V = Sampling Rate, l/s

A_1 and A_2 = Total disintegrations in each counting period

7. For ease in counting the working levels, a spreadsheet - **work-lvl.xls** - has been developed. It is only necessary to enter collection data, count data and variables a , b , c , and d from Table 1.
8. Compare the measured working levels to the appropriate DACs. The DAC for radon is 0.33 WL. The DAC for thoron is 1.0 WL. Notify the Site RSO immediately if the sum-of-fractions of the for the two working levels exceeds 0.1.
9. When it is desired to calculate the state of equilibrium (F) between radon and it's daughter products the following is used:

$$F = \frac{WL \times 100}{Rn \text{ Conc (pCi/l)}}$$

F. QUALITY CONTROL

1. Samplers are calibrated daily before and after sample collection.
2. Alpha counting instrument is calibrated for detection efficiency every six months and is checked for constancy each day before use.
3. An independent check of field data collection sheets, laboratory count data and computer inputs is made and recorded monthly.

G. DATA CONTROL

1. Field log books and laboratory count logs are completed and filed by year.
2. The computer spreadsheet is printed at the end of each quarter and a copy is filed for reference.

SECTION IX

SAMPLE CONTROL "CHAIN OF CUSTODY" PROCEDURES

ENVIROCARE OF UTAH, INC. OPERATING PROCEDURES MANUAL

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COC-1 SAMPLE CONTROL - CHAIN-OF-CUSTODY PROCEDURE

A. PURPOSE: This chain-of-custody procedure was established to ensure the integrity of samples are not compromised from the time of collection through the final data reporting. The use of consistent procedures and methods to document the history of custody of each sample helps ensure the highest confidence in the validity of sampling results.

B. REFERENCES OR AUTHORITY:

1. RCRA Permit dated 11/30/90, Attachment II-1 "Waste Analysis Plan"
2. Ground Water Quality Discharge Permit No. UGW450005 dated 3/20/92
3. Envirocare of Utah, Inc. - Quality Assurance Manual
4. 11e.(2) Radioactive Material License SMC-1559, dated 11/19/93
5. Application for 11e.(2) Radioactive Material License SMC-1559, dated 12/23/91, as amended

C. PRECAUTIONS AND LIMITATIONS:

1. A continuously controlled sample, as documented by the chain-of-custody form, must be rigorously enforced to help assure the validity of sampling results.
2. Safe sampling practices must be employed for the gathering of all samples. Safe work practices will be followed during all waste shipment sampling activities including, but not limited to, the wearing of protective clothing, gloves, shoes, respirators, and protective eye wear. Sampling is only performed after sampling personnel have checked the shipping manifest and are familiar with the Waste Profile Record.

D. GENERAL INSTRUCTIONS:

1. This procedure is applicable to incoming waste shipment samples, environmental monitoring samples, groundwater monitoring samples, and any other samples as deemed necessary by appropriate corporate authority when the integrity of the samples is determined to be essential to the overall purpose of the sampling.
2. A sample is considered to be in a person's custody if it is:
 - a. in their physical possession;
 - b. in continuous view after possession has been assumed;
 - c. secured in an area for which access is restricted to authorized personnel;
 - d. physically secured so that no one can tamper with the sample; or
 - e. physically secured such that unauthorized access to the sample results in direct evidence of the unauthorized access (seals).
3. Always document any change of custody of the samples to certify that the sample was continuously controlled by one person from the time it was received until it was relinquished

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to the custody of someone else. That person must then certify continuous custody until the sample is transferred to someone else, and so on, until final disposition of the samples. Custody of samples may **not** be jointly controlled.

4. All samples under sample custody control are identified by a sample label. Sample labels are necessary to prevent misidentification and misuse of the samples. Each sample must be labeled or marked on the container or collection bag at the time of collection.

a. For incoming RCRA waste shipment samples, label information should include: the client's (generator's) name, date and time collected, location of sample collection, the name of the sample collector, and the shipment manifest number (reference 1).

b. For incoming LARW and 11e.(2) waste shipment samples, label information should include: the generator's name or number, date and time collected, location of sample collection (e.g. truck #, railcar #, etc.), container #, shipment type (bulk, container, etc.), and the name of the sample collector (reference 2).

c. For environmental samples, label information should include: the location or station of sample collection, date and time of sample collection, and the name of the sample collector.

d. For groundwater monitoring samples, label information should include: the well number of sample collection, any preservative added to the sample, and the date and time of sample collection.

5. Seals are used as a means to determine if access to the sample (and thus possible tampering) occurred between the time the sample was collected and the time the seal is broken in the laboratory. Seals, when affixed properly, may be used in lieu of continuous physical possession as noted in D.2.e above. Attach the seals in such a way that the sample container, collection bag, or shipping container can not be opened without breaking the seal. Seals should be of a material which is sufficiently durable to resist normal wear and tear, but which must have to be destroyed or visibly damaged to get access to the sample. A seal should have a unique identification. This can be a tape with a special printed design and a number unique to the sample, or it could be a tape with the sample collection technician's signature and the sample identification number. If special seals or tapes are not available, wide masking tape can be used to wrap the sample container lid. The sample identification information can be written on the tape with indelible ink in such a fashion that any attempt to unwrap the tape to gain access to the sample would be obvious.

a. Seals need not be applied to incoming LARW and 11e.(2) waste shipment samples due to the short duration of time between the sampling event and the actual delivery of the samples to the site laboratory for analysis. However, if a seal is not used, the samples must remain in the actual physical possession of the sample collector at all times.

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- b. For incoming RCRA waste samples, fasten gummed paper seals to the samples immediately upon sample collection and before the samples leave the custody of the sample collector (reference 1).
6. All incoming waste samples and environmental samples (except groundwater samples) will be accompanied by a properly completed chain-of-custody form (Figure IX-2) from the time of sample collection until final disposition of the sample. The chain-of-custody form should include: the custody holder, date, sampling team, sampling date and/or field log book page number(s) (samples transferred to another chain-of-custody form must have all sampling dates and/or field log book page number(s) annotated), generator name or number (noted in the remarks section - for environmental samples the generator is Envirocare), station or location (e.g. truck #, railcar #, environmental sampling station #, etc.), and sample ID (e.g. bates #).
- a. The chain-of-custody form allows samples to be taken off one chain-of-custody form and placed onto another while minimizing the amount of documentation required. If a sample is transferred from one chain-of-custody form onto another, both chain-of-custody forms need to show documentation of that transfer. The documentation should include: the number of the original chain-of-custody form, the number of the destination chain-of-custody, the initials of the person performing the transfer (the custody holder at the time), and the date and time of the transfer.
- b. A copy of all destination chain-of-custody forms are attached to the original chain-of-custody form.
7. All groundwater monitoring samples will be accompanied by a properly completed chain-of-custody form (Figure IX-1) from the time of sample collection at a particular well until final disposition of the sample. The chain-of-custody form should include:
- a. Signature of the Sampling Team Members;
 - b. Sample number for each sample;
 - c. Location where each sample was taken;
 - d. Date and time each sample was taken;
 - e. Type of sample taken (e.g. complete or grab sample);
 - f. Number of containers for each sample and their individual volume;
 - g. Analysis Required;
 - h. Signature of relinquishment and also reception for each transfer of custody;
 - i. Time and date of all transfers of custody;
 - j. Name of the shipper, the method of shipment, and the time and date of reception for shipment;
 - k. Name of the receiver of the samples at the contracted lab, and the time and date of reception.

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8. If samples cannot be delivered or shipped to the laboratory on the day of collection, they must be stored (and refrigerated if required) in a locked, or access-controlled area until shipment. Samples should be delivered only to authorized laboratory personnel.

9. Chain-of-custody documentation shall continue at the laboratories. Off-site analytical laboratories may require a sample analysis request form accompany the samples to the laboratory. The format of this form will depend on the specific analytical laboratory, but the form may be designed to be used to demonstrate laboratory internal chain-of-custody control.

E. OPERATING INSTRUCTIONS:

1. For incoming waste shipment samples:

a. Enter the sample data onto the chain-of-custody form when the sample is obtained in the field. Each generator waste stream will have one chain-of-custody form filled out per day.

b. For incoming RCRA waste samples, in addition to filling out the chain-of-custody form, record in a bound field sampling log book at the time of collection the following information: the sample type, date, time, location, name of the collecting technician, and the name and number of the client (generator) (reference 1.).

c. Label or mark the sample container or collection bag to identify the sample, in accordance with D.4 above.

d. Affix sample seals (as applicable) in accordance with D.5 above.

e. Deliver the samples to the appropriate laboratory, whereupon the laboratory technician inspects the sample shipping containers (if applicable) for any obvious signs of damage, inspects the integrity of the seals (if affixed), and signs for receipt of custody of the samples.

f. For the Envirocare chemistry laboratory:

1) The sample container or collection bag label information and the chain-of-custody number are documented in the Incoming Shipment Log, and any discrepancies are noted; and,

2) A copy of the chain-of-custody form, with documentation of continuous cradle-to-grave custody, will be kept in the Incoming Shipment Log.

COC-1 SAMPLE CONTROL - CHAIN-OF-CUSTODY PROCEDURE**2. For environmental samples:**

- a. Enter the sample data onto the chain-of-custody form when the sample is obtained in the field. A single form will be used for as many samples as possible.
- b. In addition to filling out the chain-of-custody form, record the sampling information and the chain-of-custody number in the appropriate field sampling log book at the time of sample collection.
- c. Label or mark the sample container or collection bag to identify the sample, in accordance with D.4 above.
- d. Affix sample seals (as appropriate) in accordance with D.5 above.
- e. Deliver the samples to the appropriate laboratory, whereupon the laboratory technician inspects the sample shipping containers (if applicable) for any obvious signs of change, inspects the integrity of the seals (if affixed), and signs for receipt of custody of the samples.

3. For groundwater monitoring samples:

- a. Enter the sample data onto the chain-of-custody form immediately upon completion of gathering the sample suite at each groundwater well and prior to departing the general vicinity of the well. A single form should be used for as many samples as possible.
- b. Record the chain-of-custody number in the groundwater field sampling log book.
- c. Label or mark the sample container to identify the sample, in accordance with D.4 above.
- d. Affix sample seals to the sample shipping containers in accordance with D.5 above.
- e. Deliver or ship the samples to the appropriate laboratory, whereupon the laboratory technician inspects the sample shipping container for any obvious signs of damage, inspects the integrity of the seals, and signs for receipt of custody of the samples.

F. QUALITY CONTROL

1. The overall purpose of this procedure is to ensure quality control is maintained for samples to help assure the validity of the sample results. No separate process control measures are necessary beyond periodic monitoring and/or auditing of the implementation of this procedure.

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2. In accordance with reference 3, unused or blank spaces shall be annotated to indicate that no further entries are appropriate. Corrections to chain-of-custody forms shall follow the guidance of reference 3.
3. Data Control: All samples will be accompanied by a properly completed unique chain-of-custody form (Figure IX-1 for groundwater samples and Figure IX-2 for environmental and incoming waste samples) from the time of collection until final sample disposition.
4. Sample Control: If samples are not delivered or shipped to the analytical laboratory on the day of collection, they must be stored (and refrigerated if required) until shipment, in a locked or access-controlled area. Samples should be delivered only to authorized laboratory personnel. Samples will be delivered or shipped to the laboratory within five (5) working days of sample collection.
5. Audit Requirements:

The Laboratory Supervisor will monitor the implementation of this procedure on a daily basis as samples are collected. Quarterly, the Laboratory Supervisor will audit the sample chain-of-custody records, and provide a report to the Corporate Environmental Engineer and Corporate RSO. This audit will include an evaluation of actual chain-of-custody practices. Any discrepancies will be discussed with the sample collection personnel and the Site Manager will be informed.