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MASTER HEALTH AND SAFETY PLAN REVISION 2 WITH TRANSMITTAL LETTER KANSAS CITY MO
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TAPANAM ASSOCIATES

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MASTER HEALTH AND SAFETY PLAN

REVISION 2

CAMERA COPY

APRIL 1996

TAI

TapanAm Associates, Inc.

Consulting Engineers Scientists Architects

8010 State Line, Suite 250
Leawood, Kansas 66208
(913) 648-5411 Fax (913) 648-0848

8080 Ward Parkway, Suite 360
Kansas City, Missouri 64114
(816) 531-3168 Fax (913) 648-0848

TapanAm Associates, Inc.

Engineers Architects Scientists

8080 Ward Parkway, Suite 360
Kansas City, Missouri 64114
(816) 531-3168 Fax (913) 648-0848

Leawood, Kansas
(913) 648-5411
Oak Ridge, Tennessee
(615) 483-8511

April 11, 1996

Mr. Mark Esch, BRAC Environmental Coord.
Department of the Air Force
Air Force Base Conversion Agency
Operating Location Q AFBCA
15471 Hanger Road
Kansas City, Missouri 64147

RE: Master Health and Safety Plan
Environmental Sampling and Analysis
Contract No. F41622-96-A-6503

Dear Mr. Esch:

Enclosed is a copy of TapanAms' Master Health and Safety Plan for the Blanket Environmental Sampling and Analysis Contract at Richards-Gebaur AFB.

Should you have any questions, please contact Eric Gorman or myself at (816) 444-5917.

Sincerely,

TapanAm Associates, Inc.

Shivaram Sivalingam

Siva Sivalingam, Ph.D.
Project Scientist

MASTER HEALTH AND SAFETY PLAN

REVISION 2

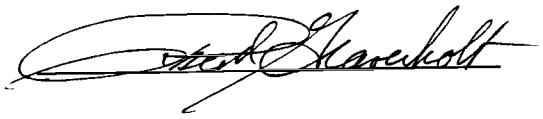
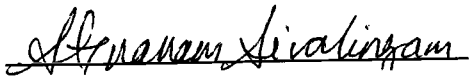
APRIL 1996

TapanAm Associates, Inc.

MASTER HEALTH AND SAFETY PLAN

APPROVAL

The following Master Health and Safety Plan (MHSP) has been prepared exclusively for use by TapanAm Associates, Inc.. This has been written and reviewed and meets the requirements of OSHA 1910.120.

Name and Title	Signature	Date
Robert Graverholt, P.E Vice-President, TapanAm		4/12/96
Siva Sivalingam, Ph.D Project Scientist Project Health and Safety Officer		4/11/96
Eric Gorman Environmental Scientist Site Health and Safety Officer		4/11/96

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Acronyms and Abbreviations

ACGIH	American Council of Governmental Industrial Hygienists
ALARA	As Low as Reasonably Achievable
ALI	Annual Limit of Intake
APR	Air Purifying Respirator
BWL	Body Water Loss
CFR	Code of Federal Regulations
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
DAC	Derived Air Concentration
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
HR	Heart Rate
H&S	Health and Safety
HSM	Health and Safety Manager
HSP	Health and Safety Plan
IDLH	Immediately Dangerous to Life or Health
LEL	Lower Explosive Limit
MHSP	Master Health and Safety Plan
MR/HR	Milliroentgens per hour
MSHA	Mine Safety and Health Administration
MUC	Maximum Use Concentration
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OT	Oral Temperature
PEL	Permissible Exposure Limit
PF	Protection Factor
PPE	Personal Protective Equipment
PRSO	Project Radiation Safety Officer
SAR	Supplied-Air Respirator (Also called air line respirator)
SCBA	Self-Contained Breathing Apparatus
SHSC	Site Health and Safety Coordinator
SM	Site Manager
SV	Sievert (Unit of Radiation Dose)
TLV	Threshold Limit Value
UEL	Upper Explosive Limit
USGPO	U.S. Government Printing Office
W	Weighting Factor for Radiation Exposure

1.0 INTRODUCTION

This Master Health and Safety Plan (MHSP) has been prepared to provide general guidance for safe work practices for any work assignment on or adjacent to a hazardous waste site. The MHSP serves as the minimum safety standard and sets forth the guidelines and requirements which TapanAm team personnel will adopt to meet site specific requirements. A Site-Specific Health and Safety Plans (HSP) will be generated for each individual site. A generic Health and Safety template will be utilized for preparing site-specific health and safety plans.

This MHSP describes requirements for worker health and safety , protective equipment, general safe work practices, decontamination, training, medical monitoring, and record keeping. This Plan has been written to meet the requirements of OSHA 1920.120.

The health and safety of site workers and protection of the environment are the primary goals during field investigations at hazardous waste sites. TapanAm will ensure that all activities related to hazardous waste site operations will be in compliance with local, State, and Federal regulations, quality assurance (QA) standards, and standard operating procedures.

* * * * *

2.0 HEALTH AND SAFETY ORGANIZATION AND RESPONSIBILITIES

Adherence to the provisions of this Master HSP and any site-specific HSPs developed under these provisions is mandatory for any activities conducted at facilities or sites containing or suspected of containing hazardous materials. This MHSP is subject to revision by TapanAm's Health and Safety Manager (HSM) based on changes in current health and safety information and new policies and procedures. Site-specific HSPs are subject to revision by the TapanAm HSM or his/her designee based on new or additional site data, contaminant monitoring, visual information, or changes in site conditions or work procedures.

2.1 Chain of Command

Vice President/Corporate Health and Safety Manager: The Vice-President of TapanAm has ultimate responsibility for implementation of all aspects of the Health & Safety program. He/she is also responsible for providing adequate funding to ensure compliance with the Master and site-specific Health and Safety Plan.

Health & Safety Manager (HSM): The HSM is responsible for developing and coordinating the implementation of all aspects of the Health & Safety program.

Project Manager: The Project Manager is responsible for oversight to ensure compliance with TapanAm's Master and site-specific Health & Safety programs and plans at the assigned site.

Task Leaders: Task leaders are directly responsible for ensuring compliance with the Master and site-specific HSPs for their assigned tasks.

Site Health and Safety Coordinator (SHSC): A SHSC will be present during field operations to oversee and enforce provisions of the Master and site-specific HSP.

Project Radiation Safety Officer (PRSO): The PRSO is responsible for developing and coordinating radiation standards and requirements for projects involving radiation sources.

2.2 Responsibilities

Generally, the supervisor is responsible for the safety of the personnel under his direction. He ensures that the provisions of this Health and Safety Plan are adhered to and that all operations are performed with the utmost regard for the health and safety of the individuals involved. Likewise, all site personnel have a responsibility for the prevention of accidents by following the safety procedures necessary to perform the work without accident or injury. Violations of health and safety procedures or of safe work practices, which would endanger any individuals' life, health, or welfare, will not be tolerated.

2.2.1 Project Manager

The project manager assumes overall administrative responsibility for the establishment and implementation of project health and safety.

2.2.2 Corporate Health and Safety Manager/Vice President

The Corporate Health and Safety Manager is responsible for the following health and safety aspects as it pertains to TapanAm Associates, Inc. (This position is currently assigned to the Vice President of TapanAm Associates, Inc.):

- Providing technical oversight/auditing of health and safety issues.
- Performing audits of health and safety procedures used during fieldwork.
- Providing review and approval of Site-Specific HSPs.

2.2.3 Health and Safety Manager (HSM)

The Health and Safety Manager's primary function is to establish, implement, and administer an effective health and safety program consistent with the company policy and recognized accident prevention standards. The HSM shall have the following responsibilities:

- Developing and implementing the health and safety program and this Master Health and Safety Plan.
- Gathering and disseminating information in accordance with the provisions of this plan.
- Assisting in the pre-planning and coordination of project health and safety operations and services (i.e., first aid, fire prevention and protection, personal protective equipment, employee training, etc.) for project management and the field staff.
- Supervising the employee safety training program to familiarize new and existing personnel with health and safety policies and procedures and assuming that all project personnel are aware of and comply with provisions of this plan.
- Writing and reviewing all HSPs unless otherwise delegated.
- Ensuring that health and safety records are maintained and updated, including Training, Respirator fit-testing, and Medical Monitoring Program records.

- Reviewing all project health and safety reports and taking appropriate actions as necessary.

- Conducting regular audits, including audits of subcontractors, to ensure compliance with the company health and safety program and federal/state safety and health regulations, and initiating corrective action when necessary.

- Maintaining a working knowledge of federal and state safety and health standards, and providing interpretation when required.

- Assuring that health and safety plans of subcontractors comply with the specifications of this plan.

- Providing consultation to personnel on health and safety issues.

2.2.4 Site Health and Safety Coordinator (SHSC)

A Site Health and Safety Coordinator will be designated for each site. The SHSC will be named by the Project Manager with approval from the HSM.

The duties of the SHSC are executed at the site level. The SHSC will implement the provisions of the Master Health and Safety Plan and Site-Specific Health and Safety Plan to ensure that all health and safety requirements are enforced.

If the SHSC determines that site conditions have become unsafe, or the plan requirements are not being met, the SHSC may temporarily suspend site operations until the problem is resolved.

2.2.5 Site Manager

The site manager is responsible for overall operations during field investigations and is directly responsible for the implementation of the Site-Specific Health and Safety Plan. The Site Manager may also be designated the Site Health and Safety Coordinator.

Specific health and safety duties of the Site Manager are outlined below:

- Implementing the Master and Site-Specific HSPs.

- Assuring that all personnel assigned to the site have received appropriate health and safety training.

- Familiarizing all on-site personnel with the site-specific health and safety training.

- Assigning key safety duties and responsibilities to team members.

- Arranging for onsite first aid facilities and off-site emergency medical care.
- Ensuring that all necessary respiratory and personnel protective equipment (PPE) are available on-site.
- Establishing and maintaining all site reporting and recordkeeping procedures.
- Monitoring and revising the Site-Specific HSP as necessary.

2.2.6 Field Team Employee

Each member of the field team is directly responsible for ensuring that the health and safety of him/herself and his/her co-workers is protected.

Specific health and safety duties to this function are:

- Understanding and following all established health and safety rules and procedures, including the provisions of this Master HSP.
- Attending and successfully completing all required training classes.
- Participating in the Medical Monitoring Program.
- Knowing and following all provisions of the Site-Specific HSP.
- Refraining from any unsafe act that might endanger themselves or co-workers.
- Using and maintaining all health and safety devices and protective equipment necessary for his protection.
- Reporting all unsafe acts, hazardous conditions, injuries, and accidents to the appropriate personnel.
- Being fully prepared to render prompt and appropriate aid to co-workers who become ill, are injured, or are involved in an accident.

2.3 Subcontractor Responsibilities

Subcontractors used by TapanAm to perform field activities will be responsible for complying with the Master and Site-Specific HSPs that cover their specific project assignments. They may choose to develop their own HSP, provided that as a minimum it conforms to the requirements of this MHSP and the Site-Specific HSPs. The determination of conformance will be made by the HSM. Deficiencies in the subcontractor's HSP will be resolved before the subcontractor is granted authorization to proceed. TapanAm personnel will monitor the subcontractors at the site

to ensure that health and safety procedures are performed in accordance with the Site-Specific HSP. Failure by the subcontractor to adhere to these requirements can cause work to stop until compliance is ensured. Subcontractors repeatedly failing to adhere to these requirements will be banned from the site.

* * * * *

3.0 MEDICAL MONITORING PROGRAM

3.1 Introduction

This chapter describes the medical monitoring requirements for personnel who are involved in any work activities at hazardous waste sites. The intent of the Medical Monitoring Program is to assess the health and fitness of individual project personnel through the use of a comprehensive baseline examination and annual re-examinations. TapanAm employees participate in a mandatory medical monitoring program. Subcontractor personnel are required to furnish documentation of a similar medical monitoring program for all employees participating in work at a field site.

All medical examinations of personnel will be performed by a licensed occupational physician. The purpose of the baseline examination, and the annual re-examination, is to:

- Certify individuals as medically fit to work at hazardous waste sites, as required by OSHA regulations.
- Establish a baseline against which future changes in health or physical well-being can be evaluated and keep accurate records for future reference.
- Identify underlying illnesses or conditions which might be aggravated by certain exposures or job activities.
- Recognize abnormalities, toxic reactions, or other changes at the earliest opportunity so that corrective measures may be taken.

Decisions concerning an employee's physical condition as it affects his/her ability to work at a hazardous waste site, including potential exposure to hazardous substances or toxic materials, will be made by the examining physician. The decision will be implemented by the HSM. Employees will have the right to question the basis of the decision and request a review of the decision by the HSM. Employees will also have the right to seek a second opinion by another physician, or additional testing by a different clinical laboratory.

Each individual enrolled in the medical monitoring program shall be subject to initial and periodic medical examinations:

- On an annual basis.
- Following an acute exposure to any toxic or hazardous material.
- When the employee is terminated or permanently reassigned to other work.
- At the discretion of the HSM and/or consulting occupational physician.

- At the request of an employee with demonstrated symptoms of exposure to toxic or hazardous materials.

The medical monitoring program will be evaluated regularly to ensure its effectiveness.

3.2 Enrollment in the Medical Monitoring Program

All individuals involved in activities at any hazardous waste sites shall be enrolled into the Medical Monitoring Program. Enrollment into the program will end when the employee terminates involvement with the program or the company, at which time an exit examination for the employee will be required. Employees can, however, waive their right to an exit physical by submitting this request in writing.

3.3 Baseline (Initial) and Annual Examinations

At a minimum, personnel potentially required to perform activities at a hazardous waste site will be subject to the medical examination requirements specified in Table 3-1. The level of medical monitoring may be enhanced at the discretion of the examining physician, based on an individual's health conditions.

Periodic medical monitoring will include an interim questionnaire, updated exposure history, and physical examination to compare to the Baseline (Initial) Examination. The physician may require additional medical testing if necessary.

3.4 Medical Records

The HSM receives a report from the examining physician indicating the following:

- Approval to work on hazardous waste sites.
- Approval to wear a respirator
- A statement of work restrictions, if any.

The physician retains all the other records and will make them available to the employees upon notice during regular business hours. The employee must complete Form 3-1 in order to have medical records released to any other party (I.E., insurance companies). TapanAm maintains a copy of the examining physician's report and issues the field clearance status for each employee. Records will be maintained for the duration of the employment plus 30 years, in accordance with OSHA's rule (29 CFR Part 1910.20)

TABLE 3.1

Baseline Medical Examination Requirements

- In Depth Medical and Occupational History
- Full Physical Examination by Physician
- Vital Signs
- Vision
- Audiometry
- Spirometry (Pulmonary Function Test)
- Chest X-ray (if not performed in last five years)
- Electrocardiogram
- Urinalysis with Microscopic Examination
- Complete Blood Count (CBC) with Differential
- Blood Chemistry Profile (SMAC 24)
  - Alb/Glob Ratio
  - Albumin
  - Alkaline Phosphatase
  - Bilirubin (direct, indirect and total)
  - BUN/Creatinine Ratio
  - Calcium
  - Chloride
  - Cholesterol
  - Creatinine
  - Globulin
  - Glucose
  - Iron
  - LDH
  - Phosphorous
  - Potassium
  - SGOT/SGPT
  - Sodium
  - Total Protein
  - Triglycerides
  - Urea Nitrogen (BUN)
  - Uric Acid
- Heavy Metals in Blood
  - Arsenic
  - Cadmium
  - Lead
  - Mercury

* * * * *

4.0 PERSONAL PROTECTIVE EQUIPMENT

4.1 Introduction

In incident response, one of the first steps in reducing health effects from toxic substances is the selection of appropriate personnel protective equipment. Until the site toxic hazards can be identified and personnel safety measures commensurate with the hazards instituted, preliminary measures will have to be based on experience, judgement, and professional knowledge. Atmospheric hazards are one of the first concerns in evaluating an unknown situation. Toxic concentrations (or potential concentrations) of vapors, gases, and particles; low oxygen content; explosive potential; and the possibility of radiation exposure, all represent immediate hazards. In addition to making air measurements to determine these hazards, visual observation and review of existing data can help determine the potential risks from other materials.

Individuals entering a hazardous waste site must wear appropriate protective clothing and equipment to shield or isolate potential chemical, physical, radioactive, and biological hazards. Proper selection of Personal Protective Equipment (PPE) is essential to protect the respiratory system, skin, eyes, face, hands, feet, head, body and hearing. Personnel must wear protective equipment when response activities involve known or suspected atmospheric contamination; when vapors, gases, or airborne particulates may be generated; or when the potential for direct contact with skin-affecting substances exists. Protection of lungs, gastrointestinal tract, and eyes against air toxicants may be accomplished through the use of respirators. Chemical-resistant clothing can protect the skin from contact with skin-destructive or absorbable chemicals. Ingestion of material may be limited or prevented through personal hygiene.

The objectives of the PPE program are 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. The use of PPE can itself decrease the efficiency of the workers and 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 protection, the greater are the associated risks. In the event of conflicting requirements, the most protective level must apply. Any downgrade in the level of protection from that specified in the Site-Specific HSP must be documented and must be approved by the SHSC.

4.2 Levels of Protection

Personal protective equipment to protect the body against contact with known or anticipated chemical hazards has been divided into four categories according to the degree of protection afforded. These are:

Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.

Level B: Should be selected when the highest level of respiratory protection is needed, but lesser level of skin protection. Level B protection is the minimum level recommended on initial site entries until the hazards have been further defined by onsite studies.

Level C: Should be selected when the type of airborne substance is known, the concentration is measured, and the criteria for using air purifying respirators are met.

Level D: Should not be worn on any site with respiratory or skin hazards. It is primarily a work uniform providing minimal protection.

The Level of Protection selected should be based primarily on:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential and measured exposure to substances in air, splashes of liquids, or other direct contact with material due to work being performed.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better characterized.

4.3 Level A Protection

Use of Level A Protection for the performance of field activities requires special training and prior notification of and consultation with the TapanAm Health and Safety Manager.

Many toxic substances are difficult to detect or measure in the field. When such substances (especially those readily absorbed by or destructive to the skin) are known or suspected to be present and personnel contact is unavoidable, Level A protection should be worn until more accurate information can be obtained.

Personnel Protective Equipment

- Positive pressure-demand, self-contained breathing apparatus (SCBA), approved by the Mine Safety and Health Administration (MSHA) and National Institute of Occupational Safety and Health (NIOSH).
- Fully encapsulating chemical-resistant suit (Butyl rubber).
- Gloves (outer), chemical-resistant.

- Gloves (inner), chemical-resistant.
- Boots, chemical-resistant, steel toe and shank.
- Long cotton underwear.
- Under suit.
- Booties (outer), chemical resistant (disposable).
- 2-way radio communications (intrinsically safe).
- Hard hat (under suit).

Criteria for Selection

Meeting any of these criteria warrants use of Level A protection:

- The chemical substance(s) has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on:

  measured or potential hazardous concentration of atmospheric vapors, gases, or particles.

  or

  site operations and work functions involving hazardous potential for splash, immersion, or exposure to unexpected vapors, gases or particles.

- Extremely hazardous substances are known or suspected to be present, and skin contact is possible.
- The potential exists for contact with substances that destroy skin.
- Operations must be conducted in confined, poorly ventilated areas until the absence of hazards requiring Level A protection is demonstrated.
- Total atmospheric readings on either the chromatograph, the photoionization detector, or similar instrument indicate 500-1,000 ppm of unidentified substances.

The fully encapsulating suit is designed to provide the highest degree of protection to skin, eyes, and respiratory system if the suit material is resistant to the chemical of concern during the time the suit is worn and/or at the measured or anticipated concentrations. While Level A provides

maximum protection, the suit material may be rapidly permeated and penetrated by certain chemicals from extremely high air concentrations, splashes, or immersion of boots or gloves in concentrated liquids or sludge. If at all possible, the suit material should be matched with the substance it is used to protect against.

The use of Level A protection and other chemical-resistant clothing requires evaluating the problems of physical stress, in particular heat stress associated with the wearing of the impermeable protective clothing. Response personnel must be carefully monitored for physical tolerance and recovery.

4.4 Level B Protection

Level B equipment provides a high level of protection to the respiratory tract, with a somewhat lower level of protection to skin. For initial site entry and reconnaissance at an open site, approaching whenever possible form the upwind direction, Level B protection should protect response personnel, providing the conditions described in selecting the Level A are known or judged to be absent. For continuous operations, the aforementioned criteria must be evaluated.

At 500 ppm total vapors/gases, upgrading to Level A protection may be advisable. A major factor for re-evaluation is the presence of vapors, gases, or particles requiring a higher degree of skin protection.

Personal Protective Equipment

- Positive pressure-demand, self-contained breathing apparatus (SCBA) (MSHA/NIOSH approved), or positive pressure-demand airline (supplied-air respirator).
- Chemical-resistant clothing (overalls and long-sleeved jacket or coveralls; hooded, one or two-piece chemical splash suit).
- Gloves (outer), chemical-resistant.
- Gloves (inner), chemical-resistant.
- Boots, chemical-resistant, steel toe and shank.
- Hard hat/face shield (optional).
- 2-way radio communications (intrinsically safe).

Criteria for Selection

Meeting any one of these criteria warrants use of Level B protection:

- The type and atmospheric concentration of toxic substances have been identified and require the highest level of respiratory protection, with a lower level of skin and eye protection. These would be atmospheres:

  With concentrations Immediately Dangerous to Life or Health (IDLH),

  or

  exceeding the limits of protection afforded by a full-face, air-purifying mask,

  or

  containing substances for which air purifying canisters do not exist or have low removal efficiency,

  or

  containing substances requiring air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard.

- The atmosphere contains less than 19.5% oxygen.

- Entry is required into any confined space having inadequate or questionable ventilation.

- Site operations make it highly unlikely that the small, unprotected area of the head or neck will be contacted by splashed by extremely hazardous substances.

- Total atmospheric concentrations of unidentified vapors or gases range from 5 ppm to 500 ppm on the chromatograph or photoionization detector, and vapors are not suspected to contain high levels of chemicals toxic to skin.

The degree of protection afforded by the chemical-resistant clothing is dependent on the variety of styles, materials, construction detail, and permeability. Therefore, selection of the most effective chemical resistant clothing based on the known or anticipated hazards and/or job function is important and must be approved by the HSM.

Level B skin protection is selected by:

- Comparing the concentration of known or identified substances in air with skin toxicity data.
- Determining the presence of substances that are destructive to and/or readily absorbed through the skin by liquid splashes, unexpected high levels of gases or particulate, or other means of direct contact.
- Assessing the effect of the substance at its measured air concentrations or splash potential, on the small area of the head and neck unprotected by chemical-resistant clothing.

4.5 Level C Protection

The main selection criterion for Level C is that conditions permit wearing air-purifying devices. The air-purifying device must be on a full-face mask (MSHA/NIOSH approved) equipped with a canister suspended from chin or on a harness. Canisters must be able to remove the substances encountered. Quarter or half-masks or cheek-cartridge full-face masks should be used only with the approval of a qualified individual or the HSM.

It is particularly important that the air be monitored thoroughly when personnel are wearing (Level C) air-purifying respirators. Continual surveillance utilizing direct-reading instruments is needed to detect changes in air quality necessitating a higher level of respiratory protection. Total unidentified vapor/gas concentrations of 5 ppm above background levels require Level B protection.

In general, Level C protection is not adequate for confined space entry under any circumstances. An exception to this must be approved by the HSM, based on air monitoring, and documented by the issuance of a written entry permit.

Personal Protective Equipment

- Full-face, air-purifying, cartridge-equipped respirator (MSHA/NIOSH approved).
- Chemical-resistant clothing (overalls, and long sleeved jacket, coveralls or Tyvek coveralls).
- Gloves (outer), chemical-resistant.
- Gloves (inner), chemical-resistant.
- Boots chemical-resistant, steel toe and shank.

- Booties (outer), chemical-resistant, disposable (optional).
- Hard hat/face shield (optional).
- 2-way radio communications (intrinsically safe).

Criteria for Selection

Meeting all of these criteria permits use of Level C protection:

- Measured air concentrations of identified substances will be reduced by the respirator to at or below the substance's permissible exposure limit and the concentrations are within the service limit of the canister.
- Atmospheric contaminant concentrations do not exceed IDLH levels.
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect the small area of skin left unprotected by chemical resistant clothing.
- Job functions have been determined not to require self contained breathing apparatus.
- Total vapor readings register between background and 5 ppm above background on instruments such as a photoionization instrument or chromatograph.
- Air will be monitored periodically.

In addition, use of a full-face air-purifying mask is approved **only** if:

- Oxygen content of the atmosphere is at least 19.5% by volume.
- Substances are identified and their concentration measured.
- Substances have adequate warning properties (i.e, odor, color, taste).
- Individual passes a qualitative fit test for the mask.
- Appropriate cartridge/canister is used, and its service limit concentration is not exceeded.

4.6 Level D Protection

Level D protection is primarily a work uniform. It can be worn in areas where only boots can be contaminated, or there are no respirable toxic substances. Level D is never allowable for confined space entry.

Personal Protective Equipment

- Coveralls.
- Gloves (optional).
- Gloves (inner), chemical-resistant (optional).
- Boots/shoes, leather or chemical-resistant, steel toe and shank.
- Outer boots, chemical-resistant disposable (optional).
- Safety glasses or chemical splash goggles.
- Hard hat (face shield - optional).
- Full-face air-purifying respirator available for use if needed.
- Escape respirator - optional.

Criteria for Selection

Meeting any of these criteria allows use of Level D protection:

- No hazardous air pollutants have been measured.
- Work functions indicate a very small likelihood of splashes, immersion, or potential for unexpected inhalation of any chemicals.
- The atmosphere has not less than 19.5% oxygen content.
- Confined space entry is not required.

4.7 Additional Considerations for Selecting Levels of Protection

Once immediate hazards other than toxic substances have been eliminated, the initial on-site survey and reconnaissance, which may consist of more than one entry, continues. Its purpose is to further characterize toxic hazards and, based on these findings, refine preliminary safety

requirements. As data are obtained from initial survey, the Level of Protection and other safety procedures are adjusted. Initial data also provide information on which to base further monitoring and sampling. No one method can determine a Level of Protection in all unknown environments. Each situation must be examined individually. Other factors which shall be considered in selecting the appropriate Level of Protection are described below:

Chemicals Toxic to Skin

Knowledge concerning the presence or absence of hazardous materials having adverse skin effects, ranging from irritation to absorption into the body, is useful in selecting the necessary Level of Protection. Therefore, a major effort should be made to identify all substances potentially present at a designated area. Any lack of knowledge, or the existence of uncertainty, in this area automatically demands Level A or Level B PPE.

Air Monitoring

A program must be established for periodic monitoring of the air during site operations. Monitoring can be done with various types of air pumps and filtering devices, followed by analysis of filtering media; portable real-time monitoring instruments located strategically on-site; personal dosimeters; and periodic walk-throughs by personnel carrying survey instruments. The frequency of monitoring is determined by what is expected at the site and what is actually measured. Any increases in concentrations detected automatically require more frequent monitoring and an upgrade in PPE level.

Atmospheric Conditions

Parameters such as atmospheric stability, ambient air temperature, wind direction, wind speed, and pressure determine the behavior of contaminants in air, or the potential for volatile material getting into air and therefore should be considered in determining the Level of Protection required. Changes in these parameters over the course of a day (sunrise-sunset) and as changes in weather occur (frontal passage) are particularly important.

Work in Exclusion Zones

The Levels of Protection and type of chemical-resistant clothing (PPE) chosen for operations in Exclusion Zones may vary. This selection is based not only on measured air concentrations, but also on the job function or objectives for being in the area and the potential for skin contact or inhalation of the materials present.

Confined Space Entry

Confined space entry may **only** be conducted in Level A or B (SCBA or supplied-air respirator) unless a written permit has been issued by the HSM stating that conditions exist for a lower level of protection to be acceptable. The reasons for such permits are expected to be very rare; in

general, no downgrade in protection level will be permitted for a confined space entry.

Escape Masks

The use of escape masks is an option on Level D protection; however, the Health and Safety Manager should determine their use on a case-by-case basis.

4.8 Emergency Equipment

For site-specific investigations, each team will be issued the following items:

- first aid kit with one way inhaler barriers
- fire extinguisher
- eye wash equipment
- emergency shower (one per job site)
- two-way radio communication devices
- emergency oxygen (or escape pack)
- field manual (site operation procedures)
- additional boots, gloves, hard hats, suits, and respirators.

4.8.1 Fire Extinguisher

Because of the potential threat of fire at hazardous waste sites during site operations, a fire extinguisher Class A,B,C. will be readily available. Fire extinguishing materials suitable for metal fires, Class D, will also be provided if necessary. At a minimum, one fire extinguisher will be kept with the field crew engaging in any subsurface activity such as drilling or backhoe operations, one will remain in the decontamination area, and one will be placed in each vehicle. Crews on foot or separated by some distance from a vehicle will be provided an extinguisher if the SHSC determines it is necessary or advisable.

4.8.2 Emergency Shower

If required, an emergency shower will be located outside the decontamination trailer, in the decontamination area, or in another suitable location.

4.8.3 Eye Wash

An eye wash station will be maintained at the decontamination zone, and portable eye wash stations (as appropriate) will be kept with the field crews. All eye wash stations will meet the current American National Standards Institute requirements for eye wash stations.

4.8.4 Communications

A telephone will be installed whenever long-term investigations require the use of a field office. This will be either a hard-wired telephone or a portable (cellular) telephone which will remain in the field office at all times during site operations. Emergency telephone numbers will be posted in a conspicuous location near the telephone, outside the trailer, and in each field vehicle, and included in each team member's field manual.

Radio communication will be used at any site where workers will be required to work more than 200 feet from the site command post/field office, or where workers are out of sight of the command post/field office. One radio will be kept in the field office/command post at all times. The "Buddy System" will be used; no worker will ever work alone, and each work team of 2 or more workers will be furnished with a radio. If multiple teams are working in the same area, the task leader or area supervisor will carry the radio.

If he leaves the field office, the site manager or site supervisor will carry a radio. The SHSC will be available at all times during field operations via radio, "beeper", or cellular phone.

Where appropriate, a set of emergency signals (air horn, car horn, siren, bull horn) will be specified in the Site-Specific HSP and explained to each worker at the site.

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5.0 RESPIRATORY PROTECTION PROGRAM

5.1 Introduction

This program establishes the policies, responsibilities, and procedures for the selection, use and care of respiratory protective equipment. The objective of the program is to provide workers the maximum protection from occupational exposure to dusts, fumes, mists, radionuclides, toxic gases, and vapors. When effective engineering controls are not feasible to eliminate exposure to contaminants and atmospheres immediately dangerous to life and health (IDLH), use of personal respiratory protective equipment is required to achieve this goal.

This program is in compliance with requirements of the Occupational Health and Safety Administration, General Industry Standard for Respiratory Protection (29 CFR 1910.134), which outlines the minimum acceptable program requirements, selection criteria, air quality requirements, and standards for use and maintenance of respirators. Standard operating procedures for respirator selection, use, and care follow the guidance provided in ANSI Standard Z88.2-1980, Practices for Respiratory Protection.

It is the responsibility of the TapanAm HSM to determine what specific applications require the use of respiratory equipment. Employees will be provided with proper respiratory equipment to meet the needs of each specific application, adequate training, and specific instructions on all equipment.

5.2 Respirator Fit-testing

TapanAm personnel will be qualitatively fit-tested on the specific type of respirator to be used prior to using a respirator on-site. The results of the fit test will be recorded on the Respirator Fit Test Record (Form 5-1) which will be maintained by the HSM. Respirator clearance is granted by the HSM based on the results of the fit test in conjunction with medial clearance.

Beards, sideburns, and other facial hair that interferes with the respirator's sealing surface shall not be permitted. Interfering facial hair must be removed prior to fit testing, and prior to any use of a respirator in the field. As a general guide, a "two-day" growth of beard is considered to interfere with proper respirator fit.

5.3 Criteria for Use of Self-Contained Breathing Apparatus (SCBAs) and Air Line (Supplied-Air) Respirators

Level B equipment provides a high level of protection to the respiratory tract, but a somewhat lower level of protection to the skin. Use of Level B equipment is standard for incompletely characterized sites. Deviation (upgrade/downgrade) from Level B usage is based on knowledge of the particular situation and justification for deviation.

When use of Level A or B equipment is warranted, a minimum of two people is required at any one time in performing field activities. A third field team member is required as a backup. Use of Level B protective equipment must be approved by the Health and Safety Manager prior to initiation of field activities.

5.3.1 General

SCBAs and air line (supplied air) respirators are used when the criteria for use of air purifying respirators (APRs) are not met. Specifically, an SCBA or Supplied-Air respirator must be used when any of the following conditions exist:

- The oxygen content of the atmosphere is known or suspected to be less than 19.5%.
- Conditions exist which are Immediately Dangerous to Life and Health (IDLH).
- Any vapors or gases are present which are unidentified and have a concentration greater that 5 ppm.
- The total concentration of all toxic or hazardous vapors is greater than 500 ppm.
- The worker is going to enter a confined space.
- Gases or vapors are suspected to be present, but their identities and concentration are unknown.
- There are no connectors or cartridges for air-purifying respirators which are effective in removing the known contaminants.
- The HSM or SHSC cannot positively establish that conditions exist which would allow the safe use of an air-purifying respirator or would not require respirator use.

Different brands of SCBAs and airline respirators may be used if warranted; however, parts may not be interchanged. In all cases, they must be positive pressure demand units. Approval to use alternate brands must be obtained from HSM.

The following provisions apply to the use of SCBAs or airline respirators:

- SCBA cylinders shall be charged with certified Grade D breathing air to 1800 psi minimum before use in the field. A SCBA half-filled (with less than a 15-minute air supply) may be used for emergency escape only.
- Oxygen must not be used to fill SCBA tanks.

- When using an SCBA or an air line during subfreezing weather, extreme caution must be taken.

- When using an SCBA or air line, the buddy system is required, with a third person to act as a backup.

5.4 Criteria for Use of Air Purifying Respirators (APRs)

Level C equipment is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. Use of Level C equipment requires, at a minimum, two field team members in gear at all times.

5.4.1 General

Where the use of an APR is required for hazardous waste site activities, the full-face MSA Ultratwin Chemical Cartridge respirator equipped with GMC-H cartridges will be used. The chemical cartridges to be used will be specified in the Site-Specific HSP.

In general, APRs may be used in the following instances:

- APRs should only be used when the chemical contaminants have been identified and quantitatively measured, and the proper cartridge specified. The HSM must be consulted regarding proper cartridge selection.

- APRs **may *not*** be used in atmospheres containing less than 19.5% oxygen, or in atmospheres exceeding the Immediately Dangerous to Life or Health (IDLH) level of a specific contaminant.

- APRs **may *not*** be used in atmospheres that exceed the Maximum Use Concentration (MUC) for the respirator. A protection factor (PF) of 100 is generally considered appropriate for Ultratwin respirators, so that the MUC for an Ultratwin is equal to the Permissible Exposure Limit (PEL) x 100, or 1000 ppm (whichever is less). The HSM can be consulted regarding use of MUCs.

- APRs **shall *not*** be used in atmospheres containing toxic compounds with poor warning properties, e.g. cannot be easily detected by odors or irritations. For example, they should not be used to protect against methyl chloride or hydrogen sulfide. The former is odorless and the latter, while foul smelling, paralyzes the olfactory nerve so quickly that odor detection is unreliable. The HSM can be consulted regarding chemicals with poor warning properties.

- APRs **shall *not*** be used for protection against toxic gases that are not effectively sorbed by the sorbents in the cartridge. Consult the HSM for guidance.

- APRs <u>may *not*</u> be used for confined space entry without specific written approval from the HSM.

5.5 Inspection, Cleaning, and Disinfection of APRs and SCBAs

OSHA requires that all respirators be inspected before and after use and after cleaning to ensure proper working condition. Written inspection procedures and records of routine inspections are kept by the HSM, who is for respirator maintenance. Respirators stored for emergency or rescue shall be inspected on a monthly basis.

Routinely-used respirators shall be collected, cleaned, and disinfected as frequently as necessary to ensure proper protection is provided as stated in OSHA 1910.134. Emergency respirators shall be cleaned and disinfected after each use.

In the field, respirators shall be cleaned and disinfected at least daily. A commercially available cleaner/disinfectant will be used as recommended by the respirator manufacturer.

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6.0 TRAINING PROGRAM

6.1 Introduction

Anyone who enters or is assigned to work at hazardous waste site must recognize and understand the potential hazards to health and safety. A comprehensive training program has been established to achieve these goals. TapanAm's training program is in compliance with OSHA 29 CFR 1910.120. The level of training provided will be in accordance with the employee's job duties and responsibilities. Employees will not be allowed to perform field work until their safety training has been completed and certification approved by the Health and Safety Manager. Proficiency in health and safety procedures shall be maintained through regular refresher training programs and regular field practice. Subcontractors and visitors will be subject to all applicable portions of the Master and Site-Specific HSPs during field operations at any hazardous waste sites.

In addition, TapanAm's personnel will also participate in specialized safety training required by clients such as DOE for operations at their facilities. Employees working in radiation areas will be trained as radiation workers.

6.2 Basic Health and Safety Training

All TapanAm field personnel are required to successfully complete a Basic Health and Safety Training course (40 hours) prior to assignment to any field activities. This training will include a minimum of 24 hours of classroom instruction. Topics covered in this course include:

- Recognition, evaluation, and control of chemical and physical hazards.
- Personal protective clothing and equipment usage.
- Respiratory protection.
- Environmental monitoring equipment.
- Standard operating procedures and safe work practices.
- Site health and safety plan development.
- Decontamination procedures.

The course also includes a practical exercise in the use of personnel protective equipment and monitoring instruments.

6.3 Refresher Training

Field personnel will be required to maintain proficiency in the areas covered in the basic training course by completing a minimum of 8 hours of refresher training annually.

6.4 On-The-Job Training

In addition to the basic training described above, all personnel must complete a minimum of 24 hours of actual field experience under the direct supervision of a trained supervisor in each level of protection (Levels A through D) before that employee is considered competent to operate at the level of protection in the field without supervision.

6.5 Management Training

On-site management and supervisors directly responsible for employees and subcontractors engaged in hazardous waste operations will receive at least eight additional hours of specialized training on managing such operations.

6.6 First Aid and Cardiopulmonary Resuscitation (CPR)

All field personnel are required to maintain certification in first aid and cardiopulmonary resuscitation. The American Red Cross Standard First Aid and Basic Life Support CPR courses are the minimum necessary to meet this requirement.

6.7 Documentation of Training

All training activity must be documented. Accepted documentation includes a course certificate, a letter/memorandum detailing the training signed by the approved course instructor, or the completed documentation of training form (Form 6-1). The HSM shall maintain the record of training in a specific file, and a copy of the file will be present at each site where operations are taking place.

6.8 Site-Specific Training Briefing Topics

Prior to entering a site, TapanAm will conduct and document Health and Safety (H&S) briefings for everyone including subcontractors or visitors. The following topics are considered to be the minimum for a site-specific briefing:

- A discussion of the Site-Specific Health and Safety Plan.
- The nature of site-specific hazards.
- Assignment and discussion of safety related duties, including who the assigned SHSC is.

- A discussion of the site work zones and control measures.
- The handling of site-specific emergencies.
- A discussion of emergency contacts (i.e., medical, police, etc.).
- Rules and regulations for vehicle use.
- A discussion/practice of specific site procedures (decontamination, etc.).
- How to ensure compliance with health and safety requirements for third parties: visitors, the press, local community residents, etc.
- Use of equipment (personal protective equipment etc.)
- Additional topics specific to site activities as needed.

An H&S briefing will be conducted each morning for all field personnel before work begins at the site, and each time visitors or new personnel arrive at the site for the first time. Attendance at the daily (morning) briefing is manditory for all personnel working at the site.

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7.0 SITE OPERATING PROCEDURES AND RADIATION SAFETY

This chapter describes the overall approach to site operations at a hazardous waste site. Because of the potential for exposures and instability of hazardous sites, a safety plan and a work plan must be developed prior to entering a site. The work zones, action levels for organic vapors, radiation exposure monitoring, decontamination, sequence of site operations, and general safe practices are described in the plans. If existing information is insufficient, an initial site reconnaissance is required to characterize conditions that may affect the health and safety of personnel.

7.1 Initial Site Reconnaissance

Initial site reconnaissance is described in detail in Section 11.1. The site reconnaissance effort includes monitoring for contaminants and becoming familiar with the site and adjacent industrial operations, private residences, sampling and well sites, and work zones. The information collected at this time should verify conditions as expected or as reported by others. Based on these results, the actual monitoring parameters will be defined for field operations in accordance with particular site-specific needs. Typical parameters measured during site reconnaissance include airborne particles, organic vapors, combustible or explosive gases, oxygen deficiency, and radiation exposure hazards.

7.2 Site-Specific Health and Safety Plan

A Site-Specific HSP is developed to ensure that all the hazards of a site are evaluated prior to entry. A copy of the plan will be present on the site, and a register will be maintained to document that all personnel working on the site have read and understand the plan and agreed to abide by it.

In order to develop an accurate safety plan, an in-depth study of the site must be completed which attempts to identify the site's history of activity. Interviews and research of any available records should provide information on the chemicals involved, method of disposal, and volume of material disposed. Elements of a Site-Specific HSP are provided in Chapter 11.

7.3 Work Plan

A work plan should be prepared before any on-site activities are undertaken. All work conducted should be evaluated to ensure that it will not drastically increase the hazards posed by the site. A detailed work plan will allow work to be completed efficiently, reducing the length of time workers are on a site. The work plan would describe in detail all materials required to complete these activities. On a site, ideally work should progress from the least contaminated areas to the more highly contaminated areas.

7.4 Work Zones

Control of site access is important for the protection of both on-site personnel and bystanders. The hazardous waste site will be divided into three specific zones: exclusion zone, contamination reduction zone, and support zone. These three zones are established on the basis of contamination potential.

The exclusion zone is the area of greatest environmental contamination and presents the greatest potential for worker exposure. Personnel entering the area must wear the mandated level of protection. A designated entry and exit point into the exclusion zone should be established. Different levels of protection will be required depending on the tasks to be completed.

The contamination reduction zone acts as a transition between the exclusion zone and clean areas. Decontamination of personnel and equipment takes place in this zone.

The support zone serves as a clean control area, and decontamination facilities end here.

All areas will be defined and marked as appropriate for the particular site. The task leader will be responsible for obtaining concurrence from the SHSC and PRSO for the types and locations of the markers. Radiation control areas will be defined by the facility health physicist or the Project Radiation Safety Officer (PRSO) and marked with magenta/yellow rope and appropriate warning signs.

7.5 Action Levels for Personal Protection from Organic Vapors

When there is the potential for airborne exposure to toxic vapor or particles, airborne monitoring must be conducted to determine if additional personal protective equipment or administrative controls are required. The monitoring instrumentation chosen will depend on the contaminants of concern and the professional judgement of the SHSC. Exposure action levels for specific monitoring methodologies, e.g. a direct reading photoionization detector for organic vapor, will be based on the contaminants of concern and their exposure limits (OSHA-Permissible Exposure Limits; American Conference of Governmental Industrial Hygienist (ACGIH) - Threshold Limit Values). The sampling strategy will be consistent with the monitoring procedure documented in the Master HSP (Chapter 9).

Note: Protection Level C may be used only when the contaminants are known and cartridge respiratory protection is applicable, as defined in the Master HSP, Chapter 5.

Personal exposure monitoring will be conducted if the potential exists for employees to exceed the exposure limits while working at the site.

7.6 Action Levels for Personal Protection From Radiation

TapanAm strongly supports the concept of maintaining radiation exposures as low as reasonably achievable (ALARA). The overall objective of TapanAm's ALARA program is to control radiation exposure to members of its staff, its subcontractor's staff, and members of the public such that all exposures are well below applicable regulatory limits. TapanAm is committed to full compliance with DOE Order 5480.11 and the Radiation Control Manual. Exposures to radiation from occupational sources must not exceed the limiting values for assessed dose specified in Table 7.1. It is TapanAm's policy that individual and collective does equivalents be maintained at ALARA levels. This policy applies to annual, committed, and cumulative dose equivalents. Natural background, therapeutic, and diagnostic medical exposures will not be included in exposures from occupational sources. TapanAm will ensure that radiation action levels meet the Radiation Control Manual requirements.

The annual effective dose equivalent to an individual is determined by summing the annual effective dose equivalents from internally deposited radionuclides and from external exposure to radioactive material and/or radiation-generating devices. When in vivo and/or in vitro measurements confirm the retention of radionuclides in the body with respect to evaluating occupation exposure, provision will be made to assess the annual effective dose equivalent due to all radionuclides retained in the body from these intakes for as long as the annual effective dose equivalent is 10 millirem (mrem) or greater.

Exposures to the skin, extremities, and lens of the eye are not included in the determination of the annual effective dose equivalent. For uniform external irradiation of the whole body, a weighing factor (W) equal to 1 may be used. This whole body dose shall be measured in accordance with the provision of DOE Order 5480.11, paragraph 9g(1). Nonuniform external and internal irradiation values of W for organs and tissues are defined by DOE Order 5480.11, paragraph 8e(12).

7.6.1 Administrative Control Limits

TapanAm administrative control limits are used to ensure that necessary radiation exposures among personnel do not approach the limits specified in Table 7.1 and to assist in keeping all exposures ALARA. The following administrative control limits are established to prevent inadvertent overexposure and to serve as reference points for obtaining necessary approval if projected work in radiation areas has indicated that additional exposure may be necessary.

7.6.1.1 Weekly control limits for personnel

The following are weekly administrative control limits (seven consecutive days, Sunday through Saturday):

- The basic control limit for the whole body is 100 Mrem effective dose equivalent per week. This weekly control limit applies to all individuals who have a cumulative whole body dose of less than 1,000 mrem for the current year.

7.6.1.2 Quarterly control limits for personnel

The prior written approval of the PRSO is required for any employee to receive a whole body dose in excess of 600 mrem effective dose equivalent during any calendar quarter.

7.6.1.3 Annual control limits for personnel

The annual administrative control limit for whole body dose is 1,000 mrem (1.0 rem or 0.01 sv).

7.6.2 Exposure Control

The primary means of controlling radiological exposures is by controlling access and duration of stay in radiation areas. The methods use to control exposure include evaluating the radiological conditions, specifying proper precautions, providing experienced health physics planning and job coverage, providing extra controls for high radiation areas, creation of radiation work permits or SOPs, posting areas, using appropriate protective clothing, monitoring personnel, ensuring that employees working in radiation areas are trained as radiation workers, and updating personnel records to determine where exposure reduction is warranted. TapanAm's policies and practices for radiological protection are based on program requirements presented in DOE's Radiological Control Manual. In combination, these practices all play important roles in controlling exposures.

7.6.3 Personnel Monitoring and Dosimetry

The TapanAm PRSO is responsible for ensuring that personnel (employees, visitors, vendors, contractors, etc.) who work on projects involving the presence of radiation hazards are appropriately monitored for exposure to ionizing radiation. Those individuals will wear the dosimetry device specified by the Site-Specific HSP or the PRSO. In general, personnel dosimetry will be required for individuals who enter a Radiologically Controlled Area with the potential for external exposure or are expected to receive an annual dose to the extremities, lens of the eye, or skin greater than 10 percent of the corresponding limits specified in Table 7.1. Dosimeters will be calibrated by facilities that successfully participate in the DOE Laboratory Accreditation Program. Personnel will be issued appropriate personnel monitoring devices. Monitoring will be provided to any visitor who enters a radiologically controlled area. Dosimeters will not be taken off the site without the approval of the PRSO.

7.6.4 Proper Location for Wearing Dosimetry Devices

Unless directed otherwise by the PRSO, personnel monitoring badge(s) and dosimeter(s) will be worn on the front of the body adjacent to each other between the neck and the waist, usually in the chest area. The PRSO may instruct the individual to wear the dosimeters in a more representative place or specify additional dosimetry devices.

Personnel should not allow their low-range, self-reading dosimeters to exceed three-fourths full scale regardless of prescribed exposure without having the dosimeters recharged and the readings recorded.

Precautions will be taken to prevent the contamination of personnel monitoring devices when entering and working in contaminated areas.

7.6.5 Official Exposure Determination

Prior to beginning work in radiological areas and at intervals recommended by the TapanAm's PRSO and/or SHSC, all employees potentially exposed to radiological contaminants will receive bioassay monitoring which may include a whole-body count, if appropriate, and/or biological monitoring.

The official and permanent record of accumulated external dose received by individual TapanAm employees will be obtained from the interpretation of the personnel monitoring badge. The official and permanent record for visitors will be obtained from the personnel dosimetry device assigned by the PRSO to each individual visitor. In the event of lost or damaged dosimeters, the PRSO will investigate to determine the official dose to be assigned. Such investigations will begin within 24 hours of receipt of a report of a lost or damaged dosimeter. Results from self-reading dosimeters may be used for visitors or for employees if badges are lost or damaged.

7.6.6 Lost or Damaged Dosimeters

Each individual will notify the PRSO immediately upon losing or damaging a dosimeter. A thorough search will be made for any device reported lost. Personnel whose exposures are being investigated will be excluded from work in controlled access areas until the proper forms and investigation are completed and new dosimetry devices are issued. An estimated dose will be assigned to the individual based upon process knowledge and measurable radiation levels in areas known to have been occupied by the individual during the period in question. Dosimeter readings from other individuals performing similar activities can often be used in making these estimates.

7.6.7 Personnel Exposure Investigations

If a situation occurs involving a suspected or known personnel exposure to ionizing radiation in excess of the limits presented in Table 7.1, the situation will be promptly investigated by the PRSO and may include special bioassays, radiation surveys, air sampling, or dosimeter analyses. Such an occurrence will also be reported immediately to the appropriate regulatory agency. Management response and follow-up should be effective, including stopping work if necessary, to ensure the appropriate corrective actions are taken to preclude the recurrence of the accident or incident. The incident investigation report will identify the root causes(s) of radiation exposure problems.

7.6.8 Control of Exposures

The primary means of controlling a worker's physical contact with radioactive materials is to minimize contact through isolation and containment of the material. It may not be possible to completely avoid contact with radioactive materials, and personnel working in controlled areas may be required to wear protective clothing and equipment to guard against chemical and radiological exposures. Administrative controls may be implemented to reduce exposure time.

The PRSO will determine the appropriate levels of protection when work activities are not covered by standard procedures.

7.6.9 Evaluation of Internal Exposures

Bioassay techniques are used to evaluate the amount of radioactive material deposited within the body. Urinalysis is the primary method used for measuring internal radioactivity. Fecal sample analysis and whole-body counting may also be conducted, as appropriate. These measurements are made at least annually, or more often based on potential for exposure or for some isotopes. Non-routine urinalyses may also be required when air sampling or process knowledge indicates the potential for internal exposure.

Personnel shall participate in a bioassay program when they are likely to receive internal depositions resulting in an annual effective dose equivalent of 100 mrem or greater. Personnel with internal exposures greater than 10 mrem annual effective dose equivalents shall have their dose assessed and reported. When bioassay results indicate significant deposition of internal radioactivity, the PRSO will determine whether follow-up action, which may include providing follow-up bioassays and removing the worker from the radioactively contaminated area.

TABLE 7.1

STANDARD FOR OCCUPATIONAL RADIATION EXPOSURE

External

Whole body, head, trunk, arm above elbow and leg above knee	5 rems/year (0.05 Sv/year) - includes summation of (external) deep dose equivalent and (internal) committed effective dose equivalent. 3 rems (0.03 Sv) (external) maximum deep dose equivalent in any quarter.
Lens of eye	15 rems/year (0.15 Sv/year)
Hand, elbow, arm below elbow, foot, knee, and leg below knee	50 rems/year (0.5 Sv/year)
Skin (10 cm^2)	50 rems/year (0.5 Sv/year)

Weighted organ doses for all organs are summed.

Doses from external and internal sources are summed.

Annual limit of intake (ALI) equivalent to 2000 DAC-hours/year. (DAC: Derived-Air Concentration)

Calculated DACs are based on the following: Organs are assigned weighing factors, based on the estimates or risk to that organ per unit of dose relative to the estimate of risk per unit of dose for uniform whole body exposure. "Capping" dose limit of 50 rems/year (0.5 Sv/year) used to avoid non-stochastic effects. For body parts other than those listed above:

ACTUAL TISSUE (rems/year)	WEIGHTING FACTOR Wt	INFERRED DOSE LIMIT (rems/year)	ACTUAL DOSE LIMIT (rems/year)
Gonads	0.25	20	20
Breast	0.15	33	33
Red bone marrow	0.12	42	42
Lung	0.12	42	42
Thyroid	0.03	167	50
Bone surfaces	0.03	167	50
Each of 5 remaining organs with the largest dose	0.06	83	50

Planned Special Exposures	Planned special exposures allowed in addition to the annual limit from routine exposures. Limits set at 1 x annual limits/year from all events in a year and 5 x annual limits/lifetime from all events. 5(N-18) dose averaging provision is eliminated.

7.7 General Safe Work Practices

The following safe work practices are necessary to protect the health and safety of TapanAm's field workers and will be reiterated in site-specific HSPs. Depending on site-specific conditions, items may be added or deleted.

- The buddy system (i.e., each worker must have another worker in the immediate area with visual contact) will be used. Hand signals will be established and utilized.

- Each worker should be a safety backup to his/her partner. Off-site personnel only provide emergency assistance. All personnel should be aware of dangerous situations that may develop. If one partner needs more than minor assistance, the alarm should be sounded and assistance should be sought; a rescue alone should not be attempted.

- Visual contact must be maintained between buddies on-site at all times.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of potentially contaminated material is prohibited in any area designated as contaminated.

- Prescription drugs should not be taken by personnel where the potential for contact with toxic substances exists, unless specifically approved by a qualified physician. In addition, individuals using prescription drugs will report to the SHSC for permission to work at the site.

- Alcoholic beverage intake is prohibited during the work day; alcohol should be consumed only in moderate amounts during off-work hours. While consuming alcoholic beverages, employees must not operate company or client vehicles, nor are they allowed to wear clothing or identification that connects the individual to the client or TapanAm's project. It is also advised that employees not operate private vehicles after consuming alcoholic beverages.

- Contact lenses will not be permitted during site work.

- Disposable clothing will be used whenever possible to minimize the risk of cross-contamination.

- The number of personnel and amount of equipment in any contaminated area should be minimized, but effective site operations must be considered.

- Work areas for various operational activities (equipment testing, decontamination) will be established.

- Procedures for leaving any contaminated area will be planned, reviewed, and operational prior to entering exclusion or radiation control areas.

- Work areas and decontamination procedures will be established based on

prevailing site conditions and will be subject to change if conditions change.

- Wind direction indicators will be strategically located on-site.
- Contact with contaminated or potentially contaminated surfaces should be avoided. Whenever possible, personnel will not walk through puddles, mud, or discolored ground surface; kneel on the ground; lean; sit; or place equipment on drums, containers, vehicles, or the ground.
- Personnel will not be allowed to enter the site without the proper safety equipment.
- Personnel will follow proper decontamination procedures before leaving the site, except in medical emergencies. Rescue and medical care providers must be informed of possible contamination if decontamination is not performed.
- Personnel must comply with established safety procedures. Any staff member or visitor who does not comply with safety policy, as established by the SHSC, will be immediately removed from the site.
- Any medical emergency supersedes routine safety requirements.

7.7.1 Safe Work Practices for Entering a Site

Before leaving the field office to enter the site, personnel should do the following:

(i) Review site information (see task leader), including the following:

- expected hazards
- special conditions
- scheduled activities for the day
- location of showers and telephone
- emergency medical information
- level of personal protection required.

(ii) Check safety gear and equipment. The following equipment will be available for issue, depending on site-specific conditions:

- Anti-C clothing
- steel-toed safety boots
- rubber boots
- coverall, Tyvek®, Saranex, etc.
- hardhat with strap
- safety goggles or glasses
- neoprene or other synthetic outer gloves
- Latex or other inner gloves
- full-face respirator with appropriate cartridges and prefilters
- self-contained breathing apparatus (SCBA)
- nylon backpack or wheelbarrow for gear and sampling equipment
- Ziplock™ baggies (quart and gallon-size) to keep spare equipment

clean
- personal first aid kit
- fire extinguisher
- communication devices
- eye wash stations, and
- field standard operating procedures.

(iii) Ensure that backup equipment is maintained at the field office, including the following:

- air bottles for SCBA
- extra suits and gloves
- first aid kits
- respirators with cartridges and prefilters
- portable emergency oxygen unit
- communication devices
- duct tape
- trash barrel for return transportation of non-disposable, contaminated gear and equipment
- salt replacement drinks (Gatorade, etc.)
- safety harness and lines (if necessary).

7.7.2 Safe Work Practices for Entering Exclusion Zone

Before entering the exclusion zone, personnel should do the following:

(i) Drink water or an electrolyte drink.

(ii) Place sample containers, etc., in field carrier (backpack, wheelbarrow, etc.)

(iii) Check location of showers/lavatory/water supply and telephones.

(iv) Lay out and check alternate safety gear, including the following:

- First aid kit, and
- Extra clothing.

(v) Safety gear required in the order listed below.

- suit
- boots, gathering excess leg material and taping the cuff over the top of the boot (Note: if wet conditions prevail or if no cuff can be formed, connect the suit and boots with tape. Many suits such as Tyvek™ are splash-resistant, not waterproof)
- latex (or other) inner gloves
- neoprene (or other) outer gloves
- work gloves (taped to suit sleeves)
- long-sleeved gloves, if necessary, for collecting samples

- respirator (test it even if it will not be worn immediately)
- hardhat with goggles and face shield. When sampling a well by pumping, bailing, etc., or when sampling any type of liquid, use both the face shield and the goggles. The face shield is meant to break the impact of splashed liquid objects.

(vi) Check buddy's gear and vice-versa for rips/tears/malfunctions.

(vii) Conduct a preliminary site survey.

- characterize physical conditions of site.
- use as much caution as possible.
- use sampling gear, such as long-handled dippers for sampling holes/pipes/gaps/tanks/trucks/manholes.

(viii) Use caution - proceed slowly.

(ix) If problems arise, exit by the same route as used to enter - NO SHORTCUTS.

(x) On return, have buddy check for external contamination. Check gear for contamination and damage.

7.7.3 Safe Work Practices During Sampling

Personnel should observe the following during sampling.

(i) No eating/drinking/smoking while sampling.

(ii) Use standard sampling techniques (see site-specific field sampling plan or task leader).

(iii) Use care in collecting samples. If the sampling site is not accessible using available gear (i.e., water too high, slippery, steeply sloped, hole), do not take a sample. Confer with buddy and/or team leader about an alternate sampling site.

(iv) Wipe spills, dirt, and residue off the sample container and equipment immediately.

(v) If any physical discomfort, abnormalities, or light-headedness are experienced, stop work, tell buddy, and return with buddy to the decontamination line.

(vi) Always return from the sampling site by the same route used to enter it.

7.8 Permit Confined Space Entry

The Confined Space Program meets the requirements of 29 CFR 1910.14. A confined space is defined as a tank, vessel, silo, vault, pit, open-topped space more than 4 ft. (1.2m) deep, or any other enclosed space and has one or more of the following characteristics:

- contains an actual or potentially hazardous atmosphere or other safety or health hazard.
- makes ready escape difficult (i.e., prevents egress in a normal walking position).
- restricts entry for rescue purposes.
- is not designed for continuous occupancy by humans.

Hazards encountered when entering and working in confined spaces can potentially cause illness, injury, or death. Accidents occur because of failure to recognize that hazards exist. Each situation, therefore, must be approached as if the most unfavorable conditions exist and as if there is danger of explosion, poisoning, and/or asphyxiation. Before work is permitted, the existence of these hazards must be systematically demonstrated or disproved.

A confined space entry permit will be required for permit confined space work. The HSM will be responsible for preparing and maintaining permits. Permits must be renewed as conditions require, but at least at the beginning of each day or work shift. Work in a permit confined space will follow 29 CFR 1910.146, including training and procedures.

* * * * *

8.0 EMERGENCY PROCEDURES

8.1 Emergency Phone Numbers

Emergencies happen quickly and unexpectedly and require immediate response. This chapter outlines the nature of site emergencies that may occur and the emergency response procedures.

The following list of emergency telephone numbers will be obtained for each investigation. It will be included in each site-specific H&S plan and posted in a conspicuous location near the field office telephone (if applicable), on the outside of the field office (if applicable), and in each field vehicle. Numbers will be obtained on a site-specific basis.

Ambulance:
Police:
Fire Department:
Hospital:
Doctor:
TapanAm's Medical Consultant:
Poison Control Center:
Radiation Emergency Assistance Center:
Telephone Company:
Electric Utilities:
Gas Company:
Water Company:
Highway Patrol:
Sheriff:
State Department of Health/Environment:

TapanAm office, Leawood, Kansas

Phone: (913)648-5411
Fax: (913)648-0848

Project Manager
Office
Home

Health & Safety Manager
Office
Home

Site Manager
Office
Home

Project Radiation Safety Officer
Office
Home

8.2 Hospital

If deemed necessary by the HSM, hospital emergency room personnel will be contacted and briefed regarding the scope of the investigation. The emergency route to the hospital from the field site will be mapped and posted inside and outside the field office and in each field vehicle; it will be also included in the Site-Specific HSP. Travel time to the hospital will be posted on the map. Field personnel will be required to drive to the hospital at the beginning of fieldwork at each site.

A local, accredited physician will be notified for emergency reference if necessary. The hospital will be notified accordingly.

8.3 First Aid

All staff members working at the field site will be qualified to perform cardiopulmonary resuscitation and first aid. First aid kits will be located at the field office, the decontamination area, and in each field vehicle; one first aid kit will be carried by each field crew. An emergency shower and eye wash station will be available and marked with prominent signs. Emergency oxygen will be available if needed. Compliance with 29 CFR 1910.1030, OSHA's bloodborne pathogen standard, will be maintained during all activities involving contact with blood or other potential infectious materials.

8.4 Accidents/Injuries

In the event of an accident or injury, outside protective clothing can be removed if it does not cause delays or aggravate the problem. Normal decontamination procedures should be followed when possible. In life-threatening situations, care must begin without considering decontamination. Care providers must be informed of possible contamination, if decontamination is not performed.

8.5 Stress

Stress can contribute significantly to accidents or harm workers in the field. The body's response to stress occurs through the following three reactions:

- Alarm reaction - the body recognizes the stressor and responds by increasing the heart rate and blood sugar level, decreasing digestive activity and dilating the pupils.

- Adaptive state - the body repairs the effect of stimulation and the stress symptoms disappear.

- Exhaustion stage - the body can no longer adapt to stress and the individual may develop emotional disturbances, physical collapse, and/or long-term diseases and ailments.

The most common types of stress that could possibly affect field personnel are heat stress and cold stress.

8.6 Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur, ranging in severity from mild (fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal.

The following examples of heat-related stress that may be encountered:

Heat Rash: caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Symptoms include a decreased ability to tolerate heat as well as being a nuisance.

Heat Cramps: caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.

Heat Exhaustion: caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating, dizziness and lassitude.

Heat Stroke: the most severe form of heat stress. Body must be cooled immediately to prevent severe injury and/or death. Sign and symptoms are: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; and ultimately, unconsciousness.

8.6.1 Heat Stress Monitoring and Work Cycle Management

For strenuous field activities that are part of on-going site work activities in hot weather, the following procedures shall be used to monitor the body's physical response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures are to be instituted when the temperature exceeds 70 degrees F.

- **Measure Heart Rate (HR).** Heart rate should be measured by monitoring the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycles should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats/minute.

- **Body temperature** should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period (before the individual has a drink) should not exceed 99 degrees F. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. However, if the OT exceeds 99.7 degrees at the beginning of the next period, the following work cycle should be further shortened by 33%. OT should be measured again at the end of the rest period to make sure that it has dropped below 99 degrees F. An ear canal thermometer may be substituted for the oral unit.

- **Body water loss (BWL)** due to sweating should be measured by weighing the worker in the morning and the evening. The clothing worn should be similar at both weighings. The scale should be accurate to plus or minus 1/4 lb. BWL should not exceed 1.5% of the total body weight. If it does, the worker should be instructed to increase his daily intake of fluids by the weight lost. Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.

8.7 Evaluation and Control

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored when ambient temperature is above 70° F.

For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes), follow the ACGIH Threshold Limit Value recommendations for suggested work/rest schedules listed in Table 8.1. This work/rest schedule is determined by the Wet Bulb Globe Temperature Index (WBGT), a measure of environment factors that most nearly correlate with deep body temperature and other physiological responses to heat. WBGT values are calculated by the following equations:

- Outdoors with solar load

  $$WBGT = 0.7\ NWB + 0.2\ GT + 0.1\ DB$$

- Indoors or outdoors with no solar load

  $$WBGT = 0.7\ NWB + 0.3\ GT$$

  where:

  WBGT = West Bulb Globe Temperature
  NWB = Natural Wet Bulb Temperature
  DB = Dry-Bulb Temperature
  GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer. Commercially available instruments can be used for convenient measurement of WBGT. To monitor these workers, measure the following:

Table 8.1.

WBGT TEMPERATURE IN WHICH VARIOUS WORK LOADS ARE PERFORMED [°F(°C)]

Work-Rest Regimen	Light	Moderate	Heavy
Continuous work permitted	86.0 (30.0)	80.1 (26.7)	77.0 (25.0)
75% work 25% rest, each hour	87.1 (30.6)	82.4 (28.0)	78.6 (25.9)
50% work 50% rest, each hour	88.5 (31.4)	84.9 (29.4)	82.2 (27.9)
25% work 75% rest, each hour	90.0 (32.2)	88.0 (31.1)	86.0 (30.0)

Source: ACGIH (1990)
°F - Degrees Fahrenheit
°C - Degrees Celsius

Table 8.2. Suggested frequency of physiological monitoring for FIT and acclimatized workers[a]

Adjusted Temperature[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90%F (32.2°C) or above minutes of work	After each 45 minutes of work	After each 15
87.5° - 90%F (30.8° -32.2°C) minutes of work	After each 60 minutes of work	After each 30
82.5° - 87.5°F (28.1° - 30.8°C) minutes of work	After each 90 minutes of work	After each 60
77.5° 82.5°F (25.3° - 28.1°C) minutes of work	After each 120 minutes of work	After each 90
72.5° - 77.5°F (22.5° - 25.3°C) minutes of work	After each 150 minutes of work	After each 120

Source: NIOSH/OSHA/USCG/USEPA (1985).

[a] For work levels of 250 kilocalories/hour.

[b] Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 X % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distant shadow; 0 percent sunshine = no shadows.)

[c] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

°C - Degrees Celsius
°F - Degrees Fahrenheit

For workers wearing semipermeable or impermeable encapsulating ensembles and/or levels of protection A, B, or C, the recommendations listed in Table 8.1 cannot be used. For these situations, workers should be monitored when the temperature in the work area is above 70° F (21°C).

- **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.

- **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 the individual has a drink). An ear canal thermometer may substituted for the oral unit.
  - If temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
  - If 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 temperature exceeds 100.6°F (38.1°C).

- **Body water loss** (to be implemented when heavy body water loss is anticipated). Measure worker's weight on a scale accurate to $\pm$ 0.25 pounds at the beginning and end of each work day to see if enough fluids are being taken in to prevent dehydration. Weights should be taken while the worker is wearing similar clothing. The body water loss should not exceed 1.5% 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 (see Table 8.2). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

8.8 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. One or more of the following recommendations will help reduce heat stress.

- 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 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 18 ounces [0.23 kilogram (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).
  - Provide small disposable cups that hold about 4 ounces (0.1 liter).
  - Have workers drink 16 ounces (0.4 liter) fluid (preferably water) 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.
  - Weigh workers before and after work to determine if fluid replacement is adequate.

- Encourage workers to maintain an optimal level of physical fitness.

  - Acclimatize workers to site work conditions: temperature, protective clothing, and workload.
  - Urge workers to maintain normal weight levels.
  - Urge workers to refrain from the use of alcohol, on and off the job.

- Wear long cotton underwear under chemical protective clothing. Cotton will aid in absorbing perspiration and will hold it close to the skin, which will provide the maximum amount of cooling from the limited evaporation that takes place underneath the chemical-resistant clothing.

- 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 to cool off protective clothing
  - Cooling jackets, vests, or suits

8.9 Cold Stress

Individuals working outdoors in low temperatures are subject to cold stress. Exposure to extreme cold for a short time can cause severe injury to the surface of the body or can result in profound generalized cooling or even death. Areas of the body that have high surface area-to-volume ratio such as fingers, toes, and ears are the most susceptible. Protective clothing used for contaminant control generally does not afford protection against cold stress.

Two factors influence the development of a cold injury: ambient temperature and wind velocity. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. Generally, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 miles per hour (mph). Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration-soaked.

8.10 Frostbite

Frostbite of the extremities can be categorized into as follows:

- Frost nip or incipient frostbite characterized by sudden blanching or whitening of skin;

- Superficial frostbite characterized by skin with a waxy or white appearance and firm to the touch, but tissue beneath is resilient; or

- Deep frostbite characterized by tissues that are cold, pale, and solid.

To administer first aid for frostbite, take the individual indoors and rewarm the areas quickly in water that is between 102°F and 105°F. Give the person a warm drink other than coffee, tea, or alcohol. The victim must not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, although the tissue will be very painful as it thaws. Then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medial care. After thawing, the victim should try to move the injured areas a little, but no more can be done without medical help.

NOTE: Do not rub the frostbitten area (this may cause gangrene). Do not use heat lamps or hot water bottles to rewarm the area.

8.11 Hypothermia

Systemic hypothermia (low body temperature) is caused by exposure to freezing or rapidly dropping temperature. However, it can also be caused by exposure to temperatures as high as 50°F if conditions for rapid heat loss (e.g., wet clothing, wind) exist. The symptoms are usually exhibited in five stages:

- shivering;
- apathy, listlessness, sleepiness;
- unconsciousness, glassy stare, slow pulse, slow respiratory rate;
- freezing of the extremities;
- death.

Field activities should be curtailed if wind chill temperature is below 0°F unless the activity is an emergency.

8.12 Fire

The potential for fire is significant at many hazardous waste sites. During subsurface operations, explosimeters and organic vapor analyzers are used to monitor levels of potentially combustible gases. A fire extinguisher (20-lb Class A, B, C) must be available at the site comments post, and field crews may be required to carry a fire extinguisher appropriate for a particular site. Fire extinguishing materials suitable for metal fires (Class D) will also be provided, if necessary. Local fire departments will be alerted (as appropriate) to the nature and location of any field investigation.

8.13 Explosion

Occasionally, there is the possibility of explosion during hazardous waste site investigations. Work will be stopped and the area evacuated when air monitor readings in excess of 25% of the lower explosive limit (LEL) are obtained. Future work will require continuous monitoring until the possibility of explosion is eliminated.

8.14 Site Evacuation

Three stages of evacuation have been determined:

- withdrawal from the immediate work area,
- withdrawal from site, and
- withdrawal from area.

8.14.1 Withdrawal From Immediate Work Area

Withdrawal to a safe upwind location will be required if any of the following occur:

- concentrations of volatile organics, or combustible/toxic gases are detected above safe levels for the level of protection being worn;
- radiation exposure rates in excess of 1 mR/hour are measured, if radiation protection procedures have not been specified in the site-specific HSP;
- occurrence of a minor accident: field operations may resume after first aid and/or decontamination procedures have been administered; or
- for confined spaces, oxygen decreases below 19.5%.
- equipment, protective clothing, or respirator malfunctions.

8.14.2 Withdrawal From Site

The site will be evacuated under the following situations:

- Explosimeter readings above 25% of the lower explosive limit (LEL). A reading of 10% of the LEL will require continuous monitoring until levels fall. For permit confined space entry, a 10% LEL reading will cause immediate evacuation of the confined space.
- Any radiation level above the predetermined safe level as prescribed by the PRSO. TapanAm personnel will not reenter a site until clearance is given by the project PRSO.
- An oxygen concentration of less than 16.5% or greater than 23%. Explosimeter readings are inaccurate outside this range.
- Fire and/ or explosion.

8.14.3 Withdrawal From Area

The site manager and SHSC are responsible for determining whether circumstances exist for general area contamination and should assume worst-case conditions until proven otherwise. In this case, all personnel are withdrawn from the area immediately. Fire and police departments must be notified. A list of their addresses and telephone numbers will be posted in the field office and also kept by each task leader.

8.15 Safety of Third Parties

Site access will be controlled so that only verified team members, subcontractors, government Safety and Health Inspectors, and previously approved guests will be allowed in work areas or areas containing potentially hazardous materials or conditions. Special badges/passes may be issued if needed. Anyone entering the work area(s) will be required to wear appropriate safety equipment and the same level of personnel protective equipment as the workers. Unauthorized, after-hours access will be deterred by locked gates and fences, as is practical and appropriate for the site. The enclosed and unenclosed areas of the site will be posted with the warning and/or no trespassing signs, subject to community relations considerations. Dangerous materials or devices at the site will segregated and secured as much as possible after work hours.

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9.0 SITE CONTROL AND WORK ZONES

9.1 Introduction

Personnel and equipment working in the hazardous waste site may carry contaminated material into clean areas. Materials may also become airborne due to their volatility, or due to the disturbance of contaminated soil. In order to minimize the spread of hazardous substances from the site, two general methods are used. One is the establishment of site work zones and site control procedures; the second is to remove contaminants from workers and equipment. Decontamination procedures are described in Chapter 10.0.

9.2 Site Control

A site must be controlled to minimize accidental spread of contaminants off-site by personnel and equipment. The potential for exposure to or spread of contaminants can be reduced or eliminated in a number of ways, including:

- Setting up security and physical barriers to exclude unnecessary personnel from the general area.
- Minimizing the number of personnel and equipment on-site consistent with effective operations.
- Establishing work zones within the site area.
- Establishing control points to regulate access to and from work zones.
- Conducting operations in a manner to reduce the exposure of personnel and equipment and to eliminate the potential for airborne dispersion.
- Implementing appropriate decontamination procedures for personnel and equipment, both inside the site and leaving the site.

9.3 Work Zones

One method of preventing or reducing the migration of contamination is to delineate zones on the site where different types of operations will occur. Movement of personnel and equipment between zones and onto the site is then limited by access control points. Contamination would then be confined within relatively small areas on the site and the potential for contamination can be minimized. Three contiguous zones (Figure 9.1) are recommended:

- Zone 1: Exclusion Zone, the contaminated area.
- Zone 2: Contamination Reduction Zone (CRZ), the area where

decontamination takes place.

- Zone 3: Support Zone, the clean area.

9.3.1 Zone 1: Exclusion Zone

The Exclusion Zone is the innermost of three concentric areas and is the zone where contamination is known or could occur. All personnel entering the Exclusion Zone must wear the prescribed Level of Protection for the specific site. The Level of Protection is determined by the measured concentration of substances in air, potential for contamination, and the known or suspected presence of highly toxic substances (See Chapter 4.0). An entry and exit check point must be established at the periphery of the Exclusion Zone to regulate the follow of personnel and equipment into and out of the zone and to verify that established entry and exit procedures are followed.

The outer boundary of Zone 1 is the Hotline. It is initially established by visually surveying the immediate environs of the site and determining where the hazardous substances involved are located; where any drainage, leachate, or spilled material is; and whether any discolorations are visible. Guidance in determining boundaries is also provided by data from the initial site survey indicating the presence of organic or inorganic vapor/gases or particulates in air, combustible gases, and radiation, or from the results of water and soil sampling.

Additional factors that should be considered include the distances needed to prevent fire or an explosion from affecting personnel outside the zone, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area. Once the Hotline has been determined, it should be well marked. During subsequent site operations, the boundary may be modified and adjusted as additional information becomes available.

9.3.2 Zone 2: Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) produces a transition between contaminated and clean areas, and serves as a buffer to further minimize the probability of the clean zone becoming contaminated or being affected by other existing hazards. It provides additional assurance that the physical transfer of contaminating substances by personnel, equipment, or in the air is limited through a combination of decontamination, distance between Exclusion and Support zones, air dilution, zone restrictions and work functions.

Initially, the Contamination Reduction Zone is considered to be a non-contaminated area. Decontamination stations are established at the boundary between the Exclusion and Contamination Reduction Zones, for personnel and for heavy equipment. Exit from the Exclusion Zone is through a decontamination station.

As field operations proceed, the area around the decontamination station may become contaminated, but to a much lesser degree than the Exclusion Zone. On a relative basis, the amount of contaminants should decrease from the Hotline to the Support Zone due to the distance involved and the decontamination procedures used.

The boundary between the Support Zone and the Contamination Reduction Zone, (the Contamination Control Line), separates the possibly low contamination area from the clean Support Zone. Access to the Contamination Reduction Zone from the Support Zone is through a control point. Personnel entering will wear the prescribed personnel protective equipment appropriate for work in the Contamination Reduction Zone.

9.3.3 Zone 3: Support Zone

The Support Zone is the outermost part of the site and is considered a non-contaminated or clean area. It is here that support equipment, command post, the equipment trailer, etc. are located, and traffic is restricted to authorized personnel. Normal work clothes are appropriate within this zone; therefore, potentially contaminated personnel clothing, equipment, and samples are not permitted, but are left in the Contamination Reduction Zone until they are decontaminated.

The location of the command post and other support facilities in the Support Zone depends on a number of factors, including:

- Accessibility: Topography, open space available, locations of highways, railroad tracks, or other limitations.

- Wind direction: preferably the support facilities should be located upwind of the Exclusion Zone. However, shifts in wind direction and other conditions may be such that an ideal location based on wind direction alone does not exist.

- Resources: adequate roads, power lines, water and shelter should be available in close proximity to site. For a long-term site, access to a telephone line is also a consideration.

9.4 Area Dimensions

The distance between the Hot Line, Contamination Control line, and Command Post and the size and shape of each zone will be based on conditions specific to each site. The following criteria would be considered in establishing area dimensions and boundaries.

- physical and topographical features of the site
- weather conditions
- field and laboratory measurements of air contaminants and environmental samples
- air dispersion calculations

- physical, chemical, toxicological and other characteristics of the substances present
- presence of radioactivity
- cleanup activities required
- potential for fire or explosion
- size of area known or suspected to be contaminated
- size of area needed to conduct operations
- decontamination procedures
- potential for exposure
- proximity to residential or industrial areas.

9.5 Monitoring and Sampling

To verify that site control procedures are preventing the spread of contamination, a monitoring and sampling program should be established. The Support Zone should be periodically monitored for air contaminants using direct-reading instruments and by collecting air samples for particle, gas or vapor analysis. Analysis of soil samples collected in the most heavily-traveled areas would indicate contaminants being carried from the Exclusion Zone by personnel, equipment, wind, or surface water runoff. Occasional swipe tests should be taken in trailers and other areas used by personnel.

These same types of sample should be collected and the air monitored in the Contamination Reduction Zone. Increased concentrations in air or other environmental media may indicate a breakdown in control over the Contamination Reduction Corridor, ineffective decontamination procedures, or failure to restrict site access.

* * * * *

10.0 DECONTAMINATION

10.1 Introduction

Personnel and equipment involved in hazardous waste site operations may become contaminated in a number of ways. Therefore, decontamination is critical for the health and safety of individuals. Although personnel protective equipment will help prevent the individual from becoming contaminated, good work practices are essential for minimizing exposure and cross contamination.

Decontamination procedures must be developed and implemented before anyone enters a site and must continue (or be modified if necessary) throughout site operations. The processes of decontamination consist of physically removing contaminants and/or altering their chemical nature to transform them into innocuous substances. The extensiveness of decontamination depends on a number of facts, the most important being the type of contaminants involved. When there is a greater potential for harm from a contaminant, the more extensive and thorough decontamination must be. Combining various decontamination techniques and the use of site work zones minimizes cross-contamination from protective clothing to wearer, equipment to personnel, and from one area to another.

Specific decontamination procedures and decontamination equipment and fluids will be given in each Site-Specific Health and Safety Plan.

10.2 Initial Planning

The initial decontamination plan assumes all protective clothing and equipment leaving the Exclusion Zone is contaminated. A system is then established to wash and rinse all the non-disposable personnel protective equipment worn. This is done in conjunction with a sequential removing of equipment, starting at the first wash and rinse regime station with the most heavily contaminated item and progressing to the last station with the least contaminated article. Each piece of clothing or operation requires a separate decontamination station, with each station separated by a minimum of 3 feet.

The initial decontamination system (based on a worst case situation) is modified, eliminating unnecessary stations or otherwise adapting it to site conditions. For instance, the initial plan might require a complete wash and rinse of chemical protective garments. If disposable garments are worn, the wash/rinse step could be omitted. Wearing disposable boot covers and gloves could eliminate washing and rinsing both gloves and disposable boots and reduce the number of stations needed.

10.3 Extent of Decontamination Required

The original decontamination plan must be adapted to specific site conditions. These conditions may warrant more or less decontamination than planned depending on a number of factors listed

below:

- **Type of Contaminant;** The more toxic a substance is, the more extensive and thorough decontamination must be. Whenever it is known or suspected that personnel can become contaminated with highly toxic or skin-destructive substances, a full decontamination procedure should be followed.

- **Amount of Contamination;** The amount of contamination on protective clothing is usually determined visually. Gross material remaining on the protective clothing for any extended period of time may degrade or permeate it. This likelihood increases with higher air concentrations and greater amounts of liquid contamination. Gross contamination also increases the probability of personnel contact.

- **Level of Protection;** The Level of Protection and specific pieces of clothing worn determine, on a preliminary basis, the layout of the decontamination line. For example, decontamination of the harness straps and backpack assembly of the self-contained breathing apparatus is difficult. Clothing variations and different Levels of Protection may require the addition or deletion of stations from the original decontamination procedure.

- **Work Function;** The task(s) each person performs determines the potential for contact with hazardous materials. However, all personnel who enter the Exclusion Zone encounter the potential for contamination. Personnel present in the Exclusion Zone will undergo decontamination procedures in all cases.

- **Location of Contamination;** Contamination on the upper areas of protective clothing poses a greater risk to the worker because volatile compounds may generate a hazardous breathing concentration both for the worker and for the decontamination personnel. An increased probability of contact with skin also exists when doffing the upper part of clothing.

- **Effectiveness of Decontamination;** There is no method to immediately determine how effective decontamination is in removing contaminants. Discoloration, stains, corrosive effects, and substances adhering to objects may indicate contaminants have not been removed; however, observable effects only indicate surface contamination and not permeation (absorption) into clothing. In addition to this, many contaminants are not easily visually observed.

10.4 General Decontamination Procedures

Most decontamination procedures involve a soap and water wash followed by a water rinse and then a distilled water rinse. Sampling equipment may require a solvent rinse prior to the distilled water rinse. Always rinse the solvent into a separate container. Equipment used for

decontamination could be a tub, inflatable pool, or some other method to contain the decontamination fluids. Scrub brushes, soap, and rinse solutions are used to remove the contaminants. Plastic sheet is used to cover the area to minimize the contamination of the ground. The decontamination fluids must be containerized and treated prior to disposal. All sampling equipment and worker gloves must be decontaminated between each sample to prevent cross contamination.

10.5 Decontamination During Medical Emergencies

Part of overall planning is managing medical emergencies. The decontamination plan should provide for:

- All team members to be fully trained in First Aid and Cardiopulmonary Resuscitation.
- Arranging with the nearest medical facility for transportation and treatment of injured and for treatment of personnel suffering from exposure to chemicals.
- Consultation services with a toxicologist or other medical specialist.
- Emergency eye washes, showers, and/or wash solutions at the site.
- First aid kits, blankets, stretcher, and resuscitator at the site.

In addition, the plan should have established methods for decontaminating personnel with medical problems and injuries. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt life-saving first aid and/or medical treatment is required, decontamination procedures should be omitted. Whenever possible, site personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination.

Physical injuries can range from a sprained ankle to a compound fracture, a minor cut to massive bleeding. Treatment may be given at the site by trained personnel depending on the seriousness of the injury. Additional assistance may be required at the site or the victim may have to be treated at a medical facility when more serious injuries are encountered.

Life-saving care should be instituted immediately without considering decontamination. The outside garments can be removed (depending on the weather) if this does not cause delays, interfere with treatment, or aggravate the problem. Respirators, masks, and backpack assemblies must always be removed. Fully encapsulating suits or chemical-resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating the inside of ambulances and/or medical personnel. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim. One exception would be if

it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life.

For minor medical problems or injuries, the normal decontamination procedure should be followed.

Heat-related illnesses range from heat fatigue to heat stroke (the most serious heat-related ailment). Heat stroke requires prompt treatment to prevent irreversible damage or death. Less serious forms of heat stress require prompt attention or they may lead to heat stroke. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately.

Exposure to chemicals can be divided into two categories:

- Injuries from direct contact, such as acid burns or inhalation of toxic chemicals.
- Potential injury due to gross contamination on clothing or equipment.

If the contaminant is inhaled, treatment can only be provided by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect.

When protective clothing is grossly contaminated, contaminants may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed.

10.6 Level of Protective Equipment for Decontamination Workers

In most instances, decontamination workers are in the same Level of Protection as site workers. The standard selection criteria apply. The minimum level of protection for decon personnel is Level C. This is because solvents may be used in the decon process and exposure to these solvents should be minimized.

10.7 Monitoring Equipment Decontamination

Measures should be taken to prevent contamination of sampling and monitoring equipment. Sampling devices usually become contaminated, but monitoring instruments, unless they are splashed, usually do not. Once contaminated, instruments are difficult to clean; therefore, any delicate instrument which cannot be decontaminated easily should be protected while it is being used. It should be bagged, and the bag taped and secured around the instrument. Openings are made in the bag for sample intake. **Note:** Some plastics or other material may interfere or affect readings.

10.8 Heavy Equipment Decontamination

Drill rigs, bulldozers, trucks, back-hoes, bulking chambers, and other heavy equipment are difficult to decontaminate. The method generally used is to wash them with water under high-pressure and/or to scrub accessible parts with detergent/water solution under pressure, if possible. Particular care must be given to those components in direct contact with contaminants such as tires and buckets. Swipe tests should be utilized to measure effectiveness. Care must also be given to the proper collection and disposal of any waste water from decontamination. Uncontrolled releases offsite will not be permitted.

10.9 Personnel and Protective Gear Decontamination

Decontamination procedures for workers, regardless of Level of Protection, must be established prior to initiation of field activities.

Decontamination procedures for personnel doffing Level A, B, and C equipment are outlined in tables 10.1 - 10.3, which follow.

10.10 Decontamination Equipment

The following list of equipment and supplies for decontamination is intended for basic guidance only. Other equipment or supplies may be necessary or useful for a given site. The Site-Specific (HSP) and the Site-Specific Field Sampling Plan (FSP) will give additional guidance as to supplies and quantities.

- Plastic sheeting
- Buckets, garbage cans, plastic trays, and/or wash tubs
- Brushes
- Garden hose (if needed) kimwipes or lint-free disposable towels pressure-type garden sprayer
- Alconox Detergent
- Potable water
- Distilled Water
- Reagent Grade Distilled Water
- Solvent (pesticide -grade isopropanol, may also use pesticide-grade or methanol but this is discouraged; do not use hexane or acetone)
- 10% Nitric acid (For use where potential for metals contamination exists)
- Drums for waste, with covers labeling material
- Face shield, if required
- Disposable gloves-inner/outer

TABLE 10.1

Level A Decontamination Procedure

Station	Action	Comment
1	Segregated Equipment Drop	
2	Boot Cover and Glove Wash	
3	Boot Cover and Glove Rinse	Repeat as many times as necessary.
4	Tape Removal from Wrists/Ankles	
5	Boot Cover Removal	
6	Outer Glove Removal	
7	Suit/Safety Boot Wash	wrap SCBA regulator with plastic to keep out water
8	Suit/Safety Boot Rinse	Repeat as many times as necessary.
9	Tank Change	If worker leaves Exclusion Zone only to change air tanks, this is the last step in the decontamination procedure.
10	Safety Boot Removal	
11	Fully Encapsulating Suit and Hard Hat Removal	
12	SCBA Backpack Removal	
13	Inner Glove Wash	
14	Inner Glove Rinse	Repeat as many times as necessary. Avoid touching face with fingers.
15	Facepiece Removal	Avoid touching face with fingers.
16	Inner Glove Removal	
17	Inner Clothing Removal	
18	Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected.
19	Redress	Exit to support zone.

TABLE 10.2

Level B Decontamination Procedure

Station	Action	Comment
1	Segregated Equipment Drop	
2	Boot Cover and Glove Wash	
3	Boot Cover and Glove Rinse	Repeat as many times as necessary.
4	Tape Removal from Wrists/Ankles	
5	Boot Cover Removal	
6	Outer Glove Removal	
7	Suit/Safety Boot Wash	Wrap SCBA regulator (if belt-mounted type) with plastic to keep out water.
8	Suit/SCBA/Boot/Glove	Repeat as many times as necessary.
9	Tank Change	If worker leaves Exclusion Zone only to change air tanks, this is the last step in the decontamination procedure.
10	Safety Boot Removal	
11	SCBA Backpack Removal	Facepiece remains intact.
12	Splash Suite Removal	
13	Inner Glove Wash	
14	Inner Glove Rinse	Repeat as many times as necessary.
15	Facepiece Removal	Avoid touching face with fingers.
16	Inner Glove Removal	
17	Inner Clothing Removal	
18	Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials or are known or suspected.
19	Redress	Exit to support zone.

TABLE 10.3

Level C Decontamination Procedure

Station	Action	Comment
1	Segregated Equipment Drop	
2	Boot Cover and Glove Wash	
3	Boot Cover and Glove Rinse	Repeat as many times as necessary
4	Tape Removal from Wrists/Ankles	
5	Boot Cover Removal	
6	Outer Glove Removal	
7	Suite/Safety Boot Wash	
8	Suit/Safety Boot Rinse	Repeat as many times as necessary
9	Canister or Mask Change	If worker leaves Exclusion Zone to Change canister (or mask), this is last step in the decontamination procedure.
10	Safety Boot Removal	
11	Splash Suite Removal	
12	Inner Glove Wash	
13	Inner Glove Rinse	Repeat as many times as necessary.
14	Facepiece Removal	Avoid touching face with fingers.
15	Inner Glove Removal	
16	Inner Clothing Removal	
17	Field Wash	Shower if highly toxic, skin-corrosive or skin absorbable materials are known or suspected.
18	Redress	

A typical Level C Decontamination Layout is shown on Figure 10.3.

10.11 Preparation of Decontamination Solutions

The use of any decontamination solution (other than alconox in water) must be approved by the site manager and the SHSC. Decontamination solutions should be designed to react with and neutralize specific contaminants found at a hazardous waste site. However, since the contaminants on a particular site will be unknown in the majority of cases, it is necessary to use a decontamination solution that is effective for a variety of contaminants. Several of these general purpose decontamination solutions (some ingredients are available at hardware or swimming pool supply stores) are listed below:

DECON SOLUTION A - A solution containing 5% sodium carbonate ($Na_2 CO_3$) and 5% trisodium phosphate ($Na_3 PO_4$).

DECON SOLUTION B - A solution containing 10% calcium hypochlorite ($Ca(OC1)_2$.

DECON SOLUTION C - A solution containing 5% trisodium phosphate (Na_3PO_4). This solution can also be used as a general purpose rinse.

DECON SOLUTION D - A dilute solution of hydrochloric acid (HC1).

See Table 10.4 for recommended uses of these solutions. At no time should these solutions be applied to bare skin without specific guidance, authorization, and supervision by the SHSC. No solution except pure, clear water should ever be used for eye washing. In all cases, a final rinse with potable water must follow the use of any of these solutions on any equipment.

10.12 Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and all other equipment that is contaminated must be secured in drums or other containers and labeled. Clothing not completely decontaminated on-site should be secured in plastic bags before being removed from the site.

Contaminated wash and rinse solutions should be contained by using step-in- containers to hold spent solutions. The spent solutions are transferred to drums, which are labeled, capped, and disposed of with other substances on-site.

TABLE 10.4

USES OF GENERAL PURPOSE DECON SOLUTIONS

	TYPE OF HAZARD	PREFERRED DECON SOLUTION	DIRECTIONS FOR PREPARATION
1.	Inorganic acids, metal processing wastes	A	To 10 gallons of water, add 4 pounds of sodium carbonate (soda lime) and 4 pounds of trisodium phosphate. Stir until evenly mixed.
2.	Heavy metals - mercury,lead, cadmium, etc.	A	Same as #1 above
3.	Pesticides, fungicides, chlorinated phenols, dioxins, PCPs	B	To 10 gallons of water, add 8 pounds of calcium hypochlorite. Stir with wooden or plastic stirrer until evenly mixed.
4.	Cyanides, ammonia and other non-acidic inorganic wastes	B	Same as #3 above
5.	Solvents and organic compounds such as trichloroethylene, chloroform and toluene	C (or A)	To 10 gallons of water, add 4 pounds of trisodium phosphate. Stir until evenly mixed.
6.	PCB's	C (or A)	Same as #5 above
7.	Oily, greasy unspecified wastes	C	Same as #5 above
8.	Inorganic bases, alkali and caustic waste	D	To 10 gallons of water, add 1 pint of concentrated hydrochloric acid. Stir with a wooden or plastic stirrer.

* * * * *

11.0 SITE RECONNAISSANCE AND SITE SAFETY PLANS

11.1 Introduction

Prior to commencement of site activities, an evaluation of the potential hazards associated with the site shall be undertaken. The evaluation will consist of summarizing available data concerning the site by reviewing current information in project files. If the information available is insufficient to adequately describe on-site conditions, an initial site reconnaissance shall be conducted to determine any evidence of explosion hazards, oxygen deficiency, toxic chemical vapors, radiation hazards, or other conditions that may adversely affect the health and safety of site personnel. The information needed to profile a site will include:

• the nature of materials suspected on-site, such as:

- container types
- physical state of materials
- physical and chemical properties of materials, and
- known or suspected hazards of these materials.

• A detailed description of the site, such as

- the exact location (detailed maps)
- site size
- building plans
- aerial photographs
- topographic maps
- history of site usage.

• A description of the surrounding area, such as

- surface waters that could be affected by contaminated runoff which might result from the site investigations
- nearby drinking water wells that could be affected by contaminated groundwater originating at the site and/or affected by site investigations
- nearby residences, businesses, or other target receptors that could be affected by airborne contaminants released by site operations; and
- present status and capabilities of emergency response teams, facilities, and equipment that would provide assistance to employees during an emergency.

11.2 Initial Site Reconnaissance

The objective of an initial site reconnaissance is to determine, on a preliminary basis, the presence of potentially hazardous conditions. A brief HSP based on whatever knowledge of the site is available is required for an initial site survey. If the HSM determines that the

available knowledge of site hazards is insufficient for safe entry, the "worst possible case" assumption will apply and the site will be entered with Level A Protection, procedures which maximize caution, and maximum decontamination. Table 11.1 provides guidelines to be used for the evaluation of atmospheric hazards during the site survey.

Organic Vapors and Gases

If the types of substances present at the site are known and the materials are volatile or can become airborne, measurements for organics should be made with one or more appropriate and properly calibrated survey instruments.

When the presence of types of organic vapors/gases is unknown, instruments such as a photoionization detector and/or a portable gas chromatograph (operated in the total readout mode) should be used to detect organic vapors. Until specific constituents can be identified, the readout indicates total airborne substances to which the instrument is responding. Identification of the individual vapor/gas constituents permit the instrument to be calibrated and used for more specific analysis.

Sufficient data should be obtained during the initial entry to map or screen the site for various levels of organic vapors. These gross measurements can be used on a preliminary basis to: 1) determine levels of personnel protection, 2) establish site work zones, and 3) select areas for more through qualitative and quantitive studies as needed.

Inorganic Vapors and Gases

The ability to detect and quantify nonspecific inorganic vapors and gases is limited. Presently, photoionizers have limited or no detection capability while the chromatographs have none. If specific inorganics are known or suspected, measurements should be made with appropriate instruments, if available. Colormetric tubes can be used if substances present are known and appropriate tubes are available.

Radiation

Radiation monitoring should be incorporated in the initial survey where radioactive materials are suspected. Normal gamma radiation background is approximately 0.01 to 0.02 milliRoentgen per hour (mR/hr) on a gamma survey instrument. However, limited investigation may continue with elevated radiation exposure rates. If the exposure rate increases to 3-5 times above gamma background, a qualified health physicist must be consulted before work is allowed to continue.

At no time should work continue with an exposure rate of 1 mR/hr or above without the advice of a health physicist.

TABLE 11.1

ATMOSPHERIC HAZARD GUIDELINES

Monitoring Equipment	Hazard or Quantity Being Monitored	Ambient Level	Action
Combustible gas indicator (CGI)	Explosion	Less than 10% LEL	Continue investigation with care.
		10%-25% LEL	Continue on-site monitoring with extreme caution as higher levels are encountered.
		More that 25% LEL	Explosion hazard; withdraw from area immediately.
Oxygen concentration meter	Oxygen	Less than 19.5%	Monitoring wearing SCBA. Note: Combustible gas readings are not valid in atmospheres with less than 19.5% oxygen.
		19.5%-25%	Continue inspection; fire hazard potential. Consult specialist.
		More than 25%	Leave area immediately.
Radiation survey	Radiation	Less than 0.1 mR/hr	Continue investigation.
		More than 0.1 mR/hr	If detected above this level, this signifies the presence of possible radiation sources at this level. More thorough monitoring is necessary. Consult health physicist.
		More than 1.0 mR/hr	Leave area immediately. Consult Health Physicist.
Colorimetric tubes	Organic and Inorganic Vapors	Depends on species	Consult standard reference manuals for air concentrations/toxicity data. (a)
Photoionization Detector (PID)	Organic vapors/gases	1) Depends on species	Consult standard reference manual for all concentrations/toxicity data. (a)
		2) Total response made	Consult EPA Standard Operating Procedures. (a)
Organic vapor analyzer (OVA)	Organic	1) Depends on species	Consult standard reference manuals for concentration/toxicity
	Vapors/Gases	data. (a)	
		2) Total Response Mode	Consult EPA Standard Operating Procedures. (a)

NOTE (a) If in doubt as to meaning of any reading or action level of any chemical, leave the area immediately.

The absence of gamma readings above background should not be interpreted as the complete absence of radioactivity. Radioactive materials emitting low-energy gamma, alpha, or beta radiation may be present, but for a number of reasons may not cause a response on a general gamma survey instrument. Unless airborne or ingested, these radioactive materials should present minimal hazard, but more thorough surveys should be conducted as site operations continue to completely characterize the presence of any radioactive material.

Oxygen Deficiency

Ambient air must contain at least 19.5% oxygen by volume. At lower percentages, air-supplied respiratory protective equipment (SCBA or Air line) is needed. Oxygen measurements are of particular importance for work in enclosed spaces, low-lying areas, or in the vicinity of accidents that have produced heavier-than-air vapors which could displace ambient air. These oxygen-deficient areas are also prime locations for taking further organic vapor and combustible gas measurements, since the air has been displaced by other substances. Oxygen-enriched atmospheres increase the potential for fires. Oxygen measurements can be made through the use of an approved oxygen meter.

Oxygen deficiency presents a special danger in confined spaces. Normally, on the initial site surveillance confined spaces should be recognized and documented, but no attempt should be made to enter them. The atmosphere in a confined space may be sampled with a remote-reading instrument if one is available. Entry into any confined space should be deferred until special preparations have been completed and the HSM has approved the entry plan.

Combustible Gases

The presence or absence of combustible vapors or gases must be determined through the use of an approved explosimeter. If readings approach or exceed 10% of the lower explosive limit (LEL), extreme caution must be exercised in continuing the investigation. If readings approach or exceed 25% LEL personnel should be withdrawn from the area immediately. Before resuming any-on-site activities, project personnel, in consultation with experts in fire or explosion prevention, must develop procedures for continuing operations.

OTHER FACTORS

While on-site, visual observations should be made to further evaluate site hazards. For example, dead fish or other animals, dead or dying vegetation, land features, wind direction, or the presence of corrosive materials may indicate increased hazard potential.

USE OF DATA FROM THE INITIAL SITE RECONNAISSANCE

Data from the monitoring activities described above will be expected to be sufficiently complete to characterize the hazards to personnel at the site. This data will then be used to write a comprehensive site-specific HSP which will be used to guide further site investigation. The site-

specific HSP will detail the hazards found, the monitoring equipment and plans necessary, the level of protection and specific PPE, and the procedures which must be used. Monitoring instruments and calibration procedures will also be spelled out based on the data.

11.3 Continuing Site Characterization

To verify that site control procedures are preventing the spread of contamination, a monitoring and sampling program should be established based on the initial site characterization. Each work zone should be periodically monitored for air contaminants. In addition, analysis of soil collected in the most heavily travelled areas would indicate contaminants being carried from the Exclusion Zone by personnel, equipment, or wind. The results of these and further tests are then used to modify the existing HSP as necessary.

11.4 Site-Specific Health and Safety Plans

The purpose of a Site-Specific Health and Safety Plan (HSP) is to establish site-specific policies and procedures to protect the health and safety of personnel and the public during all activities conducted at a site. The HSP is the means of ensuring that this Master Health and Safety Plan is implemented in the field.

A written Site-Specific HSP must be prepared prior to the initiation of any field operations. It must provide information about the site being investigated, evaluate the hazards present, establish personal protective measures for personnel assigned to the operation, and outline emergency action procedures. Before site operations commence, the HSP is distributed to site personnel and discussed with them.

Subcontractor Health and Safety Plans shall be submitted to TapanAm's Health and Safety Manager for review to assure that the specifications presented in the Site-Specific HSP are met.

11.5 Development of HSPs

The Site Manager will be responsible for the development of the HSP for a specific project. The Site-Specific HSP should address the following:

- Outline the objective of the work to be performed
- Describe the work areas including location, history, and principal disposal methods (if known)
- Identify known hazards and evaluate the risks associated with each activity to be conducted (both chemical and physical hazards)
- List key personnel and responsibilities

- Describe levels of protection to be worn during site operations
- Define work zones/site access procedures
- Describe procedures for personnel and equipment decontamination
- Establish site emergency procedures including location and arrangements for emergency medical care
- Describe environmental monitoring requirements and action levels
- Specify training required for site personnel
- Define standard operating procedures (SOPs) for the site
- Define confined space entry procedures meeting the requirements of 29 CFR 1910.146, if needed
- Define lock out/tag out procedures meeting the requirements of 29 CFR 1910.147, if needed
- Define universal precautions to prevent contact with blood or other potentially infectious materials per 29 CFR 1910.130, if needed

11.6 Specific Elements of a Site Safety Plan

The following information is an example of the level of detail required in a Site-Specific HSP. This is intended to be used as general guidance in preparing the plan.

Introduction

Specific location (buildings, Ajax Chemical Co., Cardmarks, etc.) Type of job (PCB removal, tank cleaning, etc.)

I. Statement of Hazard

A. General - Briefly describe the job: where it is, what must be done, the procedures to be used, and the conditions under which the work must be performed.

B. Specific Hazards - Describe all potential hazards to workers on-site from: 1) the material being processed, 2) the process itself including cleaning

materials, 3) the environmental conditions (heat, cold, noise) and, 4) a brief description of the type of protective clothing/respiratory protection required (Level A, B or C). Appendices should also be attached, such as chemical hazard data sheets, product information, heat stress information, etc.

II. Work Zones

A. General - Describe how the worksite will be established into the Exclusion Zone (Hot Zone Area), Contamination Reduction Zone (Transition Area) and Support Zone (Clean Area). Describe where the Decontamination Area will be located and where eating, drinking and smoking will be permitted. A sketch of the worksite outlining each zone is appropriate.

B. Exclusion Zone - Describe the Exclusion Zone in some detail as to location, how indicated or outlined, level of protection required, and where the zone will be entered.

C. Contamination Reduction Zone - Describe the Contamination Zone as to the location, how indicated or outlined, the level of protection required, the location of the Decontamination Stations and from "clean" and "dirty" workers enter the zone.

D. Support Zone - Describe the location and set up of the Support Zone.

III. Protective Equipment/Respirators

A. Exclusion Zone - Cite level of protection (A, B, C, or D) and specifically list the equipment to be worn in the Exclusion Zone.

B. Contamination Reduction Zone - If personnel are going to be working in this area, performing decon activities or personnel support, cite level of protection required and specifically list the equipment to be worn.

IV. Decontamination Procedures

A. General - State the need for decontamination, if the need exists, and briefly outline where the decontamination stations will be set up. State specific decon fluids or chemicals which maybe required.

B. Personnel Decontamination Procedure - Outline the specific procedure to be used for decontamination of personnel in protective clothing in a step-by-step method.

C. Equipment Decontamination Procedure - Outline the specific step-by-step procedure to decontaminate any equipment which has become contaminated.

V. Emergency Procedures

A. Emergency Notification - List the local telephone numbers for fire, police, hospital, ambulance services, poison control center, weather information, pertinent regulatory agency contacts, client contacts, and company contacts.

B. Emergency Equipment - List the emergency equipment on-site and location. This should include emergency showers, eye wash stations, first-aid stations, fire extinguishers and other site-specific equipment as dictated by site conditions.

C. Emergency Signal - Outline the signal which can be used to recall personnel on the worksite if an emergency exists. This may involve radios, air horns, or hand signals.

D. Buddy System - The buddy system is used at all sites. Describe the responsibilities of each buddy in this system.

VI. Monitoring

A. If air monitoring is indicated, describe the monitoring procedures, type of monitor, levels expected and action to take if those levels are exceeded. (A plan under separate cover may be required for more involved sites.)

VII. Respirators

A. Describe the procedures to be used to ensure the proper inspections and daily maintenance of respirators. Specify respirator type, cartridge type if applicable, and fit testing requirements.

VIII. General Safety

A. Safety Official - State who oversees the proper completion of safety functions at the site, that is, who is the SHSC. Sometimes the senior employee assigned to the site will provide this experience level. If a full-time site safety officer is required, list the attendant duties of this individual.

B. Daily Safety Meeting - Outline the requirement for a daily safety meeting

and list topics which will be discussed on a routine basis, such as daily work routine, hazards of work, proper use of equipment, use of respirators, decontamination, defensive driving, pinch points, heat stress, electric hazards, lab safety, and so forth.

C. Eating, Drinking, Smoking, Chewing - Outline the areas where these activities are permitted and prohibited on the worksite.

D. Hazardous Materials Storage - Specify what hazardous materials are on site, where they will be located, and the proper handling and storage procedure. Hazardous materials would include gasoline, chemicals used for cleaning, compressed gases, and samples, drilling fluid, and decontamination waste (solid and liquid).

11.7 Approval of HSPs

A HSP must be submitted to the HSM and the Corporate Health and Safety Manager for review and signature approval. Except in an emergency situation as defined by the client, no site work other than brief reconnaissance walk-throughs may begin before the site-specific HSP is approved.

11.8 Distribution of the HSP

A copy of the Site-Specific HSP will be given to every person who will enter the site (Except escorted visitors, who will receive a briefing on its contents). All site worker s will be expected to know and follow its provisions. Copies of the MHSP and the Site-Specific HSP will be kept in the site "Command Post", and each vehicle in use at the site will have a copy of the Site-Specific HSP on board at all times.

* * * * *

12.0 REPORTING AND RECORDKEEPING

12.1 Introduction

The purpose of an exposure/injury reporting system is to gain experience from past mistakes in order to maintain an exposure/injury free environment, and to document incidents as required by OSHA.

12.2 Reporting Incidents/Accidents Involving Personal Injury or Exposure to Hazardous Materials

It is important to report all exposures and injuries even though the incident is not considered serious or no adverse health effects or symptoms are apparent at the time. Often, exposure to a toxic agent has delayed or latent effects which can only be detected by specific diagnostic tests. Documenting an exposure may aid in identify the cause of symptoms or changes in health status indicators at a later date. Likewise, an injury, such as an eye injury caused by dust particles, may result in delayed damage.

In the event of fatal or serious accident/injury an immediate telephone report will be made by the Site Health and Safety Coordinator to the Health and Safety Manager outlining all details of the accident/injury and action(s) taken. The Health and Safety Manager advise the Project Manager immediately of the incident and action(s) taken. All incidents involving personal injury or exposure to potentially hazardous materials during any field activity must be documented and reported to the Health and Safety Manager. A standard Employee Exposure/Injury Report (Form 12-1) is used for this purpose. This form must be completed within 48 hours of the incident and given to the HSM.

12.3 OSHA Recordkeeping Procedures

Regulations established by the Occupational Safety and Health Act of 1970 require employers to prepare and maintain records of occupational injuries and illnesses and require the reporting of fatal or serious injuries to the U.S. Department of Labor. The requirement does not apply to minor injuries requiring only first aid treatment. All reports must be submitted on Department of Labor or applicable State approved forms. They must be kept current and must be retained for five years following the end of the calendar year in which the incident occurs.

12.3.1 Forms

Records of occupational injury and illness shall be kept on two separate report forms - OSHA Form 200, Log and Summary of Occupational Injuries and Illnesses, and OSHA Form 101, Supplementary Record of Occupational injuries and Illnesses. Examples of these forms are attached in Appendix A. When there are applicable State forms, these must be used in lieu of the Federal forms.

12.3.2 OSHA Form 200

All injuries and illnesses that require treatment other than first aid shall be reported on OSHA Form 200. Instructions and recordability of an occupational injury or illness are defined on the back of the form. Read these instructions carefully, because not all injuries and illnesses treated by a physician are recordable. Finally, OSHA's recordkeeping and reporting requirements differ from those under the various State Worker's Compensation laws. Because they differ, employees must not substitute Worker's Compensation criteria for determining whether or not a case should be recorded for OSHA. All entries on OSHA Form 200 must be identified by a case or file number.

12.3.3 OSHA Form 101

For each entry of OSHA Form 200, an OSHA Form 101, Supplementary Report of Occupational Injuries and Illnesses, must be completed. Like Form 200, the Supplementary Report must be kept current to within six (6) days. This form is designed to provide additional information concerning the injury or illness not previously recorded on the OSHA Log.

When injury or illness is referred to a doctor or hospital for treatment, the Workers' Compensation insurance carrier's Employer's First Report of Injury or Illness is accepted by the U.S. Department of Labor in lieu of OSHA Form 101.

12.3.4 Annual Summary

At the beginning of each year, employers are required to post a summary of all injuries and illnesses recorded on OSHA Form 200 for the preceding year. This Summary must be posted by February 1, and remain there until March 1. Instructions on back of Form 200 describe how the summary is compiled. The summary should be posted adjacent to the OSHA informational poster. A copy of the summary is sent to the Health and Safety Manager.

12.4 Record of Employee Exposure to Toxic or Hazardous Materials.

Federal standards applicable to toxic and hazardous substances require employers to establish and maintain accurate records of employee exposure to certain toxic or hazardous materials. A monthly report of field activities will be maintained by the Health and Safety Manager Administrator for each employee participating in operations where toxic or hazardous materials are known or suspected to be present (Form 12-2). The reports provide a permanent record of sites on which the employee worked and the types of chemicals or other agents to which the employee may have been exposed. Actual or suspected exposures are also recorded.

The employee is required to complete the report at the end of each month based on field activities performed and potential contaminants encountered. Completed reports are submitted to the HSM.

12.5 Record Maintenance

All health and safety reports and records on TapanAm personnel will be held in strict confidence by the HSM. Employees may obtain a copy of their records at any time.

12.6 Audits

The Corporate Health and Safety Manager is responsible for implementation of the health and safety audit program and will conduct the audits periodically or when necessary.

12.6.1 Office Audits

Audits will be conducted to evaluate company health and safety office procedures as they conform to program requirements. At the completion of the audit, the auditor will report the findings of the audit to the Project Manager. The auditor shall prepare a formal report summarizing the findings and recommending corrective action(s).

12.6.2 Field Audits

Field audits will be conducted to ensure that the health and safety program is being properly implemented in the field. The Site-Specific HSP will be used as the basis for the evaluation. During the audit, if the auditor discovers unsafe practices, immediate corrective action should be taken if possible. If such action is not possible, the auditor may decide to shut down the operation to prevent serious injury or exposure to site personnel. At the completion of the audit, a summary report will be prepared in the same manner as for office audits.

* * * * *

References

U.S. Army Corps of Engineers, EM385-1-1, Safety and Health Requirements Manual, October 1987 (or latest revision), USGPO.

NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985, USGPO

U.S. Environmental Protection Agency, EPA/540/P-87/001, A Compendium of Superfund Field Operations Methods, December 1987.

U.S. Department of Health & Human Services, NIOSH, Pocket Guide to Chemical Hazards, June 1994.

American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values for Chemical Substances and Physical Agents in the Work Place and Biological Response Indices, 1992-93.

U.S. Environmental Protection Agency, EPA 600/4-84-076, Characterization of Hazardous Waste Sites - A Methods Manual, Vol. II, Second Edition, 1984, USGPO.

U.S. Department of Transportation, DOT P5800.3, Emergency Response Guidebook, 1993 (or latest edition), USGPO.

APPENDIX A

FORMS AND FIGURE

FORM 3-1

AUTHORIZATION TO RELEASE MEDICAL RECORD INFORMATION TO A DESIGNATED REPRESENTATIVE

I, _____, hereby authorize _____
to release to _____, the following medical information from my personal medical record: _____
_____
_____

I give my permission for this medical information to be used for the following purpose: ___
_____
_____
_____
But I do not give permission for any other use or re-disclosure of this information.

NOTE: Several extra lines are provided below so that you can place additional restrictions on this authorization if you wish. You may, however, leave these lines blank; or you may choose to 1) specify a particular expiration date, if less than one year; 2) describe medical information to be created in the future that you intend to be covered by this authorization; or 3) describe portions of the medical information in your records which you do not intend to be released as a result of this authorization.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Full Name of Employee
or Legal Representative _____
Signature of Employee _____
Date of Signature _____

FORM 5-1

RECORD OF RESPIRATOR FIT TESTING

NAME _____ DATE _____

ORGANIZATION _____

LOCATION _____

RESPIRATOR _____ SIZE _____

CARTRIDGE TYPE _____

Facial Hair Y _____ N _____

Glasses Y _____ N _____

RESULTS

	IsoAmyl Acetate	Irritant Smoke	Other: _____
Fit	_____	_____	_____
NoFit	_____	_____	_____

COMMENTS: _____

_____

_____

FIT TESTER _____ TITLE _____

This Fit Test Record must be maintained for one year from date of the test.

FORM 6-1

DOCUMENTATION OF TRAINING

TapanAm Health and Safety Program

NAME: _____ SSN _____

NAME: _____ SSN _____

NAME: _____ SSN _____

NAME: _____ SSN _____

NAME: _____ SSN _____

NAME: _____ SSN _____

NAME: _____ SSN _____

NAME: _____ SSN _____

TRAINING COURSE NAME: _____

PRESENTED BY _____

DATES: _____

DESCRIPTION:

(Use this form only if course certificate is not available.)

HEALTH AND SAFETY MANAGER CERTIFICATION:

I certify that the above named course meets the training requirements specified By TapanAm Associates, Inc., and that the individuals named above successfully completed the course.

SIGNATURE: _____ Title: _____

DATE: _____

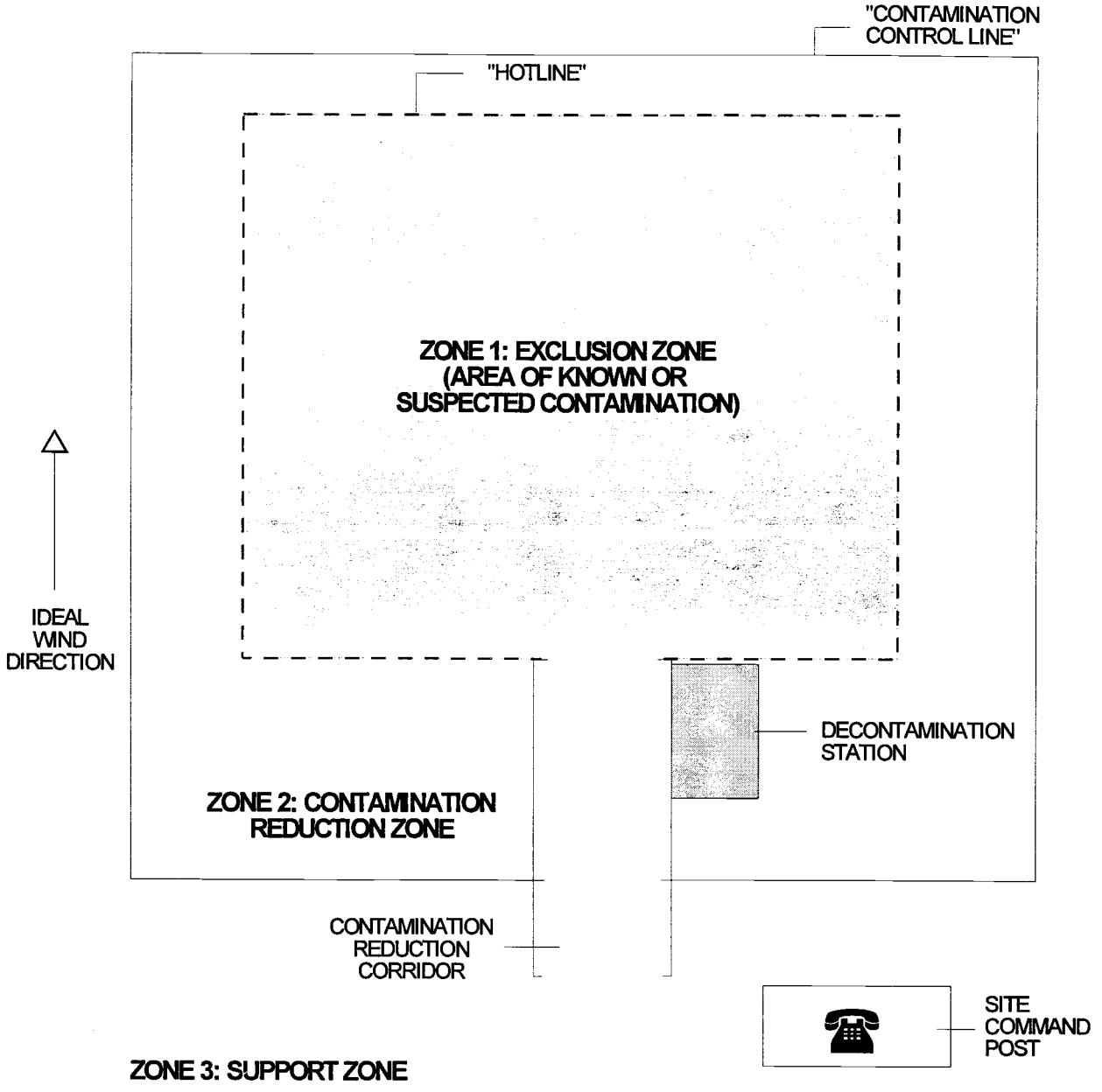

FIGURE 9.1: WORK ZONES AT A HAZARDOUS MATERIALS SITE

FORM 12-1

Employee Exposure/Injury Report

Date: _____

Employee's Name: _____ SSN _____

Sex: M _____ F _____ Age: _____

Location: _____

Project: _____ Project Title: _____

Incident:

Type: Possible Exposure _____ Physical Injury _____

Location: _____

Date of Incident: _____ Time of Incident: _____

Date of Reporting Incident: _____

Person to Whom Incident Was Reported: _____

Weather Conditions During Incident: Temperature _____

Wind Speed & Direction _____ Humidity _____

Cloud Cover _____ Precipitation _____

Materials Potentially Encountered:

Chemical (Give chemical name or description - liquid, solid, gas, vapor fume, mist):

_____

_____

_____

Radiological: _____

_____

Other: _____

_____

_____

Nature of the Exposure/Injury:

State the nature of the exposure/injury in detail and list the parts of the body affected.
(Attach extra sheets if needed.)

_____

_____

_____

Was medical care received? Yes _____ No _____

If so, when? _____

Where? _____

By Whom? Name of Paramedic: _____

Name of Physician: _____

Other: _____

If "Off-Site", name facility (hospital, clinic, etc.):

_____

Length of stay at the facility? _____

Was the Health and Safety Manager contacted? Yes _____ No _____ When _____

Was the Medical Consultant contacted? Yes _____ No _____

If so, who was the contact? _____

Did the exposure/injury result in permanent disability? Yes _____ No _____

If so, explain: _____

_____

_____

_____

_____

Has the employee returned to work? Yes _____ No _____

If so, give date: _____

List the names of other persons affected during this incident:

_____

_____

_____

List the names of persons who witnessed the exposure/injury incident:

Possible cause of the exposure/injury:

What was the name and title of the field team leader or immediate supervisor at the site of the incident?

Was the operation being conducted under an established Safety Plan?

Yes _____ No _____ If yes, attach copy. If no, explain.

Describe protective equipment and clothing used by the employee:

Other information, comments (Attach relevant data if necessary):

Did any limitations in safety equipment or protective clothing contribute to exposure? If so, explain:

What was the employee doing when the exposure/injury occurred? (Describe briefly as "Site Reconnaissance", "Site Categorization", "Sampling", etc.)

How did the exposure/injury occur? (Describe fully what factors led up to and/or contributed to the incident.)

Name of person(s) initiating report, job title, phone number:

Employee Signature Date

What corrective action(s) or change to the Site Safety Plan, if any, have been or will be taken to avoid recurrence of the exposure or accident?

Additional Comments:

Project Manager/Field Team Leader's Signature Date

FORM 12-2

HAZARDOUS MATERIALS EXPOSURE REPORT

For: _____ _____
Month Year

Name of Employee: _____
Last First Initial

Project No.	Site Name/ Location	Activity	Chemical or Other Materials Present	Duration of Exposure (Hours/Days)	Date(s)

If you filed an incident report as a result of a potential or actual exposure or injury, complete the following:

Date of Exposure	Date Report Filed	Type of Exposure

Date of Injury	Date Report Filed	Type of Injury

_____ _____
Employee Signature Date

Bureau of Labor Statistics
Log and Summary of Occupational Injuries and Illnesses

NOTE: **This form is required by Public Law 91-596 and must be kept in the establishment for *5 years*. Failure to maintain and post can result in the issuance of citations and assessment of penalties.** ***(See posting requirements on the other side of form.)***

RECORDABLE CASES: You are required to record information about every occupational death; every nonfatal occupational illness; and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid). ***(See definitions on the other side of form.)***

Case or File Number	Date of Injury or Onset of Illness	Employee's Name	Occupation	Department	Description of Injury or Illness
Enter a nonduplicating number which will facilitate comparisons with supplementary records.	Enter Mo./day.	Enter first name or initial, middle initial, last name.	Enter regular job title, not activity employee was performing when injured or at onset of illness. In the absence of a formal title, enter a brief description of the employee's duties.	Enter department in which the employee is regularly employed or a description of normal workplace to which employee is assigned, even though temporarily working in another department at the time of injury or illness.	Enter a brief description of the injury or illness and indicate the part or parts of body affected. Typical entries for this column might be: Amputation of 1st joint right forefinger; Strain of lower back; Contact dermatitis on both hands; Electrocution—body.
(A)	(B)	(C)	(D)	(E)	(F)
					PREVIOUS PAGE TOTALS →
					TOTALS (Instructions on other side of form.) →

OSHA No. 200

U.S. Department of Labor

For Calendar Year 19 _____ Page ____ of ____

Company Name

Establishment Name

Establishment Address

Form Approved
O.M.B. No. 1220-0029
See OMB Disclosure Statement on reverse.

Extent of and Outcome of INJURY						Type, Extent of, and Outcome of ILLNESS													
Fatalities	Nonfatal Injuries					Type of Illness								Fatalities	Nonfatal Illnesses				
Injury Related	Injuries With Lost Workdays				Injuries Without Lost Workdays	CHECK Only One Column for Each Illness *(See other side of form for terminations or permanent transfers.)*								Illness Related	Illnesses With Lost Workdays				Illnesses Without Lost Workdays
Enter DATE of death. Mo./day/yr.	Enter a CHECK if injury involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if injury involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 1 or 2 but the injury is recordable as defined above.	Occupational skin diseases or disorders	Dust diseases of the lungs	Respiratory conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeated trauma	All other occupational illnesses		Enter DATE of death. Mo./day/yr.	Enter a CHECK if illness involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if illness involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 8 or 9.
(1)	(2)	(3)	(4)	(5)	(6)	(7)								(8)	(9)	(10)	(11)	(12)	(13)
						(a)	(b)	(c)	(d)	(e)	(f)	(g)							

Certification of Annual Summary Totals By _____ Title _____ Date _____

OSHA No. 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1.

Instructions for OSHA No. 200

I. Log and Summary of Occupational Injuries and Illnesses

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is as detailed, easily readable, and understandable as the OSHA No. 200.

Enter each recordable case on the log within six (6) workdays after learning of its occurrence. Although other records must be maintained at the establishment to which they refer, it is possible to prepare and maintain the log at another location, using data processing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times in the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health and Human Services, or States accorded jurisdiction under the Act. Access to the log is also provided to employees, former employees and their representatives.

II. Changes in Extent of or Outcome of Injury or Illness

If, during the 5-year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 13, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost workdays away from work, the check in column 6 should be lined out, and checks entered in columns 2 and 3 and the number of lost workdays entered in column 4.

In another example, if an employee with an occupational illness lost workdays, returned to work, and then died of the illness, any entries in columns 9 through 12 should be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be nonrecordable. For example: an injury which is later determined not to be work related, or which was initially thought to involve medical treatment but later was determined to have involved only first aid.

III. Posting Requirements

A copy of the totals and information following the fold line of the last page for the year must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than ***February 1 and must remain in place until March 1.***

Even though there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the ***annual summary totals*** shall certify that the totals are true and complete by signing at the bottom of the form.

IV. Instructions for Completing Log and Summary of Occupational Injuries and Illnesses

Column A – CASE OR FILE NUMBER. Self-explanatory.

Column B – DATE OF INJURY OR ONSET OF ILLNESS.
For occupational injuries, enter the date of the work accident which resulted in injury. For occupational illnesses, enter the date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of the absence attributable to the illness which was later diagnosed or recognized.

Columns C through F – Self-explanatory.

Columns 1 and 8 – INJURY OR ILLNESS-RELATED DEATHS.
Self-explanatory.

Columns 2 and 9 – INJURIES OR ILLNESSES WITH LOST WORKDAYS.
Self-explanatory.

Any injury which involves days away from work, or days of restricted work activity, or both must be recorded since it always involves one or more of the criteria for recordability.

Columns 3 and 10 – INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK. Self-explanatory.

Columns 4 and 11 – LOST WORKDAYS—DAYS AWAY FROM WORK.
Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.
NOTE: For employees not having a regularly scheduled shift, such as certain truck drivers, construction workers, farm labor, casual labor, part-time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of lost workdays shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

Columns 5 and 12 – LOST WORKDAYS—DAYS OF RESTRICTED WORK ACTIVITY.
Enter the number of workdays (consecutive or not) on which because of injury or illness:
(1) the employee was assigned to another job on a temporary basis, or
(2) the employee worked at a permanent job less than full time, or
(3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

*U.S. Government Printing Office: 1995 — 387-186/22983

Columns
6 and 13 – INJURIES OR ILLNESSES WITHOUT LOST WORKDAYS. Self-explanatory.

Columns 7a
through 7g – TYPE OF ILLNESS.
Enter a check in only *one* column for each illness.

TERMINATION OR PERMANENT TRANSFER—Place an asterisk to the right of the entry in columns 7a through 7g (type of illness) which represented a termination of employment or permanent transfer.

V. Totals

Add number of entries in columns 1 and 8.
Add number of checks in columns 2, 3, 6, 7, 9, 10, and 13.
Add number of days in columns 4, 5, 11, and 12.
Yearly totals for each column (1-13) are required for posting. Running or page totals may be generated at the discretion of the employer.

If an employee's loss of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already lost and include this figure in the annual totals. No further entries are to be made with respect to such cases in the next year's log.

VI. Definitions

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment.
NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one-time exposure to chemicals, are considered to be injuries.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. For purposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a. Occupational Skin Diseases or Disorders
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflammations; etc.

7b. Dust Diseases of the Lungs (Pneumoconioses)
Examples: Silicosis, asbestosis and other asbestos-related diseases, coal worker's pneumoconiosis, byssinosis, siderosis, and other pneumoconioses.

7c. Respiratory Conditions Due to Toxic Agents
Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung; etc.

7d. Poisoning (Systemic Effect of Toxic Materials)
Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins; etc.

7e. Disorders Due to Physical Agents (Other than Toxic Materials)
Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn); etc.

7f. Disorders Associated With Repeated Trauma
Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

7g. All Other Occupational Illnesses
Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first-aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed (for example: a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where distinctly separate activities are performed at a single physical location, such as construction activities operated from the same physical location as a lumber yard, each activity shall be treated as a separate establishment.

For firms engaged in activities which may be physically dispersed, such as agriculture; construction; transportation; communications; and electric, gas, and sanitary services, records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report or work at a single establishment, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is comprised of the physical location, equipment, materials processed or used, and the kinds of operations performed in the course of an employee's work, whether on or off the employer's premises.

Bureau of Labor Statistics
Supplementary Record of
Occupational Injuries and Illnesses

U.S. Department of Labor

This form is required by Public Law 91-596 and must be kept in the establishment for *5 years.* Failure to maintain can result in the issuance of citations and assessment of penalties.

Case or File No.

Form Approved
O.M.B. No. 1220-0029

See OMB Disclosure Statement on reverse.

Employer

1. Name

2. Mail address *(No. and street, city or town, State, and zip code)*

3. Location, if different from mail address

Injured or Ill Employee

4. Name *(First, middle, and last)* | Social Security No.

5. Home address *(No. and street, city or town, State, and zip code)*

6. Age | 7. Sex: *(Check one)* Male ☐ Female ☐

8. Occupation *(Enter regular job title, not the specific activity he was performing at time of injury.)*

9. Department *(Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)*

The Accident or Exposure to Occupational Illness

If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.

10. Place of accident or exposure *(No. and street, city or town, State, and zip code)*

11. Was place of accident or exposure on employer's premises? Yes ☐ No ☐

12. What was the employee doing when injured? *(Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)*

13. How did the accident occur? *(Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)*

Occupational Injury or Occupational Illness

14. Describe the injury or illness in detail and indicate the part of body affected. *(E.g., amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)*

15. Name the object or substance which directly injured the employee. *(For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.)*

16. Date of injury or initial diagnosis of occupational illness | 17. Did employee die? *(Check one)* Yes ☐ No ☐

Other

18. Name and address of physician

19. If hospitalized, name and address of hospital

Date of report	Prepared by	Official position

OSHA No. 101 (Feb. 1981)