SITE SAFETY AND HEALTH PLAN

FOR

DEMOLITION OF BUILDING 401
NIAGARA FALLS STORAGE SITE
Lewiston, New York

Prepared by:

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September 11, 2003

APPROVAL

Name

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Project Manager

9/30/03
(Date)

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Mark Nicklas - Sevenson
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Stan Waligora – Environmental Dimensions Inc.
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9/30/03
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COMPLETION OF INDEPENDENT TECHNICAL REVIEW

Sevenson Environmental Services, Inc. has completed the review of the Site Safety and Health Plan for the Demolition of Building 401 at the Niagara Falls Storage Site, Lewiston, New York. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Quality Control Plan. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy.

(Signature)
Alfred LaGreca
Sevenson Environmental Services, Inc.
Corporate Project Manager

9/29/03
(Date)

Rick Haaker
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NIOSH	National Institute for Occupational Safety and Health
NFSS	Niagara Falls Storage Site
NYDOH	New York Department of Health
OSHA	Occupational Safety and Health Administration
PPE	Personnel Protective Equipment
RCP	Radiation Control Plan
SCBA	Self Contained Breathing Apparatus
Sevenson	Sevenson Environmental Services, Inc.
SPL	Sound Pressure Level
SRSO	Site Radiation Safety Officer
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SZ	Support Zone
TLD	Termoluminescent Dosimeter
TNT	2,4,6 - Trinitrotoluene
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WCS	Waste Containment Structure

ABBREVIATIONS & STANDARDS

ACGIH	American Conference of Government Industrial Hygienists
ACM	Asbestos Containing Material
AEC	Atomic Energy Commission
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CO	Contracting Officer
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
dBA	Decibels (A scale)
DOE	Department of Energy
ENG	Engineering
EMS	Emergency Medical Service
ERT	Emergency Response Team
EZ	Exclusion Zone
FUSRAP	Formerly Utilized Site Remedial Action Program
HEPA	High Efficiency Particulate Air
H_2S	Hydrogen Sulfide
LEL	Lower Explosive Limit
LOOW	Lake Ontario Ordnance Works
LO/TO	Lock Out/Tag Out
MED	Manhattan Engineer District
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association

1.0 GENERAL

This Site and Safety and Health Plan (SSHP) is written to comply with the Occupational Safety and Health Administration (OSHA) Standards and Regulations, parts 1910 and 1926, and the United States Army Corps of Engineers (USACE) Safety and Health Requirements as stated in EM 385-1-1, revised 3 September 1996. These provide the basis for the safety and health program. Additional specifications contained within this document are provided to conform to the requirements of the United States Environmental Protection Agency (USEPA), National Institute for Occupational Safety and Health (NIOSH), and American Conference of Government Industrial Hygienists (ACGIH).

2.0 PURPOSE

This Site Safety and Health Plan is designed to meet the requirements of the Contract Specifications and to:

1. Prevent injuries to employees or other persons.
2. Maintain employee exposures to health hazards well below the occupational limits established by OSHA or ACGIH.
3. Keep the exposures of area residents to air contaminants well below the levels established for general public exposure by the USEPA or New York Department of Health (NYDOH).
4. Prevent increases in the levels of contaminants in soil, water, or sediment near the site.
5. Prevent violations of OSHA, USEPA, New York or other applicable regulations.

3.0 SITE DESCRIPTION AND SCOPE OF WORK

Niagara Falls Storage Site (NFSS) is part of the United States Army Corps of Engineers' Formerly Utilized Sites Remedial Action Program (FUSRAP) established to decontaminate or control sites where residual radioactivity exceeding the current guidelines remains from the activities supported by the nation's atomic energy program.

NFSS is located at 1397 Pletcher Road, Lewiston, New York, and the site is owned by the Federal Government. The site consists of an engineered Waste Containment Structure (WCS), various buildings, and open areas (Figure 1). The site was originally a part of the Lake Ontario Ordnance Works (LOOW). The primary use of the site from early 1940s through mid 1950s was for storage, trans-shipment, and disposal of radioactive waste from various sources. Building 401 was initially the powerhouse for the production of trinitrotoluene (TNT) at LOOW, and it was also used to store radioactive materials in support of Manhattan Engineer District (MED) activities during World War II. It was used for the production of Boron-10 from 1953 to 1959 and from 1965 to 1971 and then became a waste storage facility used by the Atomic Energy Commission/Department of Energy (AEC/DOE). In 1971, Building 401 was gutted and its instrumentation and hardware were disposed of as surplus materials. The building has been largely inactive since, and evidence of bird and animal occupation has been observed. An asbestos abatement was performed on Building 401 in the spring and summer of 2002, resulting in the removal of interior asbestos containing material (ACM). Potential exterior ACM was not included as part of this abatement.

Building 401 is steel-framed four-story structure enclosing approximately 100,000 square feet of floor area. The main structural system of the building consists of steel and concrete load bearing walls supporting what may be a transite roof. The interior walls are concrete, concrete block and other construction materials. The exterior appears to be comprised of sections of corrugated steel and transite siding and roofing. Inside the building there are multiple floors, which contain rooms and offices and building service areas (boiler rooms and tower areas). There also is a tower area and high bay that may be as high as 75 feet or more. Additionally, Building 401 has three large concrete silos that shall be demolished along with the building.

The major work to be completed include:

a. Preparation of required work plans
b. Mobilization.
c. Pre-demolition radiological survey.
d. Asbestos removal.
e. Demolition of Building 401 and silos.
f. Load, transport, and dispose of demolition debris.
g. Site restoration.
h. Demobilization.

4.0 PERSONNEL RESPONSIBLE FOR SAFETY AND HEALTH

The following personnel are responsible for the safety and health program to be implemented at the site:

1. <u>Paul Hitcho - Certified Industrial Hygienist (CIH);(Certificate #2771)</u>

His duties are:

a. To develop, implement, oversee, and enforce the site-specific safety and health plan;
b. To conduct initial site specific training;
c. To provide continuing health and safety support, as needed;
d. To review results of air monitoring and accident reports;

e. To be present on site during the first three days of remedial activities and at the startup of each new major phase;
f. Be available for emergencies;
g. To coordinate any modifications to the SSHP with the Site Superintendent, the Site Safety and Health Officer (SSHO), and the Contracting Officer (CO);
h. To provide continued support for upgrading/downgrading of the level of personal protection;
i. To serve as a member of Sevenson's quality control staff;
j. Sign and date SSHP prior to submittal; and
k. Visit the site monthly to audit effectiveness of the SSHP.

2. Alfred LaGreca - Corporate Project Manager

His duties are:

a. To allocate resources to safely perform all operations; and,
b. To receive from and direct correspondence to the Contracting Officer regarding health and safety.

3. Jack Brueckl - Project Operations Manager/ Environmental Protection Officer

His duties are:

a. Overall responsibility for work operations; and,
b. To assist the SSHO in the identification of existing and predictable hazards and to take prompt corrective measures to eliminate these hazards.

4. Mark Nicklas – Site Safety and Health Officer (SSHO)

His duties are:

a. To assist in the implementation and enforcement of the SSHP;
b. To conduct air monitoring, training, site safety inspections, and accident investigations;
c. To remain on site during all project operations;
d. To have the authority to stop operations if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions;
e. To consult with and coordinate any modifications to the SSHP with the CIH, Site Superintendent, and the CO;
f. To serve as a member of Sevenson's quality control staff on matters relating to safety and health;

g. To conduct accident investigations and prepare accident reports;
h. To review results of daily quality control inspections and document safety and health findings into the Daily Inspection Log; and,
i. To coordinate and to oversee the implementation of the corrective action with site management and the CIH.

5. Rebecca Scarborough – Site Radiation Safety Officer (SRSO)

Her duties are:

a. Implement the Radiation Control Plan (RCP);
b. Radiological data analysis and report preparation.

6. To Be Determined - Site Superintendent/Competent Person

His duties are:

a. To coordinate all construction and sub-contractor activities; and,
b. To assure compliance with SSHP for all construction activities.

Sevenson's Project Operations Manager and Site Superintendent will be directly responsible for enforcing the SSHP for Contractor and Sub-contractor personnel and will report directly to the SSHO any unsafe site activities as they occur.

All modifications to the SSHP will be approved and signed by the CIH. The requested modification will not be implemented until authorized in writing by the Contracting Officer. An organizational chart and resumes can be found in Appendix A.

5.0 OCCUPATIONAL HEALTH PHYSICIAN AND MEDICAL SURVEILLANCE PROGRAM

Sevenson will utilize the services of a physician who is board certified in occupational medicine to supervise the medical surveillance program. Dr. Harvey Wentzel is a board certified occupational health physician associated with the Environmental Medicine Department of Jefferson Medical College, Philadelphia, Pennsylvania. Employee medical examinations will be conducted at the Niagara Falls Memorial Occupational Health Clinic, Niagara Falls, New York. St. Mary's Hospital, Lewiston, New York will serve as an emergency medical facility.

1. The medical examination will consist of:

a. Medical and Occupational History Questionnaire;

b. General Physical, including evaluation of all major organ systems;
c. Pulmonary Function Examination;
d. Electrocardiogram;
e. Chest X-Ray (optional);
f. Otoscopic Examination;
g. Audiometric Examination;
h. Visual Acuity Examination;
i. Blood Tests, Blood Count, Blood Profile;
j. Drug Screen.

2. A baseline examination will be given prior to the employee starting any work activities. A medical examination will be repeated under one or more of the following conditions:

   a. More than a year has passed since the employee's last examination;
   b. The employee experiences an acute exposure to a toxic, hazardous, or radioactive material, or an injury;
   c. The examining physician, the Contracting Officer, the CIH, or SSHO recommends one;
   d. At the request of an employee with demonstrated symptoms of an occupational exposure to toxic, hazardous, or radioactive materials;
   e. Employees who are leaving the job site for more than 6 months; or,
   f. Exit examinations will be given to all affected employees.

Sevenson will obtain a certification from the occupational physician that the employee is medically fit to wear respiratory protection and has no medical condition that would place him at an increased risk. No employee will be permitted to work in the exclusion zone (EZ) until his certificate has been submitted to the Contracting Officer.

All medical records will be kept for at least 30 years and will be made available to the Contracting Officer or other regulatory agencies, as required.

6.0 HAZARD/RISK ANALYSIS

During all active site work, Sevenson will implement and maintain an Accident Prevention Program to provide for a safe and accident free completion of all definable features of work. Sevenson's Corporate Health and Safety Plan was created to meet all aspects of the Accident Prevention Program found in the Contract Specifications. A copy of this plan is included in Appendix B and discussed in the Accident Prevention Program (Section 8.0 of this plan). As a minimum, Sevenson will implement the safety standards presented in USACE Requirements Manual, EM-385-1-1, revised 3 September 1996.

The hazards expected to be encountered by personnel with the exception of possible heat stress due to the wearing of protective equipment and exposure to radiologically contaminated material are common to any construction site. Some of these hazards and their applicable OSHA regulations include:

1. Fall protection - (1926.500)
2. Motorized equipment - (1926.600-604)
3. Fire protection and prevention - (1926.150-152)
4. Demolition – (1926.850)

This project involves potential contact with radiologically contaminated and asbestos containing material.

Appendix C contains an activity hazard analysis (AHA) for the project's definable features of work. Prior to the initiation of any work, procedures and methods will be reviewed and the AHAs will be modified to reflect the actual scope and sequence of work. Table 1 presents information concerning general hazard identification and their associated controls. Appropriate training for task specific hazards will be completed by field personnel prior to initiating work activities.

TABLE 1 - POTENTIAL HAZARDS AND CONTROLS

Potential Hazards	Controls
General Site Safety Rules	1. Fighting, horseplay, running and jumping, possession of firearms, possession or being under the influence of intoxicants/controlled substances is prohibited. 2. Smoking is only allowed in designated areas. 3. Eating, drinking, and chewing tobacco are prohibited during work activity. These are permitted only in approved areas. 4. Employees on medication with impaired alertness are prohibited from working on hazardous activities. 5. All fire extinguishers shall be fully charged and inspected monthly. 6. Safety signs, labels, tags, and notices apply to all employees. 7. Equipment operators must be qualified to operate the heavy equipment. All equipment must be operated safely. Spotters must be used in pinch point areas or near overhead utilities. 8. Know the emergency evacuation procedures.
Exposures to OSHA Defined Hazardous Materials	1. All chemicals brought on-site must be adequately labeled and the MSDSs available on-site. 2. MSDSs brought on-site will be organized in a MSDS binder, in alphabetical order. A chemical inventory form will be included and updated. 3. Training on OSHA defined hazardous materials will be

TABLE 1 - POTENTIAL HAZARDS AND CONTROLS

Potential Hazards	Controls
	completed and documented. Specific operations with potential for contact with hazardous chemicals have been identified, along with specific procedures for worker protection using the AHA process. 4. Follow the requirements in Section 8.0.
Heavy Equipment Operations (General)	1. Conduct pre-operational inspection of all equipment. In addition, daily inspections will be conducted on the equipment prior to site activities. Inspections will be documented using a daily inspection checklist. 2. Maintain a safe distance of 10 feet from unguarded overhead power lines. 3. Always stay out of the swing radius of all heavy equipment. Always use a spotter during movement of equipment. The spotter and others, as appropriate, shall maintain constant communication with the operator. 4. All operators must have adequate training and be qualified to operate the particular heavy equipment unit.
Hand and Power Tools	1. Keep hand tools sharp, clean, oiled, dressed, and not abused. 2. Worn tools are dangerous e.g., the "teeth" in a pipe wrench can slip if worn smooth; an adjustable wrench will slip if the jaws are sprung; hammer heads can fly off loose handles. 3. Tools subject to impact (chisels, star drills, and caulking irons) tend to "mushroom". Keep them dressed to avoid flying spalls. Use tool holders. 4. Don't force tools beyond their capacity. DO NOT USE "cheaters" 5. Don't use tools for pry bars. 6. Flying objects can result from operating almost any power tool, so you must always warn people around you and use proper eye protection. 7. Each power tool should be examined before use, for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. 8. Air must be shut off or the electric cord unplugged before making tool adjustments. Air must be "bled down" before replacement or disconnection. 9. Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place. No "homemade" handles or extensions (cheaters) are permitted!

TABLE 1 - POTENTIAL HAZARDS AND CONTROLS	
Potential Hazards	**Controls**
	10. Replace all guards before start-up. Remove cranks, key, or wrenches used in service work.
Material Handling	1. Lift with the legs; keep the natural curves of the back; do not use your back muscles. 2. Use gloves when working with sharp or abrasive objects or where splinters are possible. 3. Know the weight of objects to be handled. If the size of the object is cumbersome, get assistance, use a mechanical device or consult your supervisor. 4. Know the capacity of the handling device (crane, forklift, chain fall, come-along) that you intend to use. 5. Chock all material and equipment (such as pipes, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling. 6. Tie down all light, large-surface-area material that might be moved by the wind.
Inclement Weather	1. Stop outdoor work during electrical storms and other extreme weather conditions such as extreme heat or cold temperatures. 2. Take cover indoors or in a vehicle. 3. Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods. 4. As a general rule, work will be suspended when lighting is observed and there is a 6 second delay between the visualization of the lightning and hearing the thunder.
Noise	1. Wear hearing protection whenever you need to raise your voice above normal conversational speech due to a loud noise source; this much noise indicates the need for protection. 2. Hearing protection is required when measured sound pressure levels (SPL) exceed 85 dBA where employees stand or conduct work. 3. Conduct initial noise monitoring assessment of all operations. 4. Post noise signs Hearing Protection Required in this Area in areas where the noise levels exceed 85 dBA. 5. Participate in hearing conservation program.
Lockout/ Tagout (LO/TO) Electric Shock	1. Perform LO/TO procedures. Ensure that all applicable personnel receive LO/TO training. 2. Heavy equipment must maintain appropriate distance from overhead utilities; 10-foot minimum clearance from power lines required. 3. Use ground-fault circuit interrupters as required in Section P of

TABLE 1 - POTENTIAL HAZARDS AND CONTROLS	
Potential Hazards	**Controls**
	Appendix B. 4. Use three-pronged plugs and extension cords. 5. Contact your local underground utility-locating service, if necessary. (800-962-7962) 6. Follow code requirements for electrical installations in hazardous locations. 7. Conduct daily inspections for frayed wires or open electrical boxes. 8. Only qualified electricians are permitted to conduct repair work or live testing.
Physical Injury	1. Wear hard hats and safety glasses when on-site. 2. Maintain visual contact with the equipment operator. 3. Avoid loose-fitting clothing. 4. Prevent slips, trips, and falls; keep work area uncluttered. 5. Keep your hands away from moving parts.
Back Injury	1. Use a mechanical lifting device or a lifting aid where appropriate. 2. If you must lift, plan the lift before doing it. 3. Check you route for clearance. 4. Bend at the knees and use leg muscles when lifting. 5. Use the buddy system when lifting heavy or awkward objects. 6. Do not twist or jerk your body while lifting.
Heat Stress	1. Increase water intake while working. 2. Minimize and/or avoid alcohol intake the night before working in heat stress situations. 3. Increase number of rest breaks and/or rotate workers in shorter work shifts; take breaks in shaded areas. 4. Watch for signs and symptoms of heat exhaustion and fatigue. 5. Plan work for early morning or evening during hot months. 6. Use ice vests when necessary. 7. Rest in cool, dry areas. 8. In the event of heat syncope (fainting), exhaustion, or stroke, bring the victim to a cool environment and initiate first aid procedures. 9. Follow ACGIH Heat Stress Guidelines for Monitoring and establishing a work/rest regimen. (Appendix F).
Cold Stress	1. Take breaks in heated shelters when working in extremely cold temperatures. 2. Remove the outer layer of clothing and loosen other layers to

TABLE 1 - POTENTIAL HAZARDS AND CONTROLS	
Potential Hazards	**Controls**
	promote evaporation of perspiration, upon entering the shelter. 3. Be aware of cold stress symptoms such as shivering, numbness in the extremities, and sluggishness. 4. Follow procedures outlined in Appendix G. 5. Drink warm liquids to reduce the susceptibility to cold stress.
Insects Outdoor Work, if Required	1. Tuck pants into socks. 2. Wear long sleeves. 3. Use insect repellent. 4. Avoid contact by always looking ahead to where walking, standing, sitting, leaning, grabbing, lifting, or reaching-in-to. 5. Check for signs of insect/spider bites, such as redness, swelling, and flu-like symptoms. 6. Use buddy system to check each other for signs of insect/spider bites. 7. Remove ticks immediately with fine tipped tweezers by grasping the tick as close to your skin as possible and gently pulling straight out. Do not squeeze the tick's body as this may inject fluids into you. Wash the bite area of skin and apply antiseptic. 8. If you have known or suspected allergies, carry an Epi-Pen at all times and notify co-workers that you are allergic.
Poisonous Plants (such as Poison Ivy, or Oak or Sumac) if outdoors where identified	1. Don't enter areas infested with poisonous plants; learn to identify them.. 2. Immediately wash any areas that come into contact with poisonous plants. 3. Protect exposed skin area with gloves and Tyvek suits and barrier creams. 4. Be aware that the oil from the plant can be carried on boots, clothes and equipment. Always protect skin from contact.
Fire Control	1. Smoke only in designated areas. 2. Keep flammable liquids in closed containers. 3. Keep site clean; avoid accumulating combustible debris such as paper. 4. Follow Hot Work Safety Procedures when welding or performing other activities requiring an open flame. 5. Isolate flammable and combustible materials from ignition sources.

TABLE 1 - POTENTIAL HAZARDS AND CONTROLS	
Potential Hazards	**Controls**
	6. Ensure fire safety integrity of equipment installations.
Biological Agents (Histoplasmosis and fungal)	1. Know symptoms – flu-like with fever, cough, and headaches. 2. Wear personal protective equipment (Level C) when working in area of bird and/or animal droppings. 3. Visual inspection and sampling may be necessary to determine type and extent of contamination. 4. Training program which outlines the disease, cause(s) of the disease, prevention of exposure, symptoms, and treatment.
Equipment Decontamination	1. Wear modified Level D protection, including a face shield and safety goggles. 2. Ensure that other personnel are out of the area prior to decontamination. 3. Secure the area around the decon pad with cones, caution tape, or barricades. 4. Ensure that safe work practices and precautions are taken to minimize the potential for physical injury from high pressure water spray. 5. Pressure washer wand must be equipped with a safety release handle. 6. Ensure that area is clean after equipment is decontaminated. Barricades, cones, or caution tape must be left in place and secured at all times.
Maintenance	1. Wear appropriate PPE to avoid skin, eye, and inhalation contact with contaminated groundwater and/or soil. 2. Stand upwind when conducting tasks and minimize possible inhalation exposure. 3. Conduct air monitoring to determine level of respiratory protection. 4. Isolation of equipment from process. 5. Proper tools and parts.
Exposure to Radiological Contamination	1. Air monitoring. 2. Use of PPE. 3. Participation in medical surveillance program. 4. Training; Hazard Communication Program. 5. Rad Worker Training. 6. Dosimetry Program.
Exposure to Asbestos	1. ACM removal to be done in compliance with EPA and New

TABLE 1 - POTENTIAL HAZARDS AND CONTROLS	
Potential Hazards	**Controls**
Containing Material	York State Department of Labor regulations. 2. Areas which contain ACM are to be isolated. 3. Work done under the provisions of the asbestos removal plan. 4. Workers licensed by the state are the only ones permitted to handle ACM.
Fall Protection (See Section Gg of Appendix B)	1. Implement at heights greater then 6 feet. 2. Training – nature of fall hazards, correct usage of chosen fall protection system, and responsibilities. 3. Systems – guardrail, personal fall arrest, safety net, and warning line. 4. System inspected before each use.
Possible Exposure to Lead	1. Determination of extent of lead contamination and possible exposure to personnel. 2. Lead awareness training. 3. Use of PPE, biological and monitoring.

7.0 SAFETY TRAINING

The SSHO or designee will provide and require that all personnel assigned to or entering the site complete training or refresher sessions. Training and refresher sessions will assure that all personnel are capable of and familiar with the use of safety, health, respiratory, and protective equipment and with the safety and security procedures required for this site. The training session will include the OSHA mandated 40 hour training course for new Sevenson personnel, as well as refresher courses for those persons who have had this training. Supervisors will have completed an additional 8 hours of supervisor training per 29 CFR 1926.65.

Documentation will be kept on file, which certifies that each employee or subcontractor employee has satisfied the requirements of the OSHA training regulation 1926.65 (e).

There will be at least two people (Mark Nicklas and Rebecca Scarborough) present on site who will be trained and certified in Standard First Aid and Adult Cardiopulmonary Resuscitation (CPR) as required by the Contract Specifications.

1. The CIH and/or the SSHO will provide and conduct a training program on site for all site personnel prior to commencing work within the Exclusion Zone (EZ). This training program will address as a minimum the following topics:

a. Potential hazards;
b. Biology, chemistry and physics of hazardous materials;
c. Rights and responsibilities of workers under OSHA, New York Right to Know Act, and Sevenson's Hazard Communication Program;
d. Standard safety operating procedures;
e. Types of monitoring equipment to be used;
f. Site Safety and Health Plan;
g. Internal and external communications;
h. Medical surveillance program;
i. Personal protective clothing and equipment;
j. Respiratory equipment including training and qualitative fit-testing for full face piece respirators;
k. Air monitoring program;
l. Decontamination procedures;
m. Evacuation, first aid, and emergency procedures dealing with fire and medical situations;
n. Work zones established at the site;
o. Safe work practices associated with employee's work assignment, including dust control measures, hazardous materials recognition, and use of the buddy system;
p. Basic operational safety, emphasizing hazards expected on site;
q. Fall protection;
r. Prohibitions (inside EZ and CRZ), including:

   1. Glasses and/or facial hair, such as beards or long sideburns, which interfere with respirator fit;
   2. Eating, drinking, smoking, and/or chewing in the EZ or CRZ;
   3. Wearing of personal articles, e.g. watches, rings, etc.; and
   4. Working when ill.

2. All personnel assigned to the site will receive the site-specific safety and health training. Upon completion of this training, a training acknowledgment log will be completed and submitted to the Contracting Officer. The training acknowledgment logs will include provisions for the following information:

a. Employee or visitor's name.
b. Verification of topics covered, including:

   1. Materials used;
   2. Equipment demonstration;
   3. Hands-on equipment practice for each employee;
   4. Prohibitions covered;
   5. Buddy-System explanation; and,
   6. Standard operating procedures.

c. Date and signature by trainee and trainer.

3. All personnel will participate in Radiation Worker Training provided by Sevenson's Corporate Radiation Safety Officer. The contents of the training can be found in Appendix I. In addition all personnel are to participate in the NFSS site specific health and safety orientation meeting and awareness training.

   A sample of a Training Acknowledgment Log is included in Appendix E.

   There may be additional safety training sessions conducted by the CIH or SSHO throughout the duration of the project. The purposes of these training sessions are to reinforce the proper procedures, to correct any deficiencies noted in the safety and health program, and to prepare the workers for any change in the safety and health plan due to changes in the operations or unanticipated problems.

   Material Safety Data Sheets will be available at Sevenson's Health and Safety trailer and a copy will be sent to the Contracting Officer. Personnel will be instructed on the location and content of each new MSDS when it is received. Documentation of this training will be submitted to the Contracting Officer. Documentation will include the topic(s) covered and a signed list of attendees.

   All on site personnel (contractor, subcontractor(s), and government representatives) will participate in daily safety tailgate meetings that address the health and safety concerns presented by the project's definable features of work. Training attendance and topics will be documented in a daily sign-in log (Appendix E). The CIH will delegate the day-to-day implementation of these follow-up training sessions to the SSHO.

4. All visitors will be required to undergo a training program conducted by the SSHO provided that training does not prevent the SSHO from performing his designated duties subsequently causing a delay in site work. The training will consist of:

   a. Hazards present at the site;
   b. Effects of these hazards;
   c. Progress of work and the relationship of the present work in regard to the type of hazards that may be encountered;
   d. Emergency signals and procedures;
   e. Type and limitations of personal protective equipment in use;
   f. Proper use of protective equipment;
   g. General safety rules and policies in effect at the site; and,
   h. Completion of a training acknowledgment log.

If a visitor does not, for any reason, obtain the required site training nor have the required OSHA training and medical examination, they will not be permitted in the Exclusion Zone.

8.0 ACCIDENT PREVENTION PROGRAM

Sevenson has developed a comprehensive Accident Prevention Program hereto referred as the Corporate Health and Safety Plan which follows the requirements listed in 29 CFR 1926 and the USACE Safety and Health Manual EM385-1-1. Some of the more important features of the program are:

1. Statement of company policy;
2. Delegation of responsibility;
3. A self inspection guide;
4. Safety meetings;
5. Outline of topics suitable for safety meetings;
6. Fire prevention program;
7. Posting requirements;
8. Assured equipment grounding conductor program;
9. Policy for violation of safety rules;
10. Accident investigation;
11. General safety rules for employees;
12. Lock out/tag out procedure;
13. Confined space entry;
14. Training requirements; and
15. Safety inspection policy and procedures.

A copy of the Corporate Safety and Health Plan can be found in Appendix B.

Sevenson's Operations Manager is responsible for the administration of the Accident Prevention Program. The CIH is responsible for the implementation and overview of the program while the SSHO will manage the program on a daily basis. The SSHO will determine whether any of the safety rules are being violated, advise the employee(s) on the proper procedure(s), initiate any disciplinary action(s) which may be required, conduct the daily safety inspections, investigate all accidents, and make recommendations that will correct all unsafe conditions.

It is anticipated that all phases of the project will have essentially the same types of hazards present, and there will be no change in the emphasis of Sevenson's Accident Prevention Program.

All subcontractors will also be required to follow Sevenson's Accident Prevention Program. Subcontractor personnel will be trained in the content and procedures associated with the program. The SSHO will be responsible for determining subcontractor compliance with this program.

There will be daily safety meetings conducted by the SSHO. The topics will be developed in conjunction with the CIH. All on site personnel will be required to attend the safety meetings. A log will be kept of the attendees and subjects covered.

1. Additional Topics

   a. Cutting and Welding: All cutting and welding ("hot work") operations will require a burning permit signed by the SSHO. The burning permit will require the following information:

      i) Percent oxygen level;
      ii) Percent of lower flammable limit;
      iii) Vapor concentration;
      iv) Availability of fire extinguisher;
      v) Location of nearest combustibles;
      vi) Welding/burning operations in compliance with OSHA regulation 1910.252; and,
      vii) Designated fire watch.

   The testing of the atmosphere will be the SSHO or his designee's responsibility and a copy of the Hot Work Permit can be found in Appendix E. At each hot work location an individual will be designated as fire watch. This person's sole responsibility shall be to monitor the hot work and have immediate access to a fire extinguisher located at each hot work site.

   b. Fire Prevention: Basic fire prevention measures will be followed. A fire alarm plan is included in Emergency Response and Contingencies Section 19.0. Fire extinguishers will be inspected and tagged monthly as required by NFPA 10.

   c. Housekeeping: The site will be kept in a neat and orderly fashion. Non-contaminated refuse will be disposed of on a regular basis. The disposal of contaminated material is discussed in Personnel and Equipment Decontamination Section 16.0. Sanitation will be provided in accordance with the personal decontamination procedures outlined in Personal and Equipment Decontamination Section 16.0.

   d. Heavy Equipment Inspection: All equipment will be inspected by the operator prior to use. A form has been developed for this purpose, which can be found in Appendix E. Motorized equipment will be checked to see that brake and steering mechanisms are in working order and that all alarm systems and safety guards are operational. Electrical equipment will be checked to determine whether it is properly grounded and there are no frayed cords or other obvious defects.

e. First Aid: There will be two persons (Mark Nicklas and Rebecca Scarborough) on site at all times during actual work hours trained and certified in first aid and cardiopulmonary resuscitation. There will also be an industrial first aid kit located in the site office. All injuries and/or illnesses will be reported to the SSHO who will then decide on the proper course of treatment i.e., routine first aid or emergency medical treatment. The emergency medical treatment facility and the route to be followed to get there is discussed in Emergency Response and Contingencies Section 19.0.

f. Accident Reports: All accidents, occupational illnesses, and exposure events will be reported to the SSHO who will then investigate the accident and make recommendations to prevent its reoccurrence.

g. Inspections: The SSHO will make safety inspections of the site. A checklist has been developed for this inspection which can be found in Appendix E. All safety hazards will be immediately corrected.

9.0 HEAT STRESS

Heat stress is one of the most common hazards encountered at a site, and there are a number of factors that have an effect in determining the amount of heat stress experienced by an individual worker. These factors include environmental conditions, type of clothing worn, workload, and individual characteristics. Since heat stress is a common hazard and has the potential to become a serious illness, Sevenson has developed a program to protect its employees. A copy of this program can be found in Appendix F.

10.0 COLD STRESS

During colder months (temperatures <40°F), Sevenson will monitor for cold stress. The wind speed and temperature will be determined by the on site weather station. All workers will be trained in the Sevenson Cold Stress Program (Appendix G).

11.0 HEARING CONSERVATION

When noisy operations make normal conversation difficult, sound level pressure meter readings will be taken to document noise exposure to on site personnel. Previous sound level pressure readings have been taken and it has been determined that the heavy equipment exceeds 85 decibels A Scale (dBA). Therefore, all operators and laborers in close proximity to the equipment will participate in a hearing conservation program. The hearing conservation program consists of the use of personal protection (ear plugs and/or muffs), audiometric examinations, and employee training. All on site employees are given the audiometric examination and the training.

12.0 STANDARD SAFETY OPERATING PROCEDURES

1. The following general safety rules will be in effect for all site personnel:

   a. Eating, drinking, smoking, chewing gum or tobacco, applying and wearing make up, and other practices that increase the probability of hand-to-mouth transfer and ingestion of hazardous material is prohibited in any area designated contaminated.

   b. Hands and face shall be thoroughly washed upon leaving the work area and before eating, drinking, urinating, or other activities.

   c. Medicine and alcohol can increase the effects of exposure to toxic chemicals. Therefore:

      1. Personnel using prescription drugs shall inform the doctor who prescribed them of their potential contact with toxic materials.
      2. Personnel who take over-the-counter drugs within a day before work on a site must inform the SSHO of the warnings listed on the drug's container (the part of the label that says, for example, "Do not take this medication if you are operating a motor vehicle").
      3. Alcoholic beverage intake shall be prohibited during project operations. Personnel under the influence of alcohol or recreational or illegal drugs will not be allowed on site.

13.0 LEVELS OF PROTECTION/PERSONAL PROTECTIVE EQUIPMENT

Sevenson will provide for its personnel all necessary protective clothing and equipment and maintain it in accordance with the manufacturer's specifications. All equipment will be NIOSH approved.

All of Sevenson' personnel who are required to wear a respirator will have to pass a fit test given in accordance with 29 CFR 1926.58. Fit tests will be given on a bi-annual basis unless a significant loss/gain of body weight or a new respirator is issued. Respirators will not be interchanged between workers without cleaning and sanitizing. Cartridges will be changed daily or upon increased resistance.

Respirators worn in a radiologically contaminated area must be surveyed by a radiation safety technician before donning respirator.

Prescription glasses worn on site will be safety glasses. Prescription lens inserts will be provided for all employees who wear a full face air purifying or supplied air respirator.

All PPE worn on site will be decontaminated or properly disposed of at the end of the work day.

1. The following are the various levels of protection that will be in effect for this project:

    a. Level D

        1. Work Clothing, as dictated by the weather
        2. Safety (steel toe/shank) shoes or boots
        3. Hard hat
        4. Safety glasses, goggles, or face shield
        5. Hearing Protection (for noisy areas)
        6. Optional: Latex surgical gloves with cotton liners, disposable boot covers

    b. Level D Modified

        1. Same as for Level D, plus:
        2. Disposable, hooded, one-piece, full-body coveralls.
        3. Overboots of (minimum) 60 mil rubberized PVC or neoprene. Disposable type overboots allowed for equipment operators.
        4. Cotton knit gloves and nitrile gloves.

    c. Level C

        1. Level D modified PPE and;
        2. Full or half facepiece, air purifying respirator (NIOSH approved) equipped with cartridges approved by NIOSH for particulates and organic vapors.

    d. Level B

        1. Level D modified PPE and;
        2. On demand SCBA or Supplied Air Line Respirators with a 5 minute escape bottle.

The initial minimum level of protection for each major site activity is outlined below. Sevenson will conform to the initial levels of protection unless an upgrade or downgrade is warranted by air monitoring data and an evaluation of work practices/controls.

TASK	LEVEL OF PROTECTION IN EXCLUSION ZONE	
Mobilization	Initial: Contingency:	D D Modified
Pre-demolition Radiological Survey	Initial: Contingency:	D D Modified
Asbestos Removal	Initial: Contingency:	D Modified C
Demolition	Initial: Contingency:	D D Modified
Load Debris	Initial: Contingency:	D D Modified
Site Restoration		D
Demobilization		D

2. Personal protective upgrade will only occur when the SSHO or SRSO makes the change based on site activity, air monitoring of contaminant levels, and work place practices as specified in this plan.

3. The following provisions apply to respiratory protection:

   a. Employees who are required to wear respirators must pass a pulmonary function test;
   b. Each time a respirator is donned the employee must perform a positive pressure/negative pressure fit test;
   c. No facial hair which interferes with a satisfactory fit is permitted. A "two day" growth of beard is considered to interfere with the fit; and,
   d. Cartridges and filters shall be changed daily or more frequently if breakthrough or increased resistance occurs.

A copy of Sevenson's complete Respiratory Protection Program can be found in Section O of Sevenson's Corporate Health and Safety Plan found in Appendix B.

14.0 CONFINED SPACE ENTRY

A Confined Space Entry Program will be required when employees enter into tanks, sewers, trenches greater that 4 feet in depth, or any place with limited ventilation and not designed for human habitation. Prior to entry into a confined space, the SSHO or designee will review with the affected personnel all potential hazards, proper work procedures, required safety equipment, and emergency procedures.

As part of Sevenson's Confined Space Entry Program, the following actions will be completed prior to entry:

1. Pre-planing of all operations with those both directly and indirectly involved, including rescue teams;
2. Notification of the Operations Manager and other proper authorities of the planned entry and actions to be taken;
3. Working out all emergency signals with all involved in the confined space entry;
4. Have a complete list of emergency telephone numbers for police, fire, hospital, and emergency rescue units as well as directions and map of routes to nearest hospital and emergency treatment facility found in Figure 2;
5. Having all safety equipment readily available;
6. Having all mechanical equipment thoroughly checked and in proper working order prior to initiating any confined space activities;
7. Checking all retrieval lines and safety harnesses for unusual signs of wear and making sure the Self-Contained Breathing Apparatus (SCBA) is fully charged;
8. Calibration and rezeroing of portable gas detectors daily or more often, per manufacturer's instructions;
9. Blanking off, bleeding, blocking, securing, and isolating the confined space to a zero-mechanical state;
10. Lockout and tagout all electrical and mechanical equipment including verification that it is properly locked out by attempting to start equipment.
11. Considering all manholes, pump station wet wells, and confined spaces dangerous before entry until proven safe; and
12. Preparing a Confined Space Entry Permit for each manhole or other confined space to be entered. The form can be found in Appendix E. A copy of the completed confined space entry permit must be posted at the entry into any Permit Required Confined Space.

All confined spaces will have their atmosphere tested prior to entry. The following air tests will be taken:

a. Oxygen level;
b. Presence of organic vapors;
c. Potentially explosive atmospheres;
d. Detection of Carbon Monoxide and Hydrogen Sulfide (H_2S); and,
e. Real time particulate.

If necessary, Sevenson will ventilate the confined space prior to employees entering and during all phases of work. A positive draft will be maintained into the confined space. The SSHO or designee will also continuously monitor the atmosphere of the confined space using portable combustible gas, oxygen deficiency, and toxic gas detectors during all activities which require employees to enter the confined space.

An oxygen deficient atmosphere has a percent oxygen concentration below 19.5%. An oxygen enriched atmosphere is above 22%. Excessive organic vapor concentrations occur when the level is above 100 parts per million (ppm). A flammable atmosphere has a reading above 10% of the Lower Explosive Limit (LEL). Excessive hydrogen sulfide concentrations occur when the measured level is above 5 ppm. Excessive particulate is above 100ug/m^3. This testing will occur at all depths (top to bottom) of the confined space.

Finally, the SSHO or designee will verify that the confined space is isolated from all unwanted forms of energy and material.

At the present time no confined space entries are planned as part of this project.

15.0 SITE CONTROL

1. Signage: The SSHO or designee, will provide, install, and maintain signs and other warning devices to inform site personnel and the public of the hazards present at the site.

   In addition, areas of special hazards, such as open excavations, will be posted with a hazard warning banner or sign.

2. Zones: Sevenson will clearly layout and identify all work areas in the field and will limit equipment, operations, and personnel in the area as defined below:

   a. Exclusion Zone (EZ) (Hazardous or Contaminated Zone)

      This includes all areas which are found to be significantly contaminated with material above the limits detailed in the Radiation Control Plan and where asbestos removal occurs.

      The EZ will be clearly delineated in the field prior to commencing site work by orange safety fencing and/or warning tape placed around the perimeter of the zone.

      Access from the Support Zone (SZ) into the EZ will be controlled by surrounding the Contamination Reduction Zone (CRZ) with stakes, flagging, and warning signs.

      Access to the EZ will be restricted to personnel who are wearing the proper personnel protective equipment, have received the required medical examination, and have undergone the safety and health training required by the SSHP. Eating, drinking, smoking, or chewing are prohibited in this area.

b. Contamination Reduction Zone (CRZ)

This zone will occur at the interface of the EZ and the Support Zone and will provide for the transfer of construction materials and equipment, the decontamination of transport vehicles handling contaminated soil prior to entering the Support Zone, the decontamination of personnel and clothing prior to entering the Support Zone and for the physical segregation of the Support Zone from the EZ. All materials, equipment, tools, and vehicles removed from this zone for uncontrolled release must be certified as uncontaminated by the SRSO or her designee.

Access to the CRZ will be restricted to personnel who are wearing the proper personal protective equipment, have undergone the required medical examination, and have participated in the training program outlined in the SSHP. Eating, drinking, or smoking is prohibited in this area.

c. Support Zone (SZ)

This area is the remainder of site and is defined as being an area outside the CRZ and EZ. The SZ will be clearly delineated and procedures will be implemented to prevent active or passive contamination from the work site. The function of the SZ includes:

1. An entry area for personnel, material, and equipment to the CRZ;
2. An exit area for decontaminated personnel, materials, and equipment from the CRZ;
3. The housing of site special services; and,
4. A storage area for clean, safety and work equipment.

The SZ will be clearly delineated in the field. As asbestos removal and demolition proceed throughout the site, the zones will be modified.

3. Emergency Telephone Numbers: The following emergency telephone numbers will be posted at all on-site telephones:

EMERGENCY PHONE NUMBERS		
	CONTACT	TELEPHONE NUMBER
1.	Ambulance	911 or 716-284-4228
2.	Police Department	911 or 716-754-8477
3.	Fire Department	911 or 716-754-4487
4.	Paul J. Hitcho, PhD, CIH Sevenson	716-284-0431
5.	Physician a. Name: Dr. Harvey Wentzul b. Address: Jefferson Medical College Philadelphia, PA 19207	(Non-emergency occupational exposure information only) 215-955-8381
12.	Emergency Treatment Facility a. Name: Mt. St. Mary's Hospital b. Address: Lewiston, NY	716-298-2325 (Emergency Room)

16.0 EQUIPMENT & PERSONNEL DECONTAMINATION

1. Personnel Decontamination: Sevenson will provide:

   a. Contained storage and disposal for used disposable outerwear;
   b. A shower trailer;
   c. A facility for changing into and out of and storing work clothing separate from street clothing; and,
   d. A lunch and/or break room.

   Personnel decontamination consists of the following steps:

   a. Disposable PPE will be removed and discarded into properly labeled "contaminated material" impermeable receptacles;
   b. At the end of the work day non-disposable PPE such as respirators will be washed in a low sudsing detergent, rinsed with warm water, and wiped dry with a disposable cloth;
   c. Decontaminated PPE will be stored in a secure area of the SZ;
   d. All personnel will be required to wash their hands and face prior to eating and/or smoking; and,
   e. Steps for Level B, Level C, and Modified Level D decontamination can be found in Appendix H.
   f. Working will be frisked as they leave a radiation control zone.

2. Equipment decontamination: All equipment will be decontaminated by wash down in the CRZ prior to maintenance work. Maintenance work such as greasing heavy equipment need not require decontamination unless the job requires body contact with soil.

   Equipment decontamination will consist of the following steps:

   a. All equipment in the EZ will be assumed to be contaminated and will be surveyed for contamination before it leaves the work zone;
   b. At the decontamination pad, all visible contamination will be removed with scrub brushes and high pressure water spray; and
   c. The equipment will be scanned to determine whether it meets the release criteria.

   In order to institute and enforce this decontamination program, the SSHO and SRSO will be required to complete and sign a Certificate of Decontamination (Appendix E). This certificate will contain the following information:

   a. Date;
   b. Equipment being surveyed;
   c. Decontamination procedure used;
   d. Signature of SSHO and SRSO.

   All equipment must be approved for release by the USACE.

17.0 EMERGENCY RESPONSE AND CONTINGENCY PLAN

Pre-emergency planning, responsibilities, and emergency first aid information are presented below.

Pre-Emergency Planning

Based on a preliminary needs analysis, the type of potential emergencies include fire, explosion, medical emergencies, and extreme weather conditions. In addition, a hospital location map and directions (Figure 2) and appropriate emergency first aid information are also included (Table 2). The information will be posted and will be available at each active work area.

Responsibilities:

Emergency Coordinator (EC) (SSHO) / Mark Nicklas

- Must be competent to recognize an emergency situation (on-site), and take appropriate action
- Notifies Emergency Medical Services (EMS) through site security (if possible)
- Notifies Sevenson's Management
- Notifies USACE representative
- Notifies the local and state authorities, as appropriate
- Documents the events of the emergency and assists in follow up reporting
- Administers first aid (as required)
- Attends to the cause of the emergency
- Initiates spill response measures (as required)
- Determines if all site personnel are accounted for
- Informs EMS personnel of applicable PPE to be worn and hazards to be expected
- Provides EMS personnel with applicable PPE. Emergency PPE kits must be available at all times
- Guides emergency service personnel into and away from the emergency area
- Provides for a means of minimizing the spread of contamination to EMS personnel and EMS vehicles

Emergency Medical Services (EMS)

- Initially reports to the Support Zone trailer and meets the EC
- Receives pertinent information from the EC
- Acts on emergency as necessary

Site Personnel

- Exit the Exclusion Zone, when required, in an orderly manner
- Follow instructions from the EC
- Meet at assembly area

EMERGENCY FIRST AID

FIRST AID

Ingestion: DO NOT INDUCE VOMITING. Call Poison Control - follow instructions. Administer CPR, if necessary. Seek medical attention.

Inhalation:	Remove person from contaminated environment. Administer CPR if necessary. Seek medical attention.
Skin Contact:	Brush off dry material, remove wet or contaminated clothing. Flush skin thoroughly with water. Seek medical attention if irritation persists.
Eye Contact:	Flush eyes with water for 15 minutes. Seek medical attention.
Exposure Symptoms:	Headache, dizziness, nausea, drowsiness, irritation of eyes, nose, throat, breathing difficulties.
Contingency Plan:	Report incident to Project Manager (PM) and SSHO after emergency procedures have been implemented.

RESPONDER MUST HAVE A CURRENT CERTIFICATE TO ADMINISTER FIRST AID OR CPR

EMERGENCY PROCEDURES

1. Survey the situation. Do not endanger your own life.

2. Call 911 IMMEDIATELY. Explain the physical injury, chemical exposure, fire, or release.

3. Decontaminate the victim without delaying life-saving procedures.

4. If victim's condition appears to be non-critical, but seems to be more severe than minor cuts, he/she should be transported to the nearest hospital by trained EMS personnel: let the doctor assume the responsibility for determining the severity of the injury. If the condition is obviously serious, EMS must transport the victim.

5. Notify the PM and the SSHO. Complete the Incident Report within 24 hours.

ON-SITE EQUIPMENT AND PROCEDURE

Sevenson Environmental Services, Inc. will provide first aid supplies and equipment, emergency eyewash stations, emergency deluge showers, and potable water for all on-site work. Water for emergency eyewash and shower will be treated with bactericide and tempered. This unit will be protected from contamination and comply with ANSI Z358.1.

At least one fully stocked industrial first aid kit and stretcher will be provided and maintained. Additional first aid stations will be provided, as necessary. These kits will be adequately marked (highly visible) and will include buffer solutions for treating caustic burns. An adequate water supply will also be provided at first aid locations. In addition to first aid kits, the site will be supplied with an adequate number of bloodborne pathogens exposure control kits.

Emergency Equipment

In addition to those items specified elsewhere, the SSHO will maintain the following equipment and protective clothing in the event of emergencies:

- Emergency eye-wash bottles and a water bottle
- Fire extinguishers
- Three complete sets of Modified Level D PPE
- Air horns
- Portable, two-way radios
- Emergency eye wash station

TABLE 2
CONTINGENCY PLANS FOR SITE EMERGENCIES

Situation	Action
Evacuation	1. Immediately notify all on-site personnel of an emergency requiring evacuation. 2. Leave the dangerous area and report to the on site trailer area or security post, which ever is safest. 3. Notify EMS, as appropriate. 4. Account for all personnel. 5. Contact the Superintendent, the SSHO, and USACE as soon as possible. 6. Maintain site security and control measures for community safety until emergency responders arrive.

TABLE 2
CONTINGENCY PLANS FOR SITE EMERGENCIES

<table>
<tr><th>Situation</th><th>Action</th></tr>
<tr><td>Medical Emergency/ Accidents Chemical Exposure</td><td>1. Survey the situation:
Do not enter an area that may jeopardize your safety.
• Establish the patient's level of consciousness.
• Call for help.
• Contact EMS and inform them of patient's condition.
2. Primary assessment (patient unconscious)
• Arousal
• Airway
• Breathing
• Circulation
3. Secondary assessment (patient conscious)
• Check for bleeding: Control with direct pressure.
• Do not move patient (unless location is not secure).
• Monitor vital signs.
• Provide First Aid to the level of your training.
4. If chemical exposure to the skin or eyes, immediately move the victim to the emergency eyewash/shower and flush the affected area for at least 15 minutes. Contact EMS immediately.

If inhalation occurs, personnel will be removed from the contaminated atmosphere. Give artificial respiration if necessary. Call EMS or transport to the hospital if the condition is serious or could potentially be serious.

If ingestion occurs, contact the poison control center and have the affected personnel evaluated by a physician.</td></tr>
<tr><td>Fire/Explosion Emergency</td><td>All fires and explosions must be reported using the Sevenson Environmental Incident Reporting system. A fire that cannot be readily extinguished with a fire extinguisher will be considered major and will require evacuation of personnel to safe refuge areas. The SSHO will notify the local fire department and the Superintendent who will in turn notify USACE. The SSHO coordinate with fire emergency personnel as follows:

1. The local fire department and other emergency services will report to the on-site trailer to receive instructions from the EC or SSHO.

2. Briefly explain the nature of the emergency:
• Identify themselves by name
• Location of emergency
• Description of emergency</td></tr>
</table>

<table>
<tr><th colspan="2">TABLE 2
CONTINGENCY PLANS FOR SITE EMERGENCIES</th></tr>
<tr><th>Situation</th><th>Action</th></tr>
<tr><td></td><td>• Conditions that may require special rescue equipment, such as confined spaces, excavations, and elevated work platforms
• Potential chemical hazards and recommended PPE
• Estimated wind speed and direction
• Whether or not an explosion or fire is involved
• Emergency decontamination procedures

Note: Unless otherwise specified by the SSHO emergency decontamination procedures will consist of removing disposable PPE and ensuring that visible contamination is removed from personnel and equipment.

3. Escort emergency services personnel to the location of the emergency, ensure that PPE is available and properly donned by emergency services personnel, and that emergency decontamination procedures are conducted.

Note: No personnel will enter the Exclusion Zone without a partner. Line-of-site contact between rescue/response personnel and support will be maintained.

4. The SSHO will guide emergency services personnel while they are on site so that public health hazards, safety hazards to other site personnel, and environmental concerns are minimized. This should allow emergency services personnel to focus their attention on the emergency.

5. If personal injuries result from any fire or explosion, follow Sevenson's Incident Reporting Procedures.

6. The SSHO or designee will administer medical procedures to injured personnel as required and attend to the cause of the emergency (i.e., turn off leaking valve, shut down equipment), if possible.</td></tr>
<tr><td>Emergency Reporting</td><td>Any emergency or accident will be reported to the Superintendent and USACE. The SSHO will review all emergency or accident reports and may further investigate any such report if necessary. The SSHO will assist in ensuring that OSHA is notified should the emergency cause three or more personnel to be injured and transported to the hospital, or if there is a fatality. During and immediately following the emergency situation, SSHO will:

1. Notify the Superintendent, SRSO, and USACE.</td></tr>
</table>

TABLE 2
CONTINGENCY PLANS FOR SITE EMERGENCIES

Situation	Action
	2. Ensure that the examining medical facility consultant and physicians are fully appraised of the site conditions and/or hazards which caused the medical emergency. 3. Complete the accident report. 4. Conduct an investigation of the site condition which caused the medical situation prior to reassigning the task. The root causes must be determined and communicated to all applicable parties. The investigation team must consist of the Superintendent, the SSHO, SRSO, applicable subcontractor personnel, and USACE, as appropriate. 5. Ensure that all injured or ill employees receive written medical clearance to return to work on the site. The local medical provider will prepare this. 6. Ensure that a copy of the Medical Clearance is provided to USACE. 7. Provide a copy of the Medical Clearance and the Accident Report for the employee's medical records. 8. The Emergency Coordinator will be responsible for documenting the events of the emergency. Documentation will be made in a bound field log book and include at a minimum the following information: • Chronological history of the emergency • Facts pertaining to the incident and when they became available • Names and titles of all personnel involved • Actions taken (i.e., orders and instruction given, decisions made by the PM and other on-site/off-site personnel • Potential exposure of on-site personnel • Signature, date and time of individual entering data

18.0 DUST AND EMISSIONS CONTROL

A Dust Control Plan will be implemented during all relative site activities. The plan will consist of the following provisions:

a. Dusty operations will be curtailed when wind speed is excessive, as determined by exceedences in dust monitoring action levels;
b. Heavy equipment will be cleaned by wet decontamination in areas designed to collect the run-off. Mud from the equipment will not be allowed to dry on the decon pad;
c. Trucks in which rubble and debris are carried will be covered and sealed to control dust releases;
d. If emissions are observed, Sevenson will apply water to reduce the creation and dispersion of dust.

The SSHO will confirm that dust suppression practices are effective and being utilized.

19.0 AIR MONITORING

Air monitoring will be conducted to determine worker exposure to airborne particulate and to assess whether the surrounding area is being affected. This will be accomplished by implementing a real time monitoring program.

Real time monitoring will consist of particulate monitoring in the work area and at the site perimeter.

Real time monitoring will be conducted every 2 hours during the course of this project.

The following real time action levels will be used to determine the proper PPE ensemble and/or modifications to the work practice controls:

Airborne Particulate In Work Area

- < 1 mg/m^3 - continue work
- ≥ 1 - 10 mg/m^3 - upgrade to Level C Protection with ½ face piece respirator equipped with HEPA cartridge.
- > 10 mg/m^3 - cease work and institute dust control procedures.

Airborne Particulate In Perimeter

- ≤ 150 ug/m^3 (above background) - Continue work.
- > 150 ug/m^3 (above background) – Institute dust control procedures.

Background is determined at an upwind location. This result is then subtracted from the downwind reading to obtain the concentration at the downwind location.

Air monitoring for radiologically contaminated emissions is discussed in the Radiation Control Plan.

20.0 RECORD KEEPING

1. The SSHO or designee will maintain all records documenting the implementation of the SSHP. The records will include:

   a. Training logs;
   b. Daily logs;
   c. Weekly reports;
   d. Real time air monitoring;
   e. Documentation of safety meetings;
   f. Decontamination logs;
   g. Monitoring equipment calibration sheets;
   h. Permit for open flame or welding;
   i. Confined space entry permit;
   j. Accident report;
   k. Employee/visitor register; and,
   l. Medical certifications.

   A copy of the forms to be used can be found in Appendix E.

2. If an accident, an explosion or fire, or a release of toxic materials occurs during the course of the project, the Contracting Officer will be telephoned immediately and receive a written notification within 24 hours. The report shall include the following items:

   a. Name, organization, telephone number, and location of the Contractor;
   b. Name and title of the person(s) reporting;
   c. Date and time of the accident/incident;
   d. Location of the accident/incident, i.e., site location, facility name;
   e. Brief summary of the accident/incident giving pertinent details including type of operation ongoing at the time of the accident/incident;
   f. Cause of the accident/incident, if known;
   g. Casualties (fatalities, disabling injuries);
   h. Details of any existing chemical hazard or contamination;
   i. Estimated property damage, if applicable;
   j. Nature of damage, effect on contract schedule;
   k. Action(s) taken by the Contractor to provide for safety and security; and,

l. Other damage or injuries sustained, public or private.

Within two working days of any reportable accident the Contractor shall complete, and submit to the Contracting Officer, an accident report on ENG Form 3394 in accordance with AR 385-40 and supplement 1 to that regulation.

3. Daily safety inspection logs will be submitted to the Contracting Officer for review and include the following items:

   a. Date;
   b. Areas inspected;
   c. Employees in the particular areas;
   d. Equipment being utilized by the employees named;
   e. Protective clothing and equipment being worn by the employees;
   f. Air monitoring results; and,
   g. Signature of SSHO.

4. Employee's and Visitor's Logs shall include:

   a. Date;
   b. Name;
   c. Address;
   d. Representing Agency or Company;
   e. Time entering site; and
   f. Time exiting site.

21.0 PROJECT SAFETY AND HEALTH SUMMARY

Sevenson will submit, to the Contracting Officer a Safety Summary Report within thirty days of the project completion. The report shall be signed by the project CIH and will include:

a. Summary of all environmental air monitoring accomplished on the project;
b. Procedures and techniques used to decontaminate equipment and personnel;
c. Results of air monitoring;
d. Daily Safety Inspection Reports;
e. Training Logs;
f. Accident Reports;
g. Records of radiation surveys, monitoring, and disposal;
h. Notification of radiological incidents;
i. Reports of overexposure and excessive levels and concentrations; and
j. Notifications and reports to individuals.

ACTIVITY HAZARD ANALYSIS – DEMOLITION OF BUIDLING 401 AND SILOS

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ Air monitoring ▪ Radiological survey ▪ Asbestos containing material (ACM) removal ▪ Structure demolition ▪ Loading and transporting debris	Chemical/Toxicological Hazards: 1. Possible exposure to radiologically contaminated material 2. Possible exposure to ACM	Chemical/Toxicological Hazards 1. Use of personal protective equipment. 2. Personal decontamination prior to consumption of food, beverage, or tobacco. 3. Results of air monitoring and radiological surveys used to determine proper type of control program. 4. ACM removed in accordance with asbestos removal plan.
	Biological Hazards: 1. Slight possibility of wild animals 2. Slight possibility of stinging and biting insects 3. Histoplasmosis	Biological Hazards: 1. Avoid physical contact with wild animals. Do not threaten and/or corner animals. Make noise to get the animal to retreat. Stay in or return to vehicle or equipment. 2. Use appropriate insect repellants i.e. DEET. 3. Avoid contact with bird and animal waste; Level C PPE.

ACTIVITY HAZARD ANALYSIS – DEMOLITION OF BUIDLING 401 AND SILOS

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ Air monitoring ▪ Radiological survey ▪ Asbestos containing material (ACM) removal ▪ Structure demolition ▪ Loading and transporting debris	Physical Hazards: 1. Moving equipment 2. Falls from elevations 3. Slips and trips 4. Heat and Cold Stress 5. Noise exposure 6. Caught between/struck by or against 7. Severe weather 8. Manual lifting 9. Rotating parts 10. Electrical 11. Traffic 12. Rigging	Physical Hazards: 1. Moving equipment ▪ Only trained, experience operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation ▪ Back up alarms functional ▪ One set of signals given for movement of equipment 2. Falls from elevations ▪ Maintain three points of contact when climbing on or off equipment ▪ Fall protection program – preplanning, training and 100% fall protection 3. Slips and trips ▪ Keep walking and working surfaces dry ▪ Housekeeping – remove trip hazards 4. Heat and Cold Stress ▪ Refer to Appendices F and G of this plan. 5. Noise exposure ▪ Hearing control program which consists of audio-metric examination, training, sound level pressure monitoring, and use of hearing protection 6. Caught between/struck by or against ▪ Stay out of swing radius of equipment ▪ Ground personnel near operating heavy equipment will wear hard hats and traffic vests ▪ Do not walk, work, or stand near equipment being loaded or unloaded ▪ Backup alarms to be in operable condition. No unnecessary backing. 7 Severe weather ▪ As determined by Site Safety and Health Officer, operations are to cease during severe weather 8. Manual lifting ▪ Proper lifting technique utilized. Back straight and lift with legs. ▪ Split heavy loads into smaller loads ▪ Use mechanical aid, whenever possible ▪ Make sure the path of travel is clear prior to the lift 9. Rotating parts ▪ Personnel restricted in area of rotating parts 10. Electrical ▪ Licensed electrician to perform installation ▪ Installation in compliance with OSHA, National Electric Code, and local codes ▪ Equipment kept at least 10 feet from energized power lines 11. Traffic ▪ Posted speed limit of 15 mph ▪ Signage and establish traffic patterns and routes ▪ Workers in traffic area to wear reflective vests 12. Rigging ▪ All rigging equipment inspected before use by a qualified person ▪ Defective rigging removed from service ▪ Positive latching device used ▪ Established hand signals for crane operation ▪ Rigging equipment not loaded in excess of its recommended safe working load

ACTIVITY HAZARD ANALYSIS – DEMOLITION OF BUIDLING 401 AND SILOS

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Track excavator 2. Loader 3. Trucks 4. Crane 5. Bulldozer 6. Radiological monitoring equipment 7. Air monitoring equipment	Site Inspection: 1. Daily inspection by Site Safety and Health Officer Motor Vehicles: 1. Before initial use vehicles will be inspected and found to be in a safe operating condition. Equipment: 1. Before equipment is placed in use it will be inspected and tested by a competent person. 2. Inspections and test will be done in accordance with manufacturer's instructions. 3. All equipment will be inspected daily when in use by the operator. 4. Air and radiological monitoring equipment calibrated and operated in accordance with manufacturer instructions.	Site Specific: 1. OSHA HAZWOPER 2. HTRW activity training 3. Initial site specific 4. Daily tailgate safety meetings 5. Hazard communication Supervisory Personnel: 1. OSHA supervisor's training Motor Vehicles 1. Operators shall hold a valid license for the type and class of vehicle they are operating. Heavy Equipment; 1. Trained and qualified operators. 2. Crane operator licensed by state. Equipment General: 1. Employees will be qualified and trained to operate or service mechanical equipment.

H:/Hitcho/Building 401/AHA Site Demo Silos

ACTIVITY HAZARD ANALYSIS – SITE RESTORATION

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ Dismantle work zones ▪ Perform radiological survey ▪ Decontamination of equipment ▪ Dismantle utilities ▪ Remove trailers and equipment from site	Chemical/Toxicological Hazards: 1. Exposure to radiologically contaminated material	Chemical/Toxicological Hazards 1. Level D protection for the majority of work 2. Level D modified for decontamination
	Biological Hazards: 1. Possibility of wild animals 2. Possibility of stinging and biting insects.	Biological Hazards: 1. Avoid physical contact with wild animals. Do not threaten and/or corner animals. Make noise to get the animal to retreat. Stay in or return to vehicle or equipment. 2. Use appropriate insect repellants i.e. DEET.

ACTIVITY HAZARD ANALYSIS – SITE RESTORATION

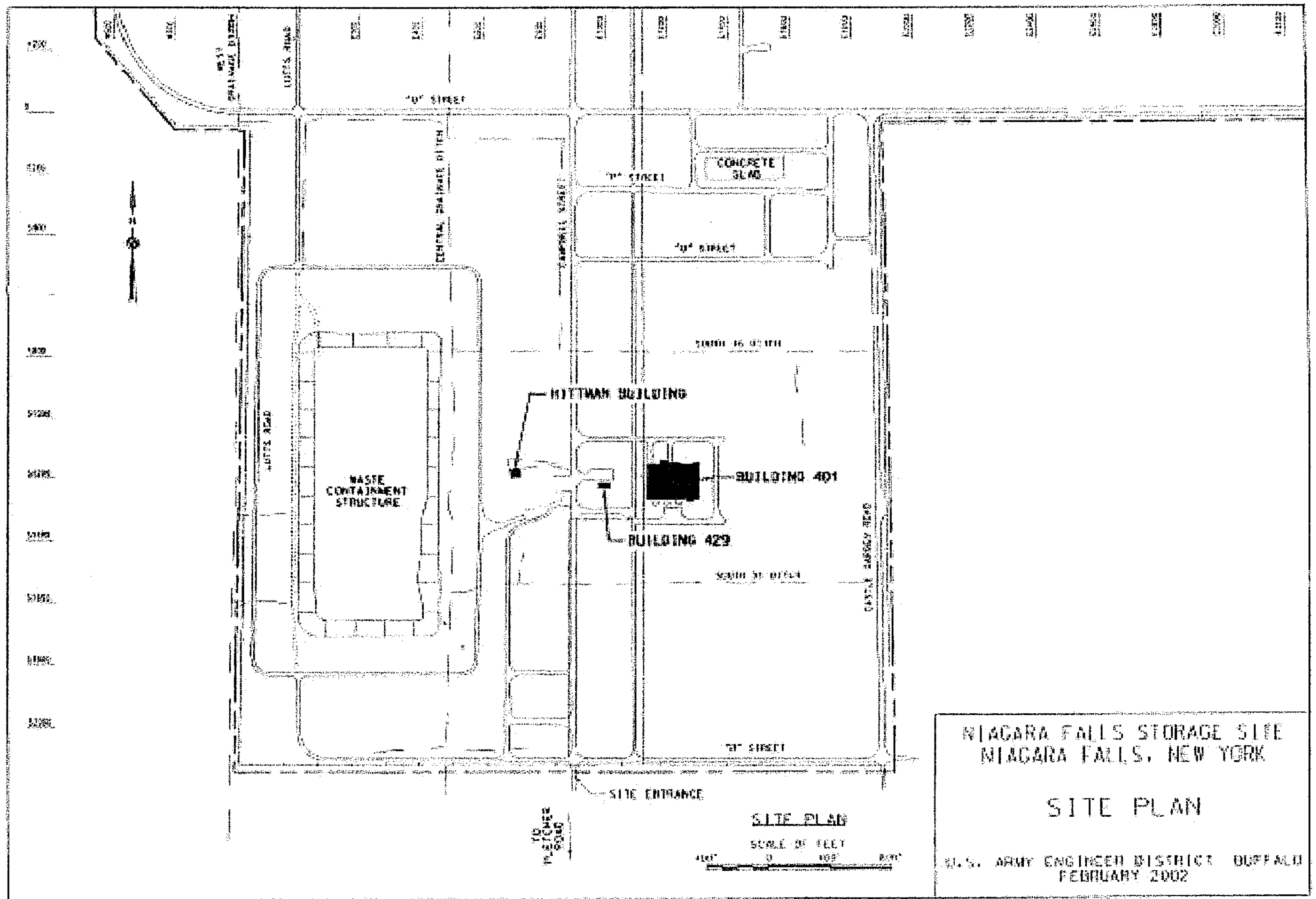
ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ Dismantle work zones ▪ Perform radiological survey ▪ Decontamination of equipment ▪ Dismantle utilities ▪ Remove trailers and equipment from site	Physical Hazards: 1. Moving equipment 2. Falls from elevations 3. Slips and trips 4. Heat and Cold Stress 5. Noise exposure 6. Caught between/struck by or against 7. Severe weather 8. Manual lifting 9. Electrical 10. Traffic	Physical Hazards: 1. Moving equipment ▪ Only trained, experience operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation ▪ Back up alarms functional ▪ One set of signals given for movement of equipment 2. Falls from elevations ▪ Maintain three points of contact when climbing on or off equipment ▪ Fall protection program – preplanning, training, and 100% fall protection 3. Slips and trips ▪ Keep walking and working surfaces dry ▪ Housekeeping – remove trip hazards 4. Heat and Cold Stress ▪ Refer to Appendices F and G of this plan 5. Noise exposure ▪ Hearing control program which consists of audio-metric examination, training, sound level pressure monitoring, and use of hearing protection 6. Caught between/struck by or against ▪ Stay out of swing radius of equipment ▪ Ground personnel near operating heavy equipment will wear hard hats and traffic vests ▪ Do not walk, work, or stand near equipment being loaded or unloaded ▪ Backup alarms to be in operable condition. No unnecessary backing. 7. Severe weather ▪ As determined by Site Safety and Health Officer, operations are to cease during severe weather 8. Manual lifting ▪ Proper lifting technique utilized. Back straight and lift with legs. ▪ Split heavy loads into smaller loads ▪ Use mechanical aid, whenever possible ▪ Make sure the path of travel is clear prior to the lift 9. Electrical ▪ Licensed electrician to perform installation ▪ Installation in compliance with OSHA, National Electric Code, and local codes ▪ Equipment kept at least 10 feet from energized power lines 10. Traffic ▪ Posted speed limit of 15 mph ▪ Signage and establish traffic patterns and routes ▪ Workers in traffic area to wear reflective vests

ACTIVITY HAZARD ANALYSIS – SITE RESTORATION

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Pickup trucks 2. Track excavator 3. Loader 4. Bulldozer 5. Radiological monitoring equipment	Site Inspection: 1. Daily inspection by Site Safety and Health Officer Motor Vehicles: 1. Before initial use vehicles will be inspected and found to be in a safe operating condition. Equipment: 1. Before equipment is placed in use it will be inspected and tested by a competent person. 2. Inspections and test will be done in accordance with manufacturer's instructions. 3. All equipment will be inspected daily when in use by the operator. 4. Radiological monitoring equipment calibrated and operated in accordance with manufacturer instructions.	Site Specific: 1. OSHA HAZWOPER 2. HTRW activity training 3. Initial site specific 4. Daily tailgate safety meetings 5. Hazard communication Supervisory Personnel: 1. OSHA supervisor's training Motor Vehicles 1. Operators shall hold a valid license for the type and class of vehicle they are operating. Heavy Equipment; 1. Trained and qualified operators. Equipment General: 1. Employees will be qualified and trained to operate or service mechanical equipment.

H:/Hitcho/Building 401/AHA Site Restor

Figure 1
Site Map



WASTE CONTAINMENT STRUCTURE
HITTMAN BUILDING
BUILDING 401
BUILDING 429
CONCRETE SLAB
SITE ENTRANCE
SITE PLAN
NIAGARA FALLS STORAGE SITE
NIAGARA FALLS, NEW YORK
SITE PLAN
U.S. ARMY ENGINEER DISTRICT BUFFALO
FEBRUARY 2002

PLATE 1

Figure 2
Directions to Emergency Facility

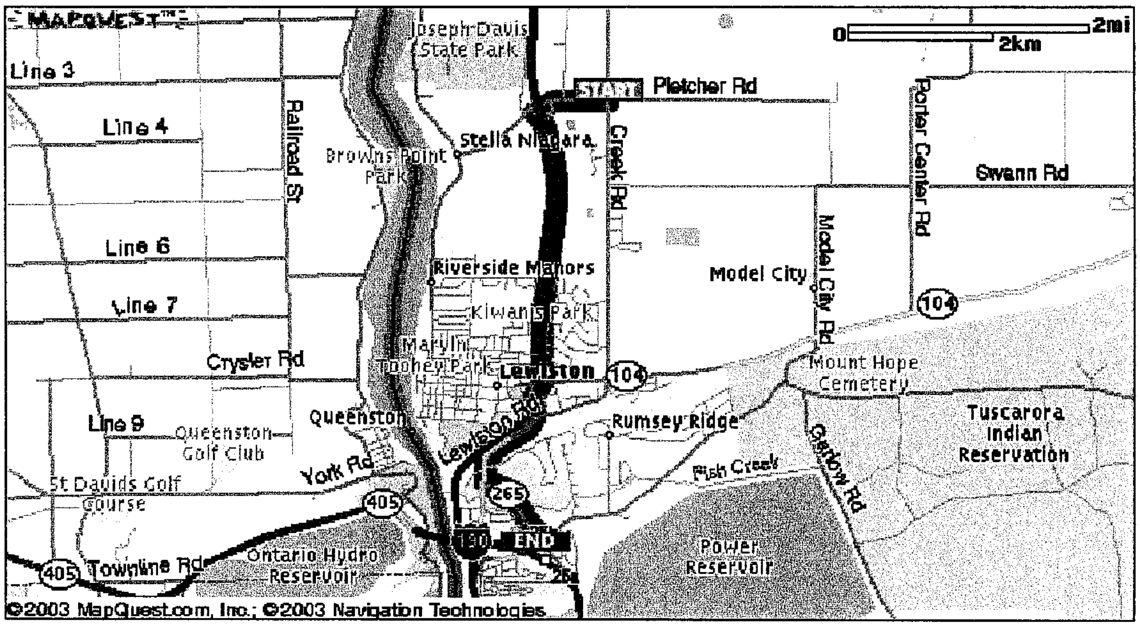
Start: [765-800] Pletcher Rd
Lewiston, NY
14092 US

End: Mount St Mary's Hospital Fndtn
5300 Military Rd
Lewiston, NY
14092-1997 US

Distance: 4.85 miles

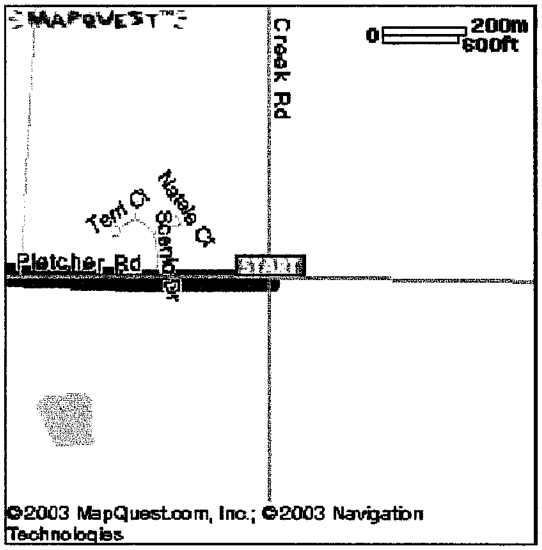
Total Estimated Time: 7 minutes

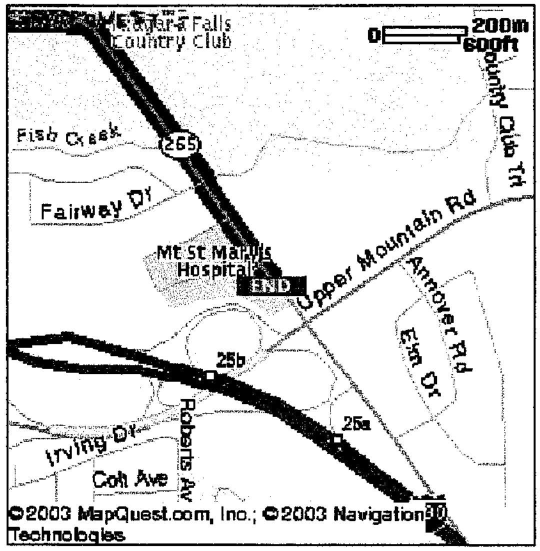
✔ Driving Directions	Distance
☐ **1.** Start out going West on PLETCHER RD toward SCENIC DR.	0.65 Miles
☐ **2.** Turn LEFT to take the ROBERT MOSES PKWY ramp toward NIAGARA FALLS.	0.13 Miles
☐ **3.** Merge onto ROBERT MOSES STATE PKWY S.	2.38 Miles
☐ **4.** Take the RT-104 W exit toward I-190 W/CANADA/BUFFALO.	0.28 Miles
☐ **5.** Stay straight to go onto LEWISTON RD/NY-104.	0.78 Miles
☐ **6.** Turn LEFT onto NY-265/MILITARY RD.	0.63 Miles



Start:
[765-800] Pletcher Rd
Lewiston, NY
14092 US

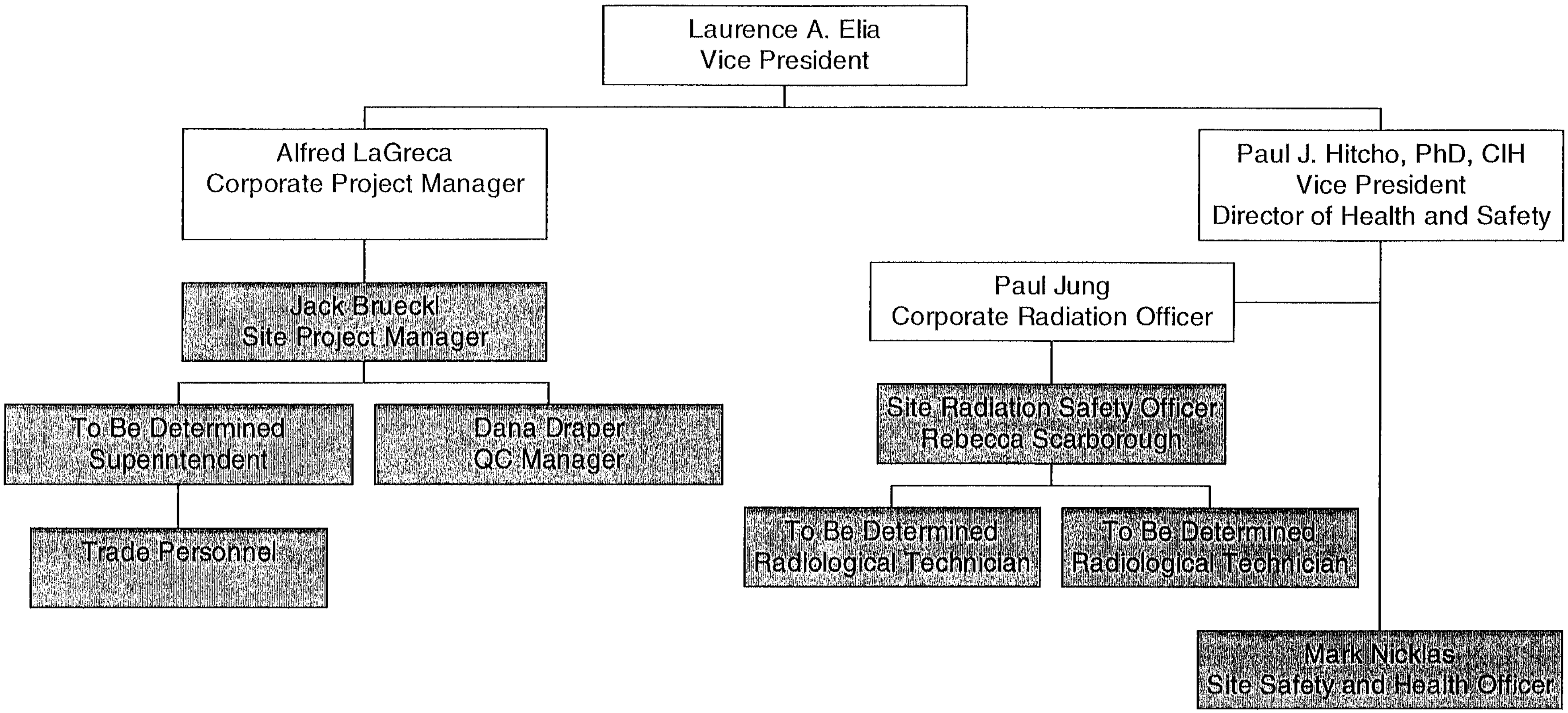
End:
Mount St Mary's Hospital Fndtn
5300 Military Rd
Lewiston, NY
14092-1997 US


Creek Rd
0
200m
600ft
Terri Ct
Natale Ct
Scenic Dr
Pletcher Rd
©2003 MapQuest.com, Inc.; ©2003 Navigation Technologies


Country Club
0
200m
600ft
Fish Creek
265
Fairway Dr
Hospital
END
Upper Mountain Rd
Annover Rd
Elm Dr
25b
25a
Irving Dr
Roberts Av
Colt Ave
©2003 MapQuest.com, Inc.; ©2003 Navigation Technologies

Appendix A
Safety and Health Organizational Chart

Organizational Chart



Off Site Personnel

On Site Personnel

Appendix B
Corporate Health and Safety Plan

Sevenson Environmental Services, Inc.

CORPORATE HEALTH AND SAFETY PLAN

Revision November 17, 2000

Sevenson Environmental Services, Inc.
CORPORATE HEALTH AND SAFETY PLAN
TABLE OF CONTENTS

Table of Contents cont.

APPENDICES

CORPORATE HEALTH AND SAFETY PLAN

A. SAFETY POLICY AND MANAGEMENT SYSTEM

1. Safety Policy

Sevenson Environmental Services, Inc. maintains comprehensive programs to prevent health or safety risks. The quality of work life has a high priority in our organization, which means that safety and health protection responsibilities must be regarded seriously by all employees. Our goal is to minimize injury or illness and business interruption due to accidents, fire, or other hazards.

To fulfill this goal, management is committed to:

a. Maintaining programs that identify and assess occupational health and safety risks.

b. Providing the funds to implement health and safety programs that control and minimize risks to employees.

c. Controlling and reducing employee exposure to all hazardous agents in accordance with government regulations.

d. Informing employees of health and safety risks and ensuring that all members of the organization understand the company's health and safety measures.

e. Communicating with customers, stockholders, governmental agencies, and the public on matters that affect employee and public health and safety.

f. Planning, designing, and constructing a safe and healthful work environment at all job sites.

g. Developing processes and establishing operating methods that minimize health and safety risks.

h. Encouraging all employees to work in a safe and healthful manner and providing training directed toward this objective, when needed.

Michael A. Elia
President

Paul J. Hitcho
Vice President of Health and Safety

2. Description of Health and Safety Organization

Sevenson Environmental Services, Inc. has developed and implemented a health and safety program which provides for the protection of its employees, the general public, and the environment. This program is based upon the accepted principles and practices of safety engineering and industrial hygiene and the applicable governmental regulations. Sevenson also implements safety and health procedures established by the client and will also work with the client to develop the appropriate safety and health controls.

The most important component of the safety and health program is our staff. Sevenson has a staff of safety and health professionals who have experience in a wide variety of projects.

The Health and Safety Organization is headed by Dr. Paul J. Hitcho, C.I.H., Vice President of Health and Safety. He reports directly to Michael Elia, President and CEO of Sevenson. Top management has a personal interest in safety and health. The health and safety statistics for specific jobs are regularly reviewed. This information is used to strengthen areas of concern.

The Site Health and Safety Officers report directly to Dr. Hitcho. The on-site health and safety officers are responsible for implementing the site specific plans. Depending upon the size of the project, the site health and safety officers may have safety technicians reporting to them. The technicians would be responsible for area air monitoring and implementation of the Health and Safety Plan for their particular work area.

Sevenson's involvement in the remediation of low-level radiation sites has resulted in the need for a Radiation Safety Officer. In addition to other health and safety responsibilities, he implements the ALARA and dosimeter programs. In conjunction with Dr. Hitcho, the staff of radiation technicians is coordinated through the RSO.

The Health and Safety Organizational Chart is shown on page 7.

3. Responsibilities

a. Individual

1. Strict adherence to the health and safety rules, policies, and procedures is a condition of employment. Deviations are only allowed after supervisor consideration as outlined in this section.

2. Review changes in company safety rules. These changes are to be posted on the employee bulletin boards located at operations centers and/or other work sites. A safety meeting will be held with all those involved, whenever safety rules are changed.

3. Comply with all health and safety instructions and operating practices and procedures.

4. Perform work task in accordance with operation's descriptions.

5. Inform immediate supervisor of any unsafe or unhealthy work condition and of any existing or potential health and safety hazards.

6. Promptly notify the immediate supervisor of any occupational accident, illness, or injury.

7. Report to the medical services facility as provided by Sevenson for treatment of any occupational illness or injury.

b. <u>Field Supervision</u>

1. Implement requirements of the Sevenson Health and Safety Program.

2. Support accomplishment of established health and safety objectives.

3. Maintain proficiency in proper operating procedures to enable ready identification of existing or potential hazards and to ensure proper employee placement.

4. Ensure that all employees within their respective area of responsibility are thoroughly instructed in proper operations and procedures related to job assignments.

5. Ensure that all necessary tools, protective clothing, and equipment are provided.

6. Monitor employee performance to ensure compliance with proper health and safety work procedures. Periodically review with employees their safety awareness.

7. Enforce safe operating procedures through reinstructing employees, recommending employee training, or initiating disciplinary action when health and safety violations occur.

8. Request employee training as necessary to meet Health and Safety Program requirements.

9. Notify Health and Safety Department of all occupational injuries, accidents, and illnesses in accordance with Health and Safety Directives.

10. Notify the appropriate functional area of any health and safety hazard or unsafe condition for correction. Report immediately to the Health and Safety Department any violation or unsafe condition for which area supervision does not have the ability to correct. Unsafe conditions should be remedied as soon as possible.

11. Maintain constant awareness of health and safety responsibilities to preserve a healthy and safe working environment for employees.

12. Maintain and comply with operating practices and procedures.

13. Supervisors will enforce general safety rules. Any failure to comply with the rules will be handled as outlined in "Infractions and Disciplinary Action" within this section.

14. Supervisors will inform all employees of any changes in safety rules by use of safety meetings and bulletin boards.

c. <u>Managers</u>

1. Ensure that Sevenson's Health and Safety Program requirements are implemented within their respective areas of responsibility and enforce safe operating practices through training or disciplinary action.

2. Ensure that supervisors within their respective area of responsibility are knowledgeable of and comply with applicable Health and Safety Program requirements.

3. Ensure that health and safety objectives are established and that health and safety performance requirements are understood and considered during performance appraisal and merit review.

4. Ensure that all Health and Safety Program directives, communications, and instructions are distributed to all affected areas.

5. Participate in health and safety activities as required by the Health and Safety Program. Investigate health and safety issues and provide information or reports as directed.

6. Continuously review work environments to identify existing or potential health and safety hazards.

7. Ensure that corrective actions are implemented.

d. Site Safety and Health Officers

1. Responsible for assuring compliance with company, client and OSHA regulations.

2. Responsible for implementing and enforcing site safety plans and conducting site health and safety inspections.

3. Responsible for conducting site specific safety training and safety meetings and for conveying hazard communication information.

4. Responsible for investigating accidents, injuries, illnesses, and safety complaints.

5. Responsible for recommending improvements in the company safety program, for promoting safety, and for advocating appropriate safety suggestions.

e. Vice President of Safety and Health

1. Maintain current knowledge of safety and environmental regulations (OSHA, NIOSH, EPA, etc.) and changes as they impact Sevenson.

2. Responsible for enforcement of safety and loss control.

3. Responsible for this manual's compliance with any corporate policy changes and OSHA regulations. Responsible for any manual changes.

4. Responsible for reviewing weekly safety performance of on- and off-site work activities. Issue final draft of all injury and illness reports.

5. Responsible for safety promotion.

6. Responsible for OSHA recordkeeping.

7. Responsible for forming and providing direction to Site Safety and Health Officers and Field Supervision.

8. Responsible for providing recommendations on safety equipment purchases.

9. Responsible for following up on any safety suggestions.

10. Responsible for resolution of any safety complaints.

11. Responsible for employee medical surveillance program.

12. Responsible for employee hazard communication program.

13. Responsible for worker's compensation.

14. Responsible for substance abuse program.

15. Preparing site safety and health plans.

4. Lines of Authority

The Site Safety and Health Officers report to the Vice President of Health and Safety who in turn reports directly to the Chief Executive Officer of Sevenson Environmental Services, Inc.

B. TASK TRAINING AND INFORMATION

1. Policy

It is the policy of Sevenson to inform its employees of the known or suspected health or physical hazards of the activities and materials encountered in the course of their employment. It is the employee's right to have this information, and this right is guaranteed by state and federal laws.

Sevenson wants its employees to clearly understand how exposure to chemicals may present risks to their health, how they may be exposed, and how to prevent or minimize the potential for exposure. To accomplish these goals Sevenson has established a variety of training and informational programs. Included in these programs are:

a. A hazard communication program in accordance with 29 CFR 1910.120D.

b. In-house training programs for hazardous waste site workers and emergency response personnel in accordance with 29 CFR 1910.120 and 1926.65.

c. Site specific training prior to the initiation of work.

d. Safety meetings on all active work sites.

e. Distribution and posting of safety bulletins, site inspection reports, and other safety-related information.

f. Written site safety and health plans describing anticipated chemical and physical hazards and providing information on appropriate engineering controls, work practices, and personal protective equipment. Also included in site safety and health plans are material safety data sheets or their equivalent.

g. On-site retraining as necessary.

2. Hazardous Waste Site Worker Training

Sevenson provides training to its employees through its own in-house hazardous waste site worker training course. The training meets the minimum requirements of the OSHA Hazardous Waste Operations and Emergency Response Standard, 29 CFR 1910.120 (e). Prospective employees who can demonstrate or document equivalent training or work experience may be exempt from the initial training pending an evaluation of their knowledge and experience by the Vice President of Safety and Health.

The content of the training program is clearly established by OSHA in 1910.120. The principle objectives are:

a. Understanding and recognizing hazards encountered on hazardous waste sites.

b. Learning how to use control devices and personal protective equipment and learning basic operating procedures to prevent injury or illness.

c. Knowing the limitations of equipment and protective measures.

d. Being aware of emergency procedures.

Waste site worker training also includes annual training which will include a review of the topics covered in the 40-hour course as well as discussion of Sevenson's actual experiences on projects and any related health or safety problems. All waste site workers must attend annual retraining sessions.

3. Daily Safety Meetings And Site Specific Training

Site Supervisors or Site Safety and Health Officers are required to conduct short daily safety meetings at the start of each workday or each work shift, if applicable. The content of the meeting should cover the general site hazards and special task hazards that may be encountered in the course of the workday. Safety bulletins or other information distributed by the Health and Safety Department may also be discussed.

Site specific training is essential for all sites. The briefing may be conducted by the Site Supervisor or the Safety and Health Officer. The briefing must discuss the anticipated hazards and appropriate personal protective equipment and operating procedures. Emergency information (route to hospital, evacuation routes, emergency procedures, etc.) must be discussed. The site safety plan provides the basic document to guide the briefing. All employees who attend the briefing are expected to sign a form to acknowledge that the hazards have been explained to them, and that they understand the standard and emergency operating procedures of the site. Employees assigned to the site after the training has been held must be briefed about the content of the site safety plan.

4. Site Safety and Health Plans

Site safety and health plans are required for all hazardous waste site activities. The Health and Safety Department will prepare an appropriate site safety plan based upon the information available at that time. It is important for the site supervisor to review the site safety and health plan carefully before mobilization and to discuss it with the Health and Safety Department for any errors, omissions, special requirements, or changes in proposed work plans.

The content of a site safety and health plan is specified in 29 CFR 1910.120 (b)(4). The site safety and health plan provides the basis for the site specific training and most site safety meetings. The site safety and health plan is also a reference document for standard operating and emergency procedures and safety practices (personal protective equipment, decontamination procedures, etc.). Site safety and health plans are prepared by the Health and Safety Department and can only be altered or deviated with the Vice President of Health and Safety's advice and consent.

5. Specialized Training

During the course of many projects, certain operations that require specialized training may be performed. These operations include:

a. High pressure water blasting
b. Confined space entry
c. Line breaks
d. Lock out / Tag out
e. Drum handling
f. Spill response
g. Asbestos removal
h. Demolition procedures
i. Welding and burning

When these operations take place, the following will occur:

a. Experienced personnel will be assigned to the task. If an inexperienced worker is assigned, he will work under the direct supervision of a supervisor or experienced worker who will be responsible for his actions.

b. The standard operating procedure will be discussed.

c. The site specific hazards and their relationship to the standard operation procedures will be discussed.

d. Workers will then voice their concerns and/or suggestions concerning the task.

e. Task will be completed.

All employees are to receive safety and health training as part of their indoctrination into Sevenson. This training may include the 40-hour OSHA HAZWOPER training and/or training in the specialized operations. This is to be followed by on the job training under direct field supervision.

Competent Person's Qualifications Requirements

When required for a particular task or operation, a competent person will be assigned. The person designated as "competent" will meet the following criteria:

a. Knows the hazards which exist or are likely to exist;
b. Knows how to control or eliminate the hazards;
c. Has been given the authority to immediately correct the hazards and will.

The competent person may be the health and safety officer, the site superintendent, or the foreman. The qualifications will be determined by knowledge, experience, training and capabilities. Where specific training is needed to meet these requirements the individual will either be sent to the appropriate class(es) or receive in-house training from Dr. Hitcho or another qualified trainer. When competent persons are to be identified for specific sites and operations, they will be addressed in the site specific Health and Safety Plan.

C. HAZARD COMMUNICATION PROGRAM

1. Program

The hazard communication program is the plan by which information and training concerning hazardous materials and waste is delivered to our employees. It consists of proper labeling, material safety data sheets, and employee training.

The hazard communication program relies heavily upon the dissemination of information through the in-house hazardous waste site worker training program, the daily site safety and pre-entry safety meetings, and the written site safety and health plans. The principle objectives of these programs are to alert employees to potential hazards, to instruct them in how to recognize hazards, and how to protect themselves. Sevenson recognizes that employees involved in hazardous waste cleanups have unique exposure problems and often have poor information about the chemical hazards they may face. For this reason, the training programs adopt a broad-based approach to recognizing hazards.

Material Safety Data Sheets are obtained for hazardous chemicals or wastes. For products and materials Sevenson purchases for use in its shops, laboratories, water treatment systems, decontamination procedures, or waste handling activities, Sevenson will have material safety data sheets as described in the written hazard communication program. For waste materials, the equivalent information will be obtained from various reference books, data banks, or other safety data sheets such as the CHRIS manuals. This information must be included in the site safety and health plan and discussed at the site specific training. Employees can obtain copies of this information from their supervisors or from the Health and Safety Department in accordance with the procedures outlined in the written program.

The complete written hazard communication program is a separate plan and is to be kept at all job sites.

D. SAFETY MEETINGS

1. Site Specific Training

Site specific training as described in Section B.3. is given to all employees prior to the initiation of work. Topics discussed at this training session include:

a. Safety and health hazards present at site.
b. Standard operating procedures.
c. Air monitoring program.
d. Internal and external communications.
e. Medical surveillance program.
f. Personal protective equipment.
g. Work zones.
h. Decontamination procedures.
i. Evacuation, first aid, and emergency procedures.
j. Lines of authority.

After completion of this training, a training log - acknowledgment log will be completed.

2. Daily Safety Meetings

All on-site personnel (contractor and subcontractor employees) will participate in daily safety meetings. These meetings will inform employees of the day's activities and individual responsibilities, inherent hazards, any changes in levels of protection, evacuation routes and emergency procedures for each work area, and approved changes to the safety and health plan. Opportunity will be provided for employees to voice safety-related concerns. There will be documentation concerning topics and attendance at this meeting.

E. SAFETY INSPECTIONS

Sevenson recognizes that health and safety programs cannot be effective, no matter how well thought-out and prepared, if there is no program to inspect and ensure compliance with company, federal, state, and local occupational health and safety standards. For this reason, Sevenson has developed the following guidelines to conduct facility and job site inspections.

1. Responsibilities

Overall health and safety compliance is the responsibility of the Vice President of Health and Safety with the cooperation of the Vice President of Operations. The Vice President of Health and Safety or his designees will identify health and safety concerns or regulatory violations, recommend appropriate or necessary corrective or remedial actions, and communicate this information to the Vice President of Operations for implementation. Where expenditures for equipment or materials are required, the Vice President of Health and Safety will make application for funds and provide the justification for expenditures. The Vice President of Health and Safety will provide purchase specifications.

The Vice President of Operations will provide necessary manpower when required, ensure personnel are available for training as necessary, and discipline personnel appropriately when applicable.

Superintendents and foreman are responsible for maintaining their job sites and facilities in compliance with health and safety procedures and standards. They are encouraged to contact the Vice President of Health and Safety to ask questions or to receive guidance on OSHA or other health and safety regulations.

2. Inspections

Inspections can take a variety of forms: formal or informal, announced or unannounced, educationally oriented or strict compliance oriented. It will be the option of the Vice President of Health and Safety to choose the format of the inspection.

a. Formal Inspections. In general, these types of inspections will be conducted by a team of company management personnel, including a representative of the Health and Safety Department and one or more of Operations management. The site supervisory personnel are not permitted to act as inspectors on their own site but may, and are encouraged to, observe the inspection process. After completion of a formal inspection, a written report of findings, suggestions, or corrective actions will be prepared and distributed to the principal site supervisor, the division manager, the Vice President of Operations, and the Vice President of Health and Safety. If necessary, a follow-up inspection or meeting with appropriate personnel will be arranged.

b. Informal Inspections. These inspections are simply observations regarding site operations and procedures related to health and safety. The person(s) conducting the inspections will be from the Health and Safety Department, possibly with Operations managerial or supervisory personnel in attendance. Any problem areas or particular concerns will be verbally communicated to responsible supervisors. Unless the findings of the inspection are serious, no follow-up inspection will be arranged. A follow-up telephone conversation will be held to verify that corrective action has been taken.

c. Announced Inspections. This aspect of inspections is a courtesy to site personnel to permit them to perform a self-inspection and to correct minor problems like housekeeping.

d. Unannounced Inspections. These types of inspections are to simulate the "surprise" of an OSHA inspection and to remind site supervisory personnel that it is important to maintain proper site safety at all times.

e. Educational Inspections. These inspections are conducted to focus on a specific health or safety concern (use of scaffolding or ladders, confined space work, excavations, etc.). Site supervisors will accompany the inspector and receive an explanation on safety practices, applicable legal standards, and methods to maintain or ensure compliance. Follow-up inspections may be necessary.

f. Compliance Inspections. This is an inspection "by the book" (29 CFR 1910 and 1926). The inspector will conduct the inspection with the site supervisor in attendance. Any violations of standards will be written on a citation form which will note what standard was violated, how to correct the problem, and when the problem must be corrected. Copies of the citation will be given to the site supervisor, the division manager, the Vice President of Operations, and the Vice President of Health and Safety. It will be posted for three days. A follow-up inspection within an appropriate time period to permit remedial action will be mandatory. Failure to correct violations will be considered willful disregard for health and safety by the site supervisor.

3. Inspection Follow-up

Simply conducting an inspection is not sufficient. Each inspection is performed to achieve a goal. To ensure that the goal is achieved, the Health and Safety Department must follow up inspections with verification inspections, meetings, or telephone calls. In most cases, the follow-up will be comparable to the initial inspection. Failure by Operations personnel to cooperate in correcting identified health or safety problems will be reported to the Vice President of Operations for disciplinary action.

4. Inspection Checklist

In order to make site management aware of the specific hazards that may be present on their site, a site specific safety and health check list is prepared. This check list is incorporated into the site safety and health plan and is to be used to perform a weekly inspection of the job site. This check list is not meant to be inclusive of all hazards that may be present, but it is to be used as a guide in inspecting the site.

F. ACCIDENT AND INCIDENT INVESTIGATION

1. Policy

All accidents or incidents are to be investigated. This is to be done by either the Site Safety and Health Officer or Superintendent. The results of the investigation are then sent to the Vice President of Health and Safety, who is responsible for initiating the proper course of action.

The primary reasons for reporting accidents are to determine causes, to evaluate preventative measures, and to protect employees. Prompt, accurate, and complete reporting ensures that the medical bills are promptly paid and that compensation is received in a timely manner when due. Our principal concerns are protecting employees from injury and the company from liability to the best of our ability.

2. Accident

A form has been developed for the accident investigation procedure. The information requested is necessary for the proper filing of worker compensation, Occupational Safety and Health Administration records, possible legal disputes, and methods to analyze and correct the conditions which may have caused the accident. Therefore, it is important that all the requested information be accurate and the report signed.

3. Incident

An incident is defined as an explosion, fire, release of toxic materials, property damage, motor vehicle accident, or near miss accident. In these cases a narrative report is required, and the information requested includes:

a. Name and title of person reporting;
b. Date and time of incident;
c. Location;
d. Summary of incident;
e. Cause(s);
f. Details of existing hazard and/or contamination;
g. Estimated damage;
h. Nature of damage; and
i. Actions taken.

4. Timeliness

The following is a time schedule which must be followed to assure the proper response and to comply with regulatory requirements:

a. Fatalities must be reported immediately to Vice President of Health and Safety.

b. Injuries and illnesses requiring medical attention - verbally to Vice President of Health and Safety within 24 hours. The written report within 72 hours.

c. Vehicle accidents verbally to Vice President of Health and Safety within 24 hours. Written report within 72 hours.

d. Fires, explosions, spills, or other incidents - immediately but no later than 12 hours. Written report within 72 hours.

G. DISCIPLINE AND INCENTIVE PROGRAM

1. Policy

To perform all work in a safe and healthful manner is a primary goal of Sevenson. Therefore, a system of disciplinary and incentive actions has been developed to help attain this goal.

2. Discipline

It is understood that at times it is difficult for an employee to completely understand and comply with all safety rules and regulations. Therefore, a policy of training, retraining, verbal and written warnings, and finally disciplinary action including suspension and termination from the company has been placed into effect.

All operating employees receive safety and health training. It is the responsibility of both the Supervisor and the Site Safety and Health Officer to reinforce this training by example and by correcting the employee when he\she is in violation of a particular rule. Usually this informal reinforcement enables the employee to understand the rule and thus gain his\her cooperation and compliance. However, there are instances when a more formal procedure becomes warranted. In these cases a formal verbal warning will be issued. The next step is a written warning that is placed in the employee's personnel file. If the inappropriate behavior persists, then either a suspension without pay or termination from the company will occur. In the case of a major violation of safety procedures an employee will be removed from the job.

3. Incentive

It is expected that all employees perform their assigned tasks in a safe and healthful manner. Therefore, safe work performance is a key element in an employee's review of his\her suitability for continued employment.

A supervisor's safety performance is an important element in the determination of his\her annual bonus. Records are kept and reviewed of the accidents and incidents related to a specific project. This record is then discussed with the Chief Executive Officer and assists him in the determination of a supervisor's annual bonus.

In addition to the individual incentives there are also awards given to crews who have completed a project without a lost time accident or illness. These awards have included dinners, jackets, hats, and sweat shirts.

H. EMPLOYEE PERFORMANCE REVIEW

1. Policy

In order to determine the effectiveness of its employees Sevenson has developed a system which reviews employee work performance. An important criterion in this review is safety and health performance.

2. Performance Review

All salaried employees are subject to an annual performance review conducted by their direct supervisor. One of the items included in this review is their safety record and performance. Accident statistics are kept for both the individual supervisor and specific project. These statistics are then taken into account when promotions, salary increases, and bonuses are decided.

Hourly employees undergo an informal review by their immediate supervisor. Again safety performance is a criterion. If an employee consistently and willfully violates safety rules and regulation, he\she is subject to the discipline program outlined in Section G.

I. MEDICAL SURVEILLANCE

SES will retain the services of a licensed physician to provide the necessary medical examinations and surveillance. The name and qualifications of the physician will be kept at each job site. In addition a record of examination of all personnel on site for work activities involving hazardous materials will be maintained by the SSHO. SES personnel medical records will be maintained by Sevenson at the site office for the duration of the project and will be available to appropriate authorities upon request.

All on-site personnel involved in this project will be provided with medical surveillance within a reasonable time period prior to entering the site, within 30 days after leaving the site, and at any time there is suspected excessive exposure to toxic chemicals or physical agents.

Medical surveillance protocol is the physician's responsibility but will meet the requirements of OSHA standard 29 CFR 1910.120 and for the contaminants that may be encountered. This would generally include:

a. Medical/Occupational Questionnaire
b. Full Physical Examination
c. Vitals (height, weight, blood pressure, pulse)
d. Screening Audiometric Test with Otoscopic Exam for Wax
e. Visual Acuity Measurement, including Color Perception
f. Pulmonary Function Test (Spirometry - FVC and FEV 1.0)
g. Resting EKG
h. Chest X-Ray (PA) Read by Board Certified Radiologist (every ten years)

i. Blood Chemistry Profile[1]
j. Complete Blood Count with Differential and Platelet Evaluation, including WBC, RBC, HGB, Hematocrit
k. Urinalysis with Microscopic Examination
l. Blood Lead and ZPP

Sevenson will maintain all medical surveillance records for a period of thirty (30) years and will make those records available to governmental agencies as required by State and/or Federal regulations.

1 Minimum Blood Chemistry Profile: Calcium, Phosphorous, Glucose, BUN, Uric Acid, Cholesterol, Total Protein, Albumin, total Bilirubin, direct Bilirubin, Indirect Bilirubin, Alkaline Phosphatase, LDH, SGOT, Sodium, Potassium, Chloride, CPK, SGPT, CGT, Creatinine, Triglycerides, Osmolality, Bun/creatinine Ratio, Globulin, A/G Ratio, Beta Cholesterol, (LDL)

J. EMERGENCY CONTINGENCY AND RESPONSE PLAN

1. Off-Site Contingency Plan

Prior to commencing work involving the handling or excavation of hazardous materials, SES will assist the Client in the coordination and development of an off-site emergency contingency plan. This plan is intended to provide immediate response to a serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from the site into adjacent public areas.

A coordination meeting will be held with appropriate authorities which may include the City, Fire, Hospital, State and City Police, State Department of Transportation, Health Department and Civil Defense officials. The meeting will identify the off-site Emergency response coordinator through whom all information and coordination will occur in the event of an incident. Plans will be developed, or existing plans incorporated into the master plan, for:

i) evacuation of adjacent areas
ii) fire fighting procedures
iii) transport of injured personnel to medical facilities
iv) priority transportation routes
v) coordination and/or modification of highway operations.

Techniques and recommended procedure for immediate first aid emergency response will be developed with local medical facilities.

2. On-Site Contingency Plan

To ensure the safety of on-site personnel, the following procedures will be followed should an emergency occur:

a. In the event of injury to on-site personnel or contact with hazardous materials, the following protocol will be followed:

  i) In the event of injury, notify the Client and the Safety Officer.

  ii) Phone the hospital identified to be closest to the site and describe injury.

  iii) Decontaminate personnel and administer appropriate first aid.

  iv) Transport personnel to the specified hospital along the predetermined route.

b. In the event that unanticipated drums or canisters are encountered, all work will immediately cease and the Safety Officer in conjunction with the Client will determine appropriate modifications to the health and safety plan.

c. In the event of excessive gases or vapors at the work area, the following actions will be taken:

  i) Remove all workers from the area.

  ii) Monitor contaminate concentrations to determine the type of respiratory protective device that will be sufficient before workers re-enter the area.

d. In the event of a fire, earth moving equipment will be used to quickly backfill and smother the fire.

e. In the highly unlikely event of a major leak of toxic gas, such as might occur if a compressed gas cylinder were encountered and ruptured during excavation, all on-site personnel will be evacuated to a safe distance, and the Police and Fire Department and local hospital notified. Police and Fire Department Officials will assume responsibility for and coordinate the emergency response strategy upon arrival.

K. PERSONAL SAFETY AND RELATED EQUIPMENT

Sevenson will provide all on-site personnel, including up to two non-Sevenson personnel, with appropriate personal safety equipment and protective clothing.

Sevenson will ensure that all safety equipment and protective clothing is kept clean and well maintained. As a minimum, Sevenson will supply:

a. Disposable outerwear such as coveralls, gloves, hardhat liners, and foot coverings. The type of coveralls used will be selected from Tyvek, Tyvek PE, or Saranex Coated Tyvek.

b. Hard hats.

c. Rubber, chemical resistant overboots.

d. Respirator with dual high efficiency organic vapor and particulate filters.

e. Nitrile/butyl outer gloves.

f. Inner gloves.

g. Goggles.

Protective equipment usage procedures have been developed by Sevenson. These requirements will contain, but not be limited to, the following:

1. All prescription eyeglasses in use on the site will be safety glasses. Contact lenses will not be permitted on-site within active work areas.

2. Respirator filters will be changed daily or upon breakthrough, whichever occurs first.

3. Coveralls and gloves will be tightly secured to outer clothing (by tape, for example) to minimize worker exposure to contaminants.

4. All disposable or reusable gloves worn on the site will be nitrile/butyl approved by the Safety Officer. Inner gloves will be disposable latex or cotton.

5. Footwear used on-site will be steel-toed safety shoes or boots, with chemical resistant soles, and will be covered by rubber overshoes when entering or working in the Exclusion Zone or Decontamination Zone.

6. All on-site personnel will wear an approved hardhat when present in the Exclusion Zone.

7. All personal protective equipment worn on site will be decontaminated at the end of the work day. The Safety Officer will be responsible for ensuring all personal protective equipment is decontaminated.

8. Duct Tape will be used to ensure that disposable coveralls and gloves are tightly secured when personnel are working within the contaminated zones.

L. PERSONAL HYGIENE

Sevenson will be responsible for, and ensure that all personnel performing or supervising remedial work within a potentially contaminated work area, or exposed or subject to exposure to hazardous chemical vapors, liquids, or contaminated soils, observe and adhere to the personal hygiene-related provisions of this section.

On-site personnel found to be disregarding the personal hygiene-related provisions of this plan will, at the request of the Client, or Site Safety Officer, be barred from the site.

Sevenson will provide, as a minimum, the following for the personal hygiene of all on-site personnel:

a. Suitable disposable outerwear, gloves, hardhat liners, and footwear on a daily basis for the use of on-site personnel and visitors.

b. Contained storage and disposal for used disposable outerwear.

c. Emergency shower, eye wash, and hand washing facilities for all on-site personnel.

d. Personnel hygiene facility for changing into and out of and storing work clothing separate from street clothing at the site, showers, and wash basins.

e. A lunch and/or break room at the site.

f. A smoking area at the site.

Sevenson will also include and enforce the following provisions:

i) On-site personnel will wear disposable outerwear, gloves, and outer footwear at all times when entering or working in the Exclusion or Decontamination Zone.

ii) Used disposable outerwear will not be reused, and when removed, will be placed inside disposable containers provided for that purpose.

iii) Smoking and chewing nicotine products will be prohibited except in a designated area.

iv) Eating and drinking will be prohibited except in a designated lunch or break area.

v) Soiled disposable outerwear will be removed prior to entering the lunch area, and prior to cleansing hands.

vi) On-site personnel will thoroughly cleanse their hands and other exposed areas before entering the smoking or lunch area.

vii) All personnel working in the "Dirty" Area or Decontamination Zone will change to fresh clothing after each working period or shift, prior to leaving the site.

viii) Used work coveralls will be disposed of at the conclusion of the project.

ix) Wash water will be stored on site in a Sevenson provided storage tank and will subsequently be pumped to the water treatment facility.

M. AIR MONITORING

During the progress of active remedial work, Sevenson will monitor air quality in and around each active work location. Sampling will be conducted on a regular periodic basis, and additionally as required by special or work-related conditions. Air leaving the active work locations will be monitored by downwind air sampling.

Instruments provided by Sevenson for air monitoring will be appropriate for the contaminants which are expected to be encountered.

Air monitoring equipment will be operated by personnel trained in the use of the specific equipment provided and will be under the control of the Site Safety Officer. All equipment will be operated, calibrated and maintained in accordance with the manufacturer's instructions.

N. SAFETY AND HEALTH HAZARD ANALYSIS

Prior to the start of the job, a safety and health hazard analysis will be performed. The safety and health hazards for each operation will be noted, then the appropriate control(s) for each hazard will be instituted. Prior to the start of any operation, the tasks, possible hazards, and their associated control techniques will be discussed with the affected employees.

O. RESPIRATORY PROTECTION PROGRAM

This respiratory protection program has been written to comply with the applicable OSHA regulations and contract specifications, to provide the basis for the administration of the respirator program, and to serve as a training tool for the affected workers. Specifics of the program such as brands of respirators used, cartridges or filters, and type of monitoring equipment will be provided upon mobilization.

Since respiratory protection, in many instances, will be the primary method for protecting a worker's health, it is SES's policy that all portions of this program be followed and that any deficiencies in the administration and enforcement of this program will be immediately corrected.

The overall responsibility for documenting and administering the respirator program rests with the Project Manager. This responsibility will be delegated to the Senior Site Safety Officer. The Site Safety Officer will be responsible for the purchasing, maintenance, cleaning, and "refresher" training of personnel. The Certified Industrial Hygienist will be responsible for the preparation and evaluation of this program.

The type of respirators that will be used will be selected on the basis of either legally mandated requirements or on the professional judgment of the Certified Industrial Hygienist. OSHA standard 1910.134 and the contract specifications are explicit in the types of respirators that are permitted to be worn when contaminants are handled. Those requirements are based on the airborne concentration of the various types of contaminants. Since monitoring is a requirement of the OSHA standard and contract specifications, sufficient data will be generated to determine the proper type of respiratory protection. The type of respirators to be worn will be chosen from the following types:

1. Half mask air purifying equipped with high efficiency particulate, organic vapor, and acid gas cartridges.

2. Full face air purifying equipped with high efficiency particulate, organic vapor, and acid gas cartridges.

3. Powered air purifying respirator equipped with high efficiency particulate filters.

4. Full face piece supplied-air respirator operated in the pressure demand mode.

It is important that a worker understands the proper use and limitations of the various respirators. Therefore, all workers who are required to wear respirators will undergo a training program that consists of:

1. Nature of the hazards
2. Explanation of why other control methods are not feasible
3. Explanation of the selection criteria for the respirators that are to be used
4. Limitations
5. Inspection
6. Proper donning and wearing
7. Positive and negative pressure fit tests
8. Maintenance
9. Emergency situations

In addition, all respirator users will be given a qualitative fit test.

All respirators will be cleaned and disinfected at the end of each day's use. The following procedure will be used:

1. Cartridges, filters, and canisters will be removed and discarded.
2. Wash respirator in warm water (approx. 120°F) and cleaner/disinfectant solution.
3. Rinse in clean, warm water and then in a 50% isopropyl alcohol solution.
4. Air dry or use a hair dryer.
5. Inspect all parts of respirator and replace any that are missing or defective.
6. Place face piece in plastic bag.
7. Immediately before use insert new cartridges.

All respirators will be stored in a separate plastic bag and stored in the decontamination trailer.

It will be the responsibility of the site safety officer to assure that all respirators have been properly inspected and maintained.

The inspection will consist of:

1. Tightness of connections.
2. condition of face piece, straps, connecting tubes, and canisters.
3. Condition of exhalation and inhalation valves.
4. Pliability and flexibility of rubber parts.
5. Condition of lenses of full face piece respirators.
6. Charge of compressed air cylinder of self contained breathing apparatus.
7. Proper functioning of regulators and warning devices.

As outlined in the air monitoring section of the health and safety plan, personal air samples will be taken to determine the extent of worker exposure. The results of this sampling will be reviewed and evaluated and the proper type of respiratory protection will then be determined by the CIH.

As the work progresses, the type and extent of the health hazards will become more fully documented. Also there is the potential for the development of new hazards. Therefore, this respiratory protection program will be continually evaluated by the on-site safety and health personnel in consultation with the CIH.

All personnel who will be required to wear respirators must participate in the medical surveillance program outlined in the health and safety plan. A certificate stating that the employee is physically able to wear a respirator will be obtained and made available to the Client's representative.

All respiratory protective equipment used on this project will be approved by the National Institute for Occupational Safety and Health.

Air Supplied Breathing Apparatus Standards contains specific requirements for supplied air systems.

Respirator Fit

An employee wearing a respirator can be protected against airborne contaminants only if there is successful sealing of the respirator on his or her face. All employees may not obtain a successful fit for a specific respirator, since facial dimensions vary considerably from person to person. A half face piece must contact a rather complex facial surface and the possibility of leakage is greater than in the case of the full face piece. Studies have shown that temples on glasses, absence of dentures, full beards, handlebar mustaches or wide sideburns can reduce respirator performance by as much as 25 percent.

The respirator face piece-to-face seal will be tested each time the employee enters a contaminated atmosphere. Most respirator manufacturers provide instructions for wearing and leak testing and these instructions will be followed. The training program will cover these procedures. Face piece-to-face fit tests include the following:

A. Positive Pressure Test - close or "block off" the exhalation valve and exhale gently into the face piece. If a slight positive pressure is built up with no apparent outward leakage around the seal, then the facepiece-to-face seal is satisfactory. Note that this test only applies to those respirators which have an exhalation valve which can be blocked (the exhalation valve cover may have to be removed for the test).

B. Negative Pressure Test - Close the inlet opening or hose of the respirator facepiece with the hand(s), tape or other means, inhale gently so that the facepiece collapses slightly and hold the breath for ten seconds. If the facepiece remains slightly collapsed and no inward leakage occurs, then the facepiece-to-face seal is probably satisfactory.

C. The respirator fit test will be performed according to the Qualitative Fit Test (QLFT) protocols as outlined in Appendix D of OSHA Standard 1910.1025, which is detailed below. Positive and negative pressure tests will be performed by the employee before each wearing of his respirator.

The isoamyl acetate protocol is as follows:

a. **Odor Threshold Screening**

1. Three 1-liter glass jars with metal lids (e.g. Mason or Bell jars) are required.

2. Odor-free water (e.g. distilled or spring water) at approximately 25°C will be used for the solutions.

3. The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor-free water in a 1-liter jar and shaking for 30 seconds. This solution will be prepared new at least weekly.

4. The screening test will be conducted in a room separate from the room used for actual fit testing. The two rooms will be well ventilated but may not be connected to the same recirculating ventilation system.

5. The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into 500 cc of odor-free water using a

clean dropper or pipette. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.

6. A test blank is prepared in a third jar by adding 500 cc of odor-free water.

7. The odor test and test blank jars will be labeled 1 and 2 for jar identification. If the labels are put on the lids they can be periodically dried off and switched to avoid people thinking the same jar always has the IAA.

8. The following instructions will be typed on a card and placed on the table in front of the two test jars (i.e. 1 and 2);

   "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

9. The mixtures used in the IAA odor detection test will be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA QLFT may not be used.

11. If the test subject correctly identifies the jar containing the odor test solution, he may proceed to respirator selection and fit testing.

b. **Respirator Selection**

1. The test subject will be allowed to select the most comfortable respirator from a large array of various sizes and manufacturers that include at least three sizes of elastomeric half facepieces and units of at least two manufacturers.

2. The selection process will be conducted in a room separate from where the fit test will take place.

3. The test subject should understand that he is being asked to

select the respirator which provides the most comfortable fit for him. Each respirator represents a different size and shape and, if fit properly, will provide adequate protection.

4. The test subject holds each facepiece up to his face and eliminates those which are obviously not giving a comfortable fit. Normally, selection will begin with a half-facepiece and if a fit cannot be found here, the subject will be asked to go to the full face piece respirators. (A small percentage of users will no be able to wear any half-facepiece respirator).

5. The more comfortable face pieces are recorded; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in #6 below. If the test subject is not familiar with using a particular respirator, he will be directed to don the mask several times and to adjust the straps each time, so that he becomes adept at setting proper tension on the straps.

6. Assessment of comfort will include reviewing the following points with the test subject:

   - Chin properly placed
   - Positioning of mask on nose
   - Strap tension
   - Fit across nose bridge
   - Room for safety glasses
   - Distance from nose to chin
   - Room to talk
   - Tendency to slip
   - Cheeks filled out
   - Self-observation in mirror
   - Adequate time for assessment

7. The test subject will conduct the conventional negative and positive pressure fit checks (e.g. see ANSI Z88.2-1980). Before conducting the negative or positive-pressure checks, the subject will be told to "seat" his mask by rapidly moving the head side-to-side and up and down, taking a few deep breaths.

8. The test subject is now ready for fit testing.

9. After passing the fit test, the test subject will be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator will be tried.

10. The employee will be given the opportunity to select a different facepiece and be retested if during the first two weeks of on-the-job wear the chosen facepiece becomes unacceptably uncomfortable.

c. **Fit Test**

1. The fit test chamber will be substantially similar to a clear 55 gallon drum liner suspended inverted over a two foot diameter frame, so that the top of chamber is about six inches above the test subject's head. The inside top center of the chamber will have a small hook attached.

2. Each respirator used for the fitting and fit testing will be equipped with organic vapor cartridges to offer protection against organic vapors. The cartridges or masks will be changed at least weekly.

3. After selecting, donning, and properly adjusting a respirator himself, the test subject will wear it to the fit testing room. This room will be separate from the room used for odor threshold screening and respirator selection, and will be well ventilated, as by an exhaust fan or lab hook, to prevent general room contamination.

4. A copy of the following test exercises and rainbow (or equally effective) passage will be taped to the inside of the test chamber:

Test Exercises

i. Normal breathing.
ii. Deep breathing. Be certain breaths are deep and regular.
iii. Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the shoulders. Have the test subject inhale when his head is at either side.
iv. Nodding head up and down. Be certain motions are complete and made about every second. Alert the test subject not to bump the respirator on the chest. Have the test subject inhale when his head is in the fully up position.
v. Talking. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

vi. Normal breathing.

5. Each test subject will wear his respirator for at least ten minutes before starting the fit test.

6. Upon entering the test chamber, the test subject will be given a six inch by five inch piece of paper towel or other porous absorbent single ply material, folded in half and wetted with three-quarters of one cc of pure IAA. The test subject will hang the wet towel on the hook at the top of the chamber.

7. Allow two minutes for the IAA test concentration to be reached before starting the fit-test exercises. This would be an appropriate time to talk with the test subject, to explain the fit test, the importance of his cooperation, the purpose for the head exercises, or to demonstrate some of the exercises.

8. Each exercise described in No. 4 above will be performed for at least one minute.

9. If at any time during the test, the subject detects the banana-like odor of IAA, he will quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

10. Upon returning to the selection room, the subject will remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, etc. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject will wait about five minutes before retesting. Odor sensitivity will usually have returned by this time.

11. If a person cannot be fitted with the selection of half-facepiece respirators, include full facepiece models in the selection process.

12. When the test subject leaves the chamber he will remove the saturated towel, returning it to the conductor. To keep the area from becoming contaminated, the used towels will be kept in a self-sealing bag. There should be no significant IAA concentration buildup in the test chamber from subsequent tests.

13. Persons who have successfully passed this fit test may be assigned the use of the tested respirator in atmospheres with up to ten times the PEL of airborne lead. In other works this IAA protocol may be used to assign a protection factor no higher than ten.

P. ASSURED EQUIPMENT GROUNDING CONDUCTOR PROGRAM

The purpose of the Sevenson's Assured Equipment Grounding Conductor Program is to provide company policy and guidelines to eliminate all serious injuries resulting from possible malfunctions, improper grounding, and/or defective electrical powered tools, equipment, cord sets, receptacles, and other electrical appliances connected with the above.

This program assigns responsibilities, outlines actions and methods which will reduce and keep to minimum accidental and serious injuries.

The Safety Director directs and has overall responsibility for the execution of this program and will coordinate with the job superintendent its implementation.

Daily Visual Inspection

A daily visual inspection will be made of the following to determine any external defects or indications of internal damage prior to each day's use. cord sets, attachment cap, plug and receptacle of cord sets and any other equipment connected by cord and plug (with the exception of cord sets and receptacles which are fixed and not exposed to damage) such as deformed or missing pins, insulation damage. Equipment found to be damaged will be tagged and removed from service until repaired and tested.

Tests

The following tests will be conducted at intervals not to exceed three (3) months on all cord sets, receptacles which are not a part of the permanent wiring of the building or structure and company-owned cord and plug-connected equipment required to be grounded.

1. Grounding conductors tested for continuity and will be electrically continuous.

2. Each receptacle and attachment cap or plug will be tested for correct

attachment of the equipment grounding conductor. The equipment grounding conductor will be connected to its proper terminal. The above required tests will be performed before first use, before equipment is returned to service following repairs, before equipment is used after any incident which can be reasonably suspected to have caused damage (example: when cord is run over or crushed). Cord sets and receptacles which are fixed and not exposed to damage will be tested at six (6) month intervals.

3. The above requirements set forth will be adhered to prior to making available or permitting the use by employees of any equipment.

4. Tests performed as required in this program will be recorded. Test records to identify each receptacle, cord set, cord and plug connected equipment that passed the test and will indicate the last date it was tested or the interval for which it was tested. This record will be kept by means of logs, color coding, or other effective means, and will be maintained until replaced by a more current record. The record will be made available at the job site for inspection OSHA personnel and any affected employee.

Q. GENERAL SAFETY RULES FOR EMPLOYEES

The following rules are to be adhered to while in our employ:

1. ACCIDENTS OR INJURIES, no matter how minor, must be reported to the foreman or superintendent for immediate treatment or first aid to prevent infection or complication.

2. JOB CLEANLINESS (housekeeping) will be practiced on all construction projects. Excess material not needed on present operations will be stockpiled or stacked until needed. Form and scrap lumber with protruding nails, and all other debris, will be kept cleared from work areas, passageways and stairs, in and around buildings or other structures, will not be allowed to accumulate and will be removed at regular intervals. Removal of debris will follow a prescribed (designated) procedure.

3. PERSONAL PROTECTIVE EQUIPMENT will be provided and used by workers where potential hazards exist. This includes lifelines where a danger of falling exists, respiratory equipment in a dangerous atmosphere, and safety glasses, goggles or face shields on all concrete breaking, metal chipping, welding or other operations where there is exposure to flying objects or anything injurious to the eyes.

4. FOOT PROTECTION - shoes that are workwise and in serviceable condition for the operation to which the employee is assigned are required. Check with superintendent or foreman as to the proper foot protection requirement for the assigned work.

5. **BE ALERT** when handling rough edges or abrasive material, when the work subjects hands to lacerations, puncturing, or burns. Special hand protection may be designated by the job superintendent or foreman.

6. **CLOTHING** will be appropriate to duties being performed and will not include torn or loose articles.

7. **HAND TOOLS** will not be used for any other purpose than that intended. Hand tools provided by either employer or employee that are damaged or worn will be promptly repaired or replaced.

8. **POWER TOOLS** will be operated only by authorized personnel, in accordance with manufacturers' instructions, and if electrical, will be grounded. All safety equipment provided will be tested, kept in good repair and will be utilized.

9. **CONSIDER** all wires "live" until checked and locked out. Keep safe distance from "live" electricity.

10. **DO NOT** use electrical power equipment while standing in water.

11. **ALL MACHINE GUARDS** will be kept in place while machinery is in operation. Tampering with machine guards is prohibited, and any removal requires the prior approval of a responsible supervisor. All guards are to be promptly replaced after the repair work that necessitated their removal has been completed.

12. **COMPRESSED GAS CYLINDERS** will be chained or otherwise secured in an upright position, and will be placed in cylinder carts whenever being transported to different locations on the project. Empty cylinders will be removed from the project.

13. **COMPRESSED GAS OR AIR** is not to be used for dusting off clothes or cleaning equipment. Never point an air hose at anyone, extremely dangerous.

14. **SOURCES OF IGNITION** will be prohibited from areas where flammable liquids or explosives are stored or issued, and appropriate warning signs will be posted at these locations. **"NO SMOKING"** rules must be observed in posted areas.

15. **INTOXICATING BEVERAGES** and non-prescribed drugs, possession or use during working hours, is strictly forbidden, or whenever such use directly affects job performance.

16. **TAMPERING WITH** or unauthorized removal of fire extinguishers from assigned locations is prohibited.

17. **PARTIALLY USED OR USED** fire extinguishers will be reported to foreman or superintendent.

18. **FLAMMABLE LIQUIDS** will be contained in approved metal safety cans.

19. **KEEP SALAMANDERS** or other portable (temporary) heating devices away from combustible materials.

20. **KNOW THE LOCATION** and use of fire extinguishing equipment and how to give fire alarm.

21. **NO EMPLOYEE** other than the operator will ride on any trucks, loaders, shovels, or other moving equipment unless specifically authorized to do so.

22. **NO EMPLOYEE** will operate any machinery, equipment or tool unless he has been properly instructed in its use and is thoroughly familiar with all details of its operation.

23. **BE AWARE** of work going on around you. Keep clear of suspended loads and traffic areas. Work with care and good judgment at all times.

24. **ALL SWITCHES** or drives on machinery will be shut down before cleaning, greasing, oiling, or making adjustments or repairs.

25. **EXCAVATION AND TRENCH CONSTRUCTION** - Employees will not work in areas where there is a danger of slides or cave-ins. Excavations will be braced and trenches sloped to an angle to relieve danger of cave-ins of the material being excavated.

26. **PLACE EXCAVATION SPOIL** far enough away, a minimum of two feet from the edge, to avoid load strain on walls. Remove surface rocks that may fall in.

27. **DO NOT** permit vehicles too close to edge of cut.

28. **WELDING AND BURNING OPERATIONS** will be carried on only by authorized personnel with appropriate individual protective equipment.

29. **FLOOR AND WALL OPENINGS** will be covered; if covers are removed for working purposes, then railings and toe boards must be utilized.

30. **NO EMPLOYEE** will work on scaffolding higher than ten feet above the ground or floor without proper guard rails, toe boards and proper flooring, except when proper precautions, such as lifelines with harnesses, barricades, etc., have otherwise been taken.

31. **NO EMPLOYEE** will work on scaffolding four to ten feet in height having a minimal horizontal dimension in either direction of less than 45 inches without standing guardrail installed on all open sides and ends of the platform.

32. **UNSTABLE OBJECTS** such as barrels, boxes, loose bricks or concrete block will not be used to support scaffolding or planks.

33. **KEEP ALL TOOLS** and materials away from the edge of scaffolds, platforms, shaft openings, etc.

34. **NO EMPLOYEE** will work above protruding reinforcing steel unless it has been protected to eliminate the possibility of impalement. Equipment used in placing concrete will be safe, and employees using it will follow proper safety procedures.

35. **HORSEPLAY OR PRACTICAL JOKES** will not be permitted or tolerated on the jobsite at any time.

36. **AVOID SHORTCUTS** - Use designated walkways, ramps, stairs, ladders, etc.

37. **WHEN ENTERING** different work areas, familiarize yourself with any required safety precautions.

38. **KEEP YOUR MIND** on your job - and temper under control ...<u>always</u>!

39. **ALL POSTED SAFETY RULES** will be obeyed and will not be removed except by management's authorization. Violation of these safety rules may be cause for immediate dismissal of any employee.

40. **SUPERINTENDENTS AND FOREMAN** will enforce all safety rules, instruct personnel in performing duties in a safe manner, start work only when sure that no dangerous conditions exist; instruct new personnel on safety rules.

R. SEVENSON POSTING REQUIREMENTS

1. **SAFETY** - The following must be posted in a conspicuous place on each jobsite:

   a. OSHA Poster
   b. Hand Signals (cranes and derricks)
   c. Emergency Phone Numbers (ambulance, doctor, hospital, fire department, and police)
   d. Fire Alarm Evacuation Plan

2. OSHA and State Citations

   a. Copies of all citations must be posted upon receipt.
   b. Citations must be posted until the violations are corrected or for three working days, whichever period is longer.

3. **SIGNS** - The following, where applicable, must be posted at the appropriate location:

   a. Danger Signs
   b. Caution Signs
   c. No Smoking
   d. Rated load capacities and special instructions for employees operating hoist, derricks, and cranes.
   e. Unauthorized Personnel "KEEP OUT".

4. OTHER POSTERS

   a. Non-discrimination in employment
   b. EEO officer appointment letter
   c. Age discrimination
   d. Equal Employment Opportunity

S. LOCKOUT PROCEDURE

Purpose

This procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It will be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

Compliance with this Program

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with this procedure. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance will not attempt to start, energize, or use that machine or equipment. Any employee found violating this procedure will be subject to discipline including written warning, suspension, or dismissal from the company.

Sequence of Lockout

1. Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance. It is the responsibility of the equipment operator to notify all affected supervision and employees when a piece of equipment is to be repaired.

2. The authorized employee will refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, will understand the hazards of the energy, and will know the methods to control the energy.

3. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).

4. De-activate the energy isolating device(s) so that the machine or equipment isolated from the energy sources(s).

5. Lock out the energy isolating device(s) with assigned individual lock(s).

6. Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.

7. Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.

   Caution: Return operating control(s) to neutral or "off" position after verifying the isolation of the equipment.

8. The machine or equipment is now locked out.

Restoring Equipment to Service

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps will be taken.

1. Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.

2. Check the work area to ensure that all employees have been safely positioned or removed from the area.

3. Verify that the controls are in neutral.

4. Remove the lockout devices and reenergize the machine or equipment.

   Note: The removal of some forms of blocking may require reenergization of the machine before safe removal.

5. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

T. SUBSTANCE ABUSE PROGRAM

Sevenson Environmental Services, Inc. in the interest of promoting occupational safety and health, complying with applicable laws and regulations, and complying with the contractual requirements of many clients, is instituting a substance abuse program for all employees.

STATEMENT OF COMPANY POLICY:

As a condition of employment, Sevenson Environmental Services, Inc. and its subsidiaries, require all employees to strictly observe and to fully cooperate in the implementation of the Sevenson Substance Abuse Program: This program:

1. Forbids the unlawful manufacture, distribution, dispensation or medically unauthorized use or possession of alcohol, drugs and controlled or illegal substances or associated paraphernalia at the jobsite.

2. Forbids being at work in an impaired condition due to the influence of alcohol, drugs, or controlled substances.

3. Requires employees taking a drug or prescribed medication which is known as possibly affecting or impairing judgement, coordination or the ability to perform work in a safe and productive manner, to ascertain what work restrictions, if any, are deemed necessary prior to starting work.

4. Provides for disciplinary actions including termination for violations of company policy. Management, at its discretion, may require the satisfactory participation in a drug abuse or rehabilitation program of an employee who violates this policy.

5. Reserves the company's right to conduct searches and inspections including drug screening to determine if the employee is in possession of or under the influence of alcohol, drugs, or controlled substances. The company will conduct alcohol and drug screening and/or searches as required by any applicable federal or state statue or regulation or contract provision.

6. Provides for actions to be taken if an employee refuses to submit to a search or inspection, refuses to give an urine sample, or is found in possession of, or under the influence of alcohol, drugs, or controlled substances.

7. Provides that, depending on circumstances, other actions, including notification of appropriate law enforcement agencies, may be taken.

8. Requires that all employees be informed of this policy and that any employee who is convicted under a criminal drug statute for a violation occurring in the workplace report that conviction to his or her supervisor no later than five days after the conviction.

RESPONSIBILITIES

COMPANY MANAGEMENT

To implement the Sevenson Substance Abuse Program, company management undertakes the following responsibilities:

1. To state clearly and unequivocally that the unlawful manufacture, distribution dispensation or medically unauthorized use or possession of alcohol, drugs and controlled or illegal substances, or associated paraphernalia is prohibited at all of our jobsites;

2. To communicate the program requirements to all employees;

3. To train supervisors so that they become aware of symptoms that could be caused by alcohol and/or drug abuse, and that in effect render the employee questionable for duty;

4. To educate employees in regard to the health and safety hazards of the abuse and experimentation with drugs and/or alcohol;

5. To encourage employee rehabilitation prior to or coincidental with disciplinary action.

COMPANY SUPERVISION

In implementing the Sevenson Substance Abuse Program, company supervisors will:

1. Be responsible for overseeing the productivity and safety of their work areas;

2. If an employee appears to be impaired due to the influence of alcohol or drugs, to the extent practical and reasonable:

a. Ask another management representative to observe the behavior.

b. Inform the employee that he/she appears unfit to work.

c. Escort the employee to the designated medical facility for clinical assessment, with his/her consent.

d. Have the employee sign an alcohol and drug screening form.

e. If the employee refuses to go to the medical facility for the evaluation or sign the consent form, inform the employee that this refusal is a failure to follow a supervisor's request which is a violation of company policy and that discipline will follow.

f. Document the facts of the situation.

g. Follow management's direction regarding disciplinary action.

EMPLOYEES

As part of their duty to abide by the Sevenson Substance Abuse Program, employees will:

1. Abide by all company work rules concerning the safety and security of the jobsite.

2. Not come to work while impaired by the effects of drugs or alcohol.

3. If affected personally by a drug or alcohol problem, seek a confidential professional assessment and referral for appropriate treatment.

4. If taking a drug or prescribed medication that may possibly affect ability to perform work in a safe and effective manner, ascertain what work restrictions, if any, are necessary prior to starting work.

FREQUENCY OF TESTING

There will be five types of testing used. These will be:

1. Pre-employment

2. For Cause

3. Random

4. Return from Rehabilitation

5. Annual

Pre-employment testing will be conducted to allow the company the opportunity to screen out prospective employees whose drug use might present a threat to the safety, productivity, ad security of the work environment.

For Cause testing will occur when the employee exhibits certain behaviors that indicate he/she may be impaired.

Random testing will occur throughout the year. Approximately 60% (5% per month) of all active employees will be subjected to the random testing. Employee selection will be done on a strictly random basis and a selected employee will be placed back in the pool i.e., once selected an employee may be selected again.

Return from Rehabilitation - prior to being reinstated into the work force an employee must undergo a substance abuse test.

Annual - at least once a year all employees will be required to undergo a drug test.

CONTENT OF TEST

Testing will be conducted for:

Nº	Drug	Screening Test Cutoff Level (Ng/ml)	Confirmation Test Cutoff Level (Ng/ml)
1.	Cannabidiol	50	15
2.	Cocaine	300	150
3.	Opiates Morphine Codeine	300 N/A N/A	N/A 300 300
4.	Amphetamines	1,000	500
5.	Barbiturates	300	300
6.	Benzodiazepines	300	300
7.	Phencyclidine (PCP)	25	25
8.	Methadone	300	300
9.	Alcohol	0.04% by volume or 0.004g % = (40 mg/dl)	0.04% by volume or 0.004g % = (40 mg/dl)

All testing will be conducted under strict confidentiality and specimen security. There will be no intrusive testing, i.e., blood tests, used for screening, only urinanalysis. To verify the integrity of the specimen, employees will be accompanied by the clinic's specimen custodian, but will not be under direct observation while the sample is obtained. The custodian will verify with the employee that the sample is properly identified and labeled.

MEDICAL REVIEW OFFICER

Dr. Harvey Wentzel or his designee of Jefferson Medical College will be the Medical Review Officer. All collected samples will be sent to a central laboratory. All samples will be analyzed according to published techniques with stringent quality assurance requirements. Results will be reported directly to Dr. Wentzel, who will make the appropriate review and recommendation(s).

The result and recommendation(s) will be sent to the company's administrator of this program. The administrator of this program will be Paul Hitcho, Vice President of Safety and Health. Personnel who fail the test will be given counseling concerning the availability and type of treatment.

DEFINITIONS

Impaired Condition - Inability to perform the essential functions of the job effectively and in a safe manner.

Under the Influence - Workplace behavior indicates that employee may have a prohibited drug or substance in his/her system.

Pre-employment Testing - Prequalification for prospective employees to provide a body substance sample for drug testing.

Random Testing - Subject to drug testing at anytime.

Annual Testing - Qualification once a year to assume any position by providing a body substance sample for testing.

Reasonable Belief - Behavior indicates that employee is under the influence of drugs. This belief is based on objective, articulate facts.

Legal or over-the-counter drug - Drug prescribed by a licensed physician that does not impair employee's ability to effectively work.

Illegal Drug - Drugs not prescribed by a licensed physician for use by the person possessing them. (Amphetamines, Marijuana, Cocaine, Opiates, Phencyclidine, Alcohol, Barbiturates).

Unauthorized Drugs - include excessive quantities of prescribed drugs, which may adversely influence performance or behavior.

U. SAFETY INSPECTION CHECKLIST

1. AIR TOOLS

___ a. Pneumatic power tools will be secured to the hose in a positive manner to prevent accidental disconnection.

___ b. Safety clips or retainers will be securely installed and maintained on pneumatic impact tools to prevent them from being accidentally expelled.

___ c. The manufacturer's safe operating pressure for all fittings will not be exceeded.

2. COMPRESSED AIR, USE OF

___ a. Compressed air used for cleaning purposes will not exceed 30 psi and will be used with effective chip guarding and personal protective equipment.

___ b. This requirement does not apply to concrete form, mill scale, and similar cleaning operations.

3. COMPRESSED GAS CYLINDERS

___ a. Valve protection caps will be in place when compressed gas cylinders are transported, moved, or stored.

___ b. Cylinder valves will be closed when work is finished and when cylinders are empty or are moved.

___ c. Compressed gas cylinders will be secured in an upright position at all times, except when cylinders are actually being hoisted or carried.

___ d. Cylinders will be kept at safe distance or shielded from welding or cutting operations. Cylinders will not be placed where they can contact an electrical circuit.

___ e. Oxygen and fuel gas regulators will be in proper working order while in use.

___ f. Oxygen and fuel gas cylinders will be stored separately. Minimum distance of 20 feet.

4. CRANES AND DERRICKS

___ a. The employer will comply with the manufacturer's specifications and limitations.

___ b. Rated load capacities, recommended operating speeds, and special hazard warnings or instructions will be posted on all equipment and visible from the operator's station.

___ c. Equipment will be inspected before each use and all deficiencies corrected before further use.

___ d. Accessible areas within the swing radius of the revolving superstructure will be barricaded.

___ e. Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work, or where insulating barriers not a part of or an attachment to the equipment or machinery have been erected to prevent physical contact with the lines, no part of a crane or its load will be operated within 10 feet of a line rated 50 kV or below. for lines rated over 50 kV, the minimum clearance is 10 feet + 0.4 inches for each kV over 50, or twice the length of the line insulator, but never less than 10 feet.

5. DISPOSAL CHUTES

___ a. Whenever materials are dropped more than 20 feet to any exterior point, an enclosed chute will be used.

___ b. When debris is dropped through holes in the floor without the use of chutes, the area where the material is dropped will be enclosed with barricades not less than 42 inches high and not less than six feet back from the projected opening.

6. DRINKING WATER

___ a. An adequate supply of potable water will be provided in all places of employment.

___ b. Portable drinking water containers will be capable of being tightly closed and be equipped with a tap.

___ c. The common drinking cup is prohibited.

___ d. Unused disposable cups will be kept in a sanitary container, and a receptacle will be provided for used cups.

7. ELECTRICAL

___ a. All electrical work will be in compliance with the 1971 National Electrical Code unless otherwise provided by OSHA regulations.

___ b. Ground fault interrupters or assured grounding program.

___ c. The noncurrent-carrying metal parts of plug-connected or portable equipment will be grounded. Fixed equipment will be grounded and portable tools and appliances protected by an approved system of double insulation or its equivalent.

___ d. Extension cords used with portable electric tools and appliances will be the 3-wire type. Flexible cords will be used only in continuous lengths without splices, except that suitable molded or vulcanized splices may be used where properly made, and the wire connections soldered. Worn or frayed cords will not be used.

___ e. Exposed bulbs on temporary lights will be guarded to prevent accidental contact except where bulbs are deeply recessed and not suspended by their electric cords unless designed for this use.

___ f. Receptacles for attachment plugs will be of approved, concealed contact type with a contact for extending ground continuity and will be so designed and constructed that the plug may be pulled out without leaving any live parts exposed to accidental contact. Where different voltages, frequencies, or types of current (a.c. or d.c.) are to be supplied by portable cords, the receptacles will be designed so that attachment plugs are not interchangeable.

___ g. Each disconnecting means for motors and appliances and each service feeder or branch circuit at the point where it originates will be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident.

8. EXCAVATING AND TRENCHING

___ a. Before opening any excavation, efforts will be made to determine if there are underground utilities in the area, and they will be located and protected during the excavation operations.

___ b. The walls and faces of all excavations and trenches (5 feet in depth) in which employees are exposed to danger from moving ground will be guarded by a shoring system, sloping of the ground, or some other equivalent means. In unstable ground, protection must be given for trenches less than 5 feet in depth.

___ c. In excavations which employees may be required to enter, excavated or other material will be effectively stored and retained at two or more feet from the face of the excavation.

___ d. Daily inspections of excavations will be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation will cease until the necessary precautions have been taken to safeguard the employees.

___ e. Trenches more than four feet deep will have ladders or steps located so as to require no more than 25 feet of lateral travel.

9. EXPLOSIVES AND BLASTING

___ a. Only authorized and qualified persons will be permitted to handle and use explosives.

___ b. Explosive material will be stored in approved facilities as required by provisions of the Internal Revenue Service regulations published in 26 CFR 181, "Commerce in Explosives".

___ c. Smoking and open flames will not be permitted within 50 feet of explosives storage magazines.

___ d. Procedures that permit safe and efficient loading will be established before loading is started.

10. EYE AND FACE PROTECTION

___ a. Eye and face protection will be provided when machines or operations present potential eye or face injury.

___ b. Eye and face protective equipment will meet the requirements of ANSI Z87.1-1989, "Practice for Occupational and Educational Eye and Face Protection.

___ c. Employees involved in welding operations will be furnished proper filter lens shade members.

___ d. Employees exposed to laser beams will be furnished suitable laser safety goggles which will protect for the specific wave length of the laser and be of optical density (O.D.) adequate for the energy involved.

11. FIRE PROTECTION

___ a. A fire fighting program is to be followed throughout all phases of the construction and demolition work involved. It will provide for effective fire fighting equipment to be available without delay and designed to effectively meet all fire hazards as they occur.

___ b. Fire fighting equipment will be conspicuously located and readily accessible at all times and be maintained in operating condition.

___ c. A regular check of portable fire inspections to determine whether they are fully charged and have been inspected during the past year must be made.

___ d. If the building includes the installation of automatic sprinkler protection, the installation will closely follow the construction and be placed in service as soon as applicable laws permit, following completion of each story.

12. FLAGMEN

___ a. When signs, signals, and barricades do not provide necessary protection on or adjacent to a highway or street, flagmen or other appropriate traffic controls will be provided.

___ b. Flagmen will be provided with an will wear a red or orange warning garment while flagging. Warning garments worn at night will be reflectorized material.

___ c. Construction areas shall be posted with legible traffic signs at points of hazard.

13. FLAMMABLE AND COMBUSTIBLE LIQUIDS

___ a. Only approved containers and portable tanks will be used for storage and handling of flammable and combustible liquids.

___ b. Storage of containers (not more than 60 gallons each) will not exceed 1,100 gallons in any one pile or area. The storage area will be graded to divert possible spills away from buildings or other exposures, or will be surrounded by a curb or earth dike. Storage areas will be free of weeds, debris, and other combustible material not necessary to the storage.

___ c. Flammable liquids will be kept in closed containers when not actually in use.

___ d. Conspicuous and legible signs prohibiting smoking will be posted in service and refueling areas. Above ground fuel tanks must be surrounded by a curb or a dike.

14. FLOOR OPENINGS, OPEN SLIDES, HATCHWAY, ETC.

___ a. Floor openings will be guarded by a standard railing and toeboards or cover. In general, the railing will be provided on all exposed sides, except at entrances to stairways. Temporary floor openings will have standard railings.

___ b. Every open-sided floor or platform six feet or more above adjacent floor or ground level will be guarded by a standard railing, or the equivalent, on all open sides except where there is entrance to a ramp, stairway, or fixed ladder.

___ c. Runways four feet or higher will have standard railings on all open sides, except runways more than 18 inches wide used exclusively for special purposes, which may have the railing on one side omitted where operating conditions necessitate.

15. GENERAL REQUIREMENTS

___ a. The employer will initiate and maintain such programs as may be necessary to provide for frequent and regular inspections of the jobsite, materials, and equipment.

___ b. The employer will instruct each employee in the recognition and avoidance of unsafe conditions and in the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury. Weekly safety meetings.

16. HAND TOOLS

___ a. Employers will not issue or permit the use of unsafe hand tools.

___ b. Wrenches will not be used when jaws are sprung to the point that slippage occurs. Impact tools will be kept free of mushroomed heads. The wooden handles of tools will be kept free of splinters or cracks and will be kept tight in the tool.

___ c. Electrical power-operated tools will be either approved double-insulated or properly grounded.

17. HEATING DEVICES, TEMPORARY

___ a. Solid fuel salamanders are prohibited in buildings and on scaffolds.

18. HOISTS, MATERIAL AND PERSONAL

___ a. The employer will comply with the manufacture's specifications and limitations.

___ b. Rated load capacities, recommended operating speeds, and special hazards warnings or instructions will be posted on cars and platforms.

___ c. Hoistway entrances will be protected by substantial gates or bars.

___ d. Hoistway doors or gates will be not less than six feet six inches high and will be provided with mechanical locks which cannot be operated from the landing side, and will be accessible only to persons on the car.

___ e. Overhead protective coverings will be provided on the top of the hoist cage or platform.

19. HOUSEKEEPING

___ a. During the course of construction, alteration, or repairs, form and scrap lumber with protruding nails and all other debris will be kept cleared from work areas, passageways, and stairs, in and around buildings or other structures.

___ b. Combustible scrap and debris will be removed at regular intervals.

___ c. Containers will be provided for collection and separation of all refuse. Covers will be provided for containers used for flammable or harmful substances.

___ d. Wastes will be disposed of at frequent intervals.

20. LADDERS

___ a. The use of ladders with broken or missing rungs or steps, broken or split rails, or other faulty or defective construction is prohibited. When ladders with such defects are discovered they will immediately be withdrawn from service.

___ b. Portable ladder feet will be laced on a substantial base, and the area around the top and bottom of the ladder will be kept clear. Portable ladders will be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is about 1/4 of the working length of the ladder (the length along the ladder between the foot and top support). Portable ladders in use will be tied, blocked, or other wise secured to prevent their being displaced.

___ c. Portable metal ladders will not be used for electrical work or where they may contact electrical conductors.

___ d. Job-made ladders will be constructed for intended use. If a ladder is to provide the only means of access or exit from a working area for 25 or more employees, or simultaneous two-way traffic is expected, a double-cleat ladder will be installed. Cleats will be inset into the edges of the side rail 1/2 inch, or filler blocks will be used on the rails between the cleats. The cleats will be secured to each rail with three 10d common wire nails or other fasteners of equivalent strength. Cleats will be uniformly spaced, 12 inches top-to-top.

21. MEDICAL SERVICES AND FIRST AID

___ a. The employer will ensure the availability of medical personnel for advice and consultation on matters of occupational health.

___ b. Provisions will be made prior to commencement of the project for prompt medical attention in case of serious injury. In the absence of reasonably accessible medical facilities, which are available for the treatment of injured employees, a person who has a valid certificate in first aid training from the American Red Cross, the U.S. Bureau of Mines, or equivalent training that can be verified by documentary evidence, will be available at the worksite to render first aid.

___ c. Post the phone numbers of the emergency facility, ambulance, fire, and police.

___ d. First aid supplies approved by the consulting physician will be readily available.

22. MOTOR VEHICLES AND MECHANIZED EQUIPMENT

___ a. Motor vehicles covered are those vehicles that operate within an off-highway jobsite, not open to public traffic. All vehicles will have a service brake system, and a parking brake system. All vehicles in use will be checked at the beginning of each shift to assure that all parts, equipment, and accessories affecting safe operation are free from defects and in safe operating condition.

___ b. No employer will use any motor vehicle equipment having an obstructed view of the rear unless:

- the vehicle has a reverse signal alarm audible above the surrounding noise level or
- the vehicle is backed up only when an observer signals that it is safe to do so.

___ c. Bulldozer and scraper blades, end loader buckets, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls will be in neutral position with the motors stopped and brakes set, unless work being done requires otherwise. Whenever the equipment is parked, the parking brake will be set. Equipment parked on inclines will have the wheels chocked and the parking brake set.

23. PERSONAL PROTECTIVE EQUIPMENT

___ a. The employer is responsible for requiring the wearing of appropriate personal protective equipment in all operations where the need is indicated for using such equipment to reduce the hazard to the employees. All employees are wearing the required safety equipment.

___ b. Lifelines, safety belts, and lanyards will be used only for employee safeguarding.

___ c. Employees working over or near water, where danger of drowning exists, will be provided with U.S. Coast Guard-approved life jackets or buoyant work vests.

24. POWER TRANSMISSION APPARATUS

___ a. All hand and power tools and similar equipment will be maintained in a safe condition. Belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment will be guarded if such parts are exposed to contact by employees or otherwise create a hazard.

___ b. Guarding will meet the requirements of ANSI B15.1-1953 (R 1958). "Safety Code for Mechanical Power Transmission Apparatus."

25. RAILINGS

___ a. A standard railing will consist of top rail, intermediate rail, and posts and have a vertical height of approximately 42 inches from upper surface of top rail to the floor, platform, etc.

___ b. The top rail of a railing will be smooth-surfaced with a strength to withstand at least 200 pounds. The intermediate rail will be approximately halfway between the top rail and floor.

___ c. A stair railing will be of construction similar to a standard railing, but the vertical height will be not more than 34 inches nor less than 30 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

26. ROLLOVER PROTECTIVE STRUCTURES (ROPS)

___ a. Rollover protective structures (ROPS) apply to the following types of materials handling equipment: all rubber tired, self-propelled scrapers; rubber tired front end loaders; rubber tired dozers; wheel type agricultural and industrial tractors; crawler type loaders; and motor graders, with or without attachments that are used in construction work. This requirement does not apply to sideboom pipelaying tractors.

___ b. Above equipment manufactured before 7/1/69 is not required to have ROPS as of this printing.

27. SAFETY NETS

___ a. Safety nets will be provided when workplaces are more than 25 feet above the surface where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical.

___ b. Where nets are required, operations will not be undertaken until the net is in place and has been tested.

28. SAWS, PORTABLE CIRCULAR (WOODWORKING)

___ a. All portable, power-driven circular saws will be equipped with guards above and below the base plate or shoe. The upper guard will cover the saw to the depth of the teeth, except for the minimum area required to permit the base to be tilted for bevel cuts. The lower guard will cover the saw to the depth of the teeth, except for the minimum are required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard will automatically and instantly return to the covering position.

29. SCAFFOLDS

___ a. Scaffolds will be erected on sound, rigid footing capable of carrying the maximum intended load.

___ b. Scaffolds and their components will be capable of supporting without failure at least four times the maximum intended load.

___ c. Guardrails and toeboards will be installed on all open sides and ends of platforms more than 6 feet above the ground or floor, except needle beam scaffolds and floats. Scaffolds four feet to 10 feet in height, having a minimum dimension in either direction of less than 45 inches, will have standard guardrails installed on all open sides and ends of the platform.

___ d. There will be a screen with maximum 1/2 inch openings between the toeboard and the top rail where persons are required to pass or work under the scaffold.

___ e. All planking will be scaffold grade as recognized by grading rules for the species of wood used. The maximum permissible spans for 2 x 9 inch or wider planks are shown in the following table:

MATERIAL		
	Full Thickness Undressed Lumber	Nominal Thickness Lumber
Working Load (p.s.f.)	25 50 75	25 50
Permissible Span (ft.)	10 8 6	8 6

The maximum permissible span for 111/4 x 9 inch or wider plank of full thickness is four feet with medium loading of 50 p.s.f.

___ f. Scaffold planking will be overlapped a minimum of 12 inches or secured from movement.

___ g. Scaffold planks will extend over their end supports not less than six inches nor more than 12 inches.

___ h. All scaffolding and accessories will have any defective parts immediately replaced or repaired.

30. TOEBOARDS (FLOOR AND WALL OPENINGS AND STAIRWAYS)

___ a. Railings protecting floor openings, platforms, scaffolds, etc., will be equipped with toeboards wherever, beneath the open side, persons can pass, there is moving machinery, or there is equipment with which falling material could cause a hazard.

___ b. A standard toeboard will be at least four inches in height and may be of any substantial material, either solid or open, with openings not to exceed one inch in greatest dimension.

31. WELDING

___ a. The employer will thoroughly instruct employees in the safe use of fuel gas welding and cutting operations.

___ b. Employers will instruct employees in the safe means of arc welding and cutting operations.

___ c. Proper precautions (isolating welding and cutting, removing fire hazards from the vicinity, providing a fire watch, etc.) for fire prevention will be taken in areas where welding or other "hot work" is being done. No welding, cutting, or heating will be done where the application of flammable paints, or the presence of other flammable compounds, or heavy dust concentrations creates a fire hazard.

___ d. Arc welding and cutting operations will be shielded by noncombustible or flameproof shields to protect employees from direct arc rays.

___ e. When electrode holders are to be left unattended, the electrodes will be removed and the holders will be so placed or protected that they cannot make electrical contact with employees or conducting objects.

___ f. All arc welding and cutting cables will be completely insulated and free from repair or splices within 10 feet from the electrode holder. Defective cables will be repaired or replaced.

___ g. Fuel gas hose and oxygen hose will be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Oxygen and fuel gas hoses will not be interchangeable. A single hose having more than one gas passage will not be used.

___ h. General welding, cutting, and heating operations (not involving conditions and materials described in Safety and Health Standards) may normally be done without mechanical ventilation or respiratory protective equipment. But where, because of unusual physical or atmospheric conditions, an unsafe accumulation of contaminants exists, suitable mechanical ventilation or respiratory protective equipment will be provided.

___ i. Employees performing any type of welding, cutting, or heating will be protected by suitable eye protection equipment in accordance with the requirements of the Safety and Health Standards.

___ j. General mechanical or local exhaust ventilation will be provided whenever welding, cutting, or heating is performed in a confined space. When sufficient ventilation cannot be obtained without blocking the means of access, employees in the confined space will be protected by air line respirators, and an employee on the outside of such a confined space will be assigned to maintain communication with those working within it and to aid them in an emergency.

32. WIRE ROPE, CHAINS, ROPES

___ a. Wire ropes, chains, ropes, and other rigging equipment will be inspected prior to use and as necessary to assure their safety. Defective gear will be removed form service.

___ b. Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other such attachments, will not be used.

___ c. When U bolt wire rope clips are used to form eyes, the following table will be used to determine the number and spacing of clips.

NUMBER, SPACING OF U-BOLT WIRE ROPE CLIPS

Improved Plow Steel, Rope Diameter Inches	Number of Clips Drop Forged	Other Material	Minimum Spacing (inches)
1/2	3	4	3
5/8	3	4	3-3/4
3/4	4	5	4-1/2
7/8	4	5	5-1/4
1	5	6	6

NUMBER, SPACING OF U-BOLT WIRE ROPE CLIPS			
1-1/8	6	6	6-3/4
1-1/4	6	7	7-1/2
1-3/8	7	7	8-1/4
1-1/2	7	8	9

V. WET VACUUM OPERATION

1. Wet Vacuum Operations

The following is a Sevenson Environmental Services, Inc. procedures on Wet Vacuum Operations.

Its objective is to illustrate to personnel the safe and proper operating procedures of wet vacuum operations.

This will include three steps:

1. PRE-DEPARTURE CHECKS
2. TROUBLE SHOOTING
3. JOB EXECUTION

What is Wet Vacuum? Wet vacuuming is the process of picking up, containing and then discharging various contaminated wastes or fluids. This is achieved by means of a truck mounted vacuum pump and container for picking up fluids or slurries and transporting them to disposal areas.

Sevenson Environmental Services, Inc. operates two different types of these units. The vacuum tank capacities are generally either 2500 or 4000 gallons.

The two different methods of powering the vacuum pump are:

- By Truck P.T.O. (Power Take Off)
- By Power Pack (Separate power operating unit)

These units look similar, but operate differently. Knowing your equipment and proper procedures is the key to a safe and successful operation.

Before departure to a job, a preliminary check of the unit is necessary to ensure proper operation of the unit.

These checks are to be performed by the operator and include the following:

- Park the unit, apply emergency brake and chock the wheels.
- Check the engine oil and add if required. Check all other fluid levels.
- Check engine fuel on gauge. (If not full, fill it up).
- If your unit is equipped with separate power pack, check the fuel level also.
- Check windshield washer level and condition of wiper blades.
- Check hydraulic oil level in the reservoir by means of the dipstick, or by sight and add if required.
- Check coolant level in radiator. The level should be approximately 1" from the top. If lower, add proper coolant.
- The following fluid checks are performed on the pump. Check the oil level by inspection of the sight glass. Add if required.
- Check the separate power pack oil level of the engine by means of the dipstick - add 20 HD if required.
- A visual inspection of all lights and signals should be performed to ensure all are functional. Another man should be used for this check.
- Inspect all tires for wear, cranks, loose lug nuts and flats.
- Check the grounding wire and clamp on the unit. Always connect this ground before vacuuming operations begin.
- At this time, you should start the unit to ensure it is operating properly.
- For P.T.O. operated units, leave transmission in neutral, emergency brake applied, and wheels chocked.
- Start the engine and let it warm up.
- Depress clutch to the floor.
- Engage P.T.O. gear box by pulling the shaft up and then slowly release the clutch.
- Increase engine speed (R.P.M.) by adjusting throttle to proper setting (1280 R.P.M.). Never operate over 1280 R.P.M.
- On the drive units with P.T.O., grease the universal and bearings every

eight (8) hours.

- For units with separate power pack, leave unit parked, emergency brake applied, truck engaged in gear, wheels chocked and shut engine off.

- Place the vacuum lever in the neutral position.

- First, engage the P.T.O. and then push the starter button and start the unit.

- Increase the R.P.M. by adjusting the throttle.

- At this time, set the pump lever on the pump to vacuum position.

- Wait until 18" of mercury is reached on the vacuum pressure gauge.

- If 18" of mercury is not obtained, check to make sure:

    1. Valves at the rear of the unit are closed;
    2. That there are no leaks around the door gasket; and
    3. The pump lever is in the vacuum position.

- Once vacuum pressure has been obtained, we know the unit is functioning, shut the unit down in the reverse order of either the separate power or the P.T.O. units.

You are now ready to check your auxiliary and safety equipment.

- Check all hoses for holes, wear and proper fittings.

- Any hoses or fittings which are defective should be tagged for repairs.

Every wet vac unit should be equipped with the following items in order for the operator to execute his job properly:

1. Hammer
2. Pipe Wrench
3. Screw Driver
4. Shovel
5. Hoses
6. Hose Gaskets
7. Hose Adapters 4" to 3"
8. Vacuum Pump Filters
9. Oil for Pumps
10. Wheel Chocks

As a final pre-departure check, see that you have all your personal safety equipment.

1. Hard Hat
2. Safety Glasses
3. Safety Goggles
4. Rubber Rain Suit
5. Rubber Boots
6. Rubber Gloves
7. Face Shield
8. First Aid Kit
9. Fire Extinguisher
10. Warning Signs or Rope

A description of your job will be given to you by your foreman or supervisor. this will include location and type of material being picked up. Example:

1. Corrosive Acids
2. Non-Corrosive Acids
3. Oil Waste
4. Sewage and Non-Acidic Sludge
5. Materials that foam need special instructions on how to load and handle.

Also, he will include any disposal instructions.

You and your equipment are now fully prepared to depart to your job. On units with front wheel drive, disengage the hub locks for general use. Engage hub locks only when extra traction is absolutely necessary.

Upon arrival at the job, check with the customer for any last minute instructions or changes as well as to inform him of your arrival.

Park your unit in a designated area for the job execution. If backing up of the unit is required in blind areas, request a signal man to guide you in.

Now that your unit is parked on level ground, chock your wheels.

Rope off your area if necessary to inform others of your presence.

Hook up your hoses and lay them out in an orderly fashion.

Drain the moisture from the filters by opening the valve at the bottom of both filters.

Start the unit up the same way as at the shop.

When 18" of mercury has been obtained, commence vacuuming.

If you do not reach 18" of mercury - check to see if the vacuum lever is in the vacuum position, that the intake valve is open, if the vacuum hose is completely submerged, and/or the float valve at the top of the unit is stuck in the shut off position.

When vacuuming, check your fluid level through the inspection glasses on the back door of the tank.

If the float valve fails to function, serious damage to the pump could result. Shut the unit down at or before the fluid level reaches the top inspection glass.

Maximum efficiency is gained by keeping the hose completely submerged in the material.

When the unit is full or the job is completed, shut the intake valve and shut the equipment down in the reverse order to the start up procedure.

At this time, if you are not returning to the jobsite, disconnect your hoses and drain them.

Load the equipment back on the truck, leaving the jobsite in a neat, orderly condition.

Remember, a safe, neat and efficient job represents both your own personal, and our company's professional approach to servicing our customer's problems.

Remove the chock blocks and transport the waste to the disposal area. Install the 4" cap on the back intake and discharge valves before leaving the jobsite.

Where applicable, check with the disposal area personnel for any special instructions or procedures.

Park the unit on level ground and chock the wheels.

If you are unloading by "blowing off" - remove the 4" cap from the discharge valve, open the discharge valve at the rear of the truck before pressurizing the units tank.

Start the pump up the same way as previously done.

Position the pump control lever into the pressure position and dump the material.

If the material is of such a consistency that it does not allow adequate dumping by blow off, the unit may be hydraulically raised to dump the material.

Make sure the control lever is in the neutral position and the vacuum pump is shut off to remove all inside pressure.

Open the wing nuts or hand wheels on the rear door before dumping commences. If the wing nuts or wheel are too tight to loosen, start pump up and place lever on the vacuum position. This will make them easier to loosen.

Make sure you have adequate clearance above and behind the unit before raising the tank.

For both P.T.O. and separate power pack units, engage the P.T.O. in the cab.

Engage the hydraulic control lever outside the cab to raise the back door.

Now engage the hydraulic control lever to raise the tank to dump the load.

Once dumping has been completed, lower the tank unit. If a wash out station is available, wash out the inside of the vacuum tank. Close the back door and bolt it shut.

Put vacuum back on the pump and re-tighten bolts.

Drain the filters.

Disengage the P.T.O. and return to the job or the shop.

Prior to leaving, have the customer's supervisor approve the job and have him sign your time card.

If at any time, there is an incident that results or could have resulted in personal injury or property damage, report it to your supervisor and assist him in filling out an incident report form.

During your job execution, if you should notice any mechanical defect, make a note and report it to the shop mechanic when you return to the shop.

Refill your diesel fuel and gas and record the gallons.

W. HIGH PRESSURE WATER CLEANING

1. General

This program outlines procedures to be followed for high pressure water cleaning in excess of 3000 PSIG.

High-pressure water cleaning is performed using jet streams that have a velocity greater than that of a 45 caliber bullet and do as much damage. Caution must be used to prevent the jet stream from striking the operator, other employees, or equipment. No portion of the body will ever be placed in front of the water jet. These jets of water can puncture and tear the skin or penetrate deeper causing infection or serious internal damage.

Satisfactory protective clothing has not been developed that will protect personnel from the jet. The key to safe operation of this equipment is to focus on engineering controls, safe work practices, personnel selection and training, and administrative controls. However, personnel, performing high-pressure water cleaning, who may be exposed to the water spray or reflected material will wear a raincoat, rubber pants, safety glasses, hard hat with faceshield, rubber boots, workboots and metatarsal guards, and padded gloves. Hearing protection will also be worn. These do not provide protection from the jet, but do protect against other hazards.

In addition to the hazards of the water jet, back thrust force physically stresses the operator and affects operator control. The weight of the back thrust from a jet stream can be calculated, and the following are examples of back thrust pressures at different jet pressures and flow rates:

Jet Pressure (psi)	Flow Rate (gpm)	Back Thrust (lb)
10,000	10	52
9,000	10	49
8,000	10	46
7,000	10	43
10,000	9	46
9,000	9	44
8,000	9	42
7,000	9	39
10,000	8	41
9,000	8	39
8,000	8	37
7,000	8	35

It is recommended that no person should be required to withstand a back thrust of more than one-third of his body weight for an extended period of time. From the chart above at a jet pressure of 10,000 psi and a flow of 10 gpm a worker must weigh at least 156 pounds.

Therefore, the weight of the worker must be considered and sound footing conditions must be established and maintained during cleaning.

All personnel engaged in this operation must be at least 18 years old and be adequately trained.

2. Equipment Set Up, Inspection, and Testing

The key element for any successful high pressure water blasting job is planning. The supervisor must review all applicable procedures with both the personnel and client representatives. Strict compliance with all procedures must be maintained throughout the duration of the job.

The area around the job and pump must be barricaded and posted to prevent unauthorized personnel from entering the work area. If the job is above ground level, barricades and postings are required below it. Warning signs restricting entry into the area shall be clearly posted outside the barriers. Adequate drainage must be available to prevent water from accumulating and presenting a hazard. Both the suction and discharge hoses must be located outside of walkways and protected from vehicular traffic.

Access procedures should be agreed upon before work begins, and should include steps to ensure that no person enters the working area while water jetting is in progress and until the operators are aware that entry is required. Those who wish to enter the area, or to have the operations stopped, should first gain the attention of a team member other than the Nozzle Operator. The Nozzle Operator shall not be distracted while operating the gun until the jetting has been shut down.

All tools, hoses, pipe, fittings, lances, nozzles, and personal protective equipment required to do the job should be listed, obtained, and inspected prior to use.

An automatic relief device must be installed on the high pressure side of the pump set to relieve at no higher pressure than the maximum allowable working pressure of the lowest rated component in the high pressure system.

Prior to starting the job all components including the rupture disk pressure rating must be visually inspected. A hose with exposed or damaged wire braid must be repaired or removed from service. The system must be slowly pressurized to verify the integrity of the system.

Hose failures usually occur near fittings due to bending stresses during use and handling. Pressurized hoses should not be handled within one foot of hose to hose connections. The operator nearest the nozzle will have a means of reducing pressure and interrupting flow to the nozzle. There must only be one control valve or switch for each tool.

A job inspection check list is attached.

3. Procedures

The three basic types of high pressure water cleaning are shotgunning, lancing, and line moleing.

a. Shotgunning

Shotgunning is a method used to clean surfaces. A shotgun is a hand held unit which has a shoulder butt and an integral fail-safe valve or contact-type control switch on it. When either the valve or switch is released by the operator, the flow of water is immediately interrupted to the nozzle. The valve or switch is guarded to prevent accidental activation. The minimum length of the shotgun from butt to nozzle is 66 inches.

b. Lancing

Lancing is a repetitive operation using a rigid or flexible lance to clean the inside of tubes. This system also has the fail safe switch or valve, and they must be guarded to prevent accidental activation. A deflector or guard is also on the lance to prevent the high pressure stream from contacting the operator's hand if the lance is accidently withdrawn from the tube. A marker must also be affixed two feet from the nozzle end of the lance to indicate nozzle location as the lance is being inserted or withdrawn from the tube. Pressure must only be applied to the nozzle when the lance is in the tube.

c. Line Moleing

Line moleing is an operation using a self-propelled jet nozzle (mole) and a high pressure hose to clean the inside of piping systems. There are fail safe switches or valves which when released by the operator shut off water to the mole. The valve or switch is also guarded, and the use of a foot operated valve is recommended.

To prevent mole reversal within the line, the length of the hose end coupling, mole tip, and any rigid pipe extensions will equal or exceed the inside diameter of the pipe being cleaned. The mole hose shall be marked 2-feet from the mole to indicate its location when the mole is being inserted or withdrawn from the pipe. Again pressure is only applied when the nozzle is within the pipe.

4. Operation

The Pump Operator shall not start the unit until told to do so, by word or signal, by the Nozzle Operator. The unit pressure will be increased to flush the pump, hose, and lance with sufficient water to remove heavy solids before installing the nozzle. While flushing the system check the dump valve. The unit will be shut down and the jetting nozzle installed. Before bringing the unit up to pressure on a second signal, the Pump Operator shall ensure that the jetting nozzle is either directed at, or positioned within, the workpiece; that the Nozzle Operator has a secure stance and control of the nozzle; and the team members are in the proper position to perform their task.

Both before and after bringing the system up to pressure the Pump Operator shall visually examine the hose and connections to the jetting gun or nozzle assembly to detect any leaks in the system. The system shall be shut down and depressurized to tighten and/or adjust any components of the system. If the dump valve, pressure relief valve or component fails during operations, the system shall be shut down and repairs made.

The Pump Operator shall slowly raise the pressure of the system to allow the Nozzle Operator to adjust to the changing reactive force from the nozzle. Once the operating pressure has been reached, the pressure shall not be further adjusted without the Nozzle Operator being aware that an adjustment is to occur.

Work Stoppage of the operation will occur;

a if any unauthorized person enters the working area;
b. if a hazardous or potentially hazardous condition is detected;
c. if an alarm is sounded within the plant or works

Select the operating pressure so that it is capable of removing the material. The pressure cannot be in excess of the rating of the pump, hose, or accessories. Keep an accurate record of the installation and the operating data for each job. This information would include type and length of lance, hoses, and pipes, type of nozzles and orifices, as well as engine speed and pressure reading.

The gun must be operated in the full open or full closed portion. Remember that pressure and flow rates are controlled by proper selection of orifice diameter and the engine speed. The gun must never be pointed at another person or object, and the clutch must be disengaged when the water blasting has been completed.

5. Completion

The shut down procedure is as follows:

- Stop engine.
- Disconnect the inlet or suction water supply from the source and water tank.
- Depressurize the discharge side of the system.
- Disconnect the gun from the discharge hose.
- Start the engine and engage the clutch. This will drain the system of water. When no additional water comes out of the hose, the water has been removed from the pump and the hose.
- Disengage the clutch and remove the discharge hose.
- During freezing conditions, add the required anti-freeze to the pump.
- Shut the engine off and perform the daily maintenance.
- Complete the post service check list.

All equipment and tools must be lubricated and cleaned. Note any malfunctions or breakdowns in equipment and repair them as soon as possible. Keep a record of the malfunctions and the completed repairs.

6. Training

Each employee involved in this operation must undergo a training course. The course must consist of the following:

1. The cutting action of the high pressure water stream, and its potential hazard to the operator will be demonstrated. This demonstration may be accomplished by using audiovisual aids and should show the effect of the water stream on a piece of lumber or cinder block.

2. The need for and limitation of personal protective equipment. Instruction will be given as to when and how specific clothing and devices will be worn.

3. Operation of the high-pressure system and auxiliaries. Training will include start-up and shut down procedures, potential equipment problems, and appropriate corrective actions.

4. Operation and purpose of all safety features. The importance of not tampering and keeping safety devices functional will be stressed.

5. The proper method of connecting hoses, including laying out without kinks, protection from excessive wear, and using the proper tools for hook-up will be explained.

6. General safety rules, job planning, set up, application, and breakdown.

7. The trainee must then demonstrate his ability to safety operate the equipment.

7. Other Considerations

It must be continuously emphasized the potential destructive force of a stream of high pressure water. Lacerations and/or wounds resulting from contact with the stream are extraordinary and must be medically treated in a manner that is not routine. All equipment and personnel will carry with them a card which states:

> "This person has been involved with high pressure water jets at pressures up to 55,000 psi (375 MPa, 3750 bar) with a velocity up to 2,000 miles per hour (3,300 kph)."

Please take this into account when making your diagnosis.

Unusual infections have been reported with microaerophilic organisms that tolerate low temperatures. These organisms may be gram negative pathogens such as those found in sewage. Bacterial swabs and cultures may be helpful. If you have any questions, please call the National Poison Control Center number at (412) 681-6669.

All rules and procedures must be strictly followed. If there is any change from these, a written variance must be obtained from the Superintendent.

The job inspection check list must be completed and any necessary actions be accomplished before the work is to start.

These must also be strict compliance with the rules and procedures established by the facility in which we are working. Be certain that you understand and follow them.

HIGH PRESSURE WATER BLASTING SAFETY CHECKLIST

		YES	NO	N/A	COMMENTS
1.	Are all the lubricant levels at the full mark?				
	a) Engine Oil	______	______	______	
	b) Pump Power End	______	______	______	
	c) Oil Reservoir	______	______	______	
	d) Pump Reduction Gear	______	______	______	
	e) Transmission	______	______	______	
2.	Are plunger lubricators operating properly?	______	______	______	
3.	If operating an internal combustion engine, is the minimum of 1000 r.p.m. being maintained?	______	______	______	
4.	Are hoses being used which have no broken braids and which are rated to proper pressures? (Not to exceed 10,000 psi.)	______	______	______	
5.	Has pressure drop been considered and reduced by using the largest possible hose for the job?	______	______	______	
6.	Are all fittings, bushings, collars, etc., rated for the maximum working pressure at which you intend to operate?	______	______	______	
7.	Only use the lowest pressures necessary to successfully complete the work.	______	______	______	
8.	Has a safety meeting been held				

with all participating personnel on job to be done and procedures? ______ ______ ______

9. Are all necessary whip checks in place? ______ ______ ______

10. Are all necessary safety shrouds in place? ______ ______ ______

11. If using flexible lances, foot guard with deadman must be used. ______ ______ ______

12. Are all high pressure workers equipped with metatarsal work boots? ______ ______ ______

13. Is the lance to be used 66" or greater in length? ______ ______ ______

14. Are all lances equipped with double deadman being used? ______ ______ ______

15. Are hand guards on flex lances in place? ______ ______ ______

16. Has the deposit to be removed been determined? ______ ______ ______

17. Have all lines leading into or out of the vessel to be cleaned been isolated, and lines blanked? ______ ______ ______

18. If required, has work permit been secured from the customer? ______ ______ ______

19. If lancing an exchanger, has a shield been placed at the back of the exchanger? ______ ______ ______

20. Is relief valve set in the open position and operating properly? ______ ______ ______

21. Is there a rupture disc in the system? ______ ______ ______

22. If working six feet above grade, is OSHA standard scaffolding with guard rails installed? Harness and lanyard required. ______ ______ ______

23. Is the area surrounding the operation properly marked off to restrict unauthorized personnel? ______ ______ ______

24. Is each operator familiar with plant safety rules and evacuation alarm plan? If each response has been either "Yes" or "N/A", begin the job. ______ ______ ______

25. If any leaks occurred in the system, was the job stopped and the leaks repaired? ______ ______ ______

26. Variances - Sevenson's Superintendent along with Company's supervision will come to a mutual agreement on all variances to be issued. (i.e. length of lance.) ______ ______ ______

NOTE: If any of the above mentioned questions are answered with a "No" CONTACT SUPERVISOR IMM

X. HEARING CONSERVATION

1. General

Studies have shown that prolonged, continuous exposure to high noise levels can produce permanent hearing loss. Such noise exposure may come from your work environment and from your daily lifestyle.

If your spare time activities include boating, snowmobiling, motorcycling, or hunting/target shooting, you are being exposed to excessive levels of noise. Household chores such as cutting the lawn, using a chainsaw and home workshops also expose you to high noise levels. Playing in a band, nights out to nightclubs/bars playing loud music, even having the radio turned up in your car or using headphones with a Walkman can cause hearing loss.

The Occupational Safety and Health Administration has promulgated a Hearing Conservation Standard in an effort to try to prevent hearing loss from work-related noise exposure. Sevenson Environmental Services, Inc. will abide by this Standard.

a. Each employee is required to wear hearing protection when the truck or heavy equipment they are assigned to is running and they are working with it. This is a requirement for waterblasting, vacuuming, sandblasting, bulldozer, and excavator operators.

b. Employees who are assigned "labor" jobs are required to wear hearing protection when the noise in that area is greater than 85 decibels.

c. Each employee will receive an annual audiogram. This test will be monitored by medical professionals to interpret any signs of hearing loss.

d. Employees will receive training on how noise affects a persons hearing, purpose and limitations of hearing protection, how to use hearing protection, and the purpose of audiometric testing.

Note: Remember, this program will address the noise exposure you may receive at work. To fully protect your hearing, you need to take the necessary precautions when you are exposed to noise in your everyday living.

2. **Purpose**

To establish a hearing conservation and noise control program to protect employees from noise exposure exceeding 90 dBa, TWA for eight (8) hours and conserve their hearing when exposed to noise levels between 85-90 dBa TWA for eight (8) hours.

a. **Scope**

This policy and procedure establishes the minimum requirements for a company-wide hearing conservation and noise control program.

b. **Responsibility**

All employees are charged with reviewing and complying with this policy. Supervisory personnel will ensure that the employees they supervise:

1. are trained in the use of hearing protectors;
2. wear the hearing protection in required areas or for required job assignments; and
3. maintain the hearing protectors.

Employees are responsible for:

1. wearing hearing protection in required areas or for required job assignments;
2. caring for their hearing protectors; and
3. replacing the protectors if lost or damaged.

It will be the specific responsibility of the superintendents of the affected areas/job classifications to enforce this Policy and Procedure as it pertains to their area of responsibility.

c. **Monitoring**

All Sevenson jobsites will be monitored at least once a year to determine sound levels and the duration of employee exposure.

Measurements will be taken using personal noise dosimeters and sound level meters. All continuous, intermittent and impulsive sound levels from 80 dBA to 130 dBA will be integrated into the computation.

Upon completion of the jobsite noise evaluation, a list of areas and job classifications required to be in this site specific hearing conservation program will be communicated to Sevenson's Corporate Office in Niagara Falls, New

York.

d. **Policy**

Where noise levels exceed acceptable exposure limits, feasible engineering and/or administrative methods will be instituted to reduce noise exposures.

Purchase orders for new equipment will specify construction or protection that will limit noise levels to 85 dBA or less for individual sources. Where suppliers cannot meet these specifications, they will be required to submit sound level estimates so that the effects on the noise control program of the jobsite can be evaluated before purchased.

Where engineering controls fail to reduce noise levels below the prescribed limits, a continuing, effective hearing conservation program will be administered for all employees whose work requires them to enter, with or without personal protective equipment, such high noise level areas.

Operating areas above 90 dBA will be posted as an ear protection area and all employees will be required to wear hearing protection while working in these posted areas. Maintenance of hearing protection signs are the responsibility of the Site Safety Officer.

e. **Audiometric Testing Program**

All employees will receive an audiogram as part of their pre-employment and annual physicals. The baseline audiogram will be used to compare subsequent audiograms for individuals exposed to 85 decibels TWA or more.

Testing to establish an audiogram will be preceded by at least fourteen (14) hours without exposure to work place noise. Hearing protectors may be used to provide the fourteen (14) hour quiet period, if necessary.

Employees exposed at or above a time weighted average of 85 decibels will be tested annually. Each employees' annual audiogram will be compared to that employee's baseline audiogram to determine if a significant threshold shift has occurred. This will be done by Sevenson's medical consultant.

If a comparison of the annual audiogram to the baseline audiogram indicates a significant threshold shift in that employee's hearing, the following steps will be taken:

1. The employee will be informed in writing, within twenty-one (21) days of the determination, of the existence of a significant threshold shift.

2. If not currently using hearing protectors, the employee will be fitted with hearing protectors, trained in their use and care, and required

to use them.

3. If already using hearing protectors, the employee will be re-fitted and re-trained in their use and provided with hearing protectors offering greater attenuation, if necessary.

4. The employee will be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary, or if it is suspected that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.

5. The employee will be informed of the need for an otological examination if a medical pathology of the ear, which is unrelated to the use of hearing protectors, is suspected.

Audiometric test and audiometer calibration will conform to the existing standards. The responsibility for this is that of Sevenson's medical consultant.

f. Hearing Protectors

Hearing protectors will be made available to all employees exposed to a time weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors will be replaced as necessary.

Hearing protectors will be worn by all employees:

1. who are exposed to a time weighted average of 85 decibels or greater or who have experienced a significant threshold shift in their hearing;

2. who are working in areas that are designated hearing protection required.

A variety of suitable hearing protectors will be made available to the employees for their selection.

All hearing protectors will meet the proper noise attenuation for the specific noise exposure in which the protector will be used. As a minimum, hearing protectors must attenuate employee exposure at least to a time weighted average of 85 decibels. For employees who have experienced a significant threshold shift in their hearing, hearing protectors must attenuate employee exposure to a time weighted average below 85 decibels.

g. Training

All employees who are exposed to noise at or above a time weighted average of 85 decibels will participate in the hearing conservation training program.

This training will be conducted annually by the employee's supervisor and/or Site Safety Officer. This training must be documented and maintained by the Site Safety Officer to comply with recordkeeping requirements of the O.S.H.A. regulations. This training has been done in the 40 hour training course, but this information must be received at the specific job site. A copy of this training documentation will be submitted to Paul Hitcho.

The training program will consist of the following:

1. The effects of noise in hearing.

2. The purpose of hearing protectors.

3. The advantage/disadvantage and attenuation of various types of hearing protectors.

4. The instructions on selection, fitting, use and care of hearing protectors.

5. The purpose of audiometric testing and an explanation of the test procedure.

h. **Recordkeeping**

Various exposure measurement records will be retained for two (2) years.

Audiometric test records will be retained for the duration of the affected employee's employment.

Y. HEAT STRESS

Heat stress is one of the most common hazards encountered at a site, and there are a number of factors which have an effect in determining the amount of heat stress experienced by an individual worker. These factors include environmental conditions, type of clothing worn, workload, and individual characteristics. Since heat stress is a common hazard and has the potential to become a serious illness, SES has developed a program to protect its employees.

All employees will be trained in the following:

1. Individual factors which influence an individual's susceptibility to heat.

2. Environmental characteristics such as temperature, humidity, wind speed,

and cloud cover.

3. Body response to heat.

4. Effect of personal protective equipment and workload.

5. The various types of heat disorders and their associated symptoms.

6. SES heat stress program - acclimatization, monitoring, work/rest regimen, and fluid intake (balanced electrolytic fluids).

Training for the heat stress program will be conducted at the time of the initial training.

Monitoring will be initiated when the ambient air temperature in the work area is 70°F or greater. The monitoring frequency will depend upon the temperature and the type of protective clothing worn. As the temperature increases, the monitoring will become more frequent. Also, if an employee is wearing impermeable protective clothing, the frequency of monitoring will increase. For example, at 72.5°F (adjusted temperature)[2] and wearing an impermeable suit, and employee will be monitored after every 120 minutes of work. If the temperature increases to 87.5°F (adjusted temperature), the workers will be monitored after every 60 minutes of work.

The monitoring will include:

1. Heart rate;
2. Body temperature (oral); and
3. Body water loss (if practicable).

The heart rate will be determined for 30 seconds as soon as practicable during the rest period. If this heart rate exceeds 110 beats per minute, the next work cycle will be shortened by one third.

The oral temperature will also be taken at the end of the work period. If the oral temperature exceeds 99.6°F, then the next work cycle will be shortened by one third. If the employee's body temperature exceeds 100.6°F, he will not be assigned work which requires an impermeable protective suit.

If the heat stress conditions become severe, then the Site Safety and Health Officer or Industrial Hygienist will recommend that body water loss be determined. The employee will be weighed, and the total body water loss will be kept below 1.5 percent body weight loss in a work day.

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[2]Adjusted Temperature = Air temperature + (13 x % sunshine)

The length of the work cycle will depend upon the monitoring cycle. The length of the rest cycle depends upon the physical monitoring results. The initial rest period will be 15 minutes (minimum) in duration. During the 15 minute rest period the body will usually return to homeostasis. If not, the rest period will then be increased to ensure that a homeostatic condition is reached.

Z. RIGGING

During all rigging operations, these general rules must be followed:

- All rigging equipment must be inspected prior to each shift and defective equipment removed from service.
- Equipment must not be loaded in excess of its recommended safe working load. There are tables available that list all of the types of lifting material and their rated safe loads.
- Rigging equipment, when not in use, must be removed from the immediate work area so as not to present a hazard.
- Specially designed rigging equipment must be marked to indicate their safe working loads and proof tested prior to use to 125% of there rated load.

There are three (3) basic types of rigging equipment used in our work - alloy steel chains, wire rope, and synthetic web slings.

When using alloy steel chains:

- Check to see if the size, grade, rated capacity, and manufacturer are permanently affixed to it.
- Hooks, rings, and other mechanical coupling links must have a rated capacity equal to that of the chain.
- At least once a year a written inspection of the chain must be made.

Wire rope:

- If the safe working load cannot be determined from the applicable tables, a safety factor of at least five (5) of the manufacturer's recommended capacity will be used.
- When used for eye splices, the rope clip must be applied with the "V" section

in contact with the dead end of the rope. Remember, never saddle a "dead" horse.

Synthetic web slings:

- The manufacturer shall mark the sling with its name, rated capacity, and type of material.
- Nylon slings are not to be used where fumes, vapors, sprays, mists, or liquids or acids or phenolics are present.
- Polyester and polypropylene where caustics are present.

A.a. DREDGE AND DEWATERING PROCEDURES

1. Objective

All Sevenson Environmental Services, Inc. personnel who will be operating the dredge will be trained in the safety, operation, and maintenance of this equipment. Only properly trained and authorized personnel will be allowed to operate the dredge.

2. Purpose

This procedure describes the requirements for the safe operation of the dredge.

3. Requirements - Personal Protective Equipment

The following equipment will be worn by dredge operators and assistants:

- United States Coast Guard (USCG) approved life vest or life jacket.
- Hearing protection.
- Eye protection.
- Hard hat.
- Safety shoes or boots.
- Heavy gloves, such as monkey grips.
- Tyvek Suit (minimum).
- Refer to site specific health and safety plan for any additional requirements.

4. Dredge Safety Procedure

a. Only trained, authorized personnel will operate the dredge.

b. The operator must have an assistant to aid in moving the guide cables. This assistant will maintain constant two-way radio contact with the dredge operator.

c. The operator and assistant must maintain a secure footing on the dredge deck and pond perimeters.

d. A floating ring buoy with at least 90 feet of line must be kept in close proximity to the pond. Distance between ring buoys shall not exceed 200 feet.

e. Two tender boats will be available on-site, one for shuttling the operator between the dredge and the shore and the other in case of an emergency.

f. All chains, cables, and rigging will be inspected weekly and this inspection will be documented.

g. Two 20 lb. ABC fire extinguishers will be available on board the dredge and will be inspected daily.

h. All pumps and systems will be de-engerized and locked out and the diesel motor stopped before removing obstructions from the pump impeller or auger-cutter assembly.

i. The dredge will not be operated if the safety guard for the auger-cutter blades is non-functional.

j. The dredge will not be operated in high winds, waves in excess of 12-inches or swift currents.

5. Dewatering Press Safety Procedure

a. Only trained, authorized personnel will operate the dewatering press.

b. All wiring and electrical hook-ups will be properly grounded and shielded. Clear access will be maintained to all electrical panels.

c. The operator will verify that all personnel are clear before the press plates are opened or closed.

d. Personnel will not attempt repairs until all systems (electrical, hydraulic, etc.), are locked out and tagged.

6. Specific Procedures for Oil-Based Sludges

a. Monitoring for hydrogen sulfide (H_2S) will be conducted.

b. If H_2S is present, ferric chloride may be injected into the sludge as it is pumped to reduce H_2S emissions.

c. Waterless hand cleaner or detergent will be provided for hand-washing. Diesel fuel will not be used for personnel decontamination.

d. A canvas shroud over the shaker/mix tank with negative air drawn through carbon filters may be required to reduce H_2S emissions.

B.b. PERSONAL PROTECTIVE EQUIPMENT PROGRAM

1. Introduction

Anyone entering a hazardous waste site must be protected against potential hazards. The purpose of personal protective clothing and equipment (PPE) is to shield workers from the chemical, physical, and biologic hazards that may be encountered. Careful selection and use of adequate PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. This program describes the various types of PPE that are appropriate for use at hazardous waste sites, provides guidance for their selection and use, and discusses heat stress and other key physiological factors that must be considered in connection with PPE use.

The Occupational Safety and Health Administration (OSHA) requires the use of PPE in 29 CFR Part 1910 (see Table 1), as does the U.S. Environmental Protection Agency (EPA) in 40 CFR Part 300, which includes requirements for all private contractors working on Superfund sites to conform to applicable OSHA provisions and any other federal or state safety requirements deemed necessary by the lead agency overseeing the activities.

No single combination of PPE can protect against all hazards; therefore, it should be used in conjunction with other protective methods. PPE can itself create significant hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility, and communication. In general, the greater the level of PPE used, the greater the associated risks. For any given situation, equipment and clothing should be selected to provide maximum protection using minimum equipment.

The two main objectives of any PPE program should be to protect the wearer from safety and health hazards, and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. To accomplish these goals, a comprehensive PPE program, including hazard identification, medical monitoring, environmental surveillance, training, and selection, use, and decontamination of PPE is developed for each site.

2. Program Review and Evaluation

The PPE program will be reviewed at least annually. Elements which should be considered in the review include the following:

- A survey of each site to ensure compliance with applicable regulations;
- The number of person-hours that workers wear various protective ensembles;
- Accident and illness experience;
- Levels of exposure;
- Adequacy of equipment selection;
- Adequacy of the operational guidelines;
- Adequacy of decontamination, cleaning, inspection, maintenance, and storage programs;
- Adequacy and effectiveness of training and fitting programs;
- Coordination with overall safety and health program elements;
- The degree of fulfillment of program objectives;
- Adequacy of program records;
- Recommendations for program improvement and modification; and
- Program costs.

The results of the program evaluation should be made available to employees and presented to senior management so that program adaptations may be implemented.

3. Selection of Respiratory Equipment

Respiratory protection is of primary importance on a hazardous waste site because inhalation is one of the major routes of exposure to airborne contaminants. Respiratory protective devices (respirators) consist of a facepiece connected to either an air source or an air-purifying device. Respirators with an air source are called atmosphere-supplying respirators; there are two types:

- Self-contained breathing apparatus (SCBAs), which supply air from a source carried by the user; and

- Supplied-air respirators (SARs), which supply air from a source located some distance away and connected to the user by an air-line hose. Supplied-air respirators are also called air-line respirators.

Air-purifying respirators, unlike atmosphere-supplying respirators, do not have a separate air source. Instead, they purify ambient air using a filter.

SCBAs, SARs, and air-purifying respirators are further differentiated by the type of air flow supplied to the facepiece:

- Positive-pressure respirators maintain a positive pressure in the facepiece during both inhalation and exhalation. The two main types of positive-pressure respirators are pressure-demand and continuous flow. In pressure-demand respirators, a pressure regulator and an exhalation valve on the mask maintain the mask's positive pressure except during high breathing rates. If a leak develops in a pressure-demand respirator, the regulator sends a continuous flow of clean air into the facepiece, preventing penetration by contaminated ambient air. Continuous-flow respirators (including some SARs and all powered air-purifying respirators) are operated in a positive-pressure continuous-flow mode using filtered ambient air. (However, at maximal breathing rates, a negative pressure may be created in the face piece.)

- Negative-pressure respirators draw air into the facepiece during user inhalation. The main disadvantage of negative-pressure respirators is that if any leaks develop in the system, the user draws contaminated air into the facepiece during inhalation.

Of atmosphere-supplying respirators, only those operated in the positive-pressure mode are recommended for work at hazardous waste sites. Table 2 lists the relative advantages and disadvantages of SCBAs, SARs, and air-purifying respirators. Different types of face pieces are available for use with the various types of respirators. The types generally used at hazardous waste sites are full facepieces and half masks.

- Full-facepiece masks cover the face from the hairline to below the chin. They provide eye protection.

- Half masks cover the face from below the chin to over the nose and do not provide eye protection.

Federal regulations require the use of respirators that have been tested and approved by the Mine Safety and Health Administration (MSHA) and NIOSH. Approval numbers are clearly written on all approved respiratory equipment; however, not all respiratory equipment that is marketed is approved. Periodically, NIOSH publishes a list, entitled NIOSH Certified Equipment List, of all approved respirators and respiratory components.

4. Protection Factor

The level of protection that can be provided by a respirator is indicated by the respirator's protection factor. This number, which is determined experimentally by measuring facepiece seal and exhalation valve leakage, indicates the relative difference in concentrations of substances outside and inside the facepiece that can be maintained by the respirator. For example, the protection factor for full-facepiece air-purifying respirators is 50. This means, theoretically, that workers wearing these respirators should be protected in atmospheres containing chemicals at concentrations that are up to 50 times higher than the appropriate limits. One source of protection factors for various types of atmosphere-supplying and air-purifying respirators is the American National Standards Institute (ANSI) standard ANSI Z88.2-1980.

At sites where the identity and concentration of chemicals in air are known, a respirator should be selected with a protection factor that is high enough to ensure that the wearer will not be exposed to the chemicals above the applicable limits. These limits include the American Conference of Governmental Industrial Hygienists' Threshold Limit Values (TLVs), OSHA's Permissible Exposure Limits (PELs), and the NIOSH Recommended Exposure Limits (RELs). These limits are designed to protect most workers who may be exposed to chemicals day after day throughout their working lives. The OSHA PELs are legally enforceable exposure limits and are the minimum limits of protection that must be met.

Protection provided by a respirator can be compromised in several situations:

- If a worker has a high breathing rate;

- If the ambient temperature is high or low; or
- If the worker has a poor facepiece-to-face seal.

At high breathing rates, positive-pressure SCBAs and SARs may lose positive pressure for brief periods during peak inhalation. Also, at high work rates, exhalation valves may leak. Consequently, positive-pressure respirators working at high flow rates may offer less protection than those working at normal rates.

A similar reduction in protection may result from high or low ambient temperatures. For example, at high temperatures excessive sweat may cause a break in the facepiece-to-face seal. At very low temperatures, the exhalation valve and regulator may become ice-clogged because of moisture in the breath and air. Likewise, a poor facepiece seal caused by facial hair, missing teeth, scars, lack of or improper fit testing, etc., can result in contaminant penetration.

5. Self-Contained Breathing Apparatus

A self-contained breathing apparatus (SCBA) usually consists of a facepiece connected by a hose and regulator to an air source carried by the wearer. (Only positive-pressure SCBAs are recommended for entry into atmospheres that are immediately dangerous to life and health (IDLH). SCBAs offer protection against most types and levels of airborne contaminants.) However, it is important to plan SCBA use carefully because the duration of the air supply is limited by the amount of air carried and its rate of consumption. Also, SCBAs are bulky and heavy; thus, they increase the likelihood of heat stress and may impair movement in confined spaces. Generally, only workers handling hazardous materials or operating in contaminated zones require SCBAs. Under MSHA regulations in 30 CFR Part 11.70(a), SCBAs may be approved for escape only or for both entry into and escape from a hazardous atmosphere.

Escape-only SCBAs are often continuous-flow devices with hoods that can be donned to provide immediate emergency protection. Employers should provide and ensure that employees carry an escape SCBA where such emergency protection may be necessary.

Entry-and-escape SCBA respirators give workers untethered access to nearly all portions of the work site, but decrease worker mobility, particularly in confined areas, because of the bulk and weight of the units. Use of these respirators is particularly advisable when one is dealing with unidentified and unquantified airborne contaminants. There are two types of entry-and escape SCBAs' open-circuit and closed-circuit. In an open-circuit SCBA, air is exhaled directly into the ambient atmosphere. In a closed-circuit SCBA, exhaled air is recycled by removing the carbon dioxide with an alkaline scrubber and by replenishing the consumed oxygen with oxygen from a solid, liquid, or gaseous source.

As required by MSHA/NIOSH 30 CFR Part 11.80, all compressed breathing gas cylinders must meet minimum U.S. Department of Transportation requirements for interstate shipment. All compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration must be of high purity and must meet all requirements of OSHA 29 CFR Part 1910.134(d). In addition, breathing air must meet or exceed the requirements of Grade D breathing air as specified in the Compressed Gas Association pamphlet G-7.1 and ANSLI Z86.1-1973.

Key questions to ask when considering whether an SCBA is appropriate follow:

- Is the atmosphere IDLH or is it likely to become IDLH? If yes, a positive-pressure SCBA should be used. A positive-pressure SAR with an escape SCBA can also be used.

- Is the duration of air supply sufficient for accomplishing the necessary tasks? If no, a larger cylinder should be used, a different respirator should be chosen, and/or the Work Plan should be modified.

- Will the bulk and weight of the SCBA interfere with task performance or cause unnecessary stress? If yes, use of an SAR may be more appropriate if conditions permit.

- Will temperature effects compromise respiratory effectiveness or cause added stress in the worker? If yes, the work period should be shortened or the mission postponed until the temperature changes.

6. Supplied-Air Respirators

Supplied-air respirators (also known as air-line respirators) supply air, never oxygen, to a facepiece via a supply line from a stationary source. SARs are available in positive-pressure and negative-pressure modes. Pressure-demand SARs with escape provisions provide the highest level of protection (among SARs) and are the only SARs recommended for use at hazardous waste sites.

(SARs are not recommended for entry into IDLH atmospheres unless the apparatus is equipped with an escape SCBA.)

(The air source for supplied-air respirators may be compressed air cylinders or a compressor that purifies and delivers ambient air to the facepiece.) SARs suitable for use with compressed air are classified as "Type C" supplied-air respirators as defined in MSHA/NIOSH 30 CFR Part 11. All SAR couplings must be incompatible with the outlets of other gas systems used on site to prevent a worker from connecting to an inappropriate compressed-gas source.

SARs enable longer work periods than do SCBAs and are less bulky. However, the air line impairs worker mobility and requires workers to retrace their steps when leaving the area. Also, the air line is vulnerable to puncture from rough or sharp surfaces, chemical permeation, damage from contact with heavy equipment, obstruction from falling drums, etc. To the extent possible, all such hazards should be removed before use. When in use, air lines should be kept as short as possible, and other workers and vehicles should be kept away from the air line.

The use of air compressors as the air source for an SAR at a hazardous waste site is severely limited by the same concern that requires workers to wear respirators: that is, the questionable quality of the ambient air. On-site compressor use is limited by OSHA standards.

Key questions to ask when considering whether use of an SAR is appropriate follow:

- Is the atmosphere IDLH or likely to become ILDH? If yes, and SAR\SCBA combination or SCBA should be used.

- Will the hose significantly impair worker mobility? If yes, the work task should be modified or other respiratory protection should be used.

- Is there a danger of the air line being damaged or obstructed (e.g., by heavy equipment, falling drums, rough terrain, or sharp objects) or permeated and/or degraded by chemicals (e.g., by pools of chemicals)? If yes, either the hazard should be removed or another form of respiratory protection should be used.

- If a compressor is the air source, is it possible for airborne contaminants to enter the air system? If yes, have the contaminants been identified, and are efficient filters and/or sorbents available that are capable of removing those contaminants? If no, another form of respiratory protection should be used.

- Can other workers and vehicles that might interfere with the air line be kept away from the area? If no, another form of respiratory protection should be used.

7. Combination SCBA/SAR

A relatively new type of respiratory protection is available that uses a regulator to combine the features of an SCBA with an SAR. The user can operate the respirator in the SCBA or SAR mode, through either manual or automatic source switching. This type of respirator allows entry into and exit from an area using the self-contained air supply and extended work periods within a contaminated area using a separate air line. This combination is particularly appropriate for sites where workers must travel a long way to a work area within a hot zone and remain that area for relatively long work periods (e.g., drum sampling). In such situations, workers may enter the site using the SCBA mode, connect to the air line during the work period, and shift back to the SCBA mode to leave the site.

The combination SCBA/SAR should not be confused with an SAR with escape provisions. The primary difference is the length of air time provided by the SCBA; the combination system provides up to 60 minutes of self-contained air, whereas the escape SCBA contains much less air, generally enough for only 5 minutes. NIOSH certification of the combination unit allows up to 20 percent of the available air time to be used during entry, while the SAR with escape provision is certified for escape only.

8. Air Purifying Respirators

Air-purifying respirators consist of a facepiece and an air-purifying device, which is either a removable component of the facepiece or an air-purifying apparatus worn on a body harness and attached to the facepiece by a corrugated breathing hose. Air-purifying respirators selectively remove specific airborne contaminants (particulates, gases, vapors, fumes) from ambient air by filtration, absorption, adsorption, or chemical reactions. They are approved for use in atmospheres containing specific chemicals up to designated concentrations, and not for IDLH atmospheres. Air-purifying respirators have limited use at hazardous waste sites and can be used only when the ambient atmosphere contains sufficient oxygen (19.5 percent) (30 CFR Par 11.90 [a]). Table 5-3 lists conditions that may exclude the use of air-purifying respirators.

Air-purifying respirators usually operate only in the negative-pressure mode, except for powered air-purifying respirators (PAPRs), which maintain a positive facepiece pressure (except at maximal breathing rates). There are three types of air-purifying devices: (1) particulate filters; (2) cartridges and canisters, which contain sorbents for specific gases and vapors; and (3) combination devices. Their efficiencies vary considerably even for closely related materials.

Cartridges usually attach directly to the respirator facepiece. Large-volume canisters attach to the chin of the facepiece or are carried with a harness and attached to the facepiece by a breathing tube. Combination canisters and cartridges contain layers of different sorbent materials and remove multiple chemicals or multiple classes of chemicals from the ambient air. Though approved for protection from more than one substance, these canisters and cartridges are tested independently against single substances. Thus, the effectiveness of these canisters against two or more substances has not been demonstrated. Filters may also be combined with cartridges to provide additional protection against particulates. A number of standard cartridges and canisters are commercially available. They are color-coded to indicate the general chemicals or classes of chemicals against which they are effective (29 CFR Part 1910.134 [g]).

MSHA and NIOSH have granted approvals for manufacturers' specific assemblies of air-purifying respirators for a limited number of specific chemicals. Respirators should be used only for those substances for which they have been approved. Use of a sorbent shall not be allowed when there is reason to suspect that it does not provide adequate sorption efficiency against a specific contaminant. In addition, it should be noted that approval testing is performed at a given temperature and over a narrow range of flow rates and relative humidities; thus, protection may be compromised in nonstandard conditions. The assembly that has been approved by MSHA and NIOSH to protect against organic vapors is tested against only a single challenge substance, carbon tetrachloride; its effectiveness for protecting against other vapors has not been demonstrated.

Most chemical sorbent canisters are imprinted with an expiration date. They may be used up to that date as long as they were not opened previously. Once opened, they begin to absorb humidity and air contaminants whether or not they are in use. Their efficiency and service life decreases, and therefore they should be used immediately, Cartridges should be discarded after use but should not be used for longer that one shift or when breakthrough occurs, whichever comes first.

Where a canister or cartridge is being used against gases or vapors, the

Respirator Program

The following amendments have been made to our Respirator Program in order to comply with the new requirements of OSHA Standard 1910.134:

- **Responsibilities**

  - Paul Hitcho - responsible for the effectiveness of the program and the protection of employees from respiratory hazards.
  - Mark Nicklas - Respirator Program Administrator who is responsible for overseeing the implementation and monitoring the continuing effectiveness of the program. He is also responsible for updating the written program, evaluating respirator hazards, and program evaluation.
  - Paul Hitcho is responsible for selecting a physician or licensed healthcare professional to administer the medical evaluation program.
  - Site Safety Officers are responsible for the fit testing of personnel on their jobs.
  - Site Safety Officers are responsible to determine whether the respirators are properly cleaned and maintained.
  - Site Safety Officers are responsible for determining the quality of the breathing air.
  - Site Safety Officers are responsible to provide training to their affected employees.
  - Site Safety Officers are to keep the required records.
  - Employees are responsible for the using, cleaning, and storing of their respirators. If they note any problems with a respirator or any deficiency's in the program, they must report it to their supervisor.

- **Hazard Evaluation**

  As part of the development of the Site Health and Safety Plan, the appropriate initial levels of protection are determined by the use of soil/sediment/water contaminant concentration and its ability to become airborne. Other considerations such as the toxicity and task are taken into consideration. The initial levels of protection may be modified due to air monitoring results and other factors such as task type and duration. This evaluation is done by the author of the Site Health and Safety Plan.

- **Respirator Selection**

  Respirator selection is based upon the respiratory hazard and user factors that affect workplace performance and reliability. Only NIOSH approved respirators will be used. Specific procedures for respirator selection can be found in Appendix A.

- **Medical Evaluation**

  A medical evaluation will be provided to determine an employee's ability to use a respirator before it is to be used in the workplace.

  Sevenson uses a number of physicians to perform the required medical evaluations. Medical evaluations will be performed according to procedures outlined in Appendix B.

- **Fit Testing**

  Before employees are required to use any respirator with a negative or positive pressure tight fitting faceplace, he will be fit tested with the same make, model, style, and size of respirator which will be used. Employees must pass either a qualitative fit test (QLFT) or quantitiative fit test (QNFT). Procedures are detailed in Appendix C.

- **Procedures and Schedules**

  All respirators will be used in compliance with the conditions of its certification by NIOSH. Respirators will be used according to the details listed in Appendix D.

- **Maintenance Procedures and Schedules**

  Respirators that are clean, sanitary, and in good working order will be supplied to all users. All respirators will be cleaned and maintained according to the procedures and schedules in Appendix E.

- **Air Quality**

  Breathing air for atmosphere supplying respirators will meet the requirements listed in Appendix F.

- **Training and Information**

  Respirator users will be trained at the time of initial assignment and annually thereafter following the requirements in Appendix G.

- **Voluntary Respirator Useage**

If the hazard assessment indicates that respirators are not required, an employee can voluntarily wear one. However, he must obtain the permission of the program administrator. If voluntary usage is permitted, the employee will be provided with the information found in Appendix D. They will also participate in the medical surveillance program. Employees who voluntarily use filtering face pieces or dust masks are not included in this program.

- **Program Evaluation**

The program will be evaluated every year. A report which consists of an assessment of the effectiveness of the program and needed corrective actions with completion dates will be prepared.

- **Recordkeeping**

Records will be maintained as outlined in Appendix H.

Appendix A - Respirator Selection Procedures

Respirators for use in IDLH atmospheres will be selected based on the following criteria:

- A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes, or
- A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.

Respirators provided only for escape from IDLH atmospheres will be NIOSH-certified for escape form the atmosphere in which they will be used.

Respirators for atmospheres that are not IDLH

The respirator selected will be appropriate for the chemical state and physical form of the contaminant. For protection against gases and vapors, we will provide:

- An atmosphere-supplying respirator, or
- An air-purifying respirator, provided that:
  - The respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant, or
  - Cartridges or canisters on respirators with no ESLI appropriate for conditions in our workplace will be changed daily or more often based upon the hazard evaluations.

For protection against particulates, we will provide:

- An atmosphere-supplying respirator, or
- An air-purifying respirator equipped with a filter certified by NIOSH under 30 CFR part 11 as a high efficiency particulate air (HEPA) filter, or
- An air-purifying respirator equipped with a filter certified for particulates by NIOSH under 42 CFR part 84, or
- For contaminants consisting primarily of particles with mass median aerodynamic diameters (MMAD) of at least 2 micrometers, and air-purifying respirator equipped with any filter certified for particulates by NIOSH.

Appendix B - Medical Evaluation

A medical examination will be provided to all respirator users to determine their ability to wear a respirator.

The medical examination will include any medical tests, consultations, or diagnostic procedures that the Physician deems necessary to make a final determination. We will provide employees with an opportunity to discuss the examination results with the Physician.

The following information will be provided to the Physician before the Physician makes a recommendation concerning an employee's ability to use a respirator.

- The type and weight of the respirator to be used by the employee
- The expected physical work effort
- Additional protective clothing and equipment to be worn
- Temperature and humidity extremes that may be encountered
- A copy of the written Respiratory Protection Program and
- A copy of OSHA Respiratory Protection standard.

The Physician will provide a written recommendation regarding each employee's ability to use the respirator. The recommendation will provide only the following information:

- Any limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether or not the employee is medically able to use the respirator.
- The need, if any, for follow-up medical evaluations.
- A statement that the Physician has provided the employee with a copy of the Physician's written recommendation.

If the Physician finds a medical condition that may place the employee's health at increased risk if a negative pressure respirator is used, a powered air purifying respirator (PAPR) will be provided if the Physician's medical evaluation finds that the employee can use such a respirator; if a subsequent medical evaluation finds that the employee is medically able to use a negative pressure respirator, then a PAPR will no longer be provided.

Additional medical evaluations will be provided if:

- An employee reports medical signs or symptoms that are related to ability to use a respirator.
- A Physician, supervisor, or the respirator program administrator informs the employer that an employee needs to be reevaluated.
- A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.
- A change in health status determined by answers to the Medical Evaluation Questionnaire administered during annual training.

Appendix C - Fit Testing

Employees using a tight-fitting facepiece respirator will be fit tested:

- Prior to initial use of the respirator
- Whenever a different respirator facepiece (size, style, model or make) is used, and
- At least annually thereafter.

An additional fit test will be provided whenever the employee reports, or the Program administrator, Physician, or supervisor, makes visual observations of, changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.

If after passing a QLFT or QNFT, an employee subsequently notifies the program administrator, supervisor, or Physician that the fit of the respirator is unacceptable, the employee will be given an opportunity to select a different respirator facepiece and be retested.

The fit test will be administered using OSHA-accepted QLFT or QNFT protocol as listed in Appendix A of the OSHA Respiratory Protection Standard.

Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators shall be accomplished by performing quantitative or qualitative fit testing in the negative pressure mode, regardless of the mode of operation (negative or positive pressure) that is used for respiratory protection.

Qualitative fit testing of these respirators will be accomplished by temporarily converting the respirator user's actual facepiece into a negative pressure respirator with appropriate filters, or by using an identical negative pressure air-purifying respirator facepiece with the same sealing surfaces as a surrogate for the atmosphere-supplying or powered air-purifying respirator facepiece.

Quantitative fit testing of these respirators will be accomplished by modifying the facepiece to allow sampling inside the facepiece in the breathing zone of the user, midway between the nose and mouth. This requirement shall be accomplished by installing a permanent sampling probe onto a surrogate facepiece, or by using a sampling adapter designed to temporarily provide a means of sampling air from inside the facepiece. Any modifications to the respirator facepiece for fit testing will be completely removed, and the facepiece restored to NIOSH-approved configuration, before that facepiece can be used in the workplace.

Appendix D - Proper Use Procedures

The following procedures will be followed to insure the proper use of respirators:

- Prohibit conditions that may result in facepiece seal leakage.
- Prevent employees from removing respirators in hazardous environments.
- Taking actions to ensure continued effective respirator operation throughout the work shift.
- Establishing procedures for the use of respirators in IDLH atmospheres.

Respirators with tight-fitting facepieces will not be worn by employees who have:

- Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with the valve function.
- Any condition that interferes with the face-to-facepiece seal or valve function.
- Corrective glasses or goggles or other personal protective equipment that interfere with the seal of the facepiece to the face.

Employees using tight-fitting respirators will perform a user fit test each time they put on the respirator using the procedures in Appendix B-1 of the OSHA Respiratory Protection Standard or procedures recommended by the respirator manufacturer.

Employees will be allowed to leave the respirator use area:

- To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use.
- If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece, the respirator will be replaced or repaired before allowing the employee to return to the work area.

Procedures for IDLH Atmospheres

In all Immediately Dangerous to Life or Health (IDLH) atmospheres, the following procedures will be followed.

- One or more employees will be located outside the IDLH atmosphere as needed.
- Visual, voice, or signal line communication will be maintained at all times between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.
- Employee(s) located outside the IDLH atmosphere will be trained and equipped to provide effective emergency rescue (Only employees properly trained and equipped to perform emergency rescue are permitted to enter an IDLH atmosphere to proved assistance).
- Employee(s) located outside the IDLH atmospheres will be equipped with:
  - Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either

- Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry, or
- Equivalent means for rescue where retrieval equipment is not used.

Appendix E - Maintenance Procedures

Cleaning and Disinfecting

Respirators will be cleaned and disinfected using the procedures in Appendix B-2 of the OSHA Respiratory Protection standard, or procedures recommended by the respirator manufacturer, provided that such procedures are of equivalent effectiveness.

Respirators will be cleaned and disinfected at the following intervals:

- Respirators issued for the exclusive use of an employee will be cleaned and disinfected as often as necessary by the employee to maintain a sanitary condition.
- Respirators used by more than one employee will be cleaned and disinfected after each use by the employee that has just finished using the respirator.
- Respirators maintained for emergency use will be cleaned and disinfected after each use by the user.
- Respirators used in fit testing and training will be cleaned and disinfected after each use by the fit tester.

Storage

All respirators will be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, also to prevent deformation of the facepiece and exhalation valve.

Respirators for emergency use will be:

- Kept accessible to the work area.
- Stored in compartments or in covers that are clearly marked as containing emergency respirators.
- Stored in accordance with any applicable manufacturer instructions.

Inspection

Respirators will be inspected as follows:

- All respirators used in routine situations will be inspected before each use and during cleaning by the user.
- All respirators maintained for use in emergency situations will be inspected at least monthly and in accordance with the manufacturer's recommendations, by the program administrator and will be checked for proper function before and after each use by the user.
- Emergency escape-only respirators will be inspected before being carried into the workplace for use by the user.

- Respirator inspections will include checking of the following:
  - Respirator function
  - Tightness of connections
  - Condition of the various parts including, but not limited to:
    - the facepiece
    - head straps
    - valves
    - connecting tube
    - cartridges, canisters or filters
    - gaskets
  - Elastomeric parts for pliability and signs of deterioration.

In addition to the requirements above self-contained breathing apparatus will be inspected monthly by the safety officer to insure that:

- Air and oxygen cylinders are charged to at least 90% of the manufacturer's recommended pressure level.

- Regulator and warning devices function properly.

Respirators maintained for emergency use will be inspected monthly. The inspection will be certified by documenting:

- The date the inspection was performed.
- The name (or signature) of the person who made the inspection.
- The findings, required remedial action.
- A serial number or other means of identifying the inspected respirator.

Provide this information on a tag or label that is attached to the storage compartment for the respirator. This information will be maintained until replaced following a subsequent inspection.

Repairs

Respirators that fail an inspection or are otherwise found to be defective must be removed from service, and discarded or repaired or adjusted in accordance with the following procedures:

- Repairs or adjustments are to be made only by persons appropriately trained to perform such operations and shall use only the respirator manufacturer's NIOSH-approved parts designed for the respirator.
- Repairs shall be made according to the manufacturer's recommendations and specifications for the type and extent of repairs to be performed.
- Reducing and admission valves, regulators, and alarms shall be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

Appendix F - Air Quality and Quantity for Atmosphere-Supplying Respirators

Compressed breathing air will meet at least the requirements for Type 1-Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1, 1989, to include:

- Oxygen content (v/v) of 19.5 - 23.5%
- Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less
- Carbon monoxide (CO) content of 10 ppm or less
- Carbon dioxide content of 1,000 ppm or less
- Lack of noticeable odor

Cylinders used to supply breathing air to respirators must meet the following requirements:

- They are tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR part 173 and part 178);
- They have a certificate of analysis from the supplier that the breathing air meets the requirements for Type 1 - Grade D breathing air;
- The moisture content within the cylinder does not exceed a dew point of -500 F (-45.60 C) at 1 atmosphere pressure.

Compressors used to supply breathing air to respirators are constructed and situated so as to:

- Prevent entry of contaminated air into the air-supply system.
- Minimize moisture content so that the dew point at 1 atmosphere pressure is 10 degrees F (5.560 C) below the ambient temperature.
- Have suitable in-line air-purifying sorbent beds and filters to further ensure breathing air quality.

  (Sorbent beds and filters shall be maintained and replaced or refurbished periodically following the manufacturer's instructions.)
- Have a tag containing the most recent change date and the signature of the person authorized by the employer to perform the change (the tag shall be maintained at the compressor).
- Monitor carbon monoxide levels in the breathing air from compressors to ensure that concentrations do not exceed 10 ppm.

Breathing air couplings will be incompatible with outlets for non respirable worksite air or other gas systems. No asphyxiating substance shall be introduced into breathing air lines.

Appendix G - Training and Information

Users will be trained so that they can demonstrate knowledge of at least the following:

- Why the respirator is necessary?
- How improper fit, usage, or maintenance can compromise the protective effect of the respirator?
- What the limitations and capabilities of the respirator are?
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions?
- How to inspect, put on and remove, use, and check the seals of the respirator?
- What the procedures are for maintenance and storage of the respirator?
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators?
- The general requirements of the OSHA Respiratory Protection Standard (29 CFR 1910.134).

All employees who use a respirator of any kind either voluntarily or as a requirement of the job will be given this training.

As part of annual respirator training, we will seek input from respirator users on the effectiveness of our program. We will specifically request user comments on:

- Respirator fit
- Ability to use the respirator without interfering with effective workplace performance
- Appropriate respirator selection for the hazards to which the employee is exposed
- Proper respirator use under the workplace conditions the employee encounters
- Proper respirator maintenance

The program administrator will maintain a list of problems and deficiencies identified during these evaluations along with corrective actions taken.

Retraining will be administered whenever any of the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete
- Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill
- Any other situation arises in which retraining appears necessary to ensure safe respirator use.

Appendix H - Recordkeeping

Medical Evaluations

Records of medical evaluations will be retained and made available in accordance with the OSHA Standard 29 CFR 1910.1020.

Fit Testing

Fit testing records will include the following information:

- The name or identification of the employee tested
- Type of fit test performed
- Specific make, model, style, and size of respirator tested
- Date of test
- The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs

Fit test records shall be retained for respirator users until the next fit test is administered.

Training Record

A record of annual training of respirator users will be maintained to verify that users were trained at the time of initial requirement to wear a respirator and at least annually thereafter.

Respirator Program

A written copy of the current respirator program will be maintained by the program administrator.

Program Audit

The program administrator will maintain copies of all audits related to this standard as well as records related to action taken to correct any deficiencies.

Written materials maintained as required by this program will be made available upon request to affected employees and to OSHA for examination and copying.

appropriate device shall be used only if the chemical(s) have "adequate warning properties" (30 CFR Part 11.150). NIOSH considers a substance to have adequate warning properties when its odor, taste, or irritant effects are detectable and persistent at concentrations below the recommended exposure limit (REL). A substance is considered to have poor warning properties when its odor or irritation threshold is above the applicable exposure limit. Warning properties are essential to safe use of air-purifying respirators since they allow detection of contaminant breakthrough, should it occur. Warning properties are not foolproof because they rely on human senses, which vary widely among individuals and in the same individual under varying conditions (e.g., olfactory fatigue), but they do provide some indication of possible sorbent exhaustion, poor facepiece fit, or other malfunctions. OSHA permits the use of air-purifying respirators for protection against specific chemicals with poor warning properties provided that (1) the service life of the sorbent is known and a safety factor has been applied or (2) the respirator has an approved end-of-service-life indicator.

9. Selection of Protective Clothing and Accessories

Personal protective clothing is considered to be any article offering skin and/or body protection, including the following:

- Fully-encapsulating suits
- Non-encapsulating suits
- Aprons, leggings, and sleeve protectors
- Gloves
- Firefighters' protective clothing
- Proximity, or approach, garments
- Blast and fragmentation suits
- Cooling garments
- Radiation-protective suits

Each type of protective clothing has a specific purpose; many, but not all, are designed to protect against chemical exposure. Accessories that might be used in conjunction with a PPE ensemble include the following:

- Knife
- Flashlight or lantern
- Personal locater beacon
- Personal dosimeters
- Two-way radio
- Safety belts and lines

10. Selection of Chemical-Protective Clothing (CPC)

Chemical-protective clothing (CPC) is available in a variety of materials offering a range of protection against different chemicals. The most appropriate clothing material depends on the chemicals present and the task to be accomplished. Ideally, the chosen material resists permeation, degradation, and penetration. Permeation is the process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level. Degradation is the loss of or change in the fabric's chemical resistance or physical properties due to exposure to chemicals, use, or ambient conditions (e.g., sunlight). Penetration is the movement of chemicals through zippers. stitched seams or imperfections (e.g., pinholes) in a protective clothing material.

Selection of CPC is a complex task and should be performed by personnel who have training and experience. Under all conditions, clothing is selected by evaluating the performance characteristics of the clothing against the requirements and limitations of the site- and task-specific conditions. If possible, representative garments should be inspected before purchase, and their use and performance discussed with someone who has experience with the clothing under consideration. In all cases, the employer is responsible for ensuring that the personal protective clothing (and all PPE) necessary to protect employees from injury or illness that may result from exposure to hazards at the work site is adequate and of safe design and construction for the work to be performed (see OSHA standard 29 CFR Part 1910. 132-1910.137).

11. Permeation and Degradation

The selection of CPC depends greatly upon the type and physical state of the contaminants found during site characterization. Once the chemicals have been identified, available information sources should be consulted to identify materials that are resistant to permeation and degradation by the known chemicals. One excellent reference, Guidelines for the Selection of Chemical-Protective Clothing (Schwope, A.D.et al., 1985), provides a matrix of clothing material recommendations for approximately 300 chemicals based on an evaluation of permeation and degradation data from independent tests, vendor literature, and raw material suppliers. Charts indicating the resistance of various clothing materials to permeation and degradation are also available from manufacturers and other sources. It is important to note, however, that no material protects against all chemicals and combinations of chemicals, and that no currently available material is an effective barrier to any prolonged chemical exposure.

In reviewing vendor literature, it is important to be aware that the data provided are of limited value. For example, the quality of vendor test methods is inconsistent; vendors often rely on the raw material manufacturers for data rather than conducting their own tests; and the data may not be up to date. In addition, vendor data cannot address the wide variety of uses and challenges to which CPC may be subjected. Most vendors strongly emphasize this point in the descriptive text that accompanies their data.

Another factor to bear in mind when selecting CPC is that the rate of permeation is a function of several factors, including clothing material type and thickness, manufacturing method, the concentration(s) of the hazardous substance(s), temperature, pressure, humidity, the solubility of the chemical in the clothing material, and the diffusion coefficient of the permeating chemical in the clothing material. Thus permeation rates and breakthrough time (time from initial exposure until hazardous material is detectable on the inside of the CPC) may vary depending on these conditions.

Most hazardous wastes are mixtures for which specific data with which to make a good CPC selection are not available. Because of the lack of testing, only limited permeation data for multicomponent liquids is currently available.

Mixtures of chemicals can be significantly more aggressive toward CPC materials than can any single component alone. Even small amounts of a rapidly permeating chemical may provide a pathway that accelerates the permeation of other chemicals. Formal research is being conducted on these effects. NIOSH is currently developing methods for evaluating CPC materials against mixtures of chemicals and unknowns in the field. For hazardous waste site operations, CPC that offers the widest range of protection against the chemicals expected on site should be selected. Vendors are now providing CPC material - composed of two or even three different materials laminated together - that is capable of providing the best features of each material.

11. Heat Transfer Characteristics

Heat transfer characteristics may be important factors in the selection of CPC. Since most chemical-protective clothing is virtually impermeable to moisture, evaporative cooling is limited. The "clo" value (thermal insulation value) is a measure of the capacity of the CPC to dissipate heat through means other than evaporation. The larger the clo value, the greater the insulating properties of the garment and, consequently, the lower the heat transfer. Given other equivalent protective properties, clothing with the lowest clo value should be selected in hot environments or for high work rates. Unfortunately, clo values for clothing are rarely available at present.

12. Other Considerations

In addition to permeation, degradation, penetration, and heat transfer, several other factors must be considered during clothing selection. These affect not only chemical resistance, but also the worker's ability to perform the required task. The following checklist summarizes these considerations:

- Durability - Does the material have sufficient strength to withstand the physical stress of the task(s) at hand? Will the material resist tears, punctures, and abrasions? Will the material withstand repeated use after contamination/decontamination?

- Flexibility - Will the CPC interfere with the workers' ability to perform their assigned tasks? (Flexibility is particularly important to consider when choosing gloves.)

- Temperature effects - Will the material maintain its protective integrity and flexibility under hot and cold extremes?

- Ease of decontamination - Are decontamination procedures available on site? Will the material pose any decontamination problems? Should disposable clothing be used?

- Compatibility with other equipment - Does the clothing preclude the use of other necessary pieces of protective equipment (e.g., suits that preclude hardhat use in hardhat areas)?

- Duration of use - Can the required task be accomplished before contaminant breakthrough occurs or degradation of the CPC becomes significant?

13. Special Conditions

Fire, explosion, heat, and radiation are considered special conditions that require special-protective equipment. Unique problems are associated with radiation, and it is beyond the scope of this manual to discuss them properly. A qualified health physicist should be consulted if a radiation hazard exists. Special-protective equipment is described in Table 8-4 (see Full Body section of the table.) When using special-protective equipment, it is important to also protect against chemicals, since the specialized equipment may provide little or no protection against chemicals which may also be present.

14. **Selections of Ensembles - Levels of Protection**

The individual components of clothing and equipment must be assembled into a full protective ensemble that both protects the worker from the site-specific hazards and minimizes the hazards and drawbacks of the PPE ensemble itself.

Ensembles based on widely used EPA Levels of Protection are categorized as Level A, B, C, or D. The specific ensemble components can be used as a starting point for ensemble creation; however, each ensemble must be tailored to the specific situation in order to provide the most appropriate level of protection. For example, if work is being conducted at a highly contaminated site or if the potential for contamination is high, it may be advisable to wear a disposable covering, such as a Tyvek coveralls or PVC slash suits, over the protective ensemble. It may be necessary to slit the back of these disposable suits to fit around the bulge of an encapsulating suit and SCBA.

The type of equipment used and the overall level of protection should be reevaluated periodically as the amount of information about the site increases, and as workers are required to perform different tasks. Personnel should be able to upgrade or downgrade their level of protection with the approval of the Site Safety Officer and the Field Team Leader.

Reasons to upgrade:

- Known or suspected presence of dermal hazards.
- Occurrence or likely occurrence of gas or vapor emissions.
- Change in work task that will increase contact or potential contact with hazardous materials.
- Request of the individual performing the task.

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally thought.
- Change in work task that will reduce contact with hazardous materials.

16. **PPE Use**

PPE can offer a high degree of protection only if it is used properly. This section covers the following aspects of PPE use:

- Training
- Work mission duration
- Personal use factors
- Fit testing
- Donning
- In-use monitoring
- Doffing
- Inspection
- Storage
- Maintenance

17. Training

Training in PPE use is recommended and, for respirators, required by federal regulation in the OSHA standards in 29 CFR Part 1910 Subparts I and Z for the following reasons:

- It allows the user to become familiar with the equipment in a nonhazardous situation.
- It instills confidence in the equipment in the user.
- It makes the user aware of the limitations and capabilities of the equipment.
- It may increase the protective efficiency of PPE use.
- It reduces the expense of PPE maintenance.

Training should be completed before actual PPE use in a hazardous environment and should be repeated at least annually. At a minimum, the training portion of the PPE program should delineate the user's responsibilities and explain the following, utilizing both classroom and field training when necessary:

- OSHA requirements as delineated in 29 CFR Part 1910 Subparts I and Z;
- The proper use and maintenance of the selected PPE, including capabilities and limitations;
- The nature of the hazards and the consequences of not using the PPE;
- The human factors influencing PPE performance;
- Instruction in inspecting, donning checking, fitting, and using PPE;
- Individualized respirator fit testing to ensure proper fit;
- Use of PPE in normal air for a long familiarity period and, finally, wearing PPE in a test atmosphere to evaluate its effectiveness;

- The user's responsibility (if any) for decontamination, cleaning, maintenance, and repair of PPE;
- Emergency procedures and self-rescue in the event of PPE failure;
- The buddy system; and
- The Site Safety Plan and the individual's responsibilities and duties in an emergency.

The discomfort and inconvenience of wearing PPE can cause user resistance to the conscientious use of PPE. One essential aspect of training is to motivate the user to properly use and maintain PPE by making him aware of the need for this equipment.

18. Work Mission Duration

Before the workers actually begin work in their PPE ensembles, the anticipated duration of the work mission should be established. The following factors limit mission length:

- Air supply consumption
- Suit/ensemble permeation and penetration by chemical contaminants
- Ambient temperature
- Coolant supply

19. Air Supply Consumption

The duration of the air supply must be considered before any SCBA-assisted work activity is planned. The anticipated operating time of an SCBA is clearly indicated on the breathing apparatus. This designated operating time is based on a moderate work rate, e.g., some lifting, carrying, and/or heavy equipment operation. In actual operation, however, several factors can reduce the rated operating time. When an SCBA-assisted work mission is planned, the following variables should be considered and work actions and operating time adjusted accordingly.

- Work rate. The actual in-use duration of SCBAs may be reduced by one-third to one-half during strenuous work, e.g., drum handling, major lifting, or any task requiring repetitive speed of motion.

- Fitness. Well-conditioned individuals generally use oxygen more efficiently and can extract more oxygen from a given volume of air (particularly when performing strenuous tasks) than unfit individuals, thereby slightly increasing the SCBA operating time.

- Body size. Large individuals generally consume air at a higher rate than small individuals, thereby decreasing the SCBA operating time.

- Breathing patterns. Quick, shallow or irregular breaths use air more rapidly than deep, regularly spaced breaths. Heat-induced anxiety and lack of acclimatization (see Heat Stress and Other Physiological Factors in this chapter) may induce hyperventilation, resulting in decreased SCBA operating time.

20. Suit/Ensemble Permeation and Penetration

The possibility of chemical permeation or penetration of CPC ensembles during the work mission is always a matter of concern and may limit mission duration. Possible causes of ensemble penetration follow:

- Suit valve leakage, particularly under excessively hot or cold temperatures;

- Suit fastener leakage if the suit is not properly maintained or if the fasteners become brittle at cold temperatures; and

- Exhalation valve leakage at excessively hot or cold temperatures.

Also, when considering mission duration, one should remember that no single clothing material is an effective barrier to all chemicals or all combinations of chemicals, and no material is an effective barrier to prolonged chemical exposure.

21. Ambient Temperature

The ambient temperature has a major influence on work mission duration, as it affects both the worker and the protective integrity of the ensemble. Heat stress, which can occur even in relatively moderate temperatures, is the greatest immediate danger to an ensemble-encapsulated worker. Methods to monitor for and prevent heat stress are discussed in the final section of this chapter, Heat Stress and other Physiological Factors. Hot and cold ambient temperatures also affect the following:

- Valve operation on suits and/or respirators;
- The durability and flexibility of suit materials;
- The integrity of suit fasteners;

- The breakthrough time and permeation rates of chemicals; and
- The concentration of airborne contaminants.

All these factors may decrease the duration of protection provided by a given piece of clothing or respiratory equipment.

22. Coolant Supply

Under warm or strenuous work conditions, adequate coolant (ice or chilled air) should be provided to keep the wearer's body at a comfortable temperature and to reduce the potential for heat stress. If coolant is necessary, the length of time that the coolant supply will function directly affects mission duration.

23. Personal Use Factors

As described below, certain personal features of workers may jeopardize safety during equipment use. Prohibitive or precautionary measures should be taken as necessary.

Facial hair and long hair interfere with respirator fit and wearer vision. Any facial hair that passes between the face and the sealing surface of the respirator should be prohibited. Even a days' growth of facial hair will allow excessive contaminant penetration. Long hair must be effectively contained within protective hair coverings.

Eyeglasses with conventional temple pieces (earpiece bars) will interfere with the respirator-to-face seal of a full facepiece. A spectacle kit should be installed in the face masks of workers requiring vision correction.

When a worker must wear corrective lenses as part of the facepiece, the lens shall be fitted by qualified individuals to provide good vision, comfort, and a gas-tight seal. Contact lenses may trap contaminants and/or particulates between the lens and the eye, causing irritation, damage, absorption, and an urge to remove the respirator. Wearing contact lenses with a respirator in contaminated atmosphere is prohibited (29 CFR Part 1910.134[e][5][ii]).

Gum and tobacco chewing should be prohibited during respirator use since they may cause ingestion of contaminants and may compromise the respirator fit.

24. Donning an Ensemble

A routine should be established and practiced periodically for donning a fully-encapsulating suit/SCBA ensemble.

Assistance should be provided for donning and doffing since these operations are difficult to perform alone, and solo efforts may increase the possibility of suit damage.

Table 4 lists sample procedures for donning a fully-encapsulating suit/SCBA ensemble. These procedures should be modified depending on the particular type of suit and/or when extra gloves and/or boots are used. These procedures assume that the wearer has previous training in SCBA use and decontamination procedures.

Once the equipment has been donned, its fit should be evaluated. If the clothing is too small, it will restrict movement, thereby increasing the likelihood of tearing the suit material and accelerating worker fatigue. If the clothing is too large, the possibility of snagging the material is increased, and the dexterity and coordination of the worker may be compromised. In either case, the worker should be recalled and better fitting clothing provided.

25. Respirator Fit Testing

The "fit" or integrity of the facepiece-to-face seal of a respirator affects its performance. A secure fit is important with positive-pressure equipment and is essential to the safe functioning of negative-pressure equipment, such as most air-purifying respirators. Most facepieces fit only a certain percentage of the population; thus, each facepiece must be tested on the potential wearer in order to ensure a tight seal. Facial features, such as scars, hollow temples, very prominent cheekbones, deep skin creases, and/or dentures or missing teeth, and the chewing of gum and tobacco may interfere with the respirator-to-face seal. A respirator will not be worn when such conditions prevent a good seal. The workers' diligence in observing these factors should be evaluated by periodic checks.

For a qualitative respirator fit testing protocol, see Appendix D of the OSHA lead standard (29 CFR Part 1910.1025). For quantitative fit testing, see the NIOSH publication "A Guide to Industrial Respiratory Protection" (NIOSH-DHEW #76-189). For specific quantitative testing protocols, literature supplied by manufacturers of quantitative fit test equipment should be consulted. Note that certain OSHA standards require quantitative fit testing under specific circumstances (e.g. 29 CFR Parts 1910.1019 [h][3] [iii], 1910.1025 [f][3][ii], and 1910.1045 [h][3][iii][B].

26. In-Use Monitoring

The wearer must understand all aspects of the clothing operation and its limitations; this is especially important for fully-encapsulating ensembles where misuse could potentially result in suffocation.

During equipment use, workers should be encouraged to report any perceived problems or difficulties to their supervisor(s). These malfunctions include, but are not limited to, the following:

- Degradation of the protective ensemble,
- Perception of odors,
- Skin irritation,
- Unusual residues on PPE,
- Discomfort,
- Resistance to breathing,
- Fatigue due to respirator use,
- Interference with vision or communication,
- Restriction of movement, and
- Personal responses such as rapid pulse, nausea, and chest pain.

If a supplied-air respirator is being used, all hazards that might endanger the integrity of the air line should be removed from the working area before use. During use, air lines should be kept as short as possible and other workers and vehicles should be excluded from the area.

27. Doffing an Ensemble

Exact procedures for removing fully-encapsulating suit/SCBA ensembles must be established and followed in order to prevent contaminant migration from the work area and transfer of contaminants to the wearer's body, the doffing assistant, and others.

Sample doffing procedures are provided in Table 5. These procedures should be performed only after decontamination of the suited worker. They require a suitably attired assistant. Throughout the procedures, both worker and assistant should avoid any direct contact with the outside surface of the suite.

28. Clothing Reuse

Chemicals that have begun to permeate clothing during use may not be removed during decontamination and may continue to diffuse through the material toward the inside surface, presenting the hazard of direct skin contact to the next person who uses the clothing.

Where such potential hazards may develop, clothing should be checked inside and out for discoloration or other evidence of contamination. This is particularly important for fully-encapsulating suits, which are generally subject to reuse because of their cost. None, however, that negative (i.e., no chemical found) test results do not necessarily preclude the possibility that some absorbed chemical will reach the suits interior.

At present, little documentation exists regarding clothing reuse. Reuse decisions must consider the known factors of permeation rates as well as the toxicity of the contaminant(s). In fact, unless extreme care is taken to ensure that clothing is properly decontaminated and that the decontamination does not degrade the material, the reuse of CPC that has been contaminated with toxic chemicals is not advisable.

29. Inspection

An effective PPE inspection program will probably feature five different inspections:

- Inspection and operational testing of equipment received from the factory or distributor;
- Inspection of equipment as it is issued to workers;
- Inspection after use or training and before maintenance;
- Periodic inspection of stored equipment; and
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment or when problems with similar equipment arise.

Each inspection will cover somewhat different areas in varying degrees of depth. Detailed inspection procedures, where appropriate, are usually available from the manufacturer.

Records must be kept of all inspection procedures. Individual identification numbers should be assigned to all reusable pieces of equipment (respirators may already have ID numbers), and records should be maintained by that number. At a minimum, each inspection should record the ID number, date, inspector, and any unusual conditions or findings. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a particularly high level of "down-time."

30. Storage

Clothing and respirators must be stored properly to prevent damage or malfunction from exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Procedures must be specified for pre-issuance (in-use) storage. Many equipment failures can be directly attributed to improper storage.

31. Clothing

Potentially contaminated clothing should be stored separate from street clothing in an area with good ventilation and good air flow around each item. Different types and materials of clothing and gloves should be stored separately to prevent issuing the wrong material by mistake. Protective clothing should be folded or hung in accordance with manufacturers' recommendations.

32. Respirators

SCBAs, supplied-air respirators, and air-purifying respirators should be dismantled, washed, and disinfected after each use. SCBAs should be stored in storage chests supplied by the manufacturer. Air-purifying respirators should be stored individually in there original cartons or carrying cases, or in heat-sealed or resealable plastic bags.

33. Maintenance

The technical depth of maintenance procedures varies. Manufacturers frequently restrict the sale of certain PPE parts to individuals or groups who are specially trained, equipped, and authorized by the manufacturer to purchase them. Explicit procedures should be adopted to ensure that the appropriate level of maintenance is performed only by individuals having this specialized training and equipment. The following classification scheme is often used to divide maintenance into three levels:

- Level 1: User or wearer maintenance, requiring a few common tools or no tools at all;
- Level 2: Shop maintenance that can be performed by the employer's maintenance shop; and

- Level 3: Specialized maintenance that can be performed only by the factory or an authorized repair person.

34. Heat Stress and Other Physiological Factors

Wearing PPE puts a hazardous waste worker at considerable risk of developing heat stress. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at hazardous waste sites, regular monitoring and other preventive precautions are vital.

Individuals vary in their susceptibility to heat stress. Factors that may predispose someone to heat stress include the following:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

Reduced work tolerance and the increased risk of excessive heat stress are directly influenced by the amount and type of PPE worn. PPE adds weight and bulk, severely reduces the body's access to normal heat exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditure. Therefore, when selecting PPE, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once PPE is selected, the safe duration of work/rest periods should be determined based on the following criteria:

- Anticipated work rate,
- Ambient temperature and other environmental factors,
- Type of protective ensemble, and
- Individual worker characteristics and fitness.

35. Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

For workers wearing semipermeable or impermeable encapsulating ensembles, the ACGIH standard cannot be used. For these situations, workers should by monitored when the temperature in the work are is above 70°F (21°C).

To monitor the worker, measure the following:

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third. Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

- Body water loss, if possible. Measure weight on a scale accurate to ± 0.25 lb at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work. The length of the work cycle will be governed by the frequency of the required physiological monitoring.

36. Prevention

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. To avoid heat stress, management should take the following steps:

- Adjust work schedules: Modify work/rest schedules according to monitoring requirements. Mandate work slowdowns as needed. Rotate personnel: alternate job functions to minimize overstress or overexertion at one task. Add additional personnel to work teams. Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.

- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.

- Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 8 ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

- Maintain water temperature at 50° to 60°F (10° to 15.6°C);

- Provides small disposable cups that hold about 4 ounces (0.1 liter);

- Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work;

- Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight; and

- Weigh workers before and after work to determine if fluid replacement is adequate.

- Encourage workers to maintain an optimal level of physical fitness:

Where indicated, acclimatize workers to site work conditions: temperature, protective clothing, and workload (see Level of Acclimatization at the end of this chapter). Urge workers to maintain normal weight levels.

- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include the following:

- Field showers or hose-down areas to reduce body temperature and/or cool off protective clothing.

- Cooling jackets, vests, or suits.

- Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress (see Table 7).

37. Other Factors

Using PPS decreases worker performance. The magnitude of this effect varies considerably, depending on both the individual and the PPE ensemble used. This section discusses the demonstrated physiological responses to PPE, the individual human characteristics that are factors in these responses, and some of the precautionary and training measures that should be taken to avoid PPE-induced injury.

The following physiological factors may affect worker ability to function using PPE:

- Physical condition
- Age
- Weight
- Level of acclimatization
- Gender

38. Physical Condition

Physical fitness is a major factor influencing a person's ability to perform work under heat stress. The more fit someone is, the more they can safely perform. At a given level of work, a fit person will have the following physical reactions compared to an unfit person:

- Less physiological strain;
- A lower heart rate;
- A lower body temperature, which indicates less retained body heat

(a rise in internal temperature precipitates heat injury);

- A more efficient sweating mechanism;
- Slightly lower oxygen consumption; and
- Slightly lower carbon dioxide production.

39. Level of Acclimatization

The degree to which a worker's body has physiologically adjusted or acclimatized to working under hot conditions affects his or her ability to work. Acclimatized individuals generally have lower heart rates and body temperatures than unacclimatized individuals and sweat sooner and more profusely. This enables them to maintain lower skin and body temperatures at a given level of environmental heat and work load than unacclimatized workers. Sweat composition also becomes more dilute with acclimatization, which reduces salt loss.

Acclimatization can occur after just a few days of exposure to a hot environment (15,16). NIOSH recommends a progressive 6-day acclimatization period for the unacclimatized worker before allowing him/her to do full work on a hot job. Under this regimen, the first day of work on site is begun using only 50 percent of the anticipated workload and exposure time, and 10 percent is added each day through day 6. With fit or trained individuals, the acclimatization period may be shortened 2 or 3 days. However, workers can lose acclimatization in a matter of days, and work regimens should be adjusted to account for this.

When enclosed in an impermeable suit, fit acclimatized individuals sweat more profusely than unfit or unacclimatized individuals and may therefore actually face a greater danger of heat exhaustion due to rapid dehydration. This can be prevented by consuming adequate quantities of water.

40. Age

Generally, maximum work capacity declines with increasing age, but this is not always the case. Active, well-conditioned seniors often have performance capabilities equal to or greater than young sedentary individuals. However, there is some evidence, indicated by lower sweat rates and higher body core temperatures, that older individuals are less effective in compensating for a given level of environmental heat and work loads. At moderate thermal loads, however, the physiological responses of "young" and "old" are similar, and performance is not affected.

Age should not be the sole criterion for judging whether or not an individual should be subjected to moderate heat stress. Fitness level is a more important factor.

The literature indicates that females tolerate heat stress at least as well as their male counterparts. Generally, a female's work capacity averages 10 to 30 percent less than that of a male. The primary reasons for this are the greater oxygen-carrying capacity and the stronger heart in the male. However, a similar situation exists as with aging: not all males have greater work capacities than all females.

41. Weight

The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/weight). Heat loss (dissipation) if a function of surface area, and heat production depends on mass. Therefore, heat balance is described by the ratio of the two.

Since overweight individuals (those with a low ratio) produce more heat per unit of surface area than thin individuals (those with a high ratio), overweight individuals should be given special consideration in heat stress situations. However, when wearing impermeable clothing, the weight of an individual is not a critical factor in determining the ability to dissipate excess heat.

C.c. BLOOD BORNE PATHOGEN EXPOSURE CONTROL PLAN

1. Purpose

One of the major goals of the Occupational Safety and Health Administration (OSHA) is to promote safe work practices in an effort to minimize the incidence of illness and injury experienced by employees. Relative to this goal, OSHA has enacted the Bloodborne Pathogens Standard, codified as 29 CFR 1910.1030. The purpose of the Bloodborne Pathogens Standard is to "reduce occupational exposure to Hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV) and other bloodborne pathogens" that employees may encounter in their workplace.

Sevenson Environmental Services, Inc. believes that there are a number of "good general principles that should be followed when working with bloodborne pathogens. These include:

- It is prudent to minimize all exposure to bloodborne pathogens.
- Risk of exposure to bloodborne pathogens should never be underestimated.

We have implemented this Exposure Control Plan to meet the letter and intent of the OSHA Bloodborne Pathogens Standard. The objective of this plan is twofold:

- To protect our employees from the health hazards associated with bloodborne pathogens.
- To provide appropriate treatment and counseling should an employee be exposed to bloodborne pathogens.

2. General Program Management

a. RESPONSIBLE PERSONS

There are three major "Categories of Responsibility" That are central to the effective implementation of our Exposure Control Plan. These are:

- The "Exposure Control Officer."
- Education/Training Coordinator.
- Our Employees.

b. EXPOSURE CONTROL OFFICER

The "Exposure Control Officer" will be responsible for overall management and support of our company's Bloodborne Pathogens Compliance Program. Activities which are delegated to the Exposure Control Officer typically include, but are not limited to:

- Overall responsibility for implementing the Exposure Control Plan for the entire company.
- Working with management and other employees to develop and administer any additional bloodborne pathogens related policies and practices needed to support the effective implementation of this plan.
- Looking for ways to improve the Exposure Control Plan, as well as to revise and update the plan when necessary.
- Collecting and maintaining a suitable referenced library on the Bloodborne Pathogens Standard and bloodborne pathogens safety and health information.
- Knowing current legal requirements concerning bloodborne pathogens.
- Acting as a liaison during OSHA inspections.
- Conducting periodic audits to maintain an up-to-date Exposure Control Plan.

Paul J. Hitcho has been appointed as the facility's Exposure Control Officer.

c. EDUCATION/TRAINING COORDINATOR

Our Education/Training Coordinator will be responsible for providing information and training to all employees who have the potential for exposure to bloodborne pathogens. Activities falling under the direction of the Coordinator include:

- Maintaining an up-to-date list of personnel requiring training.
- Developing suitable education/training programs.
- Scheduling periodic training seminars for employees.
- Maintaining appropriate training documentation such as "Sign-in Sheets', Quizzes, etc.
- Periodically reviewing the training programs with the Exposure Control Officer, to include appropriate new information.

Mark Nicklas has been selected to be the company's Education/Training Coordinator.

d. EMPLOYEES

As with all of our company's activities, our employees have the most important role in our bloodborne pathogens compliance program, for the ultimate execution of much of our Exposure Control Plan rests in their hands. In this role they must do things such as:

- Know what tasks they perform that may cause occupational exposure.

- Attend the bloodborne pathogens training sessions.

- Develop good personal hygiene habits.

e. AVAILABILITY OF THE EXPOSURE CONTROL PLAN TO EMPLOYEES

To help them with their efforts, our facility's Exposure Control Plan is available to our employees at any time. Employees are advised of this availability during their education/training sessions. Copies of the Exposure Control Plan are kept as part of the Site Health and Safety Plan.

f. REVIEW AND UPDATE OF THE PLAN

We recognize that it is important to keep our Exposure Control Plan up-to-date. To ensure this, the plan will be reviewed and updated under the following circumstances:

- Annually, on or before May 5th of each year.
- Whenever new or modified tasks and procedures are implemented which affect occupational exposure of our employees.
- When our employee's jobs are revised such that new instances of occupational exposure may occur.

3. Exposure Determination

One of the keys to implementing a successful Exposure Control Plan is to identify exposure situations employees may encounter. To facilitate this in our company, we have prepared the following:

- Job classifications in which <u>all</u> employees have occupational exposure to bloodborne pathogens.
- Job classifications in which <u>some</u> employees have occupational exposure to bloodborne pathogens.
- Tasks and procedures in which occupational exposure to bloodborne pathogens occur (these tasks and procedures are performed by employees in the job classifications shown on the next two lists).

JOB CLASSIFICATIONS IN WHICH ALL EMPLOYEES HAVE EXPOSURE TO BLOODBORNE PATHOGENS

Below are listed the job classifications in our facility where all employees may come into contact with human blood or other potentially infectious materials, which may result in possible exposure to bloodborne pathogens:

JOB TITLE	DEPARTMENT/LOCATION
Site Safety & Health Officer	All Sites
Emergency Responder/First Aid & CPR	All Sites

JOB CLASSIFICATIONS IN WHICH SOME EMPLOYEES HAVE EXPOSURE TO BLOODBORNE PATHOGENS

Below are listed the job classifications in our facility where some employees may come into contact with human blood or other potentially infectious materials, which may result in possible exposure to bloodborne pathogens:

JOB TITLE	DEPARTMENT/LOCATION
Not Applicable	

WORK ACTIVITIES INVOLVING POTENTIAL EXPOSURE TO BLOODBORNE PATHOGENS

Below are listed the tasks and procedures in our facility where employees may come into contact with human blood or other potentially infectious materials which may result in exposure to bloodborne pathogens:

JOB TITLE	JOB CLASSIFICATION	DEPARTMENT/LOCATION
First Aid	Site Safety & Health Officer	All Sites
	Emergency Responder (First Aid/CPR)	All Sites

4. Methods of Compliance

We understand that there are a number of areas that must be addressed in order to effectively eliminate or minimize exposure to bloodborne pathogens in our facility. The first three areas we deal with in our plan are:

- The use of Universal Precautions.
- Implementing appropriate Work Practice Controls.
- Using necessary Personal Protective Equipment.

Each of these areas is reviewed with our employees during their bloodborne pathogens related training (see the "Information and Training" section of this plan for additional information). By rigorously following the requirements of OSHA's Bloodborne Pathogens Standard in these three areas, we feel that we will eliminate or minimize our employees' occupational exposure to bloodborne pathogens as much as is possible.

a. UNIVERSAL PRECAUTIONS

In our facility we have begun the practice of "Universal Precautions". As a result, we treat all human blood and body fluids such as semen and vaginal secretions as if they are known to be infectious for HBV, HIV and other bloodborne pathogens.

We assume all body fluids to be potentially infectious.

b. WORK PRACTICE CONTROLS

In addition to engineering controls, our facility uses a number of Work Practice Controls to help eliminate or minimize employee exposure to bloodborne pathogens.

Our company has adopted the following Work Practice Controls as part of our Bloodborne Pathogens Compliance Program.

- Employees wash their hands immediately, or as soon as feasible, after removal of potentially contaminated gloves or other personal protective equipment.
- Following any contact of body areas with blood or any other infectious materials, employees wash their hands and any other exposed skin with soap and water as soon as possible.

c. PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment is our employees' "last line of defense" against bloodborne pathogens. Because of this, our company provides (at no cost to our employees) the Personal Protective Equipment that they need to protect themselves against such exposure. This equipment includes, but is not limited to:

- Gloves.
- Safety glasses.
- Goggles.
- Face shields/masks.
- Respirators.

Hypoallergenic gloves, glove liners and similar alternatives are readily available to employees who are allergic to the gloves our company uses.

To ensure that personal protective equipment is not contaminated and is in the appropriate condition to protect employees from potential exposure, our company adheres to the following practices:

- All personal protective equipment is inspected periodically and repaired or replaced as needed to maintain its effectiveness.
- Reusable personal protective equipment is cleaned, laundered and decontaminated as needed.

To make sure that this equipment is used as effectively as possible, our employees adhere to the following practices when using their personal protective equipment:

- Any garments penetrated by blood or other infectious materials are removed immediately, or as soon as feasible.
- All potentially contaminated personal protective equipment is removed prior to leaving a work area.
- Gloves are worn in the following circumstances:

  Whenever employees anticipate hand contact with potentially infectious materials.

  When handling or touching contaminated items or surfaces.

- Disposable gloves are replaced as soon as practical after contamination or if they are torn, punctured or otherwise lose their ability to function as an "exposure barrier".

- Utility gloves are decontaminated for reuse unless they are cracked, peeling, torn or exhibit other signs of deterioration, at which time they are disposed of.

- Masks and eye protection (such as goggles, face shields, etc.) are used whenever splashes or sprays may generate droplets of infectious materials.

5. Hepatitis B Vaccination
Post-Exposure Evaluation and Follow-up

Everyone in our company recognizes that even with good adherence to all of our exposure prevention practices, exposure incidents can occur. As a result, we have implemented a Hepatitis B Vaccination Program, as well as set up procedures for post-exposure evaluation and follow-up should exposure to bloodborne pathogens occur.

a. VACCINATION PROGRAM

To protect our employees as much as possible from the possibility of Hepatitis B infection, our facility has implemented a vaccination program. This program is available, at no cost, to all employees who have occupational exposure to bloodborne pathogens.

The vaccination program consists of a series of three inoculations over a six-month period. As part of their bloodborne pathogens training, our employees have received information regarding Hepatitis vaccination, including its safety and effectiveness.

Sharon Lee Sheelar is responsible for setting up and operating our vaccination program.

To ensure that all employees are aware of our vaccination program, it is thoroughly discussed in our bloodborne pathogens training.

EMPLOYEES ELIGIBLE FOR HEPATITIS B VACCINATION

EMPLOYEE	DEPARTMEN T	ACCEPTED/ DECLINED	DATES SCHEDULED	INOCULATIO N RECEIVED #1 / #2 / #3			ADMINISTERI NG HEALTHCARE PROFESSIONA L (INITIALS)

115

VACCINATION DECLINATION FORM

Date: _____

Employee Name:_______________________________

Employee ID#: _______________________________

I understand that due to my occupational exposure to blood or other potential infectious materials I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself. However, I decline the Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If, in the future, I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

________________________ ____________

Employee Signature Date

________________________ ____________

Facility Representative Signature Date

b. MEDICAL RECORDKEEPING

To make sure that we have as much medical information available to the participating healthcare professional as possible, our facility maintains comprehensive medical records on our employees. Jefferson Medical School is responsible for setting up and maintaining these records, which include the following information:

- Name of the employee.
- Social security number of the employee.
- A copy of the employee's Hepatitis B Vaccination status.
  Dates of any vaccinations.
  Medical records relative to the employee's ability to receive vaccination.
- Copies of the results of the examinations, medical testing and follow-up procedures which took place as a result of an employee's exposure to bloodborne pathogens.
- A copy of the information provided to the consulting healthcare professional as a result of any exposure to bloodborne pathogens.

As with all information in these areas, we recognize that it is important to keep the information in these medical records confidential. We will not disclose or report this information to anyone without our employee's written consent (except as required by law).

6. Information and Training

Having well informed and educated employees is extremely important when attempting to eliminate or minimize our employees' exposure to bloodborne pathogens. Because of this, all employees who have the potential for exposure to bloodborne pathogens are put through a comprehensive training program and furnished with as much information as possible on this issue.

This program was set up so that employees would receive the required training on or before June 4, 1992. Employees will be retrained at least annually to keep their knowledge current. Additionally, all new employees, as well as employees changing jobs or job functions, will be given any additional training their new position requires at the time of their job assignment.

Mark Nicklas is responsible for seeing that all employees who have potential exposure to bloodborne pathogens receive this training. He will be assisted by the following instructors:

- Dana Tipton

- Paul Hitcho

a. **TRAINING TOPICS**

The topics covered in our training program include, but are not limited to, the following:

- The Bloodborne Pathogens Standard itself.
- The epidemiology and symptoms of bloodborne diseases.
- The modes of transmission of bloodborne pathogens.
- Our facility's Exposure Control Plan (and where employees can obtain a copy).
- Appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.
- A review of the use and limitations of methods that will prevent or reduce exposure, including:
- Work practice controls.
- Personal protective equipment.
- Selection and use of personal protective equipment including:
- Types available.
- Proper use.
- Location within the facility.
- Removal.
- Handling.
- Decontamination.
- Disposal.
- Information on the hepatitis B Vaccine, including its:
- Efficacy.
- Safety.
- Method of Administration.
- Benefits of Vaccination.
- Our facility's free vaccination program.
- Actions to take and persons to contact in an emergency involving blood or other potentially infectious materials.
- The procedures to follow if an exposure incident occurs, including incident reporting.
- Information on the post-exposure evaluation and follow-up, including medical consultation, that our facility will provide.

b. **TRAINING METHODS**

Our facility's training presentations make use of several training techniques including, but not limited to, those checked below:

- [ ] Classroom type atmosphere with personal instruction.
- [ ] Videotape programs.
- [ ] Training manuals/employee handouts.
- [ ] Employee Review Sessions.

Because we feel that employees need an opportunity to ask questions and interact with their instructors, time is specifically allotted for these activities in each training session.

c. RECORDKEEPING

To facilitate the training of our employees, as well as to document the training process, we maintain training records containing the following information:

- Dates of all training sessions.
- Contents/summary of the training sessions.
- Names and qualifications of the instructors.
- Names and job titles of employees attending the training sessions.

We have used the forms on the following pages and/or our computer systems to facilitate this recordkeeping.

These training records are available for examination and copying to our employees and their representatives, as well as OSHA and its representatives.

BLOODBORNE PATHOGENS TRAINING SESSIONS

Date of Session: __________ Session Summary (Attached) _____

Instructor(s) Qualifications

____

____

____

* * * * * *

Attendee Name	Attendee Job Title

D.d. LEAD AWARENESS PROGRAM

1. Introduction

Lead may be present at some of the sites. Therefore, lead awareness for all affected project participants will be provided prior to the initiation of on-site tasks.

2. General

- Symbol: Pb
- Characteristics: Lead is heavy, ductile, and bluish white in color.

3. Training

The following program is provided to inform site personnel about lead, potential exposure to lead, the associated health effects, personal protective equipment and work practice controls.

4. Health Hazards

Lead can be absorbed into the body by inhalation (breathing) and ingestion (eating). Exposure to lead is usually in the form of dust and fumes. Absorption of inorganic lead through the skin does not take place to any appreciable degree. Therefore, this exposure route does not represent a hazard. Only a few lead compounds are appreciably soluble in water, but many are dissolved by acids and most are sufficiently soluble in body fluids to be toxic, especially when inhaled in finely divided form.

- Permissible Exposure Level: 0.05 mg/m3
- Threshold Limit Value: 0.05 mg/m3

5. Health Effects

The early stages and symptoms of lead poisoning are nonspecific and may resemble many diseases including influenza.

Early signs and symptoms are:

- Malaise, fatigue

- Sleep disturbance

- Constipation
- Abdominal cramps
- Anemia, hemolytic (red blood cells being destroyed) in type but not usually severe
- Irritability
- Aching muscles and bones
- Headache
- Decreased appetite
- Nausea and vomiting

These symptoms are reversible, and complete recovery is possible.

In more advanced cases of lead poisoning, the above signs and symptoms progress and frequently involve the gastrointestinal and neuromuscular systems (both nerves and muscles).

Central nervous system symptoms are:

- Brain dysfunction (encephalopathy) which may mimic bacterial meningitis. However, cerebrospinal fluid glucose level is normal. Symptoms include:

  - Fever
  - Headache
  - Stiff Neck
  - Vomiting
  - Personality changes

- Tremor
- Hallucinations
- Intellectual deterioration
- Rarely, accumulation of cerebrospinal fluid within the brain (hydrocephalus)

- Blindness may occur from optical atrophy (wasting away of the optic nerves secondary to lead exposure and convulsions)

Gastrointestinal symptoms are:

- Colon spasms
- Nausea, vomiting
- Loss of appetite
- Constipation

Signs and symptoms associated with the blood and blood G tissues are:

- Anemia in which the red blood cells have a reduced hemoglobin content thypochromic normocytic types
- Increased serum iron

The marrow also reveals increased production and specific structural (morphological) changes in nucleated red corpuscles (erythroblasts) such as:

- Basophilic stippling and
- Deformed nuclei

The iron content of the marrow is increased, and increases siderocytes, sideroblasts and reticuloendothelial cells are noted. Some investigators believe the basic effect lead has on the marrow is first hyperstimulation followed by delayed maturation.

Kidney (renal) symptoms are:

- An abnormal amount of uric acid in the blood (hyperuricemia)
- Inflammation (nephritis)
- The presence of glucose in the urine (glycosuria)
- An abnormal amount of amino acids in the urine (hyperaminoaciduria)
- Progressive increase in blood urea.

Additional signs and symptoms which may be present are:

- Gum lead line (black or purplish line on gum margin)
- Skin pallor (ashen gray)
- Loss of weight
- Weakness of extensor muscles (such as wrist or foot drop)

Cortical atrophy (reduction in size of brain tissue) has also been described but this in not a common finding.

6. Medical Program

In on-site personnel are exposed to lead levels greater than 0.03 mg/m^3, a biological monitoring program will be instituted in accordance with Sevenson's Medical Monitoring Program. This would involve the collection of blood lead samples every 6 month with results reported to the individual. Exposure levels will be determined by performing personal sampling during on-site tasks.

7. Respirators

Respiratory protection will be required of all personnel engaged in sample collection. Respirators will provide protection against the inhalation of airborne dust potentially contaminated with lead as well as organic lead in the form of tetraethyl lead.

8. Clothing

On-site personnel will be required to use dermal protection as listed in the Site Specific Safety and Health Plan.

9. Hygiene and Sanitation Practices

At no time will food, drink, tobacco products, chewing gum, etc. be stored in on-site work area. Eating, drinking (other than water), smoking shall not be permitted, except in designated areas. On-site personnel must wash their hands and face prior to doing any of the aforementioned activities. It is recommended that on-site personnel shower prior to leaving the site.

E.e. FIRE PROTECTION

The best protection when dealing with a potential for a fire is a program which emphasizes fire prevention. Prior to the start of any operation in which the potential for a fire exits the following procedures should be implemented:

- Evaluation of the fire hazards present, potential ignition sources, and available fire control means.

- Proper housekeeping - i.e., combustible materials removed from work area.

- Personnel should be trained in fire prevention techniques and use of fire extinguishing equipment.

- All hot operations done under a hot work permit.

- Evaluation of work area for potential flammable atmospheres using the proper air monitoring instruments.

- Fire watch required in areas where a fire may develop. The areas include:

  - Where combustible materials are closer than 25 feet to the point of operation.
  - Where combustible liquids and vapors are more than 25 feet away but could be ignited by sparks.
  - Wall or floor openings within the 25 foot radius which may expose combustible material.
  - Combustible materials that are adjacent to the opposite sides of partitions, walls, ceilings or roofs and are likely to be ignited by heat transfer via conduction or radiation.
- The duties of the fire watch include:

  - Use of fire extinguisher.
  - Use of combustible gas meter if "hot work" requires continuous monitoring.
  - Know specific hazards of the area and have authority to stop the operations if a hazardous condition develops.
  - Know when and where to sound the general fire alarm if the fire cannot be extinguished by the portable extinguishers.
  - Watching for fires in all exposed areas.
  - Maintaining the fire watch for at least 30 minutes after completion

of burning, cutting, or welding operations to detect and extinguish smoldering fires.

- Oxygen and acetylene cylinders and their associated hoses must be placed in a safe location where they will not be exposed to hot metal, slag, or flying sparks and properly secured.

- The selection, distribution, inspection, maintenance and testing of portable fire extinguisher shall conform to OSHA regulation 1910.157.

F.f. LINE BREAKING

The purpose of this procedure is to outline the necessary steps to safely open process lines. It must always be assumed that there is a product and/or gas at the point where the line is to be broken. The following steps outline the line breaking procedure:

- Complete line breaking checklist.
- Discuss the procedure with affected personnel.
- If necessary, the lockout/tagout procedure must be implemented.
- The line must be drained.
- All valves must be left in the open position to prevent an air lock.
- Isolate the work area and prevent entry of unauthorized personnel.
- Protective equipment suitable for the material in the line must be worn. See site specific safety and health plan.
- Bolts which are farthest from the worker are loosened first.
- Stand to the side to avoid any spray.
- Flange spreaders should be used for opening the flange joints.
- Have portable emergency shower and eye wash near the work area.
- If burning is necessary, a hot work permit must be issued and hot work procedures followed.

G.g. FALL PROTECTION

The purpose of these procedures is to prevent injury to a worker due to a fall from a higher to a lower level. This procedure will be implemented at a height greater than 6 feet above the adjacent surface. The acceptable means of providing access to elevated work are ladders, scaffolding, and mobile manlift baskets.

The purpose of this program is to prevent injuries due to falls from elevated work surfaces and to comply with OSHA fall protection standards in 29 CFR 1926, Subpart M.

This program is to be implemented when employees are working at heights greater than 6 feet.

Definitions

Competent Person - A person possessing the skills, knowledge, experience, and judgement to perform assigned tasks or activities satisfactorily.

Dangerous Equipment - Dangerous equipment means equipment which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment. Examples include tanks, degreasing units, machinery, and electrical equipment.

Guardrail System - A means of fall protection consisting of a toprail (42" ±3") above the walking / working level; midrail installed at one half the height of the toprail; and a bottomrail or toeboard at least 3 ½" in height.

Hole - Hole means a gap or void 2 inches or more in its least dimension, in a floor, roof, or other walking/working surfaces.

Opening - An opening means a gap or void 30 inches or more high and 18 inches or more wide through which employees can fall to a lower level.

Personal Fall Arrest System - A personal fall system consisting of an anchorage, connectors, body harness, and may include a lanyard, deceleration device, lifeline, or suitable combination of these. Body belts are not permitted in personal fall arrest systems on this project.

Safety Monitoring System - A means of fall protection consisting of a competent person to act as the safety monitor and warn an employee of a fall hazard.

Safety Net System - A means of fall protection in which a net is placed under the walking / working surface as close as possible but not greater than 30 feet below it.

Walking / Working Surface - A walking / working surface is any surface, whether horizontal or vertical, on which an employee walks or works, including but not limited to floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel, but not including ladders, vehicles, or trailers on which employees must be to perform their job duties.

Warning Line System - A means of fall protection in which a warning line consisting of ropes, wires, or chains and stanchion are placed 6 feet from the edge of a roof.

Responsibilities

Site supervisors have the responsibility to ensure that fall protection is provided as required by this program and site safety plans for this operation.

The Project Health and Safety Manager (PHSM) will audit implementation of this program as part of the field inspections.

The Site Health and Safety Officer (SHSO) is responsible for providing fall protection training for all site personnel and monitoring compliance with this program.

System Characteristics

Guardrail System

- Toprail - 42" ±3" above walking / working surface
- Midrail - ½ height of toprail
- Toeboard - 3 ½ " in height
- Must withstand a force of 200 pounds
- When used in hoisting area, a chain, gate, or removable guardrail section must be placed across the access opening when hoisting operations are not taking place.
- When used to protect holes, they must be erected on all unprotected sides or edges of the hole.
- When used on ramps or runways, they must be erected on all open sides.

Personal Fall Arrest

- Body harness and shock absorbing lanyard must be used.
- Only locking type of snaphooks are to be used.
- Lanyards and vertical lifelines must have a minimum breaking strength of 5,000 pounds.
- Anchorage for the system must be capable of supporting 5,000 pounds per employee attached.
- Attachment point of the body harness must be in the center of the wearer's back or above the wearer's head.
- Systems and components which were subject to impact loading must be removed from service and not used unless inspected and deemed satisfactory by a competent person.

- Must be inspected prior to each use.

Safety Monitoring

- Competent person who must recognize fall hazards and verbally warn employees when they approach such hazard.

- Must not have any other responsibilities.

Safety Net

- Fall from walking / working surface to net must be unobstructed.

- Nets must be drop tested using a 400 pound bag of sand.

- Net openings must not be greater than 36 square inches.

Warning Line

- Must be erected around all sides six feet from edge.

- Wire, rope, or chain must be flagged every 6 feet with high visibility material.

- Height must be between 34 and 39 inches.

- Must be capable of resisting 16 pounds of pressure without tipping over.

Training

General

All site personnel who might be exposed to fall hazards on the jobsite shall receive training by a competent person. The training shall be conducted at the time of the site orientation. The competent person must meet the applicable sections of 1926.503(a)(2).

The training must include:

- Nature of fall hazards in work area.

- Correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection system to be used.

- The use and operation of the system to be used.

- The relevant standards.

Retraining

Retaining shall be conducted when changes occur in the workplace which present a new fall hazard, when fall protection systems or equipment is changed, or when it appears that the employee has not retained the requisite understanding or skill regarding the fall hazards or protective measures.

Certification of Training

Certification of training or retraining shall include the name of the employee, the date of the training, the content of the training, and the signature of the person who conducted the training.

Training certification shall be maintained as part of the project file.

Ladders

- All ladders must be equipped with non-slip ladders shoes.
- Extension ladders must not be taken apart and used separately.
- Ladders must be inspected before each use.
- Secure the top part of the ladder by tying off to a solid support.
- The top of the ladder shall extend 3 feet above the elevated surface.
- Only one person at a time is permitted on the ladder.
- A ladder must be placed so that the horizontal distance from the base of the vertical plane is 1/4 of the ladder length.
- If possible, avoid placing ladders against pipelines. If need to, make certain the pipe can support the weight of the ladder and you.
- Ladder footing must be firm and level.
- Wear a full body harness and shock absorbing lanyard when working on a ladder 6 feet above the surface.
- Ladders should be constructed of wood of fiberglass.

Scaffolds

- Scaffolds shall be placed upon a sound and rigid surface.
- A standard guardrail consisting of a top rail - 42 inches high, midrail, and toe board shall be used. Supports shall be at intervals of 10 feet or less.
- A scaffold must support at least 4 times its intended load.
- All planking and platforms must be overlapped a minimum of 12 inches.
- An access ladder must be provided.
- Scaffold planks shall extend over their end supports not less than 6 inches nor more than 18.
- The legs of the scaffold must be straight and rigid.
- No work on scaffolds is permitted during storms or high winds.
- Area around the scaffold must be barricaded and signed stating - **Danger - Overhead Work.**

Manlifts

- When traveling, the boom must be in proper travel position will the engine in front and the operator facing the controls.
- Only trained personnel are permitted to operate the manlift.
- Personnel and load limits are not to be exceeded.
- Do no operate within 10 feet of a power line.

Harness

- Full body harnesses with shock absorbing lanyards are required.
- Must be worn when working in a manlift or manbucket.
- Must be worn where there is no railing or other forms of protection.

Inspections

- All personal fall-arrest systems must be inspected for wear and damage every time they are used.

- If a personal fall-arrest system has been subjected to a fall, it is not to be ever used.

- All lanyards and harness will be inspected every 6 months by a competent person. This will be documented and kept in the job file.

- During the inspection, the following items will be looked for:

  - Abrasions
  - Broken parts
  - Burn marks
  - Corrosion
  - Deformation
  - Excessive wear
  - Frayed or kinked material
  - Incompatible components
  - Loose or deformed connectors
  - Mildew
  - Rips
  - Stress cracks

H.h. CONFINED SPACE ENTRY

Purpose

The purpose of this procedure is to protect the health and safety of personnel working within confined spaces and to comply with all applicable regulations.

Definitions

See Appendix A

General Requirements

- An evaluation will be made at all job sites by the Health and Safety Officer if there are any permit required confined spaces.

- If these spaces are found, all employees will be notified at the initial site specific training.

- If the following conditions are met, then a less stringent entry procedure can be followed:

  - The only hazard is an actual or potentially hazardous atmosphere.
  - Forced air ventilation is sufficient to maintain safe entry.
  - Sufficient monitoring and inspection data are available.

- Classification of a non-permit confined space.

  - Has no actual or potential hazardous atmospheres.
  - Documentation that no hazardous atmospheres exist.

- Permit required confined space require:

  - Isolating the space - lock out/tag out, line breaking (follow procedures in Corporate Health and Safety Program); blanking or blinding, double blocks and bleeds, and disconnecting all mechanical linkages.

  - Purging, flushing, inerting or ventilating.
  - Verifying that conditions are acceptable for entry throughout the duration of an authorized entry.

- Preparation for entry.

  - Equipment needed include - air monitoring instrumentation, air moving equipment, communication, personnel protective equipment, illumination, barriers to protect entrants from external hazards, retrieval systems, and rescue and emergency equipment.

- Confined space entry permits.

  - No person will enter a confined space until a confined space entry permit has been completed.
  - Copy of the permit is in Appendix B.
  - Only personnel trained and certified as entry supervisors may issue the permit.
  - A copy of the permit must be posted until the permit is canceled.
  - Permit will be valid for the period required to complete the assigned task or for 24 hours whichever is less.

- Testing of the atmosphere.

- Tests for a flammable atmosphere, oxygen deficiency, and vapor concentration (if applicable) will be conducted.
- Oxygen content between 19.5 and 23%, Lower Flammability Level <1%, and vapor concentration less than the OSHA exposure level are acceptable for entry.
- Sufficient tests must be taken through a cross-section of the confined space to accurately characterize the environment.
- Test results and the tester's signature must be recorded on the permit form.
- Instrumentation must be tested and zeroed before each daily use and calibrated according to manufacturer's specifications.

● Attendants.

  - An authorized attendant will be stationed at each confined space.
  - The attendant will not enter the space unless he is relieved, trained and equipped for rescue operations, and a second rescuer arrives to assist.

● Training.

  - All affected personnel must receive annual training.
  - Documentation include signature of the trainee, dates of training, signature of trainer, lesson plan, and verification of each trainee's understanding.
  - Authorized entrants will receive training in:

    - Recognition of hazards.
    - Need to maintain contact with attendants.
    - Proper use of personal protective equipment.
    - Need to evacuate space if ordered by the attendant, O_2/LFL alarm indicates a hazard, entrant detects a prohibited condition, or the entrant recognizes a warning sign and/or symptoms of exposure to a dangerous situation.
    - All aspects of the permit.
    - Use of the test equipment.

  - Attendants will receive training in:

    - All aspects of the permit.
    - Requirement to remain outside confined space.
    - Recognition of hazards.
    - Requirement to maintain visual or verbal contact with entrants.
    - Alerting rescue personnel.
    - Use of test equipment.

- Entry supervisors will receive training in:

  - Determination that the space has been isolated.
  - Determination that permit is complete and correct.
  - Determination that all procedures are in effect before entry.
  - Cancellation of permit.

- Rescue services will receive training in:

  - Use of personal protective equipment and confined space rescue equipment.
  - Methods and procedures to rescue personnel.

- A training program outline can be found in Appendix C.

- Contractor entry procedures:

  - Since we are a contractor at many facilities, we must be informed by the supervising engineer of:

    - The existence of the confined spaces and the facilities program.
    - Rationale for the designation of permit confined spaces.
    - Precautions and procedures while working in or near a confined space.
    - Debriefing at conclusion of entry.

I.i. MOTORIZED EQUIPMENT USE AND INSPECTION PROGRAM

This section specifies the procedures and activities to be employed when using motorized equipment, such as heavy equipment.

For our purposes, heavy equipment includes, but is not limited to:

1. All earthmoving equipment
   - bulldozers
   - graders
   - scrapers
   - backhoes
   - front-end loaders

APPENDIX A

Definitions

Attendant - a trained individual stationed outside a permit space who monitors the authorized entrants and performs all attendant's duties assigned in the facility permit space program.

Authorized Entrant - an individual who is authorized by facility management to enter a permit space.

Blanking or Blinding - the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Certified - Written authorization by facility management for an individual to perform certain function(s) for which she/he has achieved certification. To become certified , an individual must satisfactorily complete all certification requirements as specified by facility management, such as but not limited to: participating in all required lectures and/or training; and attaining qualification in the required examination(s), drill(s), and/or field evaluation(s).

Confined Space - a space that:

(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and

(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits); and

(3) Is not designed for continuous human occupancy.

Examples of spaces that may meet the above criteria:

- boilers
- silos
- vaults
- pipelines
- tanks
- hoppers
- sewers
- trenches
- vessels
- pits
- tunnels
- ventilation ducts
- storage bins
- exhaust ducts

Non-Permit Confined Space - a confined space that does not contain or, respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. (Examples of spaces which could be considered as non-permit required spaces include water tanks, vessels that contained silica sand, brine tanks, pits, trenches, and diked areas.)

Permit-Required Confined Space (Permit Space) - a confined space that has one or more of the following characteristics.

(1) Contains or has a potential to contain a hazardous atmosphere: flammable, toxic, and/or oxygen deficient;

(2) Contains a material that has the potential for engulfing an entrant;

(3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or

(4) Contains any other recognized serious safety or health hazard.

Double Block and Bleed - a method used to isolate a confined space from a line, duct or pipe by physically locking closed two in-line valves on a system and locking open a "vented to atmosphere" valve between them.

Engulfment - the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry - the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry Supervisor (Permit Issuer) - the person, certified by management, responsible for:

- determining if acceptable entry conditions are present at a permit space where entry is planned;
- authorizing entry, and
- overseeing entry operations, and
- terminating entry as required by this procedure.

APPENDIX A cont.

Hazardous Atmosphere - an atmosphere that may expose personnel to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

(1) Flammable gas, vapor, or mist in excess of 10% of its lower flammable limit (LFL);

(2) Airborne combustible dust at a concentration that meets or exceeds its LFL;
Note: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.

(3) Atmospheric oxygen concentration below 19.5% or above 23%.

(4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, and which could result in employee exposure in excess of its dose or permissible exposure limit.

(5) Any other atmospheric condition that is immediately dangerous to life or health.

Immediately Dangerous to Life or Health (IDLH) - any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided form a permit space.

Note: Some materials - hydrogen fluoride gas and cadmium vapor, for example - may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

Inerting - the process by which a permit space is removed form service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

APPENDIX A cont.

Oxygen Deficient Atmosphere - an atmosphere containing less than 19.5% oxygen by volume.

Oxygen Enriched Atmosphere - an atmosphere containing more than 23% oxygen by volume.

Prohibited Condition - any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

Rescue Services - a defined group of trained individuals designated to rescue employees from confined spaces.

Retrieval System - the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor used for non-entry rescue of persons from permit spaces.

Testing - the process by which the hazards that may confront entrants or a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the confined space.

APPENDIX B

CONFINED SPACE ENTRY PERMIT

SEVENSON
CONFINED SPACE ENTRY PERMIT

Date__________________ Time of Issue____________ Length of Permit______________________________

Location ____________________________ Equipment ID__________________________________

Purpose of Entry & Description of Work____

Authorized Entrant(s)____

Will "HOT" Work be authorized for this Entry? ____ No ____ Yes (describe:)______________________

HAZARD IDENTIFICATION

Indicate ALL potential Hazards of this Permit Space:	YES	NO	N/A
a. Contains or may contain a hazardous atmosphere	___	___	___
b. Contains a material for potential engulfment	___	___	___
c. Has an internal configuration for potential entrapment	___	___	___

If "Yes", describe________________________

d. Contains the following recognized serious safety or health hazards:

____

PRE-ENTRY PREPARATION

		YES	N/A	Done			Removed		
				Date	Time	By	Date	Time	By
1. Lines broken and/or blanked:									
Line Contents	Location								
a.									
b.									
c.									
2. Drain or at a workable level									
3. Purge - flush and vent									
4. Force air to bottom & vent									
5. Lock out power feeds:									
Equip/Location of Lock out									
a.									
b.									
c.									
6. Shut-off heating systems									
7. Other:									

TEST TO BE TAKEN

	P.E.L.	Time				
		Tester				
		Yes	N/A	Results	Results	Results
% of Oxygen	19.5% to 21%					
Temperature	110°F/43°C					
% of LEL:	Any % over 10					
Hydrogen Sulfide	10 ppm					
Other:						
Other:						

PREVENTION OF UNAUTHORIZED ENTRY

	YES
1. Have Worker(s) to enter been trained for this specific entry?	—
2. Have Attendants been trained for this specific space?	—
3. Post "WORKER IN CONFINED SPACE" Sign	—
4. Set-up the following additional barriers:	

____

____

MANDATORY SAFETY EQUIPMENT REQUIRED

	YES	N/A
1. Fire Extinguisher	—	—
2. Retrieval Lines	—	—
3. Respirator	—	—
4. Goggles	—	—
5. Hearing Protection	—	—
6. Protective Clothing	—	—
7. Special Boots or Shoes	—	—
8. Gloves	—	—
9. Other Safety Equipment Required		

____

____

COMMUNICATION PROCEDURES AND EQUIPMENT TO BE USED FOR THIS ENTRY

(Verify that chosen equipment is in place and operation.)

	Verified by:
1. ______________________	__________
2. ______________________	__________

RESCUE EQUIPMENT TO BE PROVIDED ON-SITE

	YES	N/A	
a. Two chest harnesses or two wristlets	—	—	
b. Two five minute supplied air escape respirators		—	—
c. One 30 minute S.C.B.A.	—	—	
d. One emergency siren	—	—	
e. Other necessary Rescue Equipment	—	—	

____

____

IN CASE OF EMERGENCY

Rescue Service	Phone Number or Ext.
1. ______________________	__________
2. ______________________	__________
3. ______________________	__________

Authorizer must sign below AFTER all the above actions are fully understood and conditions necessary for SAFE entry have been met.

Authorizer of Entry ______________________ __________ __________

Signature Date Time

Upon completion of the entry covered by this Permit, and after all entrants have exited the Permit space, **Authorizer** must sign below.

Canceled by ______________________ __________ __________

Signature Date Time

H:HEALTH\CORP\FORMS\CONF2

APPENDIX C

TRAINING OUTLINE FOR CONFINED SPACE ENTRANTS

I. GENERAL HAZARDS OF WORKING IN CONFINED SPACES

A. Toxic Substances - Routes of Entry

1. Inhalation
2. Skin Absorption
3. Ingestion

B. Oxygen Deficiency - Oxygen 19.5 - 23%

C. % LFL Not Greater than 10%

D. Noise

E. Equipment Hazards

1. Sharp Edges
2. head Knockers

F. Temperature Extremes

1. Heat Stress
2. Cold Stress

G. Claustrophobia

H. Fall Protection Within Space and at Access Opening

I. Chemical Exposures

Introducing Chemicals and Contaminants (Solvents, Cleaners, Maintenance Activities, etc.)

1. Caustic
2. Acid
3. Organics
4. Welding/cutting fumes

APPENDIX C cont.

TRAINING OUTLINE FOR CONFINED SPACE ENTRANTS

J. Disturbing Sludge or Vessel Surfaces

1. Sludge can generate chemical vapors and gas
2. Vessel surfaces can collect and then release atmospheric contaminants

K. Toxicology (Examples)

- Methylene Chloride
- Hydrofluoric Acid
- Phenol

L. IDLH Atmospheres

M. Radiation (Ionizing and Non-Ionizing)

N. Dust/Mists

1. Proper respiratory protection
2. Dust explosion hazard

O. Ventilation

P. Hyperventilation

II. SPECIFIC HAZARDS AT THE FACILITY

III. REASONS FOR, PROPER USE OF, AND LIMITATIONS OF PPE IN CONFINED SPACES

1. Respiratory protection
2. Gloves
3. Chemical suits
4. Harness and lifeline
5. Hard hat
6. Goggles
7. Face shield
8. Boots/Safety toed shoes

APPENDIX C cont.

TRAINING OUTLINE FOR CONFINED SPACE ENTRANTS

IV. PERMIT SYSTEM

1. Explanation of permit
2. Duties of entry supervisor
3. Duration of permit
4. Cancellation of permit

V. ATTENDANT DUTIES

VI. CONFINED SPACE RESCUE

1. Rescue plan
2. Rescue equipment
3. Rescue team
4. Entrant responsibilities

VII. RECOGNITION OF POTENTIAL OVEREXPOSURE

A. Self
B. Others

2. Material handling equipment

- grappler
- high-lift trucks
- dump trucks (off road only)

Pre-shift Inspection

The following items will be inspected to insure proper equipment operation and condition:

a. All fluid levels (fuel, oil, coolant, hydraulic fluid, battery fluid). Do not check coolant level while engine is hot.
b. Tires or tracks
c. Horn and back-up signals
d. Steering
e. Head and tail lights
f. Windshield wipers (if applicable)
g. Brakes (service and emergency)
h. Fire extinguisher
i. Belts and hoses
j. Windows

All repairs or adjustments will be made prior to equipment operation. Minor repairs, as designated by the area superintendent, will be made at the equipment's location. All other repairs or adjustments will be made by qualified mechanics at the appropriated equipment maintenance shop. Under no circumstance is a piece of equipment for be operated which is in need of repair or adjustment. No adjustments, repairs or fluid replacement will be performed with the engine running. Any equipment requiring off-site repair or repairs outside the exclusion area will be decontaminated prior to maintenance.

Reporting of Defects

All defects, malfunctions or items needing repairs will be reported to the area superintendent. Any defects noted while the equipment is in operation will be immediately reported to the foreman (i.e. brake failure, hydraulic problems, engine overheating). The superintendent will then have appropriate arrangements made for repairs or adjustments.

General Rules

a. Only experienced personnel will operate heavy equipment. They should be qualified by practical experience and/or formal training, preferably both. Forklift operators will be trained in accordance with 29 CFR 1910.178. The superintendent is responsible for assigning competent, trained personnel to operate heavy equipment and to audit their performance.

b. Rated load capacities for machines will not be exceeded.

c. Counterweights for heavy loads will not be used unless they are provided by the manufacturer and corresponding alternate rated capacities are clearly shone on the vehicle.

d. Riders will not be allowed unless the vehicle had been designed to carry a passenger. Riders must not attempt to get on or off a moving vehicle and must not indulge in horseplay (fooling around). The greatest danger in getting on or off a moving vehicle is that of falling under the wheels or tracks especially in bad weather (i.e. rain or ice). Loaders or forklifts will not be used for lifting personnel.

e. When transporting a load down an incline with a front-end loader, the vehicle will be operated in reverse gear to prevent tipping.

f. Vehicles will be operated at a safe speed. When negotiating turns, speeds will be reduced. Speed will be reduced during dusty conditions.

g. Before putting a machine into operation, the driver will visually inspect the area around the vehicle for obstructions (i.e. other equipment, personnel, instruments, etc.).

h. Before backing, operator will visually inspect the area to the rear for personnel or equipment. If rear vision is obstructed, a second worker will guide the vehicle and operator during backing.

i. Excessive noise levels will be determined through measurement with a sound level meter. Hearing protection will be worn when operating or working in close proximity to machines having excessive noise levels. This hearing protection will be worn in addition to the protective equipment required for any operational area.

j. Vehicles will not be operated so close to steep embankments so as to create a sliding or rollover potential, or cause excessive sliding of banked materials.

k. Speed will be reduced and the horn sounded when approaching areas where vision is obstructed. If a load obstructs forward view, the machine will be operated with the load trailing.

l. Heavy machinery, equipment or parts thereof, which are suspended or held aloft by use of slings, hoists or jacks shall be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under ro between them. Bulldozer and scraper blades, end-loader buckets, dump bodies and similar equipment, shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the motor stopped and brakes set, unless work being performed requires otherwise.

m. Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked and the parking brake set.

n. If equipment is to be left with the motor running unattended, the vehicle must be within full sight of the operator and the operator not more than twenty-five (25') feet away.

o. Equipment will be inspected prior to use on-site for rollover protection and any other deficiencies as specified.

J.j. TRAFFIC CONTROL PROGRAM

Where necessary, a traffic control program will be implemented. The basic elements of this plan include:

- Establishment of speed limits.
- Appropriate signage which warn both Sevenson personnel and other affected personnel of the use of the road by trucks and heavy equipment, the posted speed limit, and other hazards, i.e. limited sight distance, slow moving vehicles, truck crossings which may be present.
- The use of flag person(s) who are trained in traffic control and the appropriate signals to be used.
- Flag person(s) using the appropriate safety gear--orange vests, orange signal flags and slow/stop signs.
- Coordination with a responsible party of the use of a road as a haul road. This would include established times for truck traffic to sue the road, spacing of trucks so as not to interfere with the normal flow of traffic, and the use of flag person(s) and/or signage at intersections.

Appendix C
Activity Hazard Analysis

ACTIVITY HAZARD ANALYSIS – SITE PREPARATION

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ General site reconnaissance ▪ Site preparation ▪ Mobilize and inspect equipment ▪ Perform radiological survey ▪ Construct work zones ▪ Utility installation	Chemical/Toxicological Hazards: 1. Exposure to radiologically contaminated material	Chemical/Toxicological Hazards 1. Level D PPE
	Biological Hazards: 1. Possibility of wild animals 2. Possibility of stinging and biting insects. 3. Histoplasmosis	Biological Hazards: 1. Avoid physical contact with wild animals. Do not threaten and/or corner animals. Make noise to get the animal to retreat. Stay in or return to vehicle or equipment. 2. Use appropriate insect repellants i.e. DEET. 3. Avoid contact with bird and animal waste; Level C PPE.

ACTIVITY HAZARD ANALYSIS – SITE PREPARATION

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ General site reconnaissance ▪ Site preparation ▪ Mobilize and inspect equipment ▪ Perform radiological survey ▪ Construct work zones ▪ Utility installation	Physical Hazards: 1. Moving equipment 2. Falls from elevations 3. Slips and trips 4. Heat and Cold Stress 5. Noise exposure 6. Caught between/struck by or against 7. Severe weather 8. Manual lifting 9. Electrical 10. Traffic	Physical Hazards: 1. Moving equipment ▪ Only trained, experience operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation ▪ Back up alarms functional ▪ One set of signals given for movement of equipment 2. Falls from elevations ▪ Maintain three points of contact when climbing on or off equipment ▪ Fall protection program – preplanning, training , and 100% fall protection 3. Slips and trips ▪ Keep walking and working surfaces dry ▪ Housekeeping – remove trip hazards 4. Heat and Cold Stress ▪ Refer to Appendices F and G 5. Noise exposure ▪ Hearing control program which consists of audio-metric examination, training, sound level pressure monitoring, and use of hearing protection 6. Caught between/struck by or against ▪ Stay out of swing radius of equipment ▪ Ground personnel near operating heavy equipment will wear hard hats and traffic vests ▪ Do not walk, work, or stand near equipment being loaded or unloaded ▪ Backup alarms to be in operable condition. No unnecessary backing. 7. Severe weather ▪ As determined by Site Safety and Health Officer, operations are to cease during severe weather 8. Manual lifting ▪ Proper lifting technique utilized. Back straight and lift with legs. ▪ Split heavy loads into smaller loads ▪ Use mechanical aid, whenever possible ▪ Make sure the path of travel is clear prior to the lift 9. Electrical ▪ Licensed electrician to perform installation ▪ Installation in compliance with OSHA, National Electric Code, and local codes ▪ Equipment kept at least 10 feet from energized power lines 10. Traffic ▪ Posted speed limit of 15 mph ▪ Signage ▪ Workers in traffic area to wear reflective vests

ACTIVITY HAZARD ANALYSIS – SITE PREPARATION

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Pickup trucks 2. Track excavator 3. Loader 4. Bulldozer 5. Radiological monitoring equipment	Site Inspection: 1. Daily inspection by Site Safety and Health Officer Motor Vehicles: 1. Before initial use vehicles will be inspected and found to be in a safe operating condition. Equipment: 1. Before equipment is placed in use it will be inspected and tested by a competent person. 2. Inspections and test will be done in accordance with manufacturer's instructions. 3. All equipment will be inspected daily when in use by the operator. 4. Radiological monitoring equipment calibrated and operated in accordance with manufacturer instructions.	Site Specific: 1. OSHA HAZWOPER 2. HTRW activity training 3. Initial site specific 4. Daily tailgate safety meetings 5. Hazard communication Supervisory Personnel: 1. OSHA supervisor's training Motor Vehicles 1. Operators shall hold a valid license for the type and class of vehicle they are operating. Heavy Equipment; 1. Trained and qualified operators. Equipment General: 1. Employees will be qualified and trained to operate or service mechanical equipment.

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ACTIVITY HAZARD ANALYSIS – DEMOLITION OF BUIDLING 401 AND SILOS

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ Air monitoring ▪ Radiological survey ▪ Asbestos containing material (ACM) removal ▪ Structure demolition ▪ Loading and transporting debris	Chemical/Toxicological Hazards: 1. Possible exposure to radiologically contaminated material 2. Possible exposure to ACM	Chemical/Toxicological Hazards 1. Use of personal protective equipment. 2. Personal decontamination prior to consumption of food, beverage, or tobacco. 3. Results of air monitoring and radiological surveys used to determine proper type of control program. 4. ACM removed in accordance with asbestos removal plan.
	Biological Hazards: 1. Slight possibility of wild animals 2. Slight possibility of stinging and biting insects 3. Histoplasmosis	Biological Hazards: 1. Avoid physical contact with wild animals. Do not threaten and/or corner animals. Make noise to get the animal to retreat. Stay in or return to vehicle or equipment. 2. Use appropriate insect repellants i.e. DEET. 3. Avoid contact with bird and animal waste; Level C PPE.

ACTIVITY HAZARD ANALYSIS – DEMOLITION OF BUIDLING 401 AND SILOS

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ Air monitoring ▪ Radiological survey ▪ Asbestos containing material (ACM) removal ▪ Structure demolition ▪ Loading and transporting debris	Physical Hazards: 1. Moving equipment 2. Falls from elevations 3. Slips and trips 4. Heat and Cold Stress 5. Noise exposure 6. Caught between/struck by or against 7. Severe weather 8. Manual lifting 9. Rotating parts 10. Electrical 11. Traffic 12. Rigging	Physical Hazards: 1. Moving equipment ▪ Only trained, experience operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation ▪ Back up alarms functional ▪ One set of signals given for movement of equipment 2. Falls from elevations ▪ Maintain three points of contact when climbing on or off equipment ▪ Fall protection program – preplanning, training and 100% fall protection 3. Slips and trips ▪ Keep walking and working surfaces dry ▪ Housekeeping – remove trip hazards 4. Heat and Cold Stress ▪ Refer to Appendices F and G of this plan. 5. Noise exposure ▪ Hearing control program which consists of audio-metric examination, training, sound level pressure monitoring, and use of hearing protection 6. Caught between/struck by or against ▪ Stay out of swing radius of equipment ▪ Ground personnel near operating heavy equipment will wear hard hats and traffic vests ▪ Do not walk, work, or stand near equipment being loaded or unloaded ▪ Backup alarms to be in operable condition. No unnecessary backing. 7. Severe weather ▪ As determined by Site Safety and Health Officer, operations are to cease during severe weather 8. Manual lifting ▪ Proper lifting technique utilized. Back straight and lift with legs. ▪ Split heavy loads into smaller loads ▪ Use mechanical aid, whenever possible ▪ Make sure the path of travel is clear prior to the lift 9. Rotating parts ▪ Personnel restricted in area of rotating parts 10. Electrical ▪ Licensed electrician to perform installation ▪ Installation in compliance with OSHA, National Electric Code, and local codes ▪ Equipment kept at least 10 feet from energized power lines 11. Traffic ▪ Posted speed limit of 15 mph ▪ Signage ▪ Workers in traffic area to wear reflective vests 12. Rigging ▪ All rigging equipment inspected before use by a qualified person ▪ Defective rigging removed from service ▪ Positive latching device used ▪ Established hand signals for crane operation ▪ Rigging equipment not loaded in excess of its recommended safe working load

ACTIVITY HAZARD ANALYSIS – DEMOLITION OF BUIDLING 401 AND SILOS

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Track excavator 2. Loader 3. Trucks 4. Crane 5. Bulldozer 6. Radiological monitoring equipment 7. Air monitoring equipment	Site Inspection: 1. Daily inspection by Site Safety and Health Officer Motor Vehicles: 1. Before initial use vehicles will be inspected and found to be in a safe operating condition. Equipment: 1. Before equipment is placed in use it will be inspected and tested by a competent person. 2. Inspections and test will be done in accordance with manufacturer's instructions. 3. All equipment will be inspected daily when in use by the operator. 4. Air and radiological monitoring equipment calibrated and operated in accordance with manufacturer instructions.	Site Specific: 1. OSHA HAZWOPER 2. HTRW activity training 3. Initial site specific 4. Daily tailgate safety meetings 5. Hazard communication Supervisory Personnel: 1. OSHA supervisor's training Motor Vehicles 1. Operators shall hold a valid license for the type and class of vehicle they are operating. Heavy Equipment; 1. Trained and qualified operators. 2. Crane operator licensed by state. Equipment General: 1. Employees will be qualified and trained to operate or service mechanical equipment.

ACTIVITY HAZARD ANALYSIS – SITE RESTORATION

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ Dismantle work zones ▪ Perform radiological survey ▪ Decontamination of equipment ▪ Dismantle utilities ▪ Remove trailers and equipment from site	Chemical/Toxicological Hazards: 1. Exposure to radiologically contaminated material	Chemical/Toxicological Hazards 1. Level D protection for the majority of work 2. Level D modified for decontamination
	Biological Hazards: 1. Possibility of wild animals 2. Possibility of stinging and biting insects.	Biological Hazards: 1. Avoid physical contact with wild animals. Do not threaten and/or corner animals. Make noise to get the animal to retreat. Stay in or return to vehicle or equipment. 2. Use appropriate insect repellants i.e. DEET.

ACTIVITY HAZARD ANALYSIS – SITE RESTORATION

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
▪ Dismantle work zones ▪ Perform radiological survey ▪ Decontamination of equipment ▪ Dismantle utilities ▪ Remove trailers and equipment from site	Physical Hazards: 1. Moving equipment 2. Falls from elevations 3. Slips and trips 4. Heat and Cold Stress 5. Noise exposure 6. Caught between/struck by or against 7. Severe weather 8. Manual lifting 9. Electrical 10. Traffic	Physical Hazards: 1. Moving equipment ▪ Only trained, experience operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation ▪ Back up alarms functional ▪ One set of signals given for movement of equipment 2. Falls from elevations ▪ Maintain three points of contact when climbing on or off equipment ▪ Fall protection program – preplanning, training, and 100% fall protection 3. Slips and trips ▪ Keep walking and working surfaces dry ▪ Housekeeping – remove trip hazards 4. Heat and Cold Stress ▪ Refer to Appendices F and G of this plan 5. Noise exposure ▪ Hearing control program which consists of audio-metric examination, training, sound level pressure monitoring, and use of hearing protection 6. Caught between/struck by or against ▪ Stay out of swing radius of equipment ▪ Ground personnel near operating heavy equipment will wear hard hats and traffic vests ▪ Do not walk, work, or stand near equipment being loaded or unloaded ▪ Backup alarms to be in operable condition. No unnecessary backing. 7. Severe weather ▪ As determined by Site Safety and Health Officer, operations are to cease during severe weather 8. Manual lifting ▪ Proper lifting technique utilized. Back straight and lift with legs. ▪ Split heavy loads into smaller loads ▪ Use mechanical aid, whenever possible ▪ Make sure the path of travel is clear prior to the lift 9. Electrical ▪ Licensed electrician to perform installation ▪ Installation in compliance with OSHA, National Electric Code, and local codes ▪ Equipment kept at least 10 feet from energized power lines 10. Traffic ▪ Posted speed limit of 15 mph ▪ Signage ▪ Workers in traffic area to wear reflective vests

ACTIVITY HAZARD ANALYSIS – SITE RESTORATION

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
1. Pickup trucks 2. Track excavator 3. Loader 4. Bulldozer 5. Radiological monitoring equipment	Site Inspection: 1. Daily inspection by Site Safety and Health Officer Motor Vehicles: 1. Before initial use vehicles will be inspected and found to be in a safe operating condition. Equipment: 1. Before equipment is placed in use it will be inspected and tested by a competent person. 2. Inspections and test will be done in accordance with manufacturer's instructions. 3. All equipment will be inspected daily when in use by the operator. 4. Radiological monitoring equipment calibrated and operated in accordance with manufacturer instructions.	Site Specific: 1. OSHA HAZWOPER 2. HTRW activity training 3. Initial site specific 4. Daily tailgate safety meetings 5. Hazard communication Supervisory Personnel: 1. OSHA supervisor's training Motor Vehicles 1. Operators shall hold a valid license for the type and class of vehicle they are operating. Heavy Equipment; 1. Trained and qualified operators. Equipment General: 1. Employees will be qualified and trained to operate or service mechanical equipment.

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Appendix D
Health Hazard Information Sheets

DOE/EM-0064P

Perspectives on Radioactivity

- *Measuring radioactivity*
- *Radioactivity in household materials*
- *Radioactivity in industry*

Radioactivity is a naturally occurring phenomena that is part of nature. It comes from cosmic rays, the sun, the earth, and manmade sources. Natural radiation is called "background radiation" and makes up about 82% of the average person's daily exposure to radiation. Medical sources, such as X-rays, make up the majority of the rest of our exposure. Nuclear materials production activities account for less than 1% of all radioactivity.

Although discovered only in the last century, radioactivity is one of the most widely studied and best understood of all natural phenomena. Radioactivity stems from the activity of atoms, the building blocks of matter. All things, whether natural or manmade, are made up of atoms. Some atoms are stable, which means they retain their form and substance forever. Others are unstable and change readily to different forms. As atoms "transform" or decay, they emit radioactivity in the form of waves and particles.

The amount of time atoms take to become stable varies greatly and is measured in "half-lives." One half-life is the amount of time required for one-half of a given quantity of a radioactive element to stop emitting radioactivity. The half-life, along with the kind of radiation emitted and its energy level or activity, is important in determining the degree of hazard from any given radioactive substance.

Measuring Radioactivity

The curie is a standard measure for the amount of radioactivity contained in radioactive material. It was named after the French scientist Marie Curie for her landmark research into the nature of radioactivity.

The basis for the curie is the radioactivity of one gram of radium, the source of radon. Radium decays at a rate of about 2.2 trillion disintegrations (2.2×10^{12}) per minute. A

Unit of Radioactivity	Symbol	Disintegrations Per Minute	Dollar Analogy	Examples of Radioactive Materials
1 Curie	Ci	2×10^{12} or 2 Trillion	2 Times the Annual Federal Budget	Nuclear Medicine Generator
1 Millicurie	mCi	2×10^{9} or 2 Billion	Cost of a New Interstate Highway from Atlanta to San Francisco	Amount Used for a Brain or Liver Scan
1 Microcurie	μCi	2×10^{6} or 2 Million	All-Star Baseball Player's Salary	Amount Used in Thyroid Tests
1 Nanocurie	nCi	2×10^{3} or 2 Thousand	Annual Home Energy Costs	Consumer Products
1 Picocurie	pCi	2	Cost of a Hamburger and Coke	Background Radiation Levels

This chart shows the relative differences between units of radioactivity and gives approximate analogies in dollars. The number of disintegrations per minute has been rounded off to the nearest whole number.

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picocurie is one trillionth of a curie. Thus, a picocurie represents 2.2 disintegrations per minute.

To put the relative size of one trillionth into perspective, consider that if the Earth were reduced to one trillionth of its diameter, the "pico earth" would be smaller in diameter than a speck of dust. In fact, it would be six times smaller than the thickness of a human hair.

The difference between the curie and the picocurie is so vast that other metric units are used between them. These are as follows:

Millicurie = 1/1,000 (one thousandth) of a curie

Microcurie = 1/1,000,000 (one millionth) of a curie

Nanocurie = 1/1,000,000,000 (one billionth) of a curie

Picocurie = 1/1,000,000,000,000 (one trillionth) of a curie

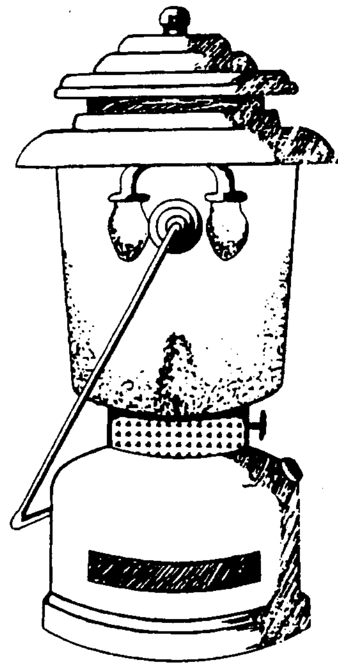
Around the House

Many household products emit a small amount of radioactivity or use radioactive materials. Examples include microwave ovens, smoke detectors, dentures, color televisions, camera and eyeglass lenses, and anti-static brushes. The radioactive component is added to the products either specifically to make them work or as a result of using compounds of elements like thorium and uranium in producing them. The amount of radiation the products give off is very small and is not hazardous.

Building materials such as brick and stone contain radioactivity. Thus, a home made from wood would have a lower level of background radiation than one built from bricks or stone such as granite. Because of cosmic rays, a person living at an altitude of five thousand feet in Denver, Colorado, receives nearly twice as much cosmic radiation from outer space as a person living at sea level in Washington, D.C. Similarly, high concentrations of radioactive minerals in beach sand in Brazil and India expose local residents to between ten and 100 times the levels of background radiation in the U.S. Even the human body contains very low-level radioactive materials. Every person has 500,000 atoms decaying in our bodies every minute. And some foods which are essential to good health contain naturally occurring radioactive elements, such as potassium-40 and carbon-14.

Lanterns: In a New Light

About 20 million gas lantern mantles are used by campers each year in the United States. Under today's standards, the amount of natural radioactivity found in a lantern mantle would require precautions in handling it at many government or industry sites. The radioactivity present would contaminate 15 pounds of dirt to above allowable levels. The average mantle contains 1/3 of a gram of thorium oxide, which contains approximately 100,000 picocuries per gram. The approximately 35,000 picocuries of radioactivity in the mantle would, if thrown onto the ground, be considered low-level radioactive contamination at a government or industry facility. However, the radiation from a gas lantern mantle is far less than the average chest X-ray.



Radiation and Industry

In addition to medical uses, defense applications, energy generation, and consumer products, radiation is used in industry. For example, radiography is used in much the same way as doctors use X-rays. It locates defects in metal casings and welds that are hard to detect. It determines microscopic thicknesses of materials, such as metal foils, and the amount of adhesive on masking tape. Radiography can also locate structural defects in statues and buildings. Archaeologists use a technique involving the radioactive decay of carbon-14 to date prehistoric objects accurately. Radiation can also be used to validate the authenticity of artwork.

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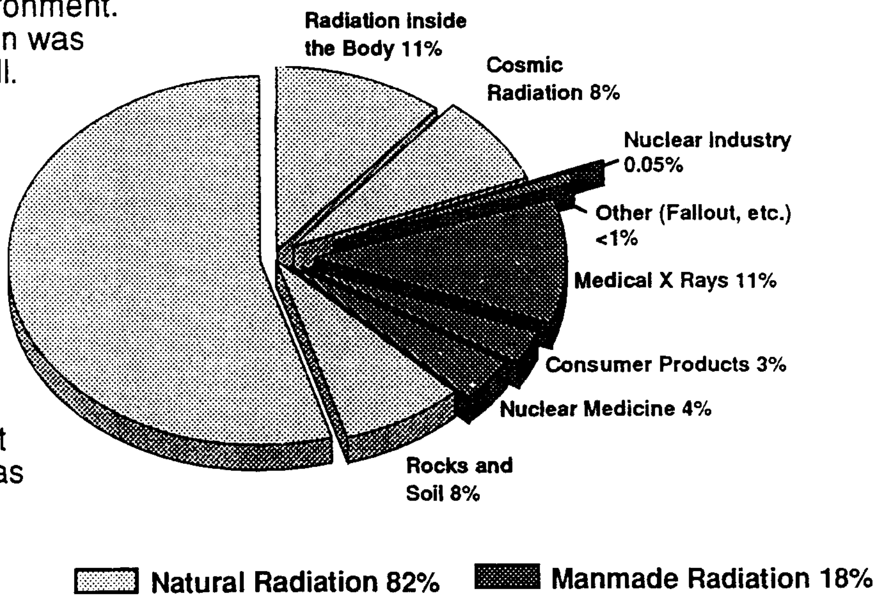
Radiation in the Environment

- *Background radiation*
- *Manmade radiation*
- *Units of Measure*

Radiation is a natural part of our environment. When our planet was formed, radiation was present, and radiation surrounds it still. Natural radiation reaches earth from outer space and continuously radiates from the rocks, soil, and water on the earth. During the last century, humankind discovered radiation, how to use it, and how to control it.



Many materials, both natural and manmade, are radioactive. These materials are composed of atoms that release energetic particles or waves as they change (decay) into more stable forms. These particles and waves are referred to as radiation and their emission as radioactivity.

As the pie chart shows, most background radiation (82%) is from natural sources. By far the largest source is radon, an odorless, colorless gas given off by natural radium in the Earth's crust. Manmade radiation, mostly from medical uses and consumer products, accounts for about eighteen percent of our total exposure, and the nuclear industry is responsible for less than one percent.

Units of Measure

Radiation can be measured in a variety of ways. Typically, units of measure show either 1) the radioactivity present in a substance, or 2) the radiation being given off.

The radioactivity of a substance is measured in terms of the decay per unit of time. The curie is the standard unit for this measurement and is based on the amount of radioactivity contained in 1 gram of radium. Numerically, 1 curie is equal to 37 billion disintegrations per second. The amounts of radioactivity that people normally work with are in the millicurie (one-thousandth of a curie) or microcurie (one-millionth of a curie) range. Levels of radioactivity in the environment from both

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Radiation that has enough energy to cause a change in the atomic balance of substances it passes through is called ionizing radiation. There are three basic forms of ionizing radiation.

Alpha particles are the largest and slowest moving type of radiation. They are easily stopped by a sheet of paper or the skin. Alpha particles can move through the air only a few inches before being stopped by air molecules.

Beta particles are much smaller and faster moving than alpha particles. Beta particles pass through paper or skin and can travel in the air for about 10 feet. However, they can be stopped by a thin shielding such as a sheet of aluminum foil.

Gamma radiation is a type of electromagnetic wave that travels at the speed of light. It takes a thick shield of steel, lead, or concrete to stop gamma rays. X-rays and cosmic rays are examples of gamma radiation.

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natural and man-made sources are in the picocurie (one-trillionth of a curie) range.

Radiation levels are measured in various units. Radiation absorbed by humans is measured in either rad or rem. The rem is the most descriptive because it measures the ability of the specific type of radiation to do damage to biological tissue. Again, typical measurements are often in the millirem (mrem), or one-thousandth of a rem, range. On the average, Americans receive about 360 mrem of radiation a year. Most of this (97%) is from natural radiation and medical exposure.

Common Sources of Radiation

Because the radioactivity of individual samples varies, the numbers given here are approximate or represent an average. They are shown to provide a perspective for concentrations and levels of radioactivity rather than dose.

mrem = millirem
pCi = picocurie

Cosmic Radiation

Cosmic radiation is high-energy gamma radiation that originates in other space and filters through our atmosphere.

Sea Level . . . . 26 mrem/year
(Increases about 1/2 mrem for each additional 100 feet in elevation)
Atlanta, Georgia . . . . 31 mrem/year
(1,050 feet)
Denver, Colorado. . . . . . 50 mrem/year
(5,300 feet)
Minneapolis, Minnesota . 30 mrem/year
(815 feet)
Salt Lake City, Utah . . . . 46 mrem/year
(4,400 feet)

Terrestrial Radiation

Terrestrial sources are naturally radioactive elements in the soil and water such as uranium, radium, and thorium. Average levels of these elements are 1 pCi/gram of soil.

United States (avg.) . . . . 26 mrem/year
Denver, Colorado. . . . . . 63 mrem/year
Nile Delta, Egypt . . . . . 350 mrem/year
Paris, France . . . . 350 mrem/year
Coast of Kerala, India . . 400 mrem/year
McAlpe, Brazil . . . . . . 2,558 mrem/year
Pacos De Caldas
Brazil . . . . 7,000 mrem/year

Buildings

Many building materials, especially granite, contain naturally radioactive elements.

U.S. Capitol Building . . . . . 85 mrem/year
Base of
Statue of Liberty . . . . 325 mrem/year
Grand Central Station. . . . 525 mrem/year
The Vatican . . . . 800 mrem/year

Radon

Radon levels in buildings vary, depending on geographic location, from 0.1 to 200 pCi/liter.

Average Indoor
Radon Level . . . . 1.5 pCi/liter
Occupational Working
Limit . . . . 200.0 pCi/liter

Food

Food contributes an average of 20 mrem/year, mostly from potassium-40, carbon-14, hydrogen-3, radium-226, and thorium-232.

Beer . . . . 390 pCi/liter
Tap Water. . . . . 20 pCi/liter
Milk . . . . 1,400 pCi/liter
Salad Oil . . . . 4,900 pCi/liter
Whiskey . . . . 1,200 pCi/liter
Brazil Nuts . . . . 14 pCi/g
Bananas . . . . 3 pCi/g
Flour . . . . 0.14 pCi/g
Peanuts & Peanut Butter . . . . . 0.12 pCi/g
Tea . . . . 0.40 pCi/g

Medical Treatment

The exposures from medical diagnosis vary widely according to the required procedure, the equipment and film used for X-rays, and the skill of the operator.

Chest X-Ray . . . . 10 mrem
Dental X-Ray, Each . . . . 100 mrem

Consumer Goods

Cigarettes - two packs/day
(polonium-210) . . . . . . 8,000 mrem/year
Color Television . . . . <1 mrem/year
Gas Lantern Mantle
(thorium-232) . . . . 2 mrem/year
Highway Construction . . . . 4 mrem/year
Airplane Travel at 39,000 feet
(cosmic) . . . . 0.5 mrem/hour
Natural Gas Heating and Cooking
(radon-222) . . . . 2 mrem/year
Phosphate Fertilizers . . . . . 4 mrem/year
Porcelain Dentures
(uranium) . . . . 1,500 mrem/year
Radioluminescent Clock
(promethium-147) . . . . . . <1 mrem/year
Smoke Detector
(americium-241) . . . . . . 0.01 mrem/year

International Nuclear Weapons Test Fallout from pre-1980 atmospheric tests

average for a U.S.
citizen . . . . 1 mrem/year

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U.S. Department of Energy
Office of Environmental Restoration and Waste Management
November 1991

Appendix E
Miscellaneous Forms

Job No. ___________

Job Address ___________________________

____

Sevenson Environmental Services, Inc.

Report of Accident, Injury, or Illness

Instructions: Please print. Fill in all blanks. When completed, return this form to Sharon Lee at the main office.

Name ______________________ Sex: ______ Age: ______

Social Security Number ______________ Birth Date: ______________

Address ______________________ Phone Number ______________

Marital Status ☐ Single ☐ Married ☐ Separated ☐ Divorced ☐ Widowed

# of Dependents ______ Date of Accident ________ Time ______ AM/PM

Date Employee notified employer: ____________ Who was notified: ____________

Employment Start Date:	Wage Rate:
Occupation:	Average Hours Worked:
Date Last Worked:	Average Days Per Week:
Time Shift Began:	Was worker paid for day of injury?
Name of Witness:	Did salary continue?
Describe how the accident happened:	
What was employee doing when injured?	
Describe the injury in detail and indicate part of body affected:	
Name of object or substance that directly injured the employee:	
Date & Time medical attention was sought:	
Name, address and phone number of hospital or doctor:	
Was employee involved in any other incidents/accidents? If yes, describe:	
Any history of work accidents, absenteeism, and/or disciplinary problems:	
Substance abuse test administered: ___ Yes, ___ No – if no, why not?	
Medical release obtained:	
Corrective Action Taken:	

Supervisor ______________________ Date ____________

Safety Officer ______________________ Date ____________

Comments: ______________________________

SEVENSON ENVIRONMENTAL SERVICES, INC
DAILY SAFETY MEETING

DATE:	JOB NAME: JOB NUMBER:

TOPIC:

	Print Name	Signature	Company
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			

Site Safety and Health Officer: Signature:

DAILY SAFETY REPORT

USACE – NFSS Building 401 Demolition

DATE:
WORK PERIOD COVERED:
WEATHER CONDITIONS:
SUMMARY OF DAY'S WORK ACTIVITY:
EQUIPMENT UTILIZED BY SAFETY MONITORS:
PROTECTIVE CLOTHING AND EQUIPMENT BEING USED BY TASK:
PHYSICAL CONDITION OF WORKERS (any heat or cold stress or other medical problems): No
ACCIDENTS OR BREACH OF PROCEDURES:
DESCRIPTION OF MONITORING AND AIR SAMPLES TAKEN:
TYPE AND NUMBER OF PERMITS ISSUED: SUMMARY OF TRAINING AND SAFETY MEETING:

NAME:	TITLE: Site Safety and Health Officer
SIGNATURE:	

Sevenson Environmental Services, Inc.

PERMIT FOR OPEN FLAME OR WELDING

I. Job description and equipment used:

II. Monitoring:

Date	Time	0_2	LEL	Organic Vapor

III. Fire Protection

a. Fire extinguishers in place	(Initials)__________
b. Area clear of other combustible	(Initials)__________

IV. Operations in compliance with OSHA regulations (Initials)_________

Signature______________________________	Date ______________

Sevenson Environmental Services, Inc.
DAILY AIR MONITORING SUMMARY- PERSONAL PUMP CALIBRATION DATA

SITE LOCATION:	HYGIENIST:	DATE ____/____/____
TEMPERATURE:	BAROMETRIC PRESSURE:	HUMIDITY:
WEATHER:		

	PUMP NUMBER	PRESAMPLE FLOW RATE	POSTSAMPLE FLOW RATE	AVERAGE FLOW RATE	TOTAL SAMPLE TIME	VOLUME AIR COLLECTED (LITERS)	TUBE LOT NO.	SAMPLE I.D. NO.
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								

Sevenson Environmental Services, Inc.
REAL TIME AIR MONITORING

DATE:	AREA:	
INSTRUMENT	MODEL NUMBER	SERIAL NUMBER
CALIBRATION:		

TIME	LOCATION/DESCRIPTION OF WORK	RESULTS

AIR MONITOR SIGNATURE:

Sevenson Environmental Services, Inc.

Acknowledgment of Health and Safety Plan

I certify that I have read and understand the contents of the Site Safety and Health and Safety Plan for the Niagara Falls Storage Site Demolition of Building 401.

DATE	NAME (please print)	SIGNATURE

Sevenson Environmental Services, Inc.

TRAINING ACKNOWLEDGMENT FORM

NAME:

ADDRESS:

SOCIAL SECURITY NO.:

EMPLOYER:

I have completed and understand the training program for work to be carried out during work at the Site, including the following topics:

a. Work Rules and Safety Requirements
b. Personal Protection Equipment
c. Potentially Hazardous Chemicals
d. Emergency Equipment and Plan
e. Reporting Injuries and Illnesses
f. Emergency Procedures
g. Job Assignment
h. Personal Hygiene
i. Medical Tests
j. Standard Operating Procedures
k. Applicable Rules and Regulations
l. Respiratory Protection 29 CFR 1910.130
m. Lockout/Tagout 29 CFR 1910.147
n. Fall Protection 29 CFR 1926.502
o. Radiation Worker Training

I further confirm that a respirator qualitative fit test was performed and that I have been issued a respirator of the same type.

Survey Site Personnel Signature: ______________________________	Date:______________

I certify that this Survey Site Person has received adequate safety training and instruction and that this person is proficient in the use of protective clothing and equipment and knowledgeable in all aspects of the Site Safety and Health Plan.

Safety Officer Signature: ______________________________	Date: ______________

Sevenson Environmental Services, Inc.

VIOLATION OF SAFETY RULES REPORT

Project Name:	
Project Number:	
Job Superintendent:	
Date of this Report:	
Nature of Violation: (Explain)	
Action Taken:	
Warning Given:	
Sent Home:	
Discharged:	

Witness:	(If refusal so state)	**Date:**
Offending Company:	(If refusal so state)	**Date:**
Offending Person:	(If refusal so state)	**Date:**
Report By:	(Position or Title)	**Date:**

CERTIFICATE
of
DECONTAMINATION

SURVEY NUMBER	
EQUIPMENT/MATERIAL	
EQUIPMENT NUMBER	
DATE DECONTAMINATED	
PROCEDURE USED	

INSTRUMENTS MODEL/SERIAL #	DETECTOR MODEL/SERIAL #	CAL. DUE DATE	CONVERSION FACTOR

Sevenson Environmental Services, Inc.

Health and Safety Site Inspection Form

Inspector: ____________________ Inspection Date: ____________________

Section 1: Project Description

Project Name: ____________________
Site Location: ____________________
Project Number: ____________________
Project Manager: ____________________
Consultant Name: ____________________
Superintendent: ____________________
Site Health and Safety Officer: ____________________

Operations:

- ☐ Industrial Operations
- ☐ Remedial Operations
- ☐ Dewatering Operations
- ☐ Drum Handling Operations
- ☐ Drilling Operations
- ☐ Emergency Response
- ☐ Excavation/Trenching/Shoring
- ☐ Confined Space Entry
- ☐ Thermal Desorption Operations
- ☐ Decontamination Operations
- ☐ Other: ____________________

Section 2: General Site Setup/Support Zone

A. Site Setup

1.	Are work zones clearly defined?	☐ YES	☐ NO	☐ N/A
2.	Are support trailers located to minimize exposure from a potential release?	☐ YES	☐ NO	☐ N/A
3.	Are support trailers accessible for approach by emergency vehicles?	☐ YES	☐ NO	☐ N/A
4.	Is the site properly secured during and after work hours?	☐ YES	☐ NO	☐ N/A
5.	Are adequate communications (telephones, radios) available on site?	☐ YES	☐ NO	☐ N/A
6.	Is drinking water available?	☐ YES	☐ NO	☐ N/A
7.	Are adequate toilet facilities available on site?	☐ YES	☐ NO	☐ N/A
8.	Are eating and food storage areas clean and maintained?	☐ YES	☐ NO	☐ N/A
9.	Is there adequate lighting?	☐ YES	☐ NO	☐ N/A
10.	Are Lock-Out/Tag-Out Kits available on site?	☐ YES	☐ NO	☐ N/A
11.	Do affected site personnel have a 40 hour certificate?	☐ YES	☐ NO	☐ N/A
12.	Do Managers and/or Supervisors have a certificate for the 8 hours of additional training?	☐ YES	☐ NO	☐ N/A
13.	Have all site personnel received medical surveillance in the previous 12 months?	☐ YES	☐ NO	☐ N/A

14. Are disposal arrangements in place for spent PPE and decontamination wash waters?	☐ YES	☐ NO	☐ N/A
15. Is all of the emergency and first aid equipment that is identified in the HASP available on site?	☐ YES	☐ NO	☐ N/A
16. Does the HSO conduct daily safety inspections which are documented to identify safety hazards and unsafe conditions?	☐ YES	☐ NO	☐ N/A
17. Are accident/injury investigation forms available?	☐ YES	☐ NO	☐ N/A
18. Are all known safety hazards and unsafe conditions corrected?	☐ YES	☐ NO	☐ N/A

B. Health and Safety Plan

1. Is a HASP accessible to all employees?	☐ YES	☐ NO	☐ N/A
2. Has the HASP been briefed to employees on site?	☐ YES	☐ NO	☐ N/A
3. Are the MSDS's available for review by employees on site?	☐ YES	☐ NO	☐ N/A
4. Is there a designated HSO on site?	☐ YES	☐ NO	☐ N/A
5. Are employees aware and understand the results of exposure?	☐ YES	☐ NO	☐ N/A
6. Is the air monitoring plan in place?	☐ YES	☐ NO	☐ N/A
7. Are air mo nitoring devices properly used, calibrated and maintained?	☐ YES	☐ NO	☐ N/A
8. Are air monitoring results logged and available for review?	☐ YES	☐ NO	☐ N/A
9. Does the HASP include the following:			
• Site Characterization, description of existing conditions.	☐ YES	☐ NO	☐ N/A
• Personnel training requirements.	☐ YES	☐ NO	☐ N/A
• A written PPE program describing the types and usage.	☐ YES	☐ NO	☐ N/A
• Listing of PPE required for each site task.	☐ YES	☐ NO	☐ N/A
• Is there a hazard/risk analysis for all site activities?	☐ YES	☐ NO	☐ N/A
• Are the frequency and types of air monitoring presented?	☐ YES	☐ NO	☐ N/A
• Are both personnel and equipment decontamination procedures presented?	☐ YES	☐ NO	☐ N/A
• Is an emergency response plan presented?	☐ YES	☐ NO	☐ N/A
• Are the medical surveillance requirements presented?	☐ YES	☐ NO	☐ N/A
• Has the nearest medical assistance been identified?	☐ YES	☐ NO	☐ N/A
• Is there a discussion of site control measures (i.e., fencing, security, work zones)?	☐ YES	☐ NO	☐ N/A
• Description of confined space entry procedures (if this work will occur).	☐ YES	☐ NO	☐ N/A
• Has a spill containment program been included?	☐ YES	☐ NO	☐ N/A
• Are Health and Safety Operating Guidelines (HSOGs) available for all pertinent activities?	☐ YES	☐ NO	☐ N/A
• Are the programs and procedures presented in the HASP being followed?	☐ YES	☐ NO	☐ N/A
• Have site personnel received training with all HSOGs?	☐ YES	☐ NO	☐ N/A

C. Site Posters

1. Are the following documents posted in a prominent and accessible area?

☐ Department of Labor 5 – 1 Poster	☐ YES	☐ NO	☐ N/A
☐ OSHA 300	☐ YES	☐ NO	☐ N/A

D. Emergency Plans

1. Are emergency telephone numbers posted and verified?	☐ YES	☐ NO	☐ N/A
2. Have emergency escape routes been designated?	☐ YES	☐ NO	☐ N/A
3. Are employees familiar with the emergency signals?	☐ YES	☐ NO	☐ N/A
4. Is the hospital route posted?	☐ YES	☐ NO	☐ N/A
5. Are employees familiar with emergency procedures?	☐ YES	☐ NO	☐ N/A
6. Is the inventory of emergency response equipment and supplies adequate?	☐ YES	☐ NO	☐ N/A

E. Medical and First Aid

1. Are First Aid Kits accessible and identified?	☐ YES	☐ NO	☐ N/A
2. Are emergency eye washes available and in proper working order?	☐ YES	☐ NO	☐ N/A
3. Are emergency showers available?	☐ YES	☐ NO	☐ N/A
4. Are the First Aid Kits large enough for the number of people on site?	☐ YES	☐ NO	☐ N/A
5. Are the First Aid Kits inspected after each use?	☐ YES	☐ NO	☐ N/A
6. Are there First Aid/CPR trained personnel available?	☐ YES	☐ NO	☐ N/A
7. Is a heat/cold stress monitoring program in place?	☐ YES	☐ NO	☐ N/A

F. Fire Protection

1. Has a fire alarm been established?	☐ YES	☐ NO	☐ N/A
2. Do employees know the location and use of all fire extinguishers on site?	☐ YES	☐ NO	☐ N/A
3. Are fire extinguishers marked and inspected monthly?	☐ YES	☐ NO	☐ N/A
4. Are combustible materials segregated from open flames?	☐ YES	☐ NO	☐ N/A

G. Fire Prevention

1. Has a smoking policy been established?	☐ YES	☐ NO	☐ N/A
2. Is smoking prohibited in flammable storage areas?	☐ YES	☐ NO	☐ N/A
3. Are fire lanes established and maintained?	☐ YES	☐ NO	☐ N/A
4. Are flammable dispensing systems grounded and bonded?	☐ YES	☐ NO	☐ N/A
5. Are proper receptacles (i.e., safety cans, cabinets) available for the storage of flammables?	☐ YES	☐ NO	☐ N/A
6. Are gasoline cans of the proper type (not plastic?)	☐ YES	☐ NO	☐ N/A
7. Has the local fire department been contacted?	☐ YES	☐ NO	☐ N/A
8. Is ground and bonding equipment available?	☐ YES	☐ NO	☐ N/A
9. Are fuel tanks properly contained with a dike?	☐ YES	☐ NO	☐ N/A
10. Is the dike capable of holding quantities being contained?	☐ YES	☐ NO	☐ N/A

Section 3: Work Areas/Contamination Reduction Zone/Exclusion Zone

H. Walking and Working Surfaces

1.	Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?	☐ YES	☐ NO	☐ N/A
2.	Are ladders within maximum length requirements?	☐ YES	☐ NO	☐ N/A
3.	Are ladders properly barricaded if used in passageways, doors, or driveways?	☐ YES	☐ NO	☐ N/A
4.	Are broken or damaged ladders tagged and taken out of service?	☐ YES	☐ NO	☐ N/A
5.	Are metal ladders prohibited in electrical service areas?	☐ YES	☐ NO	☐ N/A
6.	Are stairways and floor openings guarded?	☐ YES	☐ NO	☐ N/A
7.	Are safety feet installed on straight and extension ladders?	☐ YES	☐ NO	☐ N/A
8.	Is general housekeeping up to our standards?	☐ YES	☐ NO	☐ N/A
9.	Are fall protection devices available on site?	☐ YES	☐ NO	☐ N/A
10.	Are fall protection devices properly used and maintained?	☐ YES	☐ NO	☐ N/A
11.	Are ladders secured when in use?	☐ YES	☐ NO	☐ N/A
12.	Is there a written Fall Protection Plan?	☐ YES	☐ NO	☐ N/A
13.	Have employees received training in Fall Protection?	☐ YES	☐ NO	☐ N/A

I. Materials Handling

1.	Are materials stacked and stored as to prevent sliding or collapsing?	☐ YES	☐ NO	☐ N/A
2.	Are flammables and combustibles stored in non-smoking areas?	☐ YES	☐ NO	☐ N/A
3.	Is machinery braced and lock-out/tag-out procedures in place?	☐ YES	☐ NO	☐ N/A
4.	Are tripping hazards labeled?	☐ YES	☐ NO	☐ N/A
5.	Are riders prohibited on materials handling equipment?	☐ YES	☐ NO	☐ N/A
6.	Are OSHA approved manlifts provided for the lifting of personnel?	☐ YES	☐ NO	☐ N/A
7.	Are all containers labeled as to contents?	☐ YES	☐ NO	☐ N/A
8.	Are flammable liquids stored in approved safety cans?	☐ YES	☐ NO	☐ N/A
9.	Are hoses secured and in good condition?	☐ YES	☐ NO	☐ N/A
10.	If powered industrial trucks or fork lifts including "off road" forklifts are used, have operators been certified?	☐ YES	☐ NO	☐ N/A

J. Hand and Power Tools

1.	Are defective hand and power tools tagged and taken out of service?	☐ YES	☐ NO	☐ N/A
2.	Is eye protection available and used when operating power tools?	☐ YES	☐ NO	☐ N/A
3.	Are guards and safety devices in place on power tools?	☐ YES	☐ NO	☐ N/A
4.	Are hand and power tools inspected before each use?	☐ YES	☐ NO	☐ N/A
5.	Are spark-resistant tools available?	☐ YES	☐ NO	☐ N/A
6.	Are extension cords in good repair?	☐ YES	☐ NO	☐ N/A

K. Slings and Chains ☐ N/A

1.	Are damaged slings, chains, and rigging tagged and taken out of service?	☐ YES	☐ NO	☐ N/A
2.	Are slings inspected before each use?	☐ YES	☐ NO	☐ N/A
3.	Are slings padded or protected from sharp corners?	☐ YES	☐ NO	☐ N/A

4. Do employees keep clear of suspended loads? ☐ YES ☐ NO ☐ N/A

L. Personal Protective Equipment (PPE)

1.	Have levels of PPE been established?	☐ YES	☐ NO	☐ N/A
2.	Do all employees know their level of protection?	☐ YES	☐ NO	☐ N/A
3.	Have respirator wearers been fit tested in the past year?	☐ YES	☐ NO	☐ N/A
4.	Are respirators used, decontaminated, inspected, and stored according to standard procedures?	☐ YES	☐ NO	☐ N/A
5.	Is defective PPE tagged?	☐ YES	☐ NO	☐ N/A
6.	Does compressed breathing air meet CGA Grade "D" minimum?	☐ YES	☐ NO	☐ N/A
7.	Are airlines monitored and protected?	☐ YES	☐ NO	☐ N/A
8.	Are there sufficient quantities of safety equipment and repair parts?	☐ YES	☐ NO	☐ N/A
9.	Is PPE and respiratory equipment properly used and maintained?	☐ YES	☐ NO	☐ N/A
10.	Is hearing protection available for high noise?	☐ YES	☐ NO	☐ N/A
11.	Is all PPE that has been used either disposed of or thoroughly cleaned prior to removal from any exclusion zone?	☐ YES	☐ NO	☐ N/A
12.	Is there an adequate supply of PPE available?	☐ YES	☐ NO	☐ N/A
13.	Are donning and doffing procedures identified?	☐ YES	☐ NO	☐ N/A
14.	If SCBAs are on site, are they being inspected at least monthly?	☐ YES	☐ NO	☐ N/A

M. Electrical

1.	Are warning signs exhibited on high voltage equipment (>250V)?	☐ YES	☐ NO	☐ N/A
2.	Is electrical equipment and wiring properly guarded?	☐ YES	☐ NO	☐ N/A
3.	Are electrical lines, extension cords, and cables guarded and maintained in good condition?	☐ YES	☐ NO	☐ N/A
4.	Are extension cords kept out of wet areas?	☐ YES	☐ NO	☐ N/A
5.	Is damaged electrical equipment tagged and taken out of service?	☐ YES	☐ NO	☐ N/A
6.	Have underground electrical lines and utilities been identified by proper authorities?	☐ YES	☐ NO	☐ N/A
7.	Are qualified electricians only allowed to work on electrical systems?	☐ YES	☐ NO	☐ N/A
8.	Is lock-out/tag-out procedures in place when working with electrical systems?	☐ YES	☐ NO	☐ N/A
9.	Are ground fault interrupter circuits used on all outdoor electrical hook-ups?	☐ YES	☐ NO	☐ N/A
10.	Have the CFCIs been tested?	☐ YES	☐ NO	☐ N/A
11.	Are there any open, exposed electrical panels on site?	☐ YES	☐ NO	☐ N/A

N. Compressed Gas Cylinders ☐ N/A

1.	Are breathing air cylinders charged only to prescribed pressures?	☐ YES	☐ NO	☐ N/A
2.	Are like cylinders segregated in well ventilated areas?	☐ YES	☐ NO	☐ N/A
3.	Is smoking prohibited in cylinder storage areas?	☐ YES	☐ NO	☐ N/A
4.	Are cylinders stored securely and upright?	☐ YES	☐ NO	☐ N/A
5.	Are cylinders protected from snow, rain, etc.?	☐ YES	☐ NO	☐ N/A
6.	Are cylinder caps in place before cylinders are moved?	☐ YES	☐ NO	☐ N/A
7.	Are fuel gas and O2 cylinders stored a minimum of 20 feet apart?	☐ YES	☐ NO	☐ N/A

O. Scaffolding ☐ N/A

1.	Is scaffolding placed on a flat, firm surface?	☐ YES	☐ NO	☐ N/A
2.	Are scaffolding planks free of mud, ice, grease, etc.?	☐ YES	☐ NO	☐ N/A
3.	Is scaffolding inspected before each use?	☐ YES	☐ NO	☐ N/A
4.	Are defective scaffolding parts taken out of service?	☐ YES	☐ NO	☐ N/A
5.	Does scaffold height exceed 4 times the width or base dimension?	☐ YES	☐ NO	☐ N/A
6.	Does scaffold planking overlap a minimum of 12 inches?	☐ YES	☐ NO	☐ N/A
7.	Does scaffold planking extend over end supports between 6 to 18 inches?	☐ YES	☐ NO	☐ N/A
8.	Are employees restricted from working on scaffold during storms and high winds?	☐ YES	☐ NO	☐ N/A
9.	Are all pins in place and wheels locked?	☐ YES	☐ NO	☐ N/A

P. Personnel Decontamination ☐ N/A

1.	Are decontamination stations set-up on site?	☐ YES	☐ NO	☐ N/A
2.	Is a contamination reduction zone set-up on site?			
3.	Are waste receptacles available for contaminated PPE?	☐ YES	☐ NO	☐ N/A
4.	Are steps taken to contain liquids used for decon?	☐ YES	☐ NO	☐ N/A
5.	Have decontamination steps and procedures been covered by the HSO in site briefings?	☐ YES	☐ NO	☐ N/A
6.	Is all PPE and respiratory equipment cleaned daily?	☐ YES	☐ NO	☐ N/A

Q. Equipment Decontamination ☐ N/A

1.	Has an equipment decon been established?	☐ YES	☐ NO	☐ N/A
2.	Is contaminated wash water properly contained and disposed of?	☐ YES	☐ NO	☐ N/A
3.	Are all pieces of equipment inspected for proper decontamination before leaving site?	☐ YES	☐ NO	☐ N/A
4.	Are all pieces of equipment being cleaned per HASP?	☐ YES	☐ NO	☐ N/A

R. Welding and Cutting ☐ N/A

1.	Are fire extinguishers present at welding operations?	☐ YES	☐ NO	☐ N/A
2.	Are confined spaces such as tanks, tested prior to welding?	☐ YES	☐ NO	☐ N/A
3.	Are Hot Work Permits available?	☐ YES	☐ NO	☐ N/A
4.	Are proper gloves, helmets, aprons available for welding?	☐ YES	☐ NO	☐ N/A
5.	Are welding machines properly grounded?	☐ YES	☐ NO	☐ N/A
6.	Are spare oxygen and gas cylinders stored a minimum of 20 feet apart when not in use?	☐ YES	☐ NO	☐ N/A
7.	Are only trained personnel permitted to operate welding and cutting equipment?	☐ YES	☐ NO	☐ N/A
8.	Are welding screens available for use?	☐ YES	☐ NO	☐ N/A

S. Excavation, Trenching, and Shoring ☐ N/A

1. Are employee protection systems in place to protect employees?	☐ YES	☐ NO	☐ N/A
2. Are guardrails or fences placed around excavations near pedestrian or vehicle thoroughfares?	☐ YES	☐ NO	☐ N/A
3. Are utilities located and marked?	☐ YES	☐ NO	☐ N/A
4. Are ladders used in trenches over 4 feet deep?	☐ YES	☐ NO	☐ N/A
5. Is material excavated placed a minimum of 2 feet from the excavation?	☐ YES	☐ NO	☐ N/A
6. Is a competent person designated for the excavation?	☐ YES	☐ NO	☐ N/A

T. Confined Spaces ☐ N/A

1. Have employees been trained in the hazards of CS?	☐ YES	☐ NO	☐ N/A
2. Are CS entry permits available on site?	☐ YES	☐ NO	☐ N/A
3. Is a CS rescue team (on or off site) available?	☐ YES	☐ NO	☐ N/A
4. Are CS entry procedures being followed?	☐ YES	☐ NO	☐ N/A

Section 4: Equipment/Vehicles

U. Motor Vehicles

1. Are vehicles inspected before each use?	☐ YES	☐ NO	☐ N/A
2. Are persons licensed/certified for the equipment they operate?	☐ YES	☐ NO	☐ N/A
3. Are unsafe vehicles tagged and reported to supervision?	☐ YES	☐ NO	☐ N/A
4. Are vehicles shut down before fueling?	☐ YES	☐ NO	☐ N/A
5. When backing vehicles, are spotters provided?	☐ YES	☐ NO	☐ N/A
6. Is safety equipment on vehicles?	☐ YES	☐ NO	☐ N/A
7. Are loads secure on vehicles?	☐ YES	☐ NO	☐ N/A

V. Heavy Equipment

1. Is heavy equipment inspected before each use?	☐ YES	☐ NO	☐ N/A
2. Is defective equipment tagged and taken out of service?	☐ YES	☐ NO	☐ N/A
3. Are project roads and structures inspected for load capacities and proper clearances?	☐ YES	☐ NO	☐ N/A
4. Is heavy equipment shut down for fueling and maintenance?	☐ YES	☐ NO	☐ N/A
5. Are back-up alarms installed and working on equipment?	☐ YES	☐ NO	☐ N/A
6. Have Operators been properly trained to operate the equipment they are using?	☐ YES	☐ NO	☐ N/A
7. Are riders prohibited on heavy equipment?	☐ YES	☐ NO	☐ N/A
8. Are guards and safety devices in place and used?	☐ YES	☐ NO	☐ N/A
9. Are barriers set up to prevent personnel from entering the area within the swing radius of track equip ment?	☐ YES	☐ NO	☐ N/A
10. If not, are warning signs posted on both sides and the rear of track equipment warning employees to stay out of the swing radius and have site personnel been trained to stay out of the swing radius areas?	☐ YES	☐ NO	☐ N/A
11. Are annual inspection reports for all cranes available on site?	☐ YES	☐ NO	☐ N/A

Section 5: Comments and Recommendation (attach extra sheets if necessary)

Item No.

Sevenson Environmental Services, Inc.

Health and Safety Inspection Summary Form

Inspection Date: ______________________ Inspector: ______________________

Site: ______________________

Project Manager: ______________________

Health and Safety Officer: ______________________

Superintendent: ______________________

OPERATIONS REVIEWED:

____
____
____
____
____

Corrective Measures Required? ☐ Yes ☐ No

If Yes, please briefly describe issues and suggested corrective measure(s). See completed Site Inspection Form for details.

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______________________ Date Prepared

______________________ Inspector Signature

Appendix F
Heat Stress Program

HEAT STRESS CONTROL PROGRAM

1.0 PURPOSE

Heat-related illness is a common occupational hazard in physically demanding work activities associated with hot weather and the use of impermeable, chemical-resistant clothing. This procedure describes minimum requirements for preventing occupational injury and illness due to heat stress in work operations.

2.0 SCOPE

This procedure applies to work activities in temperatures greater than 70°F (21°C) with or without the use of impermeable, chemical-resistant clothing.

3.0 HEAT STRESS CONDITIONS

Environmental factors- temperature, radiant heat (such as from the sun) and air velocity- affect the amount of stress a worker experiences in a hot work area. Also important to the level of stress a worker faces are personal factors such as age, weight, fitness, medical condition and acclimatization.

The body reacts to high external temperature by circulating blood to the skin for release of heat. This is evidenced by increased pulse rate and dilation of peripheral blood vessels. However, if muscles are being used for labor, less blood is available to flow to the skin and release heat.

Sweating is another means the body uses to maintain a stable internal body temperature. However, sweating is only effective if the humidity level is low enough to permit evaporation, if the lost fluids and salts are replaced, and if permeable clothing is worn.

If the body cannot release excess heat via the homeostatic mechanisms listed above, it will store it. When this happens the body's core temperature rises. As the body continues to store heat, the individual is at increased risk for heat stress disorders.

4.0 HEAT STRESS DISORDERS

4.1 Heat Rash

Heat rash, also called prickly heat, is caused by continuous exposure to heat and/or humidity. Profuse sweating while wearing impermeable clothing causes moisture to remain on the skin. This results in plugging of the sweat glands resulting in retention of sweat and inflammation. Signs and symptoms of heat rash include many tiny raised red blisters on affected areas with pricking sensations during heat exposure. Heat rash is usually mild and transitory in nature.

The condition can be discouraged by resting in a cool area during break times to allow the skin to dry. Also taking frequent showers provides relief.

4.2 Heat Cramps

Heat cramps are caused by depletion of body electrolytes during sweating. If lost fluid is replaced only with water, body electrolyte levels are diluted. This results in painful cramping of the large muscle groups such as the arms, legs and abdomen, during or after work hours.

Cramps may be relieved or prevented by replacing lost fluids with fortified drinks such as Gatorade and eating a well balanced diet with foods containing sodium and potassium.

4.3 Heat Exhaustion

Heat exhaustion, or heat fatigue, occurs with sustained work in hot environments when the worker is not acclimatized and does not replace lost fluids. Dehydration and pooling of blood in the periphery causes decreased circulating blood volume to vital organs, particularly the brain and heart. While the condition is not life-threatening, the worker may faint while performing hazardous work, the injury could then be serious.

4.4 Heat Stroke

Heat stroke is a life-threatening heat stress disorder resulting from the body's inability to regulate its core body temperature. Heat stroke occurs with sustained exertion in hot environments, usually coupled with several other predisposing factors mentioned above. The worker stops sweating with hot dry skin, which may be reddish, mottled or bluish. The worker will also have elevated body temperature (in excess of 104 degrees Fahrenheit), mental confusion, loss of consciousness, seizures and/or coma. The worker will die unless treated promptly.

Call 911 (or other appropriate emergency phone number) immediately for help. Rapid cooling is essential while awaiting the arrival of medical help. Remove the worker to a cool, shaded area and immerse the worker in cool water using a tub, hose or wetted material such as towels. Vigorously fan the worker to promote cooling. Prompt first aid can prevent permanent injury to the brain and other vital organs.

5.0 RESPONSIBILITIES

5.1 Project Supervisors

- Manage field operations to reduce heat stress and prevent heat strain.
- Ensure that work schedules allow for work acclimatization and appropriate work/rest regimens.
- Provide adequate drinking water, electrolyte replacement fluids, and break areas.
- Provide appropriate personnel protective equipment for protection against thermal stresses.
- Verify that at least two individuals are trained in First Aid/CPR.

5.2 Site Health and Safety Officer (HSO)

- Notify project supervision when heat stress prevention measures should be implemented.
- Review heat stress prevention and treatment at a daily tailgate safety meeting for job sites where heat stress may exist.
- Ensure that subcontractor employees are given this information.
- Ensure at least two workers on each shift are trained in first aid and CPR.
- Document vital signs of all personnel that enter the exclusion zone wearing PPE. The vital signs shall be taken before entry and directly after exiting the exclusion zone. All vital signs shall be taken by the HSO or assigned person.
- Monitor and document the ambient temperature in the work zone as needed.
- Document notable physical appearance observations of personnel.

5.3 Workers

- Follow heat stress prevention procedures (See Sec. 6.0.).
- Be alert to self and coworkers' signs of heat stress.
- Immediately notify the site supervisor or the site safety and health officer of any worker who appears to be injured or ill.

6.0 PREVENTION AND TREATMENT

6.1 Prevention

Preventative measures for heat stress will be implemented when the ambient air temperature is greater than 70 degrees Fahrenheit in the work zone. Preventative measures will reduce the risk of serious injury and loss of work productivity.

All Sevenson employees receive pre-employment and periodic medical examinations that include an evaluation of their ability to work under thermal stresses while wearing respirators and personal protective equipment.

Workers will use the buddy system, always working in pairs or with at least one other worker within their line of sight at all times.

New workers or those unaccustomed to working under thermal stresses will be allowed to become acclimatized. During the first seven (7) days of work in a hot environment, their work load is modified to begin at approximately 50% of the expected work load, and is increased gradually each day. Workers can lose acclimatization in a few days. Therefore, those who have been away from the hot environment for more than four (4) days are allowed to re-acclimatize themselves as if they were new. The individual workloads will be based on the site safety and health officer's recommendations.

Workers are permitted to take rest breaks as needed during high heat conditions or when the worker feels affected by the heat in conjunction with HSO recommendations. However, all workers working under potential thermal stress conditions will take at least one 15-minute rest break every two hours. Work/rest cycles will be established on a site-specific basis in conjunction with health and safety management for projects requiring respirators, chemical-resistant coveralls, physically strenuous work activities, and/or potential exposure to radiant heat. Work/rest cycles will vary throughout the duration of the project based on site conditions and vital sign monitoring. Work periods may have to be decreased and rest periods increased during times of high heat stress.

Cool shaded break areas will be provided. Under extreme heat stress conditions, consideration will be given to working in the cooler times of the day or at night.

Workers are required to increase their fluid intake when working under heat stress conditions. Cool water and/or electrolyte replacement beverages are provided in designated lunch and/or break areas.

Vehicles and heavy-equipment cabs are air-conditioned, wherever possible.

Mechanization of work tasks is used to reduce the need for manual labor, wherever possible.

The use of cooling devices such as ice vests and cool deluge showers may be implemented on a site-specific basis.

Workers will self-monitor for signs and symptoms of heat stress. Additional monitoring for body temperature, peripheral pulse, respiratory rate, blood pressure and/or body weight will be considered under special circumstances.

6.2 Vital Signs

When vital signs are monitored, the following guidelines will be in place:

1. Workers will not re-enter the exclusion zone in impermeable PPE when oral body temperature exceeds 100.6°F.

2. If oral body temperature exceeds 99.6°F, the next work period will be shortened by one-third (1/3).

3 Workers will not re-enter the exclusion zone in impermeable PPE when heart rate (pulse) exceeds 110 beats per minute.

4. Workers may re-enter the exclusion zone once vital signs normalize.

6.3 First Aid

Workers experiencing symptoms of heat exhaustion such as headache, nausea, vomiting, or muscle cramps will immediately decontaminate, remove chemical-resistant clothing and respirators, and move to a shaded break area. Workers should sit or lie down. On-site first aid personnel will be summoned to evaluate ill associates. If fully conscious, the worker will be encouraged to drink cool water and the worker's head, neck, and clothing may be moistened with water to increase evaporative cooling. Workers may also be placed in an air-conditioned vehicle to facilitate cooling.

Medical personnel and emergency transport will be summoned immediately for any worker experiencing symptoms of heat stroke. The worker's respirator and chemical-resistant clothing will be removed immediately. The workers clothing may be moistened with cool water to increase evaporative cooling. Fanning the worker and placing him/her in an air-conditioned vehicle will also facilitate cooling. Heat stroke is an immediate life-threatening condition. The worker will be transported to the nearest medical treatment facility as quickly as possible.

7.0 TRAINING

Workers and supervisors working in potential heat stress conditions are trained in the following subjects:

- How to identify potential heat stress situations,
- Signs and symptoms of heat stress disorders,
- First aid for heat illness and injuries,
- Maintaining fluid and salt intake,
- Acclimatization,
- Heat stress prevention program.

Initial training is performed at the time of hiring or placement in a potentially exposed work assignment. Subsequent training is provided as part of site-specific training in daily tailgate safety meetings. Training topics will also be reviewed during first aid/CPR classes.

Copies of training documentation are maintained in the worker's health and safety files.

8.0 MONITORING

Wet Bulb Globe Temperature (WBGT) readings will be taken and the following American Conference of Governmental Industrial Hygienists (ACGIH) recommendations will be used is an indicator of potential heat stress conditions:

Work Load	Limit (WBGT)
Light	30° C
Moderate	26.7°C
Very Heavy	25° C

Appendix G
Cold Stress Program

COLD STRESS CONTROL PROGRAM

1.0 PURPOSE

Cold-related illness is a hazard of working outdoors in cold environments. This procedure describes requirements for preventing occupational injury illness due to cold stress.

2.0 SCOPE

This procedure applies to all work operations involving ambient temperatures less than 40°F (4°C).

3.0 COLD STRESS CONSIDERATIONS

The body maintains its temperature by gaining heat from food metabolism and muscular work. The body's first defense against cold is constriction of blood vessels in the hands and feet and shivering. If the body is unable to produce enough heat to maintain skin and core body temperature, the individual is at increased risk for cold stress disorders.

Environmental factors such as air velocity and moisture affect the amount of cold stress an individual experiences. Fatigue and personal factors such as weight, fitness and medical condition may influence a workers risk to cold stress disorders.

4.0 COLD STRESS DISORDERS

4.1 Frostbite

Frostbite occurs when a body part receives inadequate heat from within the body. This allows for freezing of the body tissues and fluids. The most vulnerable parts of the body to frostbite are fingers, toes, cheeks, ears and nose. Frostbite can damage the outer layers of skin or in more severe conditions, deep into the body. Signs and symptoms of frostbite include pale skin (gray-yellow-white), pain and then numbness, and stiffness and blisters.

At the first sign of altered feeling of the skin such as tingling, pain or numbness, workers should report to their supervisor and seek warming measures.

4.2 Hypothermia

Hypothermia can be life-threatening. It results from the body's inability to maintain its core body temperature. Hypothermia can occur with prolonged work in cold environments, usually coupled with other predisposing factors such as smoking and overweight. The worker shivers uncontrollably and then stops shivering. The victim will have a subnormal body temperature, cool skin, slow breathing, weak pulse, listlessness, confusion and pain in the extremities. The worker may die unless rewarmed promptly.

5.0 PREVENTION AND TREATMENT

5.1. Preventive Measures

Preventive measures for cold stress will be implemented when the ambient air temperature is less than 40 degrees Fahrenheit. Measures may be implemented at higher temperatures when moisture and wind increase the impact of cold stress. Preventive measures will reduce the risk of serious injury and loss of work productivity.

Workers will receive pre-employment and periodic medical examinations that include an evaluation of their ability to work under cold stress conditions.

Workers will use the buddy system, i.e., working in pairs or with at least one other person within their line of sight at all times.

5.2 Acclimatization

New workers or those unaccustomed to working under thermal stresses will be allowed to become acclimatized. During the first 7 days of work in a cold environment, their work load will be modified to begin at approximately 50% of the expected work load, and is then increased gradually each day. Workers can lose acclimatization in a few days. Those who have been away form the cold environment for more than four (4) days are allowed to re-acclimatize themselves as if they were new employees.

Employees are permitted to take rest breaks as often as necessary. However, all employees working under potential cold stress conditions will take at least one 15-minute rest break every two hours, as a minimum. Work/rest cycles will be implemented for projects involving exposure to cold.

Workers will be instructed to wear adequate layered clothing for warmth, but not excessive to cause sweating. The use of heating devices such as radiant jets, hot plates and blowers may be implemented on a site-specific basis.

Workers will self-monitor for signs and symptoms of cold stress. Additional monitoring by health professionals for body temperature, peripheral pulse, respiratory rate and/or blood pressure will be considered under special circumstances.

5.3 First Aid

Medical personnel and emergency transportation will be summoned immediately for any worker experiencing symptoms of hypothermia. The victim should sit or lie down. On-site first aid personnel will be summoned to evaluate victims of cold stress. If fully conscious, the worker will be encouraged to drink warm liquids and may be wrapped with warm blankets to promote warming. Workers may also be placed in a heated vehicle or trailer to facilitate warming.

Workers experiencing symptoms of cold stress such as pain in the extremities, lethargy, slurred speech, or intense shivering will immediately decontaminated, PPE removed, and moved to a warm break area. Street clothing should be removed if it is wet. The victim will be wrapped in warm blankets.

Workers experiencing symptoms of cold stress will not be permitted return to work under potential cold stress conditions until they have been evaluated by a physician and released to return to work.

Hypothermia is an immediate life-threatening condition. The victim will be transported to the nearest medical treatment facility as quickly as possible. Company or personal vehicles may be used to transport victims from work sites where ambulance transport is not available or cannot respond within 5 minutes of a telephone call to emergency medical personnel.

6.0 TRAINING

Initial training is performed for new hires in a potentially exposed work assignment and during 40-hour hazardous waste operations safety training. These will include:

- How to identify potential cold stress situations,
- Signs and symptoms of cold stress disorders,
- First aid for cold illness and injuries,
- Cold stress prevention program.

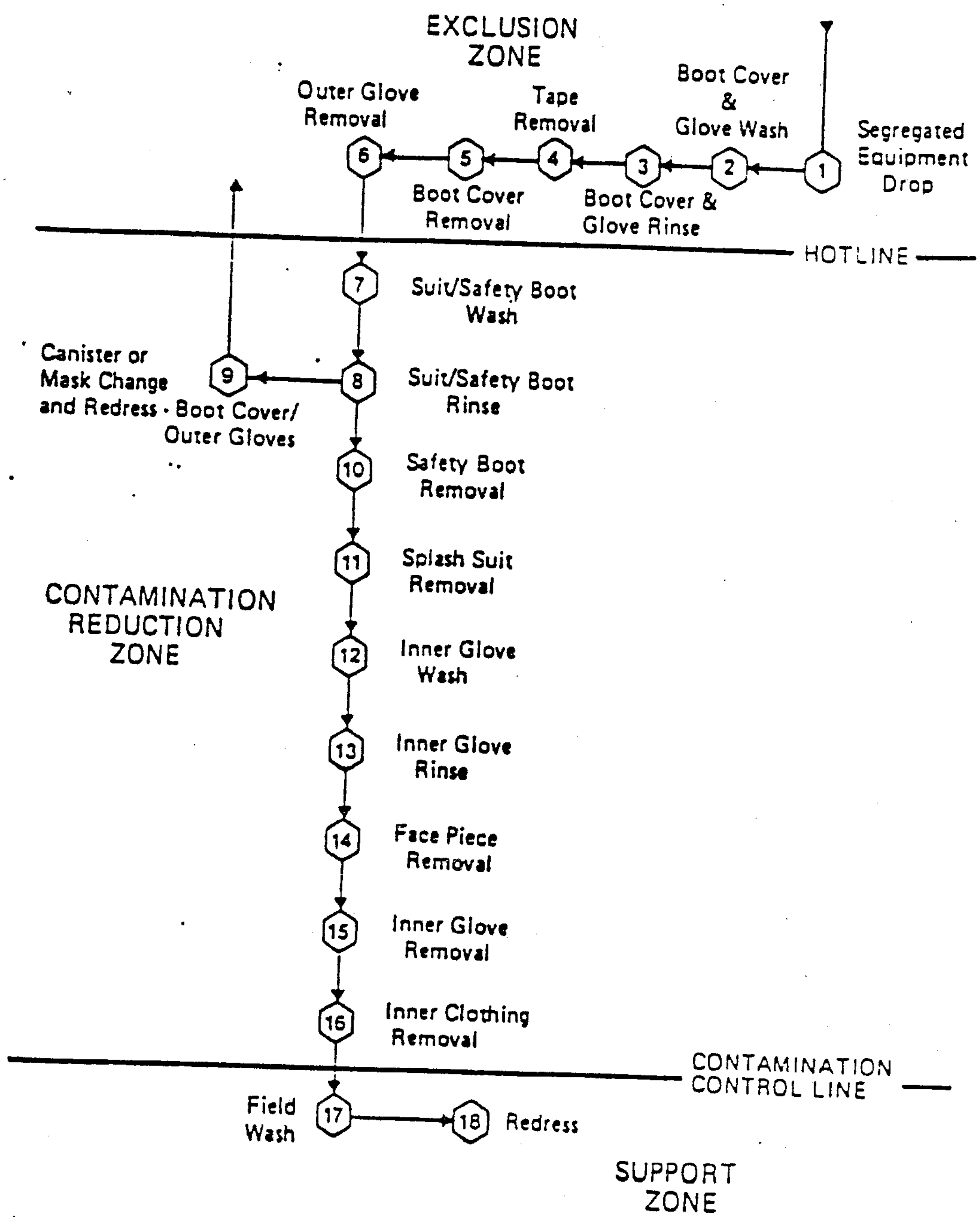
Training topics will be reviewed during first aid/CPR classes and site-specific safety meetings. Copies of training documentation are maintained in the worker's safety and health training files.

Appendix H
Decontamination Procedures

PROCESS DECON PROCEDURES

MAXIMUM DECONTAMINATION LAYOUT

LEVEL C PROTECTION



MAXIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 1:	Segrated Equipment Drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop recuces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station 2:	Boot Cover and Glove Wash	2. Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 3:	Boot Cover and Glove Rinse	3. Rinse off decon solution from station 2 using copious amounts of water.
Station 4:	Tape Removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5:	Boot Cover Removal	5. Remove boot covers and deposit in containers with plastic liner.
Station 6:	Outer Glove Removal	6. Remove outer gloves and deposit in container with plastic liner.
Station 7:	Suit and Boot Wash	7. Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution.
Station 8:	Suit and Boot, and Glove Rinse	8. Rinse off decon solution using water. Repeat as many times as necessary.
Station 9:	Canister or Mask Change	9. If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped worker returns to duty.
Station 10:	Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
Station 11:	Splash Suit Removal	11. With assistance of helper, remove splash suit. Deposit in container with plastic liner.
Station 12:	Inner Glove Rinse	12. Wash inner gloves with decon solution.
Station 13:	Inner Glove Wash	13. Rinse inner gloves with water.
Station 14:	Face Piece Removal	14. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 15:	Inner Glove Removal	15. Remove inner gloves and deposit in lined container.

MAXIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 16: Inner Clothing Removal	16. Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 17: Field Wash	17. Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 18: Redress	18. Put on clean clothes.

FSOP 7: MINIMUM MEASURES FOR LEVEL C DECONTAMINATION

Station 1: Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Canister or Mask Change	4. If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6: Face Piece Removal	6. Facepiece is removed. Avoid touching face with fingers. Facepiece deposited on plastic sheet.
Station 7: Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

Appendix I
Radiation Worker Training

Sevenson Environmental Services, Inc.

Department of Safety and Health - Radiation Safety Office

Radiological Worker I and II Training

Student Handout

Revised: February 19, 2003

Radiological Worker Training Course Outline

1. Introduction

    a. Course Objectives
    b. Safety Policy
    c. Course Overview
        i. Radiological Worker I
        ii. Radiological Worker II
    d. Evaluation Criteria

2. Radiological Fundamentals

    a. Learning Objectives
    b. Atomic Structure
    c. Definitions
    d. Four Basic Types of Radiation
    e. Units of Measure

3. Biological Effects

    a. Learning Objectives
    b. Introduction
    c. Sources of Radiation
    d. Effects of Radiation on Cells
    e. Acute and Chronic Radiation Exposure
    f. Prenatal Radiation Exposure
    g. Risks In Perspective

4. Radiation Limits

    a. Learning Objectives
    b. Introduction
    c. Dose Limits and Administrative Control Levels
    d. Workers Responsibilities Regarding Dose Limits/Control Levels

5. ALARA Program

    a. Learning Objectives
    b. Introduction
    c. ALARA Program
    d. Responsibilities For The ALARA Program
    e. External and Internal Radiation Dose Reduction
    f. Radioactive Waste Minimization

Radiological Worker Training Course Outline

6. Personnel Monitoring Programs

    a. Learning Objectives
    b. Introduction
    c. External Dosimetry
    d. Internal Dosimetry
    e. Radiation Dose Records

7. Radiological Postings and Controls

    a. Learning Objectives
    b. Introduction
    c. Radiological Work Permits
    d. Worker RWP Responsibilities
    e. Radiological Postings
    f. Posting Requirements
    g. Responsibilities of the Worker Associated with Postings, Signs, and Labels
    h. Consequences of Disregarding Radiological Postings, Signs, and Labels
    i. Requirements for Entry, Exit, and Working in Radiologically Posted Areas

8. Radiological Emergencies

    a. Learning Objectives
    b. Introduction
    c. Emergency Alarms and Responses
    d. Disregard for Radiological Alarms
    e. Radiological Emergency Situations
    f. Considerations in Rescue and Recovery Operations

9. High and Very High Radiation Areas

    a. Learning Objectives
    b. Introduction
    c. Definitions
    d. Entry Requirements
    e. Working In Requirements
    f. Emergencies

10. Radioactive Contamination and Control

    a. Learning Objectives
    b. Introduction
    c. Comparison of Radiation and Radioactive Contamination

d. Types of Contamination
e. Sources of Radioactive Contamination
f. Contamination Control Methods
g. Contamination Monitoring Equipment
h. Frisking Procedure
i. Decontamination

1. Course Objective

Upon completion of this training course, the participant will have the knowledge to work safety in areas controlled for radiological purposes using proper radiological practices.

Safety Policy

Sevenson Environmental Services, Inc. and Waste Stream Technologies, is firmly committed to having an effective and qualified radiological safety program. This program is outlined in the Sevenson Corporate Radiation Safety Program, requires that managers and supervisors at all levels be involved in the planning, scheduling and conduct of radiological work. This Policy also requires that adequate radiological safety shall not be compromised to achieve production or research activities.

Course Overview

There are four areas of training that will qualify a person to be a radiological worker. These areas of training include:

Core Academics - this training session includes seven units which discuss the theory that a worker must know to work safely around radiological hazards.

Radiation Area/High Radiation/Very High Radiation Area (RA/HR/VHR)- this training session discusses proper entry and exit requirements into RA/HR/VHR Areas where contamination is not a concern.

Contamination Control - this training session discusses proper entry and exit requirements into contaminated areas.

Practical Factors Evaluation - this evaluation is a generic practical exercise that provides a hands-on experience for the worker. The practical factors exercises are different for Radiological Worker I and Radiological Worker II.

Radiological Worker I training consists of the core academics plus the practical factors evaluation. This training is required for radiological workers whose job assignments require access to Radiological Protected Areas, Radiological Controlled Areas, Radioactive Materials Areas, and Radiation Areas. Radiological Worker I training is also required for unescorted entry into Radioactive Materials Areas containing either sealed radioactive sources or radioactive material labeled and packaged in accordance with Department of Energy (DOE), Nuclear Regulatory Commission (NRC), New York State Department of Labor, or any other Agreement State regulations or definitions.

Radiological Worker I Training alone does not prepare the worker to work around higher radiation levels or with contaminated materials. It is suggested the Radiological Worker I tasks be limited to inspections, tours, and activities that involve work on non-radiological systems.

Radiological Worker II Training consists of the Core Academics, RA/HR/VHR Area lesson plan, Contamination Control lesson plan, and the Practical Factors evaluation. This training is required for the radiological worker whose job assignments involve unescorted entry into RA/HR/VHR Areas, Contaminated Areas, High Contaminated Areas, and Airborne Radioactivity Areas. Further, workers who have potential contact with hot particles or the use of glove boxes with high contamination levels shall complete Radiological Worker II training.

Radiological Worker II training prepares the worker to work around higher radiation levels and with contaminated materials normally associated with radiological facilities/activities.

Evaluation Criteria

At the completion of the course the participant must successfully complete a written and a practical evaluation to be trained as a radiological worker. Successful completion of the written exam is a prerequisite for the practical factors evaluation.

Successful completion of the written examination (minimum score of 80%) must be achieved. The written exam is based on the objectives in theory portion of the course.

Successful completion of the practical factors evaluation must be achieved. The practical factors evaluation includes entry into a simulated controlled work environment. This evaluation is based on the application of the theory portions of this course.

2. RADIOLOGICAL FUNDAMENTALS

Learning Objectives

Upon completion of this part of the lesson plan the participant will be able to identify the fundamentals of radiation, radioactive material, and radioactive contamination.

- Identify the three basic particles of an atom and the charge and location of each.
- Define ionization.
- Define ionizing radiation, radioactive material, and radioactive contamination.
- Distinguish between ionizing radiation and non-ionizing radiation.
- Define radioactivity and radioactive half-life.
- State the four basic types of ionizing radiation.
- Identify the following for each of the four types of ionizing radiation:
  - Physical Characteristics
  - Range/shielding
  - Biological Hazard(s)
  - Sources
- Identify the units used to measure radiation, contamination, and radioactivity.
- Convert rem to millirem and millirem to rem.

Atomic Structure

The basic unit of matter is the atom. The three basic particles of the atom are protons, neutrons, and electrons. The central portion of the atom is the nucleus. The nucleus consists of protons and neutrons. Electrons orbit the nucleus similar to the way planets orbit our sun.

Protons

- Located in the nucleus of the atom.
- Positive electrical charge.
- number of protons determines the element.

Neutrons

- Located in the nucleus of the atom.
- No Electrical Charge
- Atoms of the same element have the same number of protons, but have a different number of neutrons.
- Atoms which have the same number of protons but different number of neutrons are called isotopes.
- Isotopes have the same chemical properties; however, the nuclear properties can

be quite different.

Electrons

- Orbit the nucleus.
- Negative electrical charge.
- Electrons determine the chemical properties of an atom.

Stable and unstable atoms - Only certain combinations of neutrons and protons result in stable atoms.

- If there are too many or too few neutrons for a given number of protons, the resulting nucleus will have to much energy. This atom will not be stable.
- The unstable atom will try to become stable. It does this by giving off excess energy in the form of particles or waves (radiation). These unstable atoms are also know as radioactive atoms.

Charge of the atom - The number of electrons and protons determines the overall electrical charge of the atom. The term ion is used to define atoms or groups of atoms that have a net positive or negative charge.

- No charge (neutral) - If the number of electrons equals the number of protons, the atom is electrically neutral and does not have a net electrical charge.
- Positive charge (+) - More protons than electrons.
- Negative charge (-) More electrons than protons.

Definitions

Ionization - Ionization is the process of removing electrons from neutral atoms. Electrons will be removed from neutral atoms if enough energy is supplied. The remaining atom has a positive (+) charge. The positively charged atom and the negatively charged electron are called an ion pair. Ionization should not be confused with radiation. Ions (or ion pairs) produced as a result of radiation exposure allow the detection of radiation.

Ionizing radiation - Energy (particles or rays) emitted from radioactive atoms that can cause ionization. The four basic types of ionizing radiation that are of primary concern in the nuclear industry are alpha particles, beta particles, gamma or x-rays, and neutron particles.

Non-ionizing radiation - Radiation that doesn't have enough energy to ionize an atom. Examples of non-ionizing radiation are radar waves, microwaves and visible light.

Radioactivity - Radioactivity is the process of unstable (or radioactive) atoms trying to become stable. This is done by emitting radiation.

Radioactive material - Any material containing unstable atoms that emit radiation.

Radioactive contamination - Radioactive contamination is radioactive material in an unwanted place.

- Exposure to radiation does not result in contamination of the worker, radiation is a type of <u>energy</u> and contamination is <u>material</u> in an unwanted place.

Radioactive Decay - Radioactive decay is the process of radioactive atoms releasing radiation over a certain period of time. This is done to try and become stable (non-radioactive). Radioactive decay is also know as disintegration.

Radioactive half-life - Radioactive half-life is the amount of time it takes for one half of the radioactive atoms present to decay.

The Four Basic Types of Radiation

Alpha particles (α)

- Physical characteristics

  The alpha particle has a large mass and consists of two protons, two neutrons and no electrons. It is a charged particle (charge of plus two) that is emitted from the nucleus of an atom. The positive charge causes the alpha particle (+) to strip electrons (-) from nearby atoms as it passes through the material, thus ionizing these atoms.

- Range

  The alpha particle deposits a large amount of energy in a short distance of travel. This large energy deposit limit the penetrating ability of the alpha particle to a very short distance. This range in air is about one to two inches.

- Shielding

  Most alpha particles are stopped by a few inches of air, a sheet of paper, or the dead layer (outer layer) of skin.

- Biological hazard

  Alpha particles present and internal hazard because the source of the alpha radiation is in close contact with body tissue and can deposit large amounts of energy in a small volume of body tissue. Alpha particles do not present an external hazard because they are easily stopped by the dead layer of skin on your body.

Beta Particles

- Physical characteristics

  The beta particle has a small mass and is usually negatively charged, it is emitted from the nucleus of an atom and has an electrical charge of minus one. Beta radiation causes ionization by displacing electrons from their orbits. Ionization occurs due to the repulsive force between the beta particle (-) and the electron (-), which both have a charge of minus one.

- Range

  Because of its charge, the beta particle can only penetrate a short distance. Range in air is about ten feet.

- Shielding

  Most beta particles can be shielded by plastic, glass, metal foil, or safety glasses.

- Biological Hazard

  If ingested or inhaled, the source of the beta radiation is in close contact with body tissue and can deposit energy in a small volume of body tissue. Externally, beta particles are potentially hazardous to the skin and eyes.

Gamma rays and X-rays

- Physical characteristics

  Gamma/x-ray radiation is an electromagnetic wave or photon and has no electrical charge. Gamma rays are very similar to x-rays. The main difference between gamma rays and x-rays is that gamma rays originate inside the nucleus and x-rays originate outside the nucleus. Gamma/x-ray radiation can ionize an atom by directly interacting with the electron.

- Range

  Because gamma/x-ray radiation has no charge and no mass, it has a very high penetrating ability. The range in air is very far. It will easily go several hundred feet.

- Shielding

  Gamma/x-ray radiation is best shielded by very dense materials, such as concrete, lead, or steel.

- Biological Hazard

  Because gamma and x-ray radiation has the ability to penetrate through the body, they are considered a whole body hazard.

Neutron Particles

- Physical characteristics

  Neutron radiation consists of neutrons that are ejected from the nucleus. A neutron has no electrical charge.

  A direct interaction occurs as the result of a collision between a neutron and a nucleus.

  A charged particle or other ionizing radiation may be emitted during this direct interaction, the emitted radiation can cause ionization in human cells. This is called "indirect ionization".

- Range

  Because of the lack of a charge, neutrons have a relatively high penetrating ability and are difficult to stop. The range in air is very far. Like gamma rays, they can easily travel several hundred feet in air.

- Shielding

  Neutron radiation is best shielded by materials with a high hydrogen content, such as water, concrete, or plastic.

- Biological hazard

  Because neutrons have the ability to penetrate through the body, they are considered a whole body hazard.

Units of Measure

Radiation

- Roentgen (R)

  The roentgen is a unit for measuring exposure. It is defined only for the effect on air. It applies only to gamma and x-rays. It does not relate biological effects of radiation to the human body.

  1 R (Roentgen) = 1,000 milliroentgen (mR)

- Rad (Radiation Absorbed Dose)

  The rad is a unit for measuring absorbed dose in any material. Absorbed dose results from energy being deposited by the radiation. It is defined for any material. It applies to all types of radiation, it does not take into account the potential effect that different types of radiation have on the body.

  1 rad = 1,000 millirad (mrad)

- Rem (Roentgen Equivalent Man)

  The rem is a unit for measuring dose equivalence. It is the most commonly use unit and pertains to the human body. The rem takes into account the energy absorbed (dose) and the biological effect on the body due to the different types of radiation.

  1 rem = 1,000 millirem (mrem)

Radiation Dose and Dose Rate

Dose is the amount of radiation you receive. Radiation dose rate is the rate at which you receive the dose.

Example

a) Radiation dose rate = dose/time
b) Radiation dose rate = mrem/hr

Contamination/Radioactivity

- Radioactivity is measured in the number of disintegrations radioactive material undergoes in a certain period of time.

1. Disintegrations per minute (dpm)
2. Counts per minute (cpm)
3. Curie
   - 2,200,000,000,000 (2.2×10^{12}) disintegrations per minute (dpm)
   - 37,000,000,000 (3.7×10^{10}) disintegrations per second (dps)

For the radioactivity in air and water the curie (Ci) or microcurie (μCi) is most often used.

- 1 curie = 1,000,000 μCi

- Contamination is measured radioactivity per unit area or volume.

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3. BIOLOGICAL EFFECTS

Learning Objectives

Upon completion of this unit, the participant will be able to discuss the biological risks to the exposed population.

- Identify the average annual dose to the general population from natural background and man-made sources of radiation.
- Identify the major sources of natural background and man-made radiation.
- State the method by which radiation causes damage to cells.
- Identify the possible effects of radiation on cells.
- Define the terms "acute dose" and "chronic dose".
- State examples of a chronic radiation dose.
- Define the terms "somatic effect" and "heritable effect".
- State the potential effects associated with prenatal radiation dose.
- Compare the biological risks from chronic radiation doses to health risks workers are subjected to in industry and daily life.

Introduction

Of all the environmental factors, we know more about the biological effects of ionizing radiation than any other. Rather than just being able to base our information on animal studies we have a large body of information available regarding exposures to humans.

There are four major groups of people that have been exposed to significant levels of radiation.

The first is some early workers, such as radiologist, who received large doses of radiation before the biological effects were recognized. Since that time standards have been developed to protect workers.

The second group is the more than 100,000 survivors of the atomic bombs dropped at Hiroshima and Nagasaki. These survivors received estimated doses in excess of 50,000 mrem.

The third group is individuals who have been involved in radiation accidents, the most notable being the Chernobyl accident.

The fourth and largest group of individuals are patients who have undergone radiation therapy for cancer.

Sources of Radiation

We live in a radioactive world and always have. In fact, the majority of us will be exposed to more ionizing radiation from natural background radiation than from our jobs.

Natural Sources

As human beings, we have evolved in the presence of ionizing radiation from naturally occurring sources. The are several sources of radiation that occur naturally. The radiation emitted from these sources is identical to the radiation that results from man-made sources.

The four major sources of naturally occurring radiation exposures are:

- Cosmic radiation
- Sources in the earth's crust, also referred to as terrestrial radiation
- Sources in the human body, also referred to as internal sources
- Radon

Cosmic radiation

Cosmic radiation comes from the sun and outer space. It consists of positively charged particles, as well as gamma radiation. At sea level, the average annual cosmic radiation dose is about 26 mrem. At higher elevations, the amount of atmospheric shielding deceases and thus the dose increases. The total average annual dose to the general population from cosmic radiation is about 28 mrem.

Sources in earth's crust (terrestrial)

There are natural sources of radiation in the ground (i.e., rocks, building materials, and drinking water supplies). Some of the contributors to terrestrial sources are the natural radioactive elements radium, uranium, and thorium. Many areas have elevated levels of terrestrial radiation due to increased concentrations of uranium or thorium in the soil. The total average annual dose to the general population from terrestrial radiation is 28 mrem.

Internal

The food we eat and the water we drink all contain some trace amounts of natural radioactive materials. These naturally occurring radioactive materials deposit in our bodies and, as result, cause an internal exposure to radiation. Some naturally occurring radioactive isotopes include Sodium-24, Carbon-14, Argon-41, and Potassium-40. Most of our internal exposure comes from Potassium-40.

Combined exposure from internal sources of natural background radiation account for a radiation dose of about 40 mrem per year.

Radon

Radon comes from the radioactive decay of radium, which is naturally present in the soil. Because radon is a gas, it can travel through the soil and collect in basements or other areas of the home. Radon emits alpha radiation. Because alpha radiation cannot penetrate the dead layer of skin on your body, it presents a hazard only if taken in to the body. Radon and its decay products are present in the air, and when inhaled can cause dose to the lungs. The average annual dose equivalent from radon gas is approximately 200 mrem.

Man-made Sources

The difference between man-made sources of radiation and naturally occurring sources is the place from which the radiation originates.

The four major sources of man-made radiation exposures are:

- Medical radiation
- Atmospheric testing of nuclear weapons
- Consumer products
- Industrial uses

Medical radiation sources

X-rays

X-rays are similar to gamma rays; however, they originate outside the nucleus. X-rays are an ionizing radiation hazard. A typical radiation dose from a chest x-ray is about 10 mrem. The total average annual dose to the general population from medical x-rays is 40 mrem.

Diagnosis and therapy

In addition to x-rays, radioactive sources are used in medicine for diagnosis and therapy. The total average annual dose to the general population from these sources is 14 mrem.

Atmospheric testing of nuclear weapons

Another man-made source of radiation includes residual fallout from atomospheric nuclear weapons testing in the 1950s and early 1960s. Atmospheric testing is now banned by most nations. The average annual dose from residual fall out is less than one mrem.

Consumer products

Examples include TVs, older luminous dial watches, and some smoke detectors. This dose is relatively small as compared to naturally occurring sources of radiation and averages 10 mrem in a year.

Industrial uses

Industrial uses of radiation include x-ray machines used for baggage inspection, video display terminals, and tungsten welding rods.

The average annual dose equivalent to the general population from naturally occurring and man-made sources is 360 mrem.

Effects of Radiation On Cells

The human body is made up of many organs, and each organ of the body is made up of specialized cells. Ionizing radiation can potentially affect the normal operation of the cells.

Biological effects begin with the ionization of atoms.

- The method by which radiation causes damage to human cells is by ionization of atoms in the cell. Atoms make up cells that make up the tissue of the body. These tissues make up the organs of which our body consists. Any potential radiation damage to our body begins with damage to atoms.
- A cell is made up of two principal parts, the body of the cell and the nucleus, which is like the brain of the cell.
- When ionizing radiation hits a cell, it may strike a vital part of the cell like the nucleus or a less vital part of the cell, like the cytoplasm.

Cell sensitivity

Some cells are more sensitive than others to environmental factors such as viruses, toxins, and ionizing radiation. Radiation damage to cells may depend on how sensitive the cells are to radiation.

Actively dividing and non-specialized cells

Cells in our bodies that are actively dividing are more sensitive to ionizing radiation. Cells that are rapidly dividing include: blood forming cells, the cells that line our intestinal tract, hair follicles, and cells that form sperm.

Less actively dividing and more specialized cells

Cells which divide at a slower pace or are more specialized (such as brain cells or muscle cells) are not as sensitive to damage by ionizing radiation.

Possible Effects of Radiation on Cells

When a cell is exposed to ionizing radiation, several things can happen. The following are possible effects of radiation on cells.

- There is no damage
- Cells repair the damage and operate normally
- The body of most cells is made up primarily of water. When ionizing radiation hits a cell, it is most likely to interact with the water in the cell. Often the cell can repair this damage. Ionizing radiation can also hit the nucleus of the cell. The nucleus contains the vital parts of the cell such as chromosomes (chromosomes determine the cells function). When chromosomes duplicate themselves, the chromosomes transfer their information to new cells. Damage to chromosomes, although often more difficult, can also be repaired. In fact, the average person repairs 100,000 chromosome breaks per day.

- Cells are damaged and operate abnormally

  Cell damage may not be repaired or may be incompletely repaired, in that case, the cell may not be able to do its function or it may die. It is possible that a chromosome in the nucleus could be damaged but not be repaired correctly. This is called a mutation or genetic effect. We will discuss genetic effects when we consider chronic radiation doses.

- Cells die as a result of the damage

  At any given moment thousands of our cell are dying and being replaced by normal cells nearby. It is only when the dose of the radiation is very high or is delivered very rapidly that the cell may not be able to repair itself or be replaced.

Acute and Chronic Radiation Exposure

Potential biological effects depend on how much and how fast a radiation dose is received. Radiation doses can be grouped into two categories, acute and chronic dose.

We know that radiation therapy patients receive high doses of radiation in a short period of time but generally only to a small portion of the body (not a whole body dose). Ionizing radiation is used to treat cancer in these patients because cancer cells are rapidly dividing and therefore sensitive to ionizing radiation. Some of the side effects of people undergoing radiation therapy are hair loss, nausea and tiredness.

Acute radiation doses

An acute effect is a physical reaction due to massive cell damage. This damage may be caused by a large radiation dose received in a short period of time. Large doses of radiation received in a short period of time are called acute doses. The body can't repair or replace cells fast enough from an acute dose and physical effects such as reduced blood count and hair loss may occur.

Slight blood changes may be seen at acute doses of 10,000 - 25,000 mrem but individuals would not otherwise be affected.

Radiation Sickness

At acute doses greater than 100,000 mrem, about half of the people would experience nausea (due to damage of the intestinal lining). Radiation therapy patients often receive a whole body equivalent doses in this range and above, although doses to the region of a tumor are many times higher than this.

If the acute dose to the whole body is very large (on the border of 500,000 mrem or larger) it may cause so much damage that the body cannot recover. An example is the 30 firefighters at Chernobyl who received acute doses in excess of 800,000 mrem. These individuals succumbed to the effects of the burns they received compounded by their radiation dose.

After an acute dose, damaged cells will be replaced by new cells and the body will repair itself, although this may take a number of months. Only in those extreme cases, such as with Chernobyl firefighters, would the dose be so high as to make recovery unlikely.

Acute doses to only part of the body

It is possible in that radiation exposure may be only to a limited part of the body such as the hands. There have been accidents, particularly with x-ray machines, in which individuals have exposed their fingers to millions of mrem. Some individuals have lost their finger or fingers as a result. It is important for individuals who work with x-ray or similar equipment to be trained in the safe use of this equipment.

Probability of an acute dose

What is important to understand is that it takes a large acute dose of radiation before any physical effect is seen. Theses acute doses have only occurred in Hiroshima/Nagasaki, a few radiation accidents, and Chernobyl. The possibility of a radiological worker receiving an acute dose of ionizing radiation on the job is extremely low. In many areas where radioactive materials are handled, the quantities handled are small enough that they do not produce a large amount of radiation, where there is a potential for larger exposures, many safety features are in place.

Chronic radiation doses

A chronic radiation dose is typically a small amount of radiation received over a long period of time. An example of a chronic dose is the dose we receive from natural background every day of our lives or the dose we receive from occupational exposure.

Chronic dose versus acute dose

The body is better equipped to handle a chronic dose than an acute dose. The body has time to repair damage because a smaller percentage of the cells need repair at any given time. The body has time to replace dead or non-functioning cells with new healthy cells. It is only when the dose of radiation is high and is received very rapidly that the cellular repair mechanisms are overwhelmed and the cell dies before repair can occur. A chronic dose of radiation does not result in detectable physical changes to the body such as is seen with acute doses. Because of cell repair, even sophisticated analyses of the blood do not reveal any biological effects.

Genetic effects

The biological effects of concern from a chronic dose are changes in the chromosomes of a cell and direct irradiation of a fetus. Genetic effects refer to effects to genetic material in a cell chromosome. Genetic effects can be somatic (cancer, etc.) or heritable (future generations).

- Effects in the exposed individual (somatic)

  In this case, the individual has experienced damage to some genetic material in the cell that could eventually cause that cell to become a cancer cell. An example of a somatic effect is cancer. The probability of this is very low at occupational doses.

- Heritable effects (non-somatic)

  A heritable effect is a genetic effect that is inherited or passed on to an offspring. In the case of heritable effects, the individual has experienced damage to some genetic material in the reproductive cell. Heritable effects from radiation have never been observed in humans but are considered possible and have been observed in plants and animals. This includes the 77,000 Japanese children born to the survivors of Hiroshima and Nagasaki (these children were conceived after the atom bomb). Studies have followed these children, their children, and their grand children.

Factors affecting biological damage due to exposure to radiation

- Total dose - In general, the greater the dose, the greater the potential of biological effects.
- Dose rate - The faster the dose is delivered, the less time the cell has to repair itself.
- Type of radiation - Alpha radiation is more damaging than beta or gamma radiation for the same energy deposited.
- Area of the body receiving the dose - In general, the larger the area of the body is exposed, the greater the biological effect. Extremities are less sensitive than internal organs. That is why the annual dose limit for extremities is higher than for a whole body exposure that irradiates the internal organs.
- Cell sensitivity - The most sensitive cells are those that are rapidly dividing.
- Individual sensitivity - Some individuals are more sensitive to environmental factors such as ionizing radiation. The developing embryo/fetus is the most sensitive, and children are more sensitive than adults. In general, the human body becomes relatively less sensitive to ionizing radiation with increasing age. The exception it that elderly people are more sensitive than middle aged adults due to the inability to repair damage as quickly (less efficient cell repair mechanisms).

Prenatal Radiation Exposure

Although no effects were seen in Japanese children conceived after the atomic bomb there were effects seen in some children who were in the womb when exposed to the atomic bomb radiation at Hiroshima and Nagasaki.

Sensitivity of the unborn

Embryo/fetal cells are rapidly dividing which makes them sensitive to any environmental factors such as ionizing radiation.

Potential effects associated with prenatal exposures

Many chemical and physical (environmental) factors are suspected of causing or known to cause damage to an unborn child in the early stages of pregnancy, alcohol consumption, exposure to lead, and heat from hot tubs are only a few that have been publicized lately. Some children who were exposed while in the womb to the radiation from the atomic bomb were born with small head size and mental retardation. It has been suggested but is not proven that dose to the unborn may also increase the chance of childhood cancer. Only when the dose exceeds 15,000 mrem is there a significant increase in risk.

Limits are established to protect the embryo/fetus from any potential effects that may occur from a significant radiation dose. This may be the result of dose from external sources of radiation or internal sources of radioactive material. At present occupational dose limits, the actual risk to the embryo/fetus is negligible when compared to the normal risks of pregnancy.

Risks in Perspective

Because ionizing radiation can damage the cell's nucleus, it is possible that through incomplete repair a cell could become a cancer cell.

Risk from exposure to ionizing radiation

- No increases in cancer have been observed in individuals exposed to ionizing radiation at occupational levels. The possibility of cancer induction cannot be dismissed even though an increase in cancers have not been observed, risk estimates have been derived from studies of individuals who have been exposed to high levels of radiation.

Comparison of risks

- Acceptance of a risk is a highly personal matter and requires a good deal of informed judgement.
- The risks associated with occupational radiation doses are considered acceptable as compared to other occupations and daily activities.

Table 1 compares the estimated days of life expectancy lost as a result of exposure to radiation and other health risks. These estimates indicate that the health risks from occupational radiation dose are smaller than the risks associated with normal day-to-day activities that we have grown to accept.

Table 1

Average estimated days lost due to daily activities

Health Risk	Average estimated days lost
Unmarried male	3500
Cigarette smoking	2250
Unmarried female	1600
Coal Miner	1100
25% overweight	777
Alcohol (US Average)	365
Construction worker	227
Driving a motor vehicle	207
100 mrem/year for 70 years	10
Coffee	6

Table 2 addresses the estimated days of life expectancy lost as a result of radiation doses received and common industrial accidents at radiation-related facilities. It compares these numbers to days lost as a result of fatal work-related accidents in other occupations.

Table 2

Average estimated days lost in various occupations

Industry	Average estimated days lost
Mining/Quarrying	328
Construction	302
Agriculture	277
Radiation dose of 5,000 mrem/yr for 50 years	250
Transportation/Utilities	164
All industry	74
Government	55
Service	47
Manufacturing	43
Trade	30
Radiation accidents (deaths from exposure)	<1

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4. RADIATION LIMITS

Learning Objectives

Upon completion of this unit, the participant will be able to identify restrictions regarding dose limits and administrative control levels.

- State the purpose of administrative control levels.
- Identify radiation dose limits.
- State the policy concerning prenatal radiation exposure.
- Identify the employee's responsibility concerning radiation dose limits and administrative control levels.
- Describe the action a worker should take if he or she suspects that dose limits or administrative control levels are being approached or exceeded.

Introduction

In order to minimize the biological effects associated with radiation, dose limits and administrative control levels have been established.

Dose Limits and Administrative Control Levels

Radiation dose limits are set for occupational workers based on guidance from the Environmental Protection Agency (EPA), NRC, DOE, the National Council on Radiation Protection and Measurement (NCRP), and the International Commission on Radiological Protection (ICRP). These limits are also consistent with the "Radiation Protection Guidance to Federal Agencies for Occupational Exposure" signed by the President of the United States.

Typical administrative control levels for radiological workers are lower than the Federal limits and are set to ensure that Federal limits are not exceeded. They also help reduce individual and total worker population radiation dose.

The Federal dose limits are as follows:

- Whole body

  Definition: The whole body extends from the top of the head down to just below the elbow and just below the knee. This is the location of most of the blood producing and vital organs.

  There are limits for external radiation dose and there are limits for internal radiation dose. Internal dose results from radioactive material being inhaled, ingested, injected, or absorbed through the skin or a wound.

Limits are based on the sum of internal and external dose.

The Federal radiation dose limit during routine conditions is 5 rem/year (5,000 mrem). Since Sevenson's objective is to maintain personnel radiation doses well below the regulatory limits, administrative control levels have been established. The administrative control level can vary from site to site depending on the activities.

- Extremities

Definition: Extremities include the hands and arms below the elbow and the feet and legs below the knees.

Extremities can withstand a much larger dose than the whole body since there are no major blood-producing organs located there.

The Federal radiation dose limit for the extremities during routine conditions is 50 rem/year (50,000 mrem).

- Skin and other organs

Federal radiation dose limits for skin and other organs during routine conditions is 50 rem/year (50,000 mrem).

- Lens of the eye

Federal radiation dose limits for the lens of the eye during routine condition is 15 rem/year (15,000 mrem).

- Declared pregnant worker (embryo/fetus)

Sevenson policy

A female worker is encouraged to voluntarily notify her employer, in writing, when she is pregnant. When she has done so, the employer must provide the option of a mutually agreeable job, with no less pay or promotional opportunity, such that further occupational radiation exposure is unlikely.

This declaration may be withdrawn, in writing, at any time by the declared pregnant worker.

NRC Regulatory Guidance 8.13 "Instruction Concerning Prenatal Radiation Exposure" provides information for the worker and supervisor.

Federal limit

For a declared pregnant worker who continues working as a radiological worker, the dose limit for the embryo/fetus (during the entire gestational period) is 500 mrem. Efforts should be made to avoid exceeding 50 mrem/month to the pregnant worker. If the dose to the embryo/fetus is determined to have already exceeded 500 mrem, the worker shall not be assigned to tasks where additional occupational radiation exposure is likely during the remainder of the pregnancy.

- Visitors and the public

  The Federal radiation dose limit for visitors and the public is 0.100 rem/year (100 mrem).

Workers responsibilities regarding dose limits/control levels

It is each employees responsibility to comply with Federal dose limits, and administrative control limits.

If you suspect that dose limits or administrative control levels are being approached or exceeded, you should notify you supervisor immediately.

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5. ALARA PROGRAM

Learning Objectives

Upon completion of this unit, the participant will be able to explain the methods used to implement an ALARA Program.

- State the ALARA concept.
- State the management policy for the ALARA Program.
- Identify the responsibilities of management, Radiation Safety Department, and the radiological worker in the ALARA Program.
- Identify the basic protective measures of time, distance, and shielding.
- Identify methods for reducing external and internal radiation dose.
- State the pathways by which radioactive material can enter the body.
- Identify methods a radiological worker can use to minimize radioactive waste.

Introduction

This unit is designed to inform the worker of the concept of ALARA (As Low As is Reasonably Achievable). While ALARA is a concept that can apply to any biological hazard, just the radiation hazard will be addressed. Methods for reducing both external and internal doses from radiation and radioactive material are also discussed.

Even though there are dose limits and administrative control levels, we strive to keep our radiation dose well below these. Employees should always try to maintain their radiation dose ALARA.

ALARA Program

- ALARA concept

  Since some risk, however small, exists from any radiation dose, all doses should be kept ALARA. ALARA includes reducing both internal and external radiation dose. The ALARA concept is an integral part of all activities that involve the use of radioactive materials.

- Sevenson/Waste Stream Management Policy for the ALARA Program

  Personnel radiation exposure shall be maintained ALARA. Radiation exposure of the work force and public shall be controlled such that:

  - Radiation exposures are well below regulatory limits
  - There is no occupational radiation exposure without an expected benefit

ALARA is the responsibility of all employees.

Responsibilities for the ALARA Program

Although the individual radiation worker is ultimately responsible for maintaining his/her radiation dose ALARA, management and Radiation Safety personnel also play an important role in the ALARA program. The following are some of the responsibilities of the three groups:

Management

- Being knowledgeable of the contents of the ALARA Plan.
- Ensuring that employees have been fully informed of , and possess a thorough understanding of the sections contained in this Plan which apply to their job assignment.
- Ensuring that all necessary training is scheduled, completed, and ensure the maintaining of auditable training records which will include any follow-up training as well as all annual refresher training.
- Reviewing the Radiation Control and Protection Program content contained in the ALARA Plan and reviewing the efficiency of its implementation on an annual basis.
- Maintaining records (i.e., provisions of the program, audits, reviews, surveys) related to the Radiation Safety Program.

Radiation Safety Office

- The Radiation Safety Office is responsible for implementing the ALARA Plan. They are also responsible for implementing the requirements for the entire Radiation Safety Program. These requirements are established in Sevenson's radiological policies and procedures.
- Radiation Safety Technicians (RST) provide a point of contact for the worker to obtain the most current radiological conditions in an area. RST provide assistance when trying to interpret protective requirements or radiological information concerning work assignment and they address radiological questions/concerns.

Radiological Workers

- Each person involved in radiological work is expected to demonstrate responsibility and accountability through an informed, disciplined, and cautious attitude toward radiation and radioactivity.

External and Internal Radiation Dose Reduction

Basic protective measures used to reduce external dose include minimizing time in radiation areas, maximizing the distance from a source of radiation and using shielding whenever possible.

Methods for minimizing time:

Reducing the amount of time spent in a Radiation Area will lower the dose received by the workers.

- Plan and discuss the task prior to entering the area. Use only the number of workers actually required to do the job.
- Have all necessary tools present before entering the area.
- Use mock-ups and practice runs that duplicate work conditions.
- Take the most direct route to the work area, if possible and practical.
- Never loiter in an area controlled for radiological purposes.
- Work efficiently and swiftly.
- Do the job right the first time.
- Perform as much work outside the area as possible or , when practical, remove parts or components to areas with lower dose rates to perform work.
- In some cases, Radiation Safety personnel may limit the amount of time a worker may stay in an area due to various reasons. This is known as "stay time". If you have been assigned a stay time, do not exceed this time.

Methods for maximizing distance from sources of radiation

- The worker should stay as far away from the source of radiation as possible.
- For point sources, such as valves and hot spots, the dose rate follows a principle called the inverse square law.

$$I_2 = \frac{I_1 \ D_1^2}{D_2^2}$$

  This law states that if you double the distance, the dose rate falls to 1/4 of the original dose rate. If you triple the distance, the dose rate falls to 1/9 of the original dose rate.
- Be familiar with radiological conditions in the area.
- During work delays, move to lower dose rate areas.
- Use remote handling devices when possible.

Proper use of shielding:

Shielding reduces the amount of radiation dose to the worker. Different materials shield a worker from the different types of radiation.

- Take advantage of permanent shielding including non-radiological equipment/structures.
- Use shielded containments when available.
- Wear safety glasses/goggles to protect your eyes from beta radiation, when applicable.

Temporary shielding (e.g., lead or concrete blocks) can only be installed when proper procedures are used. Temporary shielding will be marked or labeled with wording such as, "Temporary Shielding - Do Not Remove Without Permission from Radiological Safety Office". Once temporary shielding is installed, it cannot be removed without proper authorization.

- It should be remembered that the placement of shielding may actually increase the total dose (e.g., person-hours involved in installing and removing shielding).

Source Reduction

Source reduction normally involves procedures such as flushing radioactive systems, decontamination, etc. to reduce the amount of radioactive materials present in/on a system that can add to radiation levels in an area.

Internal Radiation Dose Reduction

Internal dose is a result of radioactive material being taken into the body. Radioactive material can enter the body through one or more of the following pathways:

- Inhalation
- Ingestion
- Injection
- Absorption through the skin
- Absorption through the wounds

Methods to reduce internal radiation dose

Reducing the potential for radioactive materials to enter the body is important. The following are methods the worker can use:

- Wear respirators correctly when required (if qualified).
- Report all wounds or cuts (including scratches) to radiation safety personnel before entering any area controlled for radiological purposes.
- Comply with the requirements of the controlling work documents.
- Do not eat, drink, smoke or chew in areas controlled for radiological purposes.

Radioactive Waste Minimization

One of the consequences of working in and around radioactive materials is that radioactive waste will be generated. This radioactive waste must be disposed of in the proper manner.

Examples of radioactive waste include:

- paper
- gloves
- glassware
- rags
- brooms, mops

To reduce personnel dose and reduce costs associated with the handling, packaging and disposal of radioactive waste it is very important for each employee to minimize the amount of radioactive waste generated.

Methods to Minimize Radioactive Waste

Minimize the materials used for radiological work

- Take only the tools and materials you need for the job into areas controlled for radiological purposes especially contamination areas.
- Unpack equipment and tools in clean areas to avoid bringing excess clean material to your work area.
- Whenever possible, use tools and equipment identified for radiological work. If you do not know where to get tools that are to be used for radiological work, ask your supervisor.
- Use only the material required to clean the area. An excessive amount of bags, rags, and solvent adds to radioactive waste.

Separate radioactive waste from non-radioactive waste.

- Place radioactive waste in the containers identified for radioactive waste, not in containers for non-radioactive waste.
- Do not throw non-radioactive waste, or radioactive material that may be reused, into radioactive waste containers.
- Separate compactible material form non-compactible material.
- Minimize the amount of mixed waste generated.
- Use good housekeeping techniques.

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6. PERSONNEL MONITORING PROGRAMS

Learning Objectives

Given different personnel monitoring programs, identify the purpose, types and worker responsibilities for each.

- State the purpose of each of the personnel dosimeter devices used at the site.
- Identify worker responsibilities concerning each of the external personnel dosimeter devices used at the site.
- State the purpose of each type of internal monitoring method used.
- Identify worker responsibilities concerning internal monitoring programs.
- State methods for obtaining radiation dose records.
- Identify worker responsibilities for reporting radiation dose received from other sites and from medical applications.

Introduction

Each employee's external and internal dose to ionizing radiation is assessed using special types of monitoring equipment. The types used depend on the radiological conditions present.

External Dosimetry

A dosimeter is a device that is used to measure radiation dose. Dosimeters used to measure external sources of radiation are called external dosimeters.

Self Read Pocket Dosimeter (SRPD) or Pocket Ion Chamber (PIC)

SRPDs or PICs are used in conjunction with an Optically stimulated luminescence (OSL) badge to measure real time radiation dose. These devices are primarily used for informational purposes only, however radiation dose may be assigned to a visitor by SRPD or PIC reading.

OSL badge (replaced the TLD)

OSL badge will also be used to measure radiation exposure. The OSL consists of a holder, filters, and an aluminum oxide detector. After use, the aluminum oxide is stimulated with a laser light causing the aluminum oxide to become luminescent in proportion to the amount of radiation exposure. The luminescence is measured and a report of exposure results is generated.

All personnel who work in a radiological restricted work area will be provided with a OSL.

Worker responsibility for external dosimetry include the following:

- Wear dosimeters at all times in areas controlled for radiological purposes when required by signs, work permits, procedures or Radiation Safety personnel. Primary dosimeters are worn on the chest area, between the waist and the neck in a manner directed by radiation safety personnel. There may be situations that arise that may require dosimetry to be worn on different locations of the body, if this is the case, radiation safety personnel will inform the worker of the new requirements.
- Wear supplemental dosimeters (e.g., pocket, electronic, neutron) when required, in accordance with site policy.
- Take proper actions if dosimeter is lost, off scale, damaged, or contaminated while in an area controlled for radiological purposes. These actions include:
  - Place work activities in safe condition
  - Alert others
  - Immediately exit the area
  - Notify Radiation Safety personnel
- Know the proper dosimeter storage location.
- Return dosimeters for processing periodically. Personnel that fail to return dosimeters will be restricted from continued radiological work.
- Dosimeters issued from the permanent work site cannot be worn at another site.

Internal Monitoring

Whole body counters, lung counters, and/or bioassay samples may be used to determine the kinds, quantities, or concentrations of radioactive material in the human body. In some cases, locations of radioactive material in the human body may be determined. An internal dose may be calculated from these measurements.

Whole body counters

Whole body counting is use to determine the body burden of a deposited radionuclide. This involves the placement of an external radiation detector near the body to measure radiations emitted from internally deposited radionuclides. Practically this method is limited to gamma emitting radioisotopes.

Lung counters

Lung counters are useful under occupational conditions in which workers might inhale airborne radioactive contaminants. Lung counters are also used to determine if radioactive material has been deposited into the lungs after a person has been exposed to airborne radioactive contamination.

Bioassay sampling

As used in radiation safety, the term bioassay refers to some analysis procedure for determining the nature and activity of the internal contamination present in a person by making measurements on a body excretion product. It is assumed that the concentration of radioactivity in the body elimination product is proportional to the activity deposited in the body.

There are a number of body elimination products that have been used from time to time in bioassay procedures; e.g., exhaled air, nail clippings, nasal mucous, urine, sweat, saliva, hair and feces. Routine large bioassay programs almost exclusively use urine as the sample. Sampling by nasal swab is common during a radiation accident.

Radiation Dose Records

Your exposure history is available to you upon written request to the Radiation Safety Office.

- Personnel (non-visitors) who are monitored with dosimeters will be provided an annual report of their radiation dose.
- Detailed information concerning any individual's dose shall be available to the individual upon written request by the individual.
- Terminating personnel will receive a report of the radiation dose received at that site.

Reporting radiation dose received from other facilities and medical applications.

- Notify Radiation Safety personnel, prior to and following, any radiation dose received at any other facility so that dose records can be updated.
- Notify Radiation Safety Office if you have received any medical procedures involving radioisotopes(i.e., barium, iodine, thallium - this does not include routine medical and dental x-rays).

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7. RADIOLOGICAL POSTINGS AND CONTROLS

Learning Objectives

Upon completion of this unit, the participant will be able to discuss general radiological postings and job specific Radiation Work Permits (RWP(s)).

- State the purpose of and information found on RWPs.
- Identify the worker's responsibilities in using RWPs.
- Identify the colors and symbol used on radiological postings.
- State the radiological and disciplinary consequences of disregarding radiological postings, signs, and labels.
- Define the areas controlled for radiological purposes.
- Identify the minimum requirements for entering, working in, and exiting:
    - Radiological Buffer Areas (RBA) or Contamination Reduction Zones (CRZ)
    - Radiation Areas
    - Radioactive Material Areas
    - Underground Radioactive Material Areas
    - Contaminated Areas
    - Radioactive Airborne Area
- Identify the purpose and use of personnel contamination monitors.

Radiation Work Permits

RWPs are used to establish radiological controls for entry into areas controlled for radiological purposes. They serve to inform workers of area radiological conditions, entry requirements into the areas, and provide a means to relate radiation doses received by workers to specific work activities.

There are two types of RWPs.

- A General Radiation Work Permit is used to control routine or repetitive activities such as tours and inspections in area with historically stable radiological conditions. General RWPs typically expire at midnight on December 31st of a given year.
- A Job Specific Radiation Work Permit is use to control nom-routine operations or work in areas with changing radiological conditions. It is valid for the duration of a particular job.

The RWP should include the following information:

- Description of work
- Work area radiological conditions

    - This information may also be determined from area radiological survey maps/diagrams or the radiological postings for that area.
- Dosimetry requirements
- Pre-job briefings (as applicable)
    - Pre-job briefings generally consist of workers and supervisors discussing various radiological aspects and controls of the job. This is done to minimize radiological exposure and unplanned situations.
- Required level of radiological training for entry.
- Protective clothing and protective equipment requirements.
- Radiation Safety coverage requirements and stay time controls, as applicable.
- Limiting radiological conditions which may void the permit.
- Special dose or contamination reduction considerations.
- Special personnel frisking considerations.
- Technical work document and other unique identifying numbers.
- Date of issue and expiration.
- Authorizing signatures.

Worker RWP Responsibilities

- Workers must read and comply with the RWP requirements.
- Workers must acknowledge by signature that they have read, understood, and will comply with the RWP prior to entering the radiological area.
    - RWP sign-in sheets will be used to acknowledge the above information. Sign-in sheets are auditable records so individuals must fill out the sheet completely. Errors will be crossed out with a single line through the error and then initialed and dated by the person making the correction.
- If you believe the RWP is incorrect or you don't understand any of the information, contact Radiation Safety personnel or your supervisor prior to beginning work.
- Do not make substitutions for specified requirements. The use of protective clothing or equipment beyond that specified by the Radiation Safety Office is not authorized.
- Report to Radiation Safety personnel if radiological controls are not adequate or are not being followed.

Radiological Postings

Radiological postings are used to:

- Alert personnel to the presence of radiation and radioactive materials.
- Aid in minimizing personnel dose.
- Prevent the spread of contamination.

Posting Requirements

Areas and materials controlled for radiological purposes will be designated with a magenta (or black) standard three-bladed radiological warning symbol (trefoil) on a yellow background.

- Fixed barriers such as walls, rope, tape, barricade fence, or chain will designate the boundaries of posted areas. Where possible, the barriers will be yellow and magenta in color.
- The barriers should be placed to clearly mark the boundary of the radiological areas. Controlled Areas may use the buildings as the barrier.
- Entrance points to radiologically controlled areas will have signs (or postings) stating the entry requirements, such as, "Personnel Dosimeters, RWP and Respirator Required".
- In some cases, more than one radiological hazard may be present in the area. The area will be posted with all radiological hazards that are present.
- In areas of on-going work activities, the dose rate and contamination levels or ranges of each may be included if applicable.
- The posting should be placed where it is clearly visible to personnel.
- All applicable sides of area shall be posted.

Responsibilities of the Worker Associated with Postings, Signs, and Labels

Before entering an area controlled for radiological purposes, read all signs. Since radiological conditions can change, the signs will also be changed to reflect the new conditions. A sign or posting that you saw one day may be replaced with a new one the next day.

Obey any posted, written or oral requirements including "Exit", "Evacuate", "Hold Point" or "Stop Work Orders", from the Radiation Safety Office.

- Hold points are specific times noted in a procedure, work permit, etc. where work must stop for Radiation Safety evaluations.
- Stop Work Orders are usually a result of:
  - inadequate radiological controls
  - radiological controls not being implemented, or
  - radiological hold point not being observed

Report unusual conditions to the Radiation Safety personnel such as leaks or spills, dusty or hazy air, and alarming area monitors.

Be aware of changing radiological conditions. Be aware that the activities of other personnel in the area may change the radiological conditions in your area.

If any type of material used to identify radiological hazards (i.e., radiological signs, tags, stickers, laundry bags marker contaminated laundry only, etc.) is found outside an area controlled for radiological purposes, it should be reported to Radiation Safety personnel immediately.

Consequences of Disregarding Radiological Postings. Signs, and Labels

It is each worker's responsibility to read and comply with all the information identified on radiological postings, signs and labels. Disregarding any of these or removing/relocating them without permission can lead to:

- unnecessary or excessive radiation dose
- personnel contamination
- disciplinary actions such as formal letters of reprimand, suspension, or termination.

Requirements for Entry, Exit, and Working in Radiologically Posted Areas

The following are the various areas controlled for radiological purposes.

Radiological Areas

- Radiation Areas
    - Radiation Area
    - High Radiation Area
    - Very High Radiation Area
- Contamination Areas
    - Contamination Area
    - High Contamination Area
    - Fixed Contamination Area
    - Airborne Contamination Area
    - Soil Contamination Area
- Radiological Buffer Areas
- Other Radiological Areas
    - Radioactive Materials Area
    - Underground Radioactive Materials Area

RBAs or CRZs provide secondary boundaries to minimize the spread of radioactive contamination and to limit doses to general employees who have not been trained as radiological workers.

Posting Requirements:

- "CAUTION, RADIOLOGICAL BUFFER AREA"

Minimum requirements for Unescorted Entry:

- Radiological Worker I Training
- Personnel dosimetry, as appropriate

Personnel exiting a RBA containing a contamination, high contamination, or airborne radioactivity area should, at a minimum, perform a hand and foot frisk.

Frisking methods

General Requirements for using a hand-held radioactive contamination survey instrument.

- Make sure the instrument is within it's calibration date
- Confirm the instrument is on and set to the proper scale
- Verify instrument response and perform source check
- Ensure the audible function of the instrument is on and can be heard
- Determine the instrument background
- Survey hands before picking up the probe
- Hold probe approximately ½" from the surface being surveyed for beta/gamma contamination and 1/4" for alpha contamination
- Move probe slowly over the surface, approximately 2" per second
- If the count rate increased during frisking, pause for 5 - 10 seconds over the area to provide adequate time for instrument response
- If contamination is indicated, remain in the area and notify Radiation Safety personnel
- Minimize cross contamination (for example, put a glove on a contaminated hand) while waiting for Radiation Safety personnel to arrive

Radiation Area means any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 5 mrem/hr but less than or equal to 100 mrem/hr. This is established based on dose rates at 30 cm from the source of radiation.

Posting Requirements

- "CAUTION, RADIATION AREA"
- "Personnel Dosimetry Required for Entry"

Minimum Requirements for Unescorted Entry:

- Radiological Worker I Training
- Personnel dosimetry
- Worker's signature on the RWP sign in sheet, as applicable

Requirements for working in Radiation Areas

- Don't loiter in the area
- Follow proper emergency response to abnormal situations
- Radiological Worker I and II training
- Personnel dosimetry
- Worker's signature on the RWP sign in sheet

Requirements for Exit

- Observe posted exit requirements

High Radiation Area means any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 100 mrem/hr at 30 cm from the source but less than or equal to an absorbed dose of 500 rad/hr at 1 meter from the source of radiation.

Posting Requirements

- "DANGER, HIGH RADIATION AREA"
- "Personnel Dosimetry Required for Entry"

Requirements for working in High Radiation Areas:

- Entry into this area will require specialized training.

Very High Radiation Area means any area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rad/hr at 1 meter from the source of radiation.

Posting Requirements

- "GRAVE DANGER, VERY HIGH RADIATION AREA"
- "SPECIAL CONTROLS REQUIRED FOR ENTRY"

Requirements for working in Very High Radiation Areas:

- Entry into this area will require specialized training.

Contamination Area means those areas where contamination are greater than 1 time but less than or equal to 100 times the specified DOE or NRC limits.

Posting Requirements

- "CAUTION, CONTAMINATION AREA"

Requirements for working in Contaminated Areas

- Unescorted entry into this area will require specialized training

High Contamination Area means any area where contamination levels are 100 times the specified limits.

Posting Requirements

- "DANGER, HIGH CONTAMINATION AREA"
- "RWP REQUIRED FOR ENTRY"

Requirements for working in High Contaminated Areas:

- Entry into this area will require specialized training.

Airborne Radioactivity Area means any area where the concentration of airborne radioactivity, above natural background, exceeds or is likely to exceed the specified regulatory limits.

Posting Requirements:

- "CAUTION, AIRBORNE RADIOACTIVITY AREA"
- "RWP REQUIRED FOR ENTRY"

Requirements for working in Radioactive Airborne Areas:

- Entry into this area will require specialized training.

Radioactive Materials Area (RMA) is an area where radioactive materials are used, handled or stored. This posting will not be required when the radioactive materials are located inside Contamination or Airborne Radioactivity Areas.

Radioactive material may consist of equipment, components or materials which have been exposed to contamination or have been activated. Sealed or unsealed sources are also included.

Radioactive materials may be stored in drums, boxes, etc. and will be marked appropriately.

Posting Requirements:

- "CAUTION, RADIOACTIVE MATERIALS AREA"
- "CAUTION, RADIOACTIVE MATERIALS"

The following posting will be used to designate equipment or components with actual or potential contamination.

- "CAUTION, INTERNAL CONTAMINATION"
- "CAUTION, POTENTIAL INTERNAL CONTAMINATION"

Minimum requirements for unescorted entry:

- Radiological Worker I

For entry into RMAs where whole body dose rates exceed 5 mrem/hr, the Radiation Area entry requirements will apply.

For entry into RMAs where removable contamination levels exceed the specified regulatory limits, the Contamination Area entry requirements will apply.

Requirements for working in RMAs

- Requirements for working in RMAs will be designated by the RWP or the Radiation Safety Office.

Fixed Contamination Area may be an area or piece of equipment that contains radioactive material that cannot be easily removed from surfaces by nondestructive means, such as wiping, brushing, or laundering. Fixed Contamination Areas may be located outside of Controlled Ares.

Posting Requirements:

- "CAUTION, FIXED CONTAMINATION"

Contact the Radiation Safety Office for entry requirements.

Soil Contamination Area any area that contains surface soil or sub surface contamination levels that exceed the specified regulatory limits. A Soil Contamination Area may be located outside an Radiological Buffer Area.

Posting Requirements:

- "CAUTION, SOIL CONTAMINATION AREA"

Contact the Radiation Safety Office for entry requirements.

Underground Radioactive Materials Area are established to indicate the presence of underground items that contain radioactive materials such as pipelines, radioactive cribs, covered ponds, inactive burial grounds and covered spills. Such areas may be outside of the Controlled Area.

Posting Requirements:

- "CAUTION, UNDERGROUND RADIOACTIVE MATERIALS"

Special instructions such as, "Consult with Radiation Safety Office Before Digging" may be included.

Requirements of Entry:

- An underground RMA is exempt from general entry and exit requirements if individual doses do not exceed 100 mrem/yr.
- Contact the Radiation Safety Office prior to entry.

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8. RADIOLOGICAL EMERGENCIES

Learning Objectives

Upon completion of this unit, the participant will be able to identify radiological emergencies and alarms and the appropriate response to each.

- State the purpose of emergency alarms.
- Identify the correct response to emergencies and/or alarms.
- State the possible consequences of disregarding radiological alarms.
- State the DOE and NRC occupational emergency radiation dose guidelines.

Introduction

Various radiological monitoring systems are used to alert personnel if abnormal radiological conditions exist. It is very important that employees become familiar with these alarms to prevent unnecessary exposure to radiation and contamination.

Emergency Alarms and Responses

Equipment that monitors for abnormal radiation dose rates and airborne contamination levels are placed in strategic locations throughout facilities. It is essential for the worker to be able to identify the equipment and alarms and respond appropriately to each.

Disregard for Radiological Alarms

Disregarding any of these radiological alarms may lead to:

- Possible excessive personnel radiation dose
- Unnecessary spread of contamination
- Disciplinary action

Radiological Emergency Situations

Working in a radiological environment requires more precautionary measures than performing the same job in a non-radiological setting. If an emergency arises during radiological work, additional precautions may be necessary.

Personnel injuries in areas controlled for radiological purposes.

- Medical emergencies or accidents can be divided into two categories. The first category is non-life- threatening and the second being considered as life-threatening.
    - Non-life-threatening medical emergency victims will be given first aid on

site. Prior to the victims leaving the site the victim will be monitored for radioactive contamination. If the individual is contaminated decontamination procedures will be followed unless it is determined that the emergency is life-threatening.

- In the event that a life-threatening accident or injury occurs, the victims life takes prominence over any radiological controls. The victim will be treated and transported to a medical facility as soon as possible. Attempts will be made to minimize the spread of contamination and the medical center will be notified of the potentially radioactivity contaminated victim being transported to the facility.

In emergency situations where an individual is seriously injured in a contaminated area, the first priority is to treat the injury.

Situations that require immediate exit from an area controlled for radiological purposes.

- Accidental Spillage of Radioactive Materials

Should radioactive or contaminated materials be accidentally released from their container, the following actions should be taken. Personnel are to follow the instructions below which have been developed using the SWIMS acronym:

S	=	Stop the spill
W	=	Warn other personnel
I	=	Isolate the spill area
M	=	Minimize personnel exposure
S	=	Secure the appropriate equipment

- **Stop the spill.** If the spill has occurred from a source which may or is continuing to add material to the spill, take such measures as necessary to stop the spill, such as closing a valve or blocking the path of the fluid with absorbent material. A balance of risk to the individual must be weighed for potential personnel risk in these actions versus the potential safety and economic cost if limited actions are taken. If mechanical action is needed, such as closing a valve or disabling a pump, knowledge of the effect on the total system or machinery involved is required prior to such actions.
- **Warn other personnel.** Others in the immediate area and those entering the area must be told of the event to enable all personnel to take the appropriate response actions. Health physics personnel must be notified as soon as possible.
- **Isolate the spill area.** Non-vital personnel will be kept out of the immediate vicinity, if necessary, by having someone posted at the entrance to the area. Personnel who have been contaminated will remain in the immediate vicinity to prevent the spread of contaminants until health

physics personnel release them. An exception to this is when the ambient radiation levels are high or if a traumatic injury requiring leaving the area has occurred.

- **Minimize personnel exposure.** The event may include both a radiological and a chemical hazard. Personnel will remain in the immediate vicinity until health physics personnel arrive both to assist in spill control and to be available for surveying of exposed individuals. The nature of the spill, both chemical and radiological, and the need to monitor the spill will dictate how close personnel should remain.
- **Secure the appropriate equipment.** Ventilation or other operating equipment may be selected for shutdown due to the nature of the spill and to prevent further occurrence. Knowledge of the system and equipment involved is necessary prior to taking such action.

- Fire in a Restricted Area
  - Areas will be evacuated by all non-emergency personnel when a fire, heavy smoke, or similar fumes occur in a controlled area.
  - When possible, the fire will be extinguished by personnel in the immediate vicinity rather than allowing it to grow into larger proportions while designated personnel are on their way.
  - If a fire cannot be rapidly extinguished, the local fire department will be summoned for fire detail:
    - fire fighting personnel will be informed that radioactive material may be present
    - fire detail will wear self-contained respiratory equipment, protective clothing, and any other items deemed necessary by the lead health physics individual
    - the primary function of the fire detail will be to save equipment and property without endangering their own or other lives
    - the secondary function of the fire detail is to minimize the spread of contamination outside the controlled area
  - Fire extinguishing agents, such as CO_2, foam, or dry chemicals, are preferred as this minimizes the volume of potentially contaminated liquids.
  - All firefighting personnel will be surveyed prior to exiting the event area except for those in need of immediate medical assistance outside the controlled area. Minimization of the spread of contamination will be kept in mind at all times.

Considerations in Rescue and Recovery Operations

In extremely rare cases, emergency exposure to high levels of radiation may be necessary to rescue personnel or protect major property.

Rescue and recovery operations that involve radiological hazards can be a very complex issue with regard to the control of personnel exposure. The type of response to these operations is generally left up to the official in charge of the emergency situation. The official's judgement is guided by many variables which include determining the risk versus the benefit of the action, as well as how to involve other personnel in the operation.

Rescue actions that might involve substantial personal risk shall be performed by volunteers. The use of volunteers will be based on their age, experience, and previous exposure.

DOE, NRC, and Agreement States emergency dose guidelines for rescue and recovery operations are as follows:

- Protecting major property where the lower dose limit of 5 rem is not practical - 10 rem.
- Lifesaving or protection of large populations where the lower dose limit is not practicable - 25 rem.
- Lifesaving or protection of large population - only on a voluntary basis to personnel fully aware of risks involved - greater than 25 rem.

9. HIGH/VERY HIGH RADIATION AREAS

Learning Objectives

- Define High Radiation Area and Very High Radiation Area.
- Identify the signs and postings used for High Radiation and Very High Radiation Areas.
- Identify site specific sources and locations that may produce High Radiation Areas and Very High Radiation Areas.
- State the requirements for entering, working in and exiting High Radiation and Very High Radiation Areas.
- Identify the correct responses to emergencies and/or alarms within a High Radiation Area and Very High Radiation Area.

Introduction

The High Radiation and Very High Radiation Area section of the study guide familiarizes the participant with the course content, including entry, working in and exit requirements associated with these high radiation areas.

Definitions

A High Radiation Area is an area accessible to personnel in which radiation levels could result in a person receiving a dose equivalent in excess of 0.1 rem (100 mrem) but less than or equal to 500 rad in one hour at 30 cm (1 ft) from the radiation source.

A Very High Radiation Area is an area accessible to personnel in which radiation levels could result in a person receiving and absorbed dose in excess of 500 rad in one hour at 100 cm (1 yard) from a radiation source.

Entry requirements

The requirements for entry into a High and Very High Radiation Areas include:

- Radiological Worker I training plus High Radiation and Very High Radiation Area Course or Radiological Worker II training.
- Worker signature on the appropriate RWP sign in sheet.
- Personal and supplemental dosimeter(s).
- Survey meter(s) or dose rate indicating device(s) must be available at the work area.
- Access points will be secure by control devices.
- A radiation survey prior to the first entry.
- Notification of operations personnel.

Working In Requirements

Additional requirements will be needed where dose rates are >1 rem/hr. Examples would include formal radiological review of non-routine or complex work, pre-job briefing, determination of worker's current dose, and radiological safety coverage.

Always practice ALARA when working in High or Very High Radiation Areas. In addition, one should never loiter. Know your job, perform it quickly and efficiently and exit upon completion of the identified task.

Emergencies

Violation of a radiological boundary, posting, or by passing a physical access control point is a serious issue, likely to result in damage to equipment or injury to personnel.

If unanticipated elevated radiation levels are indicated by an off scale dosimeter, radiological alarms, or other indicators, you should stop work alert others, immediately exit the area, and notify Radiation Safety personnel.

Controlling exposure to radiation during rescue and recovery actions is extremely complex. Multiple hazards and alternate methods are to be taken into account; prompt, sound judgement and flexibility of action are crucial to the success of any emergency action(s). The risk of injury to those persons involved in the rescue and recovery activities should be consistent with the immediate objectives of saving human life, recovering deceased victims, and/or protection of health and property.

The type of response to these operations is generally left up to the officials in charge of the emergency situation. The official's judgement is guided by many variables which include determining the risk versus benefit of the action, as well as how to involve other personnel in the operation.

10. RADIOACTIVE CONTAMINATION CONTROL

Learning Objectives

Upon completion of this unit, the participant will be able to discuss

- Define fixed, removable, and airborne contamination.
- State sources of radioactive contamination.
- State the appropriate response to a spill of radioactive material.
- Identify methods used to control radioactive contamination.
- Identify the proper use of protective clothing.
- Identify the purpose and use of personnel contamination monitors.
- Identify the normal methods used for decontamination.
- Define Contamination, High Contamination, and Airborne Radioactivity Areas.
- Identify the requirements for entering, working in, and exiting a Contamination, High Contamination, and Airborne Radioactivity Areas.

Introduction

This unit is designed to inform the worker of sources of radioactive contamination. It will also present methods used to control the spread of contamination.

Contamination control is one of the most important aspects of radiological safety. Using proper contamination control practices will help ensure a safe working environment. It is important for all employees to recognize potential sources of contamination as well as to use appropriate contamination prevention methods.

Comparison of Radiation and Radioactive Contamination

Ionizing radiation- the energy (particles or rays) emitted from radioactive atoms that can cause ionization.

Radioactive contamination- recall that radioactive material is material that contains radioactive atoms. Even when this radioactive material is properly contained, it may still emit radiation and be an external dose hazard, but it will not be a contamination hazard. When this radioactivity escapes its' container, it is then referred to as radioactive contamination. In other words, it is radioactive material where you don't want it.

Radiation is energy, contamination is material.

Types of Contamination

Radioactive contamination can be fixed, removable, or airborne.

- Fixed contamination is contamination that cannot be readily removed from surfaces. It cannot be removed by casual contact. It may be released when the surface is disturbed (buffing, grinding, using volatile liquids for cleaning, etc.). Over time it may "weep", leach or otherwise become loose or transferable.
- Removable/transferable contamination is contamination that can readily be removed from surfaces. It may be transferred by casual contact, wiping, brushing, or washing. Air movement across removable/transferable contamination could cause the contamination to become airborne.
- Airborne contamination is contamination suspended in air.

Sources of Radioactive Contamination

Regardless of the precautions taken, radioactive material will sometimes escape and contaminate an area. The following are some sources of radioactive contamination:

- Sloppy work practices, that lead to cross-contamination of tools, equipment or workers. Examples include:
  - Opening radioactive systems without the proper controls.
  - Poor housekeeping in contaminated areas.
  - Excessive motion or movement in areas of higher contamination.
- Leaks or breaks in radioactive systems
  - Small, sometimes microscopic pieces of radioactive material that are highly radioactive may escape. These pieces are known as "hot particles". Hot particles may be present when contaminated systems are opened. These particles may also be present when machining, cutting, or grinding is performed on highly radioactive materials. They can cause a high, localized radiation dose in a short period of time if they remain in contact with skin/tissue.
- Airborne contamination depositing on surfaces.
- Leaks or tears in radiological containers such as barrels, plastic bags or boxes.

Indicators of possible area contamination:

Workers need to be aware of potential radiological problems. Here are some examples of potential radiological problems.

- Leaks, spills, standing water
- Damaged radiological containers

Employee response to a spill of radioactive material.

Each of the examples listed above may be considered a spill of radioactive material. Here is the minimum response to a spill of radioactive material.

- Stop or secure the operation causing the spill.
- Warn others in the area.
- Isolate the area.
- Minimize exposure to radiation and contamination.
- Secure unfiltered ventilation.
- notify Radiological Safety personnel.

Contamination Control Methods

Every possible effort should be made to confine the spread of radioactive materials to the smallest area possible. By controlling contamination, the potential for internal exposure and personnel contamination can be limited. Here are some methods used to control the spread of radioactive contamination.

Prevention methods

A sound preventive maintenance program can prevent many radioactive material releases. Here are some preventative methods.

- Identify and repair leaks before they become serious problems.
- Establish adequate work controls before starting jobs.
- Discuss measures that will help reduce or prevent contamination spread. This can be done during pre-job briefs.
- Change out gloves or protective gear as necessary to prevent cross-contamination of equipment.
- Stage areas to prevent contamination spread from work activities.
- Cover piping/equipment or surfaces below a work area to prevent dripping contamination onto clean areas. Another example would be covering/taping tools or equipment used during the job to minimize decontamination after the job (i.e., taping up a screwdriver before use).
- Use good work practices such as good housekeeping and cleaning up after jobs. "Good housekeeping" is the prime factor in an effective contamination control program. It involves the interaction of all groups within the facility. Each individual should be dedicated to keeping "his house clean" to control the spread of contamination.
- Control and minimize all material taken into or out of contaminated areas.
- Be alert for potential violations to the basic principle of contamination control; such as use of improper contamination control methods, bad work practices, basic rule or procedure violations, radioactive material releases or spills.
- Radiological workers should always ensure that the proper procedures to avoid the spread of contamination are followed or implemented .

Engineering Control Methods

Ventilation

- Ventilation is designed to maintain airflow from areas of least contamination to areas of most contamination. A slight negative pressure is maintained on buildings/rooms where potential contamination exists.
- High Efficiency Particulate Air (HEPA) filters are used to remove radioactive particles from the air.

Containment

- Containment generally means using vessels, pipes, cells, glovebags, gloveboxes, tents, huts, plastic coverings, etc. to control contamination by containing it.

Personnel Protective Measures

If engineering methods are not adequate then personnel protective measures such as protective clothing and respiratory equipment will be used

Protective clothing

Protective clothing is required to enter areas containing contamination and airborne radioactivity levels above specified limits in order to prevent contamination of personnel skin and clothing. The degree of clothing required is dependent on the work are radiological conditions and the nature of the job.

Personnel effects such as watches, rings, jewelry, etc. should not be worn.

Full protective clothing generally consists of coveralls, cotton liners, gloves, shoe covers, rubber overshoes, and a hood.

Note: Cotton glove liners may be worn inside 'standard' gloves for comfort, but should not be worn alone or considered a layer of protection against contamination.

Proper use of protective clothing

- Inspect all protective clothing for rips, tears, holes, etc. prior to use. If you find damaged clothing, dispose of it properly.
- Supplemental dosimeters should be worn as prescribed by the Radiation Safety Office.
- After donning protective clothing, proceed directly from the dress-out area to the work area.
- Avoid getting coveralls wet. Wet coveralls provide a means for contamination to

reach the skin/clothing through absorption.
- Contact Radiation Safety personnel if clothing becomes ripped, torn, etc..

Respiratory protection equipment

This equipment is used to prevent the inhalation of radioactive materials. Radiological Worker I or II training does not qualify a worker to wear respiratory protection. Respiratory protection training is a separate course.

Contamination Monitoring Equipment

Contamination monitoring equipment is used to detect radioactive contamination on personnel and equipment.

Types and uses

Hand-held contamination monitor

Frisking Procedure

- Verify the instrument is in service, set to the proper scale and the audio can be heard.
- Note the background count rate at frisking station.
- Frisk hands before picking up the probe.
- Hold probe approximately ½" from surface being surveyed for beta/gamma and 1/4" inch for alpha.
- Move probe slowly over surface, approximately 2" per second.
- Proceed to perform frisk as follows, if appropriate.
  - Head (pause at mouth and nose for approximately 5 seconds).
  - Neck and shoulders.
  - Arms (pause at each elbow).
  - Chest and abdomen
  - Back, hips and seat of pants.
  - Legs (pause at knees).
  - Shoe tops.
  - Shoe bottoms (pause at sole and heal).
  - Personnel and supplemental dosimetry.
- The whole body survey should take at least 2-3 minutes per survey instrument.
- Carefully return the probe to holder. The probe should be placed on the side or face up to allow the next person to monitor.
- If the count rate increases during frisking, pause for 5-10 seconds over the area to provide adequate time for instrument response.
- Take appropriate actions if contamination is indicated; remain in the area and notify Radiological Safety personnel. Minimize cross contamination (such as

putting a glove on a contaminated hand).

Decontamination

Decontamination is the removal of radioactive materials from locations where it is not wanted. If the presence of removable contamination is discovered, decontamination is a valuable means of control.

- Personnel decontamination is normally accomplished using mild soap and lukewarm water.
- Material decontamination is the removal of radioactive materials from tools, equipment, floors, and other surfaces in the work area.

In some situations, decontamination is not always possible.

- Economical conditions: Cost of the time and labor to decontaminate the location outweigh the hazards of the contamination present.
- Radiological conditions: Radiation dose rates or other radiological conditions present hazards which far exceed the benefits of decontamination.

Note: Decontamination should only be performed by qualified personnel under the direction of the Radiation Safety Office.