

---

**VISTA Technologies, Inc.  
Radiation Safety Program**

---

**PROCEDURE - 19**

**DECONTAMINATION**



**1019 Central Parkway North, Suite 115  
San Antonio, Texas 78232  
210-494-4282**

## TABLE OF CONTENTS

1. DECONTAMINATION OF PERSONNEL .....	1
1.1. Necessary Supplies .....	1
1.2. Decontamination Facilities .....	2
1.3. Specific Instructions .....	2
2. DECONTAMINATION OF EQUIPMENT, VEHICLES, MATERIALS, AND TOOLS.....	4
2.1. Necessary Supplies .....	4
2.2. Specific Instructions .....	4
2.3. Equipment, Material, and Tools .....	5
2.4. Vehicles .....	6
3. DECONTAMINATION PROCEDURES.....	6
3.1. Pre-Decontamination Procedures .....	6
3.2. Establishment of the Decontamination Area .....	6
3.3. Decontamination.....	8
3.4. Transferable Contamination Removal.....	9
3.5. Fixed Contamination Removal.....	9
3.6. Post Decontamination.....	11

## List of Attachments

<b>Attachment Number</b>	<b>Name of Attachment</b>
43	Acceptable Surface Contamination Levels (Equipment and Articles)

## ABBREVIATIONS AND ACRONYMS

$\alpha$	-	Alpha
$\beta$	-	Beta
$\gamma$	-	Gamma
$\mu$	-	Micro
<sup>241</sup> Am	-	Americium-241
<sup>137</sup> Ce	-	Cesium-137
<sup>234</sup> Pa	-	Protactinium-234
<sup>210</sup> Pb	-	Lead-210
<sup>210</sup> Po	-	Polonium-210
<sup>214</sup> Po	-	Polonium-214
<sup>218</sup> Po	-	Polonium-218
<sup>232</sup> Pu	-	Plutonium-232
<sup>226</sup> Ra	-	Radium-226
<sup>228</sup> Ra	-	Radium-228
<sup>219</sup> Rn	-	Radon-219 (Actinium Series)
<sup>220</sup> Rn	-	Radon-220 (Thorium Series)
<sup>222</sup> Rn	-	Radon-222 (Uranium Series)
<sup>89</sup> Sr	-	Strontium-89
<sup>90</sup> Sr	-	Strontium-90
<sup>230</sup> Th	-	Thorium-230
<sup>232</sup> Th	-	Natural Thorium
<sup>238</sup> U	-	Uranium-238
$\mu$ Ci	-	MicroCurie
$\mu$ Ci/hr	-	MicroCuries per hour
$\mu$ Ci/ml	-	MicroCuries per milliliter
$\mu$ M	-	Micrometer
$\mu$ R/hr	-	MicroRoentgen per hour
$\mu$ g/mg	-	Microgram per milligram
ALARA	-	As low as reasonably achievable
ALI	-	Annual limit on intake
ANSI	-	American National Standards Institute
APR	-	Air-purifying respirator
Bq	-	Becquerel
Bq/m <sup>3</sup>	-	Becquerels per cubic meter of air
BZ	-	Breathing Zone
C	-	Coulomb
C/kg	-	Coulombs per kilogram
CDE	-	Committed Dose Equivalent
CEDE	-	Committed Effective Dose Equivalent

CFR	-	Code of Federal Regulations
Ci	-	Curie
CIH	-	Certified Industrial Hygienist
CFM	-	Cubic feet per minute
CLIA	-	Clinical Laboratories Improvement Act
CLP	-	Contract Laboratory Program
cm	-	Centimeter
cm/sec	-	Centimeters per second
cpm	-	Counts per minute
CPR	-	Cardiopulmonary resuscitation
CSE	-	Certified Safety Executive
(D)	-	Duplicate count
DAC	-	Derived air concentration
DAC-h	-	DAC hours
DCA	-	Double Contingency Analysis
DDE	-	Deep Dose Equivalent
DI	-	De-ionized water
DOT	-	U.S. Department of Transportation
dm <sup>2</sup>	-	Square Decimeter; one square decimeter equals 100 square centimeters
dpm	-	Disintegrations per minute
dpm/cm <sup>2</sup>	-	Disintegrations per minute per square centimeter
dpm/dm <sup>2</sup>	-	Disintegrations per minute per square decimeter
dps	-	Disintegrations per second
DRD	-	Direct reading dosimeter
DU	-	Depleted uranium
EPA	-	U.S. Environmental Protection Agency
eV	-	Electronvolt
FE	-	Feces sample
FIDLER	-	Field instrument for detection of low energy radiation
FR	-	Filter ratio
FSP	-	Field Sampling Plan
ft <sup>2</sup>	-	Square foot
γ	-	Gamma ray
GA	-	General area
GeLi	-	Germanium - Lithium
G-M	-	Geiger-Mueller
GMC-H	-	Mine Safety Appliances Company, full-facepiece, dual combination filter cartridges for an APR
GPD	-	Gaseous Diffusion Plant
h	-	hours
He-3	-	Helium Three (3)

HEPA	-	High efficiency particulate air
HNO <sub>3</sub>	-	Nitric acid
HP	-	Health Physics
hr	-	Hour
HS	-	Hot spot (radiation)
HSP	-	Site-specific Health and Safety Plan
HWP	-	Hazardous Work Permit
ICRP	-	International Commission on Radiological Protection
ID	-	Identification
IDLH	-	Immediately dangerous to life or health
IDW	-	Investigation derived waste
IP	-	Ionization potential
IVC	-	Independent verification contractor
keV	-	Kiloelectronvolt
kg	-	Kilogram
LANL	-	Los Alamos National Laboratory
lpm	-	Liters Per Minute
MCA	-	Multi-channel analyzer
MDA	-	Minimum detectable activity
meV	-	Millielectronvolt
m	-	Meter
m <sup>2</sup>	-	Squared Meters
m <sup>3</sup>	-	Cubic meters
mCi	-	MilliCurie
MSHP	-	Manager, Vista Safety and Health Program
mil	-	1/1000 inch
ml	-	Milliliter
mm	-	Millimeter
mR	-	MilliRoentgen
mR/hr	-	MilliRoentgens per hour
mrem	-	Millirem
mrem/hr	-	Millirems per hour
MSA	-	Mine Safety Appliances Company
MSDS	-	Material Safety Data Sheet
MSHA	-	Mine Safety and Health Administration
NaI	-	Sodium iodide
NCA	-	Nuclear Criticality Analysis
NCS	-	Nuclear Criticality Safety
NCRP	-	National Council on Radiation Protection and Measurements
NEA	-	Nuclear Energy Agency
NIST	-	National Institute of Science and Technology

NIOSH	-	National Institute for Occupational Safety and Health
n. o. s.	-	Not otherwise specified
NPDES	-	National Pollutant Discharge Elimination System
NRC	-	U.S. Nuclear Regulatory Commission
NS	-	Nose swipe
NTIS	-	National Technical Information Service
NVLAP	-	National Voluntary Laboratory Accreditation Program
OHSO	-	On-Site Health and Safety Officer
ORNL	-	Oak Ridge National Laboratory
ORPO	-	On-Site Ionizing Radiation Protection Officer
OSHA	-	U.S. Occupational Safety and Health Administration
pCi	-	PicoCurie
pCi/gm	-	PicoCuries per gram
pCi/l	-	PicoCuries per liter
P.E.	-	Professional Engineer
PF	-	Protection Factor
PIC	-	Pocket Ionization Chamber
PM	-	Project Manager
PMT	-	Photomultiplier Tube
PPE	-	Personal Protective Equipment
PRP	-	Potentially Responsible Party
PRS	-	Portable ratemeter/scaler
PVC	-	Polyvinyl chloride
QA	-	Quality assurance
QC	-	Quality control
R	-	Roentgen
RA	-	Restricted (radiation) area
rad	-	Radiation absorbed dose
RAS-1	-	Kurz air sampling pump flow calibration kit
REM	-	Roentgen equivalent man
RHSC	-	Radiation Health and Safety Committee
RSO	-	VISTA Radiation Safety Officer
RWP	-	Radiation work permit
SAP	-	Sampling and Analysis Plan
SCBA	-	Self-contained breathing apparatus
SRD	-	Self-reading dosimeter
TODE	-	Total Organ Dose Equivalent
TLD	-	Thermoluminescent dosimeter
TWA	-	Time-weighted average

U <sup>nat</sup>	-	Natural uranium
UR	-	Urine sample
U.S.	-	United States
VISTA	-	Vista Technologies, Inc.
VSHP	-	VISTA Safety and Health Program
VRSP	-	VISTA Radiation Safety Program
WL	-	Working Level
WP	-	Work Plan



## DECONTAMINATION

Decontamination involves the removal of radioactive contaminants from an exposed worker or Personal Protective Equipment (PPE), as well as equipment and materials. Decontamination will be conducted under the guidance of the Vista On-site Radiation Protection Officer (ORPO) and/or On-site Health and Safety Officer (OSHO). Vista will establish an area for personnel, equipment, and vehicle decontamination, as needed. Separate, secure storage facilities will be provided as necessary for contaminated and non-contaminated materials. Contaminated workers are decontaminated to prevent possible transfer of radioactive material, especially alpha particle emitters, to internal organs by ingestion or through cuts or abrasions. Personal decontamination also is conducted to prevent the spread of radioactive contamination to unrestricted areas.

The following sections discuss personal decontamination, and decontamination of equipment, vehicles, and monitoring equipment.

### 1. DECONTAMINATION OF PERSONNEL

The purpose of this personal decontamination procedure is to describe the techniques used to remove radioactive contamination from personnel that have been contaminated at Vista project work sites. Contaminated workers are decontaminated to prevent possible transfer of radioactive material, especially alpha particle emitters, to internal organs by ingestion or through cuts or abrasions. Personal decontamination also is conducted to prevent the spread of radioactive contamination to unrestricted areas.

This procedure gives guidelines for the removal of radioactive contamination from personnel. As it is impossible to anticipate all the different circumstances under which an individual can become contaminated, this procedure lists different methods to remove the contamination. The Vista ORPO and OSHO will decide which method is most appropriate for the situation.

The applicable references are:

- 10 CFR 20, "Standards for Protection Against Radiation";
- U.S. Department of Health, Education, and Welfare, "Radiological Health Handbook"; and
- NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors".

The following sections delineate necessary supplies, radioactive decontamination facilities and specific instructions.

#### 1.1. Necessary Supplies

- Water
- Soap
- Lava soap, or equivalent

- Detergent (Tide, or equivalent)
- Hand brush, soft
- Shampoo
- Scissors
- Soft Bristle Brushes
- Ear Plugs
- Duct Tape
- Citric Acid Paste
- Ultrasonically excited water cleaning system.
- Clipboard and Pen

### 1.2. Decontamination Facilities

Decontamination facilities may consist of the following:

- A portable hand wash or shower;
- Supplies of clean water and decontamination agents;
- Supplies of PPE for dress out after decontamination;
- Storage containers for contaminated PPE; and
- Storage containers for decontamination water.

### 1.3. Specific Instructions

Begin with the first listed method and then proceed step by step to the more severe methods as necessary. After each step, check the contaminated areas with the appropriate instrumentation. All attempts should be made to decontaminate to background levels or As Low As Reasonably Achievable (ALARA) levels. In the event of injuries causing internal contamination, the Vista ORPO will consult with Vista's RSO, to determine appropriate actions to be taken.

- Remove gross contamination from suit, boots, and gloves with a broom or wet cloths, as necessary.
- Carefully remove outer boots and gloves in the exclusion zone while carefully stepping into the contamination reduction zone.
- Wash hands and face immediately upon entering the support zone with a wet cloth.
- Remove and dispose of Tyvek® or Saranex® suits and inner gloves
- Disposable Tyvek® or Saranex® suits should be removed and placed in designated containers located within the decontamination area, if contaminated, and they should be bagged or packaged to preclude the spread of contamination.
- Use a degreasing hand cleaner. Specifically, commercially available degreasers remove grease and oil from skin as well as radioactive materials. Degreasers with lanolin are particularly good at removing  $\beta$  particle-emitting contaminants.
- Citric acid paste is effective for the removal of alpha particle-emitting contaminants.

- Using soap and water, wash affected areas for 2 to 3 minutes. Repeat 3 to 4 times, if necessary. Be careful not to spread the contamination or irritate the skin. An ultrasonic excited water cleaning system, if available, should be used.
- In all cases, the water used for decontamination must be contained until it is ascertained that the water has not been contaminated above effluent release criteria specified by the Vista ORPO and OSHO.
- PPE will be required to prevent contamination of personnel who are involved with decontamination procedures. The need for such equipment will be determined by the Vista ORPO and OSHO.
- Use a new set of disposable gloves when cleaning additional equipment, including respirators or sampling devices.
- Store reusable decontaminated equipment in a secure location.
- Wash in straight detergent and water.

After removal of PPE, personnel will be "frisked" using ionizing radiation survey meters able to detect the type of ionizing radiation potentially present on-site. Frisking is the method of going over the surface of a potentially contaminated body part with an appropriate detector, allowing detection of  $\alpha$  and  $\beta$  particles, and  $\gamma$  ray radiation. Where detectable radioactivity is present on a person's hands or face, decontamination measures will be taken. Dry decontamination techniques such as the use of masking tape are preferred over decontamination techniques involving water. If necessary, the contaminated skin will be washed thoroughly with soap and water then resurveyed. A soft-bristled brush will be used for decontaminating hands. This process will be repeated, but additional decontamination will only be performed under the direction of the Vista ORPO and OSHO.

The Vista ORPO will determine whether further decontamination efforts are necessary on a case-by-case basis. Irritation and abrasion of the skin must be avoided to prevent radioactive materials from gaining access into the body through breaks in the skin.

Water used for personnel decontamination should be at approximately body temperature. The use of other than that at body temperature water may create a more difficult contamination problem and potential internal contamination.

The release limits provided in Procedure 18, "Site Access Control Radiation Work Permits (RWP)" apply to people and equipment. In practice, radioactive contamination on skin, clothing, equipment, and vehicles will be reduced to levels that are ALARA. Each incident in which a person's skin or clothing becomes contaminated above the limits specified in Procedure 18, Section 3.1.3 "Personnel Radioactive Contamination Monitoring", will require an investigation by the Vista ORPO and OSHO, with consultation with the Vista RSO.

In the event of a serious injury that also involves radioactive contamination, the victim will be decontaminated to the extent possible without aggravating the injury. The Vista ORPO and OSHO should be available to answer questions about radioactive contamination levels on the victim. If

desired by the hospital or the ambulance service, the Vista OSHO or senior on-site field technician will accompany the victim.

## 2. DECONTAMINATION OF EQUIPMENT, VEHICLES, MATERIALS, AND TOOLS

The purpose of this procedure for decontamination of equipment, vehicles, materials, and tools is to describe the techniques used to decontaminate equipment, vehicles, and materials that have been contaminated with radioactive materials at Vista project work sites. This procedure gives guidelines for the removal of radioactive contamination from equipment, vehicles, and materials.

As it is impossible to anticipate all the different circumstances under which equipment, vehicles, and materials can become contaminated, this procedure lists only a few methods for removal of contamination. The Vista ORPO will decide which method is most appropriate for the situation (e.g., depending upon level and type of contamination and equipment available at the site for accomplishing decontamination).

Applicable references for this procedure are:

- U.S. Department of Health, Education, and Welfare, "Radiological Health Handbook,";
- 10 CFR 20, "Standards for Protection Against Radiation,";
- ANSI N13.12, "Control of Radioactive Surface Contamination on Materials, Equipment, and Facilities to be Released for Uncontrolled Use,";
- Procedure 18, Section 4.1 "Release of Equipment, Vehicles and Materials;" and
- NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors."

### 2.1. Necessary Supplies

- Water
- High efficiency particulate air (HEPA) vacuum
- Detergent
- Steam/high pressure water cleaning unit
- Wire brush (or equivalent)
- Clipboard and Pen

### 2.2. Specific Instructions

All decontamination of contaminated equipment, vehicles, materials and tools will be performed in accordance with the direction of the Vista ORPO providing the job coverage, in accordance with this procedure, and the RWP requirements.

Begin with the first listed method that is practical; proceed step by step to the more severe methods as necessary.

- Using a HEPA vacuum, vacuum contaminated surfaces.

- Manually clean contaminated surfaces by wiping, scrubbing, or mopping using detergent and water. Rinse with clean water.
- Clean contaminated surfaces using a high pressure water spray. If detergent is used with the water spray, rinse with clean water.
- A nuclear criticality analysis shall be performed before using HEPA vacuums if contaminants (to be vacuumed) are suspected (or determined) to be fissile materials.
- Clean contaminated surfaces using a high-pressure steam spray. (Detergents may be used). Rinse with clean water.

In all cases, the water used for decontamination must be contained until it is ascertained that the water has not been contaminated above effluent release criteria.

If decontamination has been unsuccessful after all of these methods have been tried, the Vista ORPO will be consulted for further guidance.

Decontamination activities will be performed within a controlled area established in accordance with the provisions of the NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors."

### 2.3. Equipment, Material, and Tools

Before tools and equipment are removed from a controlled area, they will be decontaminated and surveyed for removable and fixed radioactive ionizing and non-ionizing radiation contamination. Survey readings will be compared to the allowable total residual surface contamination limits for unrestricted use specified in Attachment 43.

Only equipment meeting the equipment release limits will be tagged and designated for future unrestricted use. Equipment contaminated with removable radioactive materials in excess of the release limits can usually be decontaminated with soap and water at the decontamination stations. The following precautions will be observed:

- Work towards the center of the contamination;
- Know where the contamination lies and prevent tracking the contamination on the person or in the surrounding area; and
- Be aware that all materials used in the decontamination procedures are considered contaminated them, and need to be handled and disposed of as such.

An effort will be made by all workers at a Vista project work site to reduce contamination to levels that are ALARA. Equipment unable to be decontaminated to levels below the limits will be placed in approved and labeled containers for disposal in accordance with the Vista's waste management plan if it is no longer needed in the restricted area.

Contaminated disposable PPE will be collected and stored in separate approved and labeled containers for disposal in accordance with the facility's waste management plan. Decontamination

water and cleaning agents will be contained, sampled, analyzed, and disposed of in accordance with Vista's waste management plan.

## 2.4 Vehicles

If vehicles are brought into a restricted area, they will be screened and/or decontaminated prior to leaving the Vista project work site. Vehicles used on-site will be driven onto the vehicle pads available on site for decontamination. If inspection of the tires indicates alpha particle contamination, contamination will be removed with whisk brooms and the vehicle rechecked. Appropriate respirators will be worn during decontamination by dry brushing.

If necessary, the vehicles will be steam-cleaned to remove gross contaminants and residue. Caution will be taken when a steam cleaning unit is used to decontaminate vehicles. Steam from the unit can scald skin. The cleaning wand will be kept pointed away from personnel at all times when it is in use. All materials used for decontamination will be contained on-site.

Vehicle cabs will be surveyed for contamination and decontaminated as appropriate. Clean plastic covers will be maintained on the cab seats and floorboards to facilitate removal of any contamination, when appropriate.

## 3. DECONTAMINATION PROCEDURES

### 3.1 Pre-Decontamination Procedures

A radiological survey will be performed by the Vista ORPO or Health Physicist (HP) on any object which is to be removed from a controlled area.

If radiological survey results indicate that a RWP is required for decontamination, the Vista ORPO will write the RWP.

If a survey indicates that decontamination is required, the item should be double bagged, wrapped, or contained under the direction of the Vista ORPO. The Vista ORPO will label the item in accordance with the provisions of Procedure 18, Section 5.0 "Release of Material from Controlled Areas."

The Vista ORPO will approve or disapprove the decontamination operation based on conditions of the RWP and the cost effectiveness of the operation versus disposal costs.

### 3.2 Establishment of the Decontamination Area

The Vista PM and the Vista ORPO will determine a location for set-up of the decontamination area.

Once a location has been established, the decontamination area will be constructed under the direction of the PM and Vista ORPO.

The decontamination area should consist of:

- (a) Herculited (or equivalent) floor surfaces. A double layer of Herculite (or equivalent) may be laid on the floor at the Vista ORPO's direction.
- (b) Herculited (or equivalent) wall surfaces, if applicable.
- (c) Engineering controls (HEPA ventilation, vacuum cleaners, containment tent walls, glove bags, etc.), if applicable. Engineering controls will be determined on the basis of the ALARA considerations section of the RWP. All possible engineering controls will be utilized when feasible to minimize the usage of respiratory protection equipment.
- (d) Safe, sturdy work stations with contamination resistant surfaces. Tables that will support decontamination attempts on heavy pieces of equipment.
- (e) Adequate supply of overhead light, adequate electrical/compressed air supply for the operation of electrical/pneumatic driven decontamination equipment.

NOTE: Use caution when decontaminating with compressed air tools to minimize spread of activity in the work area. A containment with filtered inlet and exhaust is recommended.

- (f) Overhead lifting equipment, if applicable.
- (g) Adequate supply of Vista-approved cleaning solutions and solvents; adequate supply of decontamination equipment including:
  - Light duty decontamination equipment such as paper wipes, paper towels, masslinn towels, etc.;
  - Medium to Heavy duty decontamination equipment such as scrub pads, wire brushes, steel wool, files, sandpaper, etc.;
  - Fully stocked hand tool kit for disassembly of contaminated equipment;
  - Power tools, such as drills, saws, needle guns, electric screwdrivers, etc.;
  - Radioactive material storage bags, stickers, etc.;
  - Buckets, barrels or drums for the storage of contaminated liquids, sludges or slurries, if applicable;
  - Blotter paper or sorbent, if applicable;
  - Approved absorbent material such as oil dry, etc., if applicable;
  - Storage drums/bags for the storage of contaminated protective clothing under direction of Vista ORPO;
  - Proper surveillance instruments (air monitor/sampler, contamination monitor, friskers, dose rate meter, etc.) in accordance with the RWP;
  - Adequate supply of personal protective clothing, gloves, respiratory equipment, etc.;
  - Step-Off Pad or Double Step-Off Pad in accordance with the provisions of the RWP;

- A designated area within the decontamination area for the segregation of radioactive waste; and
- Fire extinguisher(s), when specified in the RWP.

Once the decontamination area has been established and stocked for operation, the bagged or wrapped contaminated or controlled equipment should be placed in the decontamination work area by the Vista ORPO. A health physics technician should always escort radioactive contaminated or controlled (red tagged) items to the decontamination area.

### 3.3. Decontamination

After radiological posting of the decontamination area, all requirements of the RWP will be observed.

The preparation for decontamination of a particular tool, material, or piece of equipment will be performed as follows:

- (a) Position the wrapped item so that the written information on the wrapping is visible.
- (b) The Vista ORPO will direct the removal of the item from the wrapping in such a manner to control the spread of contamination.
- (c) An item that is highly contaminated with transferable contamination should be misted with an approved liquid. The water vapor will wet down the particulate contamination and help prevent the possibility of airborne contamination.
- (d) Once the item has been removed from the wrapping and has been properly positioned, discard the wrapping as radioactive.

The following decontamination techniques should be considered for the decontamination of equipment, materials, and tools:

- (a) Any equipment with inaccessible areas will be dismantled so that all surfaces are accessible for decontamination and for survey.
- (b) Decontamination will be performed in a safe, effective manner.
- (c) The Vista ORPO will be notified IMMEDIATELY if the job conditions change (e.g., suspected asbestos found, presence of mercury in a switch or a light bulb, a fluid leak, or any other special circumstances).
- (d) Someone will be assigned as a firewatch if any spark-creating decontamination techniques (grinding, etc.) are used. There will be a dedicated fire extinguisher, and any additional equipment required in the RWP, located within the decontamination area when these operations are done.
- (e) In order to secure a safe cleaning surface, the item should be positioned on the work table (if size and weight allow) and locked into a vise.
- (f) The decontamination area will remain organized and free of debris. The Junior Health Physics/Decontamination Technicians will "clean as they go."



- (g) A HEPA vacuum cleaner may be used during the decontamination operation for cleanup or for small volume ventilation (containments). Permanent facility ventilation will not be used to vacuum debris.

### 3.4. Transferable Contamination Removal

When an item is properly positioned for decontamination and the pre-survey has been completed, perform the following:

- (a) Moisten the surface of the item with an approved liquid (e.g., pH adjusted SPRAY 9 or equivalent).
- (b) Fold a paper or cloth wipe into sections, using one surface of the wipe, gently wipe contamination off in ONE direction AWAY from the body. This should reduce the possibility of personnel contamination.
- (c) Re-fold the paper or cloth wipe so that a CLEAN surface is available (this should prevent cross-contamination) and continue until item is ready for survey.
- (d) For some materials, duct tape will effectively remove transferable contamination. Wrap the duct tape loosely around the gloved hand, ADHESIVE side OUT. Roll the tape over the contaminated area.
- (e) Re-survey.

### 3.5. Fixed Contamination Removal

**CAUTION:** High power removal techniques will make fixed activity loose and airborne. Controls to minimize contamination spread must be developed prior to the operation.

There are many techniques that can be used to remove fixed contamination. The techniques selected for a particular decontamination operation is at the discretion of the Vista PM and Vista ORPO. The techniques can be divided into the following categories:

- Light hand decontamination;
- Abrasive hand decontamination;
- Power tool decontamination;
- Machine decontamination (use of abrasive bead blasters, grit blasters, high pressure water wash systems, etc.);
- Cleaning solutions/solvents (use of ultrasonic cleaners, acid baths, electropolishing, etc.); and
- The specific implementation of these techniques is not included within the scope of this procedure.

Abrasive hand decontamination will be performed in the following manner:

- (a) Remove as much transferable contamination as possible as indicated in Section 3.4 of this procedure.
- (b) Moisten the surface of the item(s) to contain contamination.
- (c) Use an abrasive cleaning tool (e.g., sandpaper, steel wool, steel brush, hand grinder, etc.) to loosen fixed contamination. Clean in one direction ONLY and clean AWAY from the body to prevent personnel contamination.
- (d) Continue to moisten the surface of the item(s) to contain contamination.
- (e) Re-survey.

Power tool decontamination will be performed in the following manner only under the direction of the Vista ORPO.

**NOTE:** when using power tools, always consider the potential of injury due to the hazards involved. Power tools will be used cautiously and in accordance with manufacturer's recommendations.

Some of the electric power tools that can be used in decontamination operations are:

- 1) Drills - used to drill out contaminated areas, to disassemble contaminated components and when used with grinding wheels or disks, may be used as an abrasive tool;
- 2) Saws - used to separate contaminated pieces from clean pieces;
- 3) Grinders - used to grind fixed contamination from surfaces; and
- 4) Electric Screwdrivers - used in the disassembly of component parts.

Some of the air-powered tools that can be used in decontamination operations are:

- 1) needle gun - a pneumatic tool which can remove contamination from concrete and/or steel surfaces;
- 2) Socket tools or impact hammer - used in disassembly of component parts; and
- 3) Jackhammer/Rotohammer - a pneumatic tool which can remove contamination from concrete and/or steel surfaces.

Power tool decontamination will be performed in the following manner:

- (a) Remove as much transferable contamination as possible as indicated in Procedure 18 Section 5.0 "Release of Materials from Controlled Areas" and Section 3.4 of this Procedure.
- (b) Moisten the surface of the item lightly to contain contamination. Use a spray bottle for moistening. **DO NOT USE ELECTRIC POWER TOOLS ON A WET WORKING SURFACE. KEEP LIQUIDS AWAY FROM ELECTRIC POWER TOOLS.**

- (c) Whenever feasible the use of containment devices (e.g., glove box, etc.) should be used to contain the spread of contamination when using power tools for decontamination operations.
- (d) Use the power tool to remove fixed contamination. Clean in one direction **ONLY** and clean **AWAY** from the body to prevent personnel contamination.
- (e) Re-survey.

### 3.6. Post Decontamination

If the decontamination was successful, the Vista ORPO will perform a free release survey in accordance with Procedure 18 Section 5.0 "Release of Materials from Controlled Areas."

If the item satisfies the criteria for release as described in the above sections of this Procedure, remove the item to a holding area for disposal and document results.

If the item remains contaminated, attempt a second decontamination.

If the item remains contaminated, attempt a third decontamination **ONLY** if directed by the Vista ORPO.

If an item cannot be effectively or economically decontaminated, the Vista PM will direct the Vista work crew to volume-reduce (reduce to component parts) the equipment, material, or tools as much as possible.

If an item is volume-reduced to its component parts and decontamination is not feasible, the item parts will be considered radioactive. Radioactive waste is to be segregated into similar materials for shipment purposes by the direction of the PM. The Vista ORPO will direct the segregation of radioactive into the following categories:

- Steels, Hard Metals;
- Wood;
- Transite, Fiber Products;
- Paper;
- Rubber;
- Cloth (duct tape is considered a cloth);
- Aluminum, Soft Metals (Brass);
- Glass;
- Concrete;
- Questionable items (e.g., light bulbs, pipe with lead solder, electronic component parts) which could be considered mixed or hazardous waste; and
- Other categories, if applicable.

After all decontamination operations have been completed the Vista ORPO will perform a release survey of the decontamination area and de-post the area in accordance with Procedure 15 under "Release Surveys."

## **ATTACHMENTS**

**ACCEPTABLE SURFACE CONTAMINATION LEVELS  
FOR EQUIPMENT AND ARTICLES IN UNRESTRICTED AREAS <sup>(1,2,3,4)</sup>**

Contamination Level (dpm/100 cm <sup>2</sup> )		
	Alpha	Beta
Total	500	5,000
Removable	50	1,000

1. Where surface contamination by both alpha- and beta-gamma- emitting nuclides exists, the limits established for alpha- and beta-gamma- emitting nuclides should apply independently.
2. As used in this table, dpm (disintegration's per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.
3. The level may be averaged over 1 square meter provided the maximum surface activity in any area of 100 cm<sup>2</sup> is less than three times the guide values. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide shown above if (1) from measurements of a representative number of sections it is determined that  $1/n \sum S_i \geq G$ , where  $S_i$  is the dis/min-100 cm<sup>2</sup> determined from measurements of section  $i$ ; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm<sup>2</sup> area exceeds 3G.
4. The amount of removable radioactive material per 100 cm<sup>2</sup> of surface area should be determined by wiping that area with a dry filter of soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. (Note: the use of dry material may not be appropriate for tritium). When removable contamination on objects of a surface area less than 100 cm<sup>2</sup> is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped.