

Approved by:		
	General Manager	Radiation Safety Officer

STANDARD OPERATING PROCEDURE

15.OPS.02

CONTAMINATION CONTROL DURING WASTE TREATMENT ACTIVITIES

1.0 OBJECTIVE

Define operational procedures for contamination control during waste treatment operations in the CHDT treatment building.

2.0 SCOPE

This standard operating procedure (SOP) defines and directs procedures for contamination control during radioactive material treatment operations. It addresses waste unloading, mixing and loading in the treatment building. It does not cover treatment formulas and chemical additives.

3.0 POLICY

Treatment operations will be conducted in such a way to prevent radioactive material from leaving the treatment building except in authorized waste movements. The goal is to prevent the spread of contamination to people, equipment and the environment and to keep other parts of the CHDT facility free from radiological contamination. To fulfill this goal, several operational measures will be implemented. A portion of the treatment building will be dedicated for use with radioactive material during treatment campaigns. The building floor around the treatment basins dedicated to these campaigns will be surveyed for radioactive contamination when operations are conducted and decontaminated is needed. Vehicles and equipment leaving the dedicated area of the treatment building will be surveyed for radioactive contamination.

4.0 RESPONSIBILITIES

Responsibilities of the CHDT Radiation Safety Officer (RSO), management, and staff are defined in the CHDT Radiation Protection Plan (15.RPP.01).

5.0 DEFINITIONS

5.1 Bed Liner

A bed liner is a sheet of plastic material that is used to form an impervious liner in the bed of a dump truck, dump trailer, or roll-off box.

5.2 Decon Bay

This is a personnel decontamination and changing area located adjacent to the Treatment Building.

5.3 Contaminated Equipment

Contaminated equipment refers to any CHDT trucks or equipment whose exteriors come into direct contact with radioactive materials. In the treatment building, this will be the trackhoe excavator dedicated for use with radioactive materials. Contaminated equipment shall undergo decontamination procedures and pass a radiation survey, as defined in the CHDT SOP 15.OPS.13, *Equipment Surveys*, before it can be considered uncontaminated.

5.4 Frisk Out

Frisk out (i.e., radiation survey) procedures shall involve a check of vehicle tires and surfaces, or personnel for radioactive contamination through the use of hand held radiation survey equipment, using the CHDT SOP 15.OPS.13, *Equipment Surveys*, and/or SOP 15.OPS.12, *Personnel Surveys*.

5.5 Radioactive Materials

These are the radioactive materials authorized for receipt, possession, treatment, and disposal at CHDT under Colorado Radioactive Materials License 1102-1.

5.6 Treatment Building

The Treatment Building is the facility located inside the CHDT surface impoundment where all waste treatment operations are performed (Figure 1).

6.0 LOADING, UNLOADING AND TREATMENT OPERATIONS

A section of the Treatment Building will be used for storage and treatment of radioactive materials on an as needed basis. This section will be marked and posted when in use. Once dedicated for use, they will remain so until decontaminated per the SOP on surveys.

6.1 Unloading Operations

Facility personnel will direct the transporter to the radioactive materials unloading area. The truck will back into the unloading area directly up to the edge of the basin. The truck will dump the waste directly into the treatment basin. Trucks will normally be equipped with bed liners for solid and sludge materials. These bed liners will prevent the waste from contacting the truck bed. After the truck has dumped, the interior of the truck will be inspected for the presence of visible contamination. If the bed liner has functioned properly, there should be no contamination of the truck interior. If visible contamination is detected, the truck bed will be raised and it will be rinsed with water with the rinsate directed into the treatment basin. The floor of the unloading area will be surveyed for radioactive contamination each day and decontaminated if needed. This will ensure that all vehicles will drive only on clean surfaces. The wash water will be directed into the treatment basin, and treated with other waste.

6.2 Exit Procedures for Incoming Waste Trucks

If the bed liner has functioned properly and no contamination is observed, no further release procedures are necessary. If waste has contacted the interior of the truck, the interior of the truck trailer or roll-off bin will be surveyed for contamination in accordance with SOP 15.OPS.13, *Equipment Surveys*. If contamination is detected, the interior of the truck dump trailer or roll-off bin will be decontaminated until the interior of the truck dump trailer or roll-off bin is

determined to meet the release criteria in the SOP. Decontamination will normally be accomplished by washing with water. The wash water will be directed into the treatment basin. A cleaning agent such as soap will be used if necessary. The truck tires will not be routinely surveyed for radiation contamination since the truck is traveling only on clean unloading areas. If the truck tires contact radioactive material (e.g., the truck driver accidentally spills radioactive material on the floor during dumping), the truck tires shall be surveyed for the presence of radioactivity above background using gamma survey equipment as defined in SOP 15.OPS.13, *Equipment Surveys*. If radioactive material is detected, the truck tires shall be decontaminated by washing with water. The rinsate will be directed into the treatment basin. The floor in this area slopes toward Basin D-1 and the rinsate will be treated along with the waste.

6.3 Loading Operations

After waste has been treated in the treatment basin and meets specifications for landfill, the waste will be loaded into site haul trucks and transported to the landfill cell. The haul truck will back into the loading area adjacent to the treatment basin. Waste will be transferred to the site haul truck using a backhoe bucket. The treatment basin and the loading area adjacent to it will be surveyed for radioactive contamination on a daily basis when in use and will be decontaminated when needed.

6.4 Exit Procedures for Site Haul Trucks

The truck tires will not be routinely surveyed for radiation contamination since the truck is traveling only on clean haul roads and unloading areas. If the truck tires contact radioactive materials, (e.g., the truck driver accidentally spills radioactive materials on the floor during dumping), the truck tires shall be surveyed for the presence of radioactivity above background using gamma survey equipment as defined in SOP 15.OPS.13, *Equipment Surveys*. If radioactive material is detected, the truck tires shall be decontaminated by washing with water. The rinsate will be directed into the treatment basin and treated with other waste.

Site haul trucks normally do not leave the facility. If they leave the facility, the interior of the truck bed will be decontaminated. In order to be considered decontaminated, they will be surveyed for radionuclide contamination in accordance with SOP 15.OPS.13, *Equipment Surveys*. If contamination is detected, the interior of the truck dump trail or roll-off bin trailer will be swept and/or washed, if necessary, until the interior of the truck is determined to meet the release criteria in SOP 15.OPS.13, *Equipment Surveys*.

6.5 Mixing Operations

Mixing operations in the treatment building are conducted using a backhoe and various chemical reagent additives. Normally, the waste is placed in the treatment basin, reagents are added, and the waste mixture is mixed until treatment is complete. Samples will be taken to verify proper treatment. The treatment building is a totally enclosed building with two emission control systems consisting of a bag house and a wet scrubber. All treatment operations must be conducted with the emission control system properly operating to control releases of waste materials.

6.6 PPE and Personnel Decontamination

Consistent with 15.RPP.09, *Personal Protective Equipment*, and other applicable procedures, standard PPE for use in the treatment building consists of a full face air purifying respirator and combination cartridges, a porous disposable Tyvek suit, plastic liner gloves with cloth or leather over gloves, and boots. Personnel may leave the treatment building on foot or in a vehicle. Drivers delivering waste to the treatment building may not leave their vehicles until they have exited the treatment building. Persons working in the radioactive materials area of the treatment building shall exit through the decon bay and undergo frisk out procedures. These procedures are delineated in SOP 15.OPS.12, *Personnel Surveys*. If the frisk out determines that radioactive material is present, the PPE shall if be removed and disposed and the individual frisked out again. Reusable PPE such as boots and respirators may be decontaminated if contaminated. Other PPE may be used as long as they provide equivalent protection. Contaminated PPE will be disposed of in the landfill.

7.0 STANDARDS AND CRITERIA

7.1 Free Release

Removable activity measured by smear samples will be evaluated against the values listed in Table 1, from ANSI/HPS N13.12-1999 (ANSI/HPS 1999). In the absence of radionuclide data to establish the appropriate screening group, the most conservative screening levels will be used.

Table 1 – Surface Contamination Limits for Free Release Surveys

Radionuclide Group	Surface Screening Levels (Bq/cm ²)	Surface Screening Levels (dpm/100cm ²) ^(a)	Removable Contamination Limits (dpm/100cm ²)
Group 1 Radium and Thorium: ²¹⁰ Po, ²¹⁰ Pb, ²²⁶ Ra, ²²⁸ Ra, ²²⁸ Th, ²³⁰ Th, ²³² Th, and associated decay chains ^(b)	0.1	600	60 alpha
Group 2 Uranium: ²³⁴ U, ²³⁵ U, ²³⁸ U, natural uranium ^(c) , and associated decay chains	1	6,000	600 alpha
Group 3 General Beta-Gamma Emitters: ²⁴ Na, ³⁶ Cl, ⁵⁹ Fe, ¹⁰⁹ Cd, ¹³¹ I, ¹²⁹ I, ¹⁴⁴ Ce, ¹⁹⁸ Au, ²⁴¹ Pu, and others	10	60,000	600 beta
Group 4 Other Beta-Gamma Emitters: ³ H, ¹⁴ C, ³² P, ³⁵ S, ⁴⁵ Ca, ⁵¹ Cr, ⁵⁵ Fe, ⁶³ Ni, ⁸⁹ Sr, ⁹⁹ Tc, ¹¹¹ In, ¹²⁵ I, ¹⁴⁷ Pm, and others	100	600,000	600 beta

(a) Rounded to one significant figure.

(b) For decay chains, the screening levels represent the total activity (i.e. the activity of the parent plus the activity of all progeny) present.

(c) Where the Natural Uranium activity equals 48.9% from ²³⁸U, plus 48.9% from ²³⁴U, plus 2.25% from ²³⁵U.

7.2 Transportation – Non-Fixed Contamination

Contamination control limits for non-fixed (i.e., removable) surface contamination are established by the Department of Transportation (DOT) in 49 CFR 173.443. Additional requirements for empty packaging are established in 49 CFR 173.428. These limits are summarized in Table 2.

Table 2 – DOT Non-Fixed Surface Contamination Limits

Radionuclide Group	Maximum Permissible Limit (Bq/cm²)	Maximum Permissible Limit (dpm/cm²)^(a)	Maximum Permissible Limit (dpm/100 cm²)^(a)	Maximum Permissible Limit for Empty Packaging (dpm/100 cm²)^(a)
1. Beta and gamma emitters and low-toxicity alpha emitters	4	220	2,200	220,000
2. All other alpha-emitting radionuclides	0.4	22	220	22,000

(a) Averaged over 300 cm².

7.3 Quality Control

In addition to the daily QC measurements required by each individual instrument SOP, survey forms must be reviewed and approved by the CHDT RSO or designee. The frequency of review and approval will be dictated by the frequency of the surveys.

8.0 REFERENCES

49 CFR 173. *Shippers – General Requirements for Shipments and Packagings*. Current Version.

ANSI/HPS 1999. Surface and Volume Radioactivity Standards for Clearance.

Figure 1. Map of Treatment Building

