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NM 7572124454

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 27TH COMBAT SUPPORT GROUP (TAC)
CANNON AIR FORCE BASE NM 88103

22 JAN 1990

Mr. Boyd Hamilton
Program Manager
Hazardous Waste Section
New Mexico Environmental Improvement Division
P. O. Box 968
Santa Fe, NM 87504-0968

Dear Mr. Hamilton

Enclosed are the four items requested in your letter dated 23 Oct 89 concerning the closure of Landfill 5, Cell 3. By previous correspondence, we submitted the certification from a professional engineer. Mr. Robert Lydick is the person who signed this letter. The certification was sent to Mr. Kelley Crossman on 22 Sep 89.

If you have any further questions, please contact Mr. Jim Richards at 784-4639.

Sincerely

David E. Benson

DAVID E. BENSON, Colonel, USAF
Commander

4 Atch
1. Cell Location Map
2. QA/QC Report
3. Summary Report QA/QC Plan
4. Certification

these att. are in Cannon magazine file

RECEIVED
JAN 23 1990

Hand delivered by Jim Richards

2 2 JAN 1990

In regards to Cannon AFB, Landfill 5, Cell 3:

I certify under penalty of law that this report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

David E Benson

DAVID E. BENSON, Colonel, USAF
Commander

INTERNATIONAL TECHNOLOGY CORPORATION

Rec'd January 23, 1990 hand delivered by Jim Reed

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CLOSURE OF CELL NUMBER 3, LANDFILL AREA 5, CANNON AIR FORCE BASE, NEW MEXICO

Health, Emergency Response, Safety, Fire Protection, Decontamination and Environmental Protection Plan

Prepared for:

Department of the Air Force
Headquarters 27th Tactical Fighter Wing,
Cannon Air Force Base

and

Bradley Construction, Incorporated

Prepared by:

International Technology Corporation

Contract Number F29605-89-C0009
IT Project Number 301289

CAFB 03d

TO VIEW THE MAP AND/OR MAPS WITH THIS DOCUMENT, PLEASE CALL THE HAZARDOUS WASTE BUREAU AT 505-476-6000 TO MAKE AN APPOINTMENT

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1.0 INTRODUCTION

This Health, Emergency Response, Safety, Fire Protection, Decontamination and Environmental Protection Plan (HESFDEP) is designed to set standards for safe work at Cannon Air Force Base (AFB) during closure of Cell Number 3, landfill Area 5. The primary intent is to minimize the public's and the on-site workers' risk of exposure to hazardous substances. The health and safety requirements of the Occupational Safety and Health Administration (OSHA) Construction Industry Standards (OSHA 2207) are assumed to govern the routine hazards of construction operations.

1.1 PROJECT HEALTH AND SAFETY OVERVIEW

Three stages of activity at Cannon AFB are covered by this program:

- STAGE I - Preparation of subgrade, root picking, smooth finishing and compaction of the existing cap of Cell 3.
- STAGE II - Excavation, loading, transportation, placement, compaction and grading of various layers in the final cover, including installation of polymeric membrane, geotextile fabric, and venting system.
- STAGE III - Construction of ditches, dikes and fences.

These activities may be performed in an order other than that shown here. Some of these activities present a potential for exposure of site personnel to hazardous chemical contaminants, while all include potential physical hazards from construction equipment, etc.

The possibility of exposure of site personnel to hazardous chemicals is considered to be quite remote on this project. Previous investigation indicated an absence of volatile organic materials and minimal amounts of metals. Due to the essentially non-invasive nature of site activities, metal exposure is not considered significant as metals are typically found on fugitive dusts, which are not expected to be liberated during construction operations.

Minimizing and preventing exposure to hazardous substance(s) is a primary concern when planning and performing work at this site. This program presents the minimum requirements for:

- Management and organizational responsibilities
- Employee training
- Medical monitoring
- Site hazard information
- On-site air monitoring
- Personal protective equipment
- Decontamination
- Reporting
- Environmental protection
- Spill control.

The information presented here meets the requirements of 29 CFR 1910.120 (Interim Final Rule) and applies to the primary contractor and all personnel visiting or observing site activities.

2.0 ORGANIZATIONAL RESPONSIBILITIES

This section describes the scope of responsibilities of the primary contractor.

2.1 RESPONSIBILITIES OF THE PRIMARY CONTRACTOR

The primary contractor's Site Safety Officer (SSO) will be a senior health and safety specialist who is independent of program activities except as they relate to health and safety. The SSO is responsible for producing the HESFDEP and has the authority to add to or change the plan and, if necessary, to postpone on-site activities until the appropriate safety procedures can be implemented.

The primary contractor's project manager is responsible for the day-to-day program activities. In addition to project management responsibilities, he or she is responsible for ensuring that the health and safety plans are prepared and that all of its provisions are met. He or she ensures that the field team members have completed the training and medical monitoring requirements of this program.

The project manager may assign a task manager or field supervisor. The project manager may act as the task manager or field supervisor and will assume the responsibilities outlined here. The field supervisor or task manager directs field operations for a given portion of the work plan and has primary responsibility for:

- Documenting field activities
- Enforcing the provisions of the HESFDEP as they relate to performance of field activities
- Consulting with the SSO
- Monitoring the safety performance of on-site personnel and correcting unsafe actions immediately
- Preparing accident incident reports.

The field supervisor or task manager relies on the SSO when determining the level of protection required and the hazard assessment of the work area. When

a dedicated person is not required for the job, the field supervisor or the task manager may act as the SSO.

The SSO has the authority to change and/or stop field activities if site conditions require it or if safety procedures are not adequately in place. The SSO:

- Confirms each team member's training to ensure that OSHA requirements are met
- Selects, maintains, and inspects protective clothing and equipment used in the field
- Controls entry and exit from the site as necessary
- Confirms each team member's suitability for work based on a physician's recommendation
- Monitors the work parties for signs of stress, heat exposure, and fatigue
- Monitors site hazards
- Enforces the buddy system
- Knows and posts emergency procedures, evacuation routes, and telephone numbers
- Notifies emergency contacts, if necessary
- Provides the on-site contact point in emergency situations.

The field team consists of the primary contractor's work crew and the SSO. The field team always consists of at least two people. The field team is responsible for completing all work safely and in compliance with the HESFDEP and for notifying the SSO of deviations from anticipated conditions and of any unsafe conditions. A deviation might be stained soil in an area previously thought to be clean. An unsafe condition could include unusual odors, or could be a team member who has not been fit tested for the kind of respirator being used on site.

3.0 EMPLOYEE TRAINING

All on-site personnel will receive 40 hours of hazardous waste site training as required by the Superfund Amendments and Reauthorization Act (SARA) of 1986. A certificate of completion for each member of the field team must be on file with the SSO before he or she may start work at a site. As a minimum, the training will include:

- Emergency first aid and procedures
- Toxic properties of chemical materials
- Physical hazards of chemicals
- Use and care of personal protective equipment
- Decontamination procedures.

This training will be refreshed annually and must have been performed within the last 12-month period.

In addition to the 40-hour training requirements, on-site personnel will complete a site-specific training program conducted by the primary contractor before beginning work. A record of this training session will be maintained by the primary contractor. The site-specific training will include:

- Standard procedures for work on the base
- A detailed review of the site safety plan
  - Chemical hazards
  - Physical hazards
  - Personal protection requirements
  - Decontamination procedures
  - Site layout
  - Emergency procedures
- Assignment of responsibilities within the field team.

Before work each day, the primary contractor's field supervisor or SSO will conduct a tailgate safety meeting to refresh the information presented in the HESFDEP and to go over site-specific details. Everyone working on the site is required to sign the daily tailgate safety meeting form. An example of this type of form is included in Attachment A.

4.0 MEDICAL MONITORING

Each person present at a hazardous waste site must participate in their company's medical monitoring program. The medical monitoring program is designed to detect and treat employee occupation-related illness or injuries. This will be accomplished through:

- Baseline or preemployment examination
- Yearly medical examinations
- Termination examination
- Treatment as required
- Exposure and incident record keeping.

Field team members, supervisors, and other on-site visitors or observers may not remain in an area potentially requiring use of a respirator until a statement from a physician is on file with the SSO stating that the person is able to wear a respirator. All illnesses experienced while field activities are going on must be registered through the SSO, whether job-related or not.

Personnel who suspect that they may have been exposed to a hazardous substance will report the incident to the SSO immediately. The exposure reporting form provided in Attachment A will be filled out to provide a permanent record of the incident. The SSO will immediately take appropriate actions to eliminate the condition causing the exposure or will stop work at the site until the condition can be mitigated. The exposure reports will be forwarded by the SSO to the Contracting Officer, Project Manager, and the examining physician/ occupational professional, as appropriate.

5.0 AIR MONITORING PLAN

A variety of air monitoring techniques will be employed to determine employee exposures to site contaminants, as well as concentrations of compounds which may be present at the site perimeter. The monitoring results will be used to dictate the appropriate contaminant control techniques and personal protective equipment. Monitoring will be conducted with direct reading instruments, high volume samplers, and personal sampling pumps. Monitoring will by conducted only by personnel familiar with the limitations, operating principles, calibration, and use of the various instruments involved. NIOSH or OSHA methods will be utilized for personnel monitoring, while EPA methods will be used for area sampling. All laboratory analyses will be performed by an American Industrial Hygiene Association (AIHA) accredited laboratory. All monitoring results, with the exception of real-time results, will be reported to the Contracting Officer within 48 hours.

5.1 REAL-TIME MONITORING

Instrumentation

Realtime monitoring will be performed with the following instrumentation:

- Photoionization detector (organics)
- Flame ionization detector (organics)
- Combustible gas/oxygen indicator (flammability)
- Detector tubes (benzene, toluene, xylene)
- Hydrogen sulfide detector.

Frequency

Direct reading instruments will be used to establish background values before site activities commence in the exclusion zone. Thereafter, routine monitoring will be conducted four times throughout the workday. All readings will be recorded on the Real-Time Air Monitor Log, included in Attachment A.

Calibration

Photo and flame ionization detectors will be calibrated daily before and after use. Combustible gas/oxygen meters will be calibrated daily before use. Calibration procedures are included as Attachment B. All calibration data will be recorded on the Calibration Log form, included in Attachment B.

5.2 AREA SAMPLING

Area sampling will consist of techniques to measure Volatile Organic Compounds (VOCs) and Semivolatile Organic Compounds, including pesticides (SVOCs).

5.2.1 Volatile Organic Compounds

Technique

VOCs will be collected on charcoal as detailed in EPA Method 8240. The sampling apparatus will consist of a sampling pump, rotameter and charcoal sorbent. The sorbent tube will be located approximately five feet above ground level. The sampler will also be positioned so that local obstacles do not impede air flow.

Frequency

Sampling for VOCs will be performed daily during any invasive activities. Sample duration shall be 24 hours. One sample will be collected in each of the following areas daily: immediate work area, exclusion zone, and contamination reduction zone, unless previous sampling results and site activities indicate otherwise. Decisions regarding changes in the number of samples obtained will be made in conjunction with the Site Safety Officer (SSO) and a Certified Industrial Hygienist (CIH). Once the clay cap is in place, area monitoring will be conducted at the discretion of the SSO and a CIH.

All results will be recorded on the forms included in Attachment A.

Calibration/Quality Control

Duplicate sampling will be performed once each week in one area on site. Field and lab blanks will be analyzed at a minimum frequency of five percent of the number of analyzed samples.

Sampling flow calibration will be performed using sampling trains identical to those used for sampling. Pump calibration checks will be performed daily, before and after use. Calibration data will be recorded on the Air Sampling Form included in Attachment A.

5.2.2 Semivolatile Organic Compounds

Technique

SVOC shall be measured by methodology based on the guidelines outlined in EPA's Method TO-4 from the "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air." Method TO-4 involves trapping semivolatiles on a glass-fiber filter followed by a polyurethane foam (PUF) cartridge. A modified high volume sampler (PUF sampler) consisting of the sampler shelter, actuation timer, elapsed time indicator, flow indicator and sample holder will be utilized for sample collection.

The sampler inlet will be placed at the "breathing zone" height, which for air quality monitoring purposes in this program will be approximately two meters above immediately adjacent ground level. The sampler will also be sited so that local obstacles, such as buildings or topographical features (berms or depressions), will not impede airflow.

Frequency

Sampling for SVOCs will be performed daily during any invasive activities. Sample duration will be 24 hours. One sample will be collected in each of the following areas daily: immediate work area, exclusion zone, and contamination reduction zone, unless previous sampling results and site activities indicate otherwise. Decisions regarding changes in the number of samples obtained will be made in conjunction with the SSO and a CIH.

Once the clay cap is in place, area monitoring will be conducted at the discretion of the SSO and a CIH, or by the Contracting Officer and as required or determined by the Cannon AFB Technical Advisor.

All results will be recorded on the forms included in Attachment A.

Calibration/Quality Control

Duplicate sampling will be conducted once per week of sample collection in one area on site. Field and lab blanks will be analyzed at a minimum frequency of five percent of the number of samples.

The PUF sampler flow rate will be calibrated using a transfer standard flow calibration device, certified against an EPA Region VI local primary flow standard or equivalent. The flow will be set at a known rate within the range of 200 to 280 liters per minute (lpm). Selection of the exact flow rate set point will be established after review of initial sampling results. Pump calibration checks will be performed daily. Calibration data will be recorded on the Air Sampling Form included in Attachment A.

5.3 PERSONAL SAMPLING

Technique

Representative personal monitoring will be conducted daily for personnel working in the immediate work area. Personal sampling pumps and appropriate collection media will be used to obtain the samples. Employee exposures to benzene and toluene will be determined during the initial two to four days of site activities in the exclusion zone (see Section 7.0), and will be conducted in accordance with NIOSH Method 1501. Subsequent analyses will be determined by the SSO and CIH based on the results of the area samples, specifically, the toxicity and concentrations of the contaminants identified. All sampling and analyses will be conducted in accordance with NIOSH and OSHA methods.

Frequency

At minimum, one eight-hour time-weighted average sample will be collected daily for employees judged to have the highest potential exposures. The SSO will evaluate the need for short-term exposure monitoring, based on previous sampling results and employee activities.

All personal sampling results will be recorded on the Air Sampling Form included in Attachment A.

Calibration

All personal sampling pumps will be calibrated daily before and after use, in accordance with OSHA Instruction CPL 2-2.20A. All calibration data will be recorded on the Air Sampling Form included in Attachment A.

6.0 LEVELS OF PERSONAL PROTECTION

6.1 INTRODUCTION

This section outlines the basic requirements of each of the four levels of personal protection, the limitations of the equipment, and the logic used in specifying a certain level. The protective measures mandated by the personal protection levels cannot protect against every hazard and, therefore, are not substitutes for other protective measures. Use of protective equipment may also increase the worker's risk of heat stress, physical and psychological stress, impaired mobility, vision, and communication. These risks must be considered when assessing the effectiveness of the protection.

The purpose of this section is to present a program of personal protection that will provide protection and will prevent injury to the wearer from incorrect use and/or malfunction of the equipment. Site-specific protection level requirements are presented in Section 12.0, Hazard Evaluations.

The selection of personal protective equipment is designed to isolate the worker from the known or suspected contaminants based on the types of activities to take place and the type and concentration of the chemical contaminants. At hazardous waste sites, the routes of exposure are primarily inhalation and skin/eye contact. For this reason, the levels of personal protection increase as the level of respiratory or skin exposure increases.

For each operation performed during this project, monitoring will be performed to determine the type and concentration of any chemicals of concern. This information will be used to determine the level of protection required for entry onto the site and the requirements for upgrading or stopping work if site conditions change. These criteria are presented in Section 12.0, Hazard Evaluations. The type of equipment and the overall level of protection will be reevaluated as the amount of information about the site increases and as workers are required to perform different tasks.

Personal hygiene is one of the most critical elements of personal protection. Hand- and face-washing facilities will be provided on site to be used

when personnel exit the exclusion zone. Toilet facilities will be provided in this area as well.

6.2 LEVEL D PROTECTION

Level D is the lowest level of personal protective equipment. Most work will be conducted initially under Level D conditions. Level D is appropriate when the atmosphere contains only background concentrations of contaminants or concentrations well below established exposure criteria. Level D provides minimal respiratory and skin protection.

Section 12.0, Hazard Evaluations, contains the upgrade criteria for increasing the level of personal protection from Level D to Level C.

Recommended protective equipment for Level D conditions are:

- Coveralls or work clothes
- Safety boots/hats
- Safety glasses
- Hard hat
- Hearing protection, if required.

6.3 LEVEL C PROTECTION

Level C protection provides additional respiratory protection and the same level of skin protection as Level B. This level will be used when the type and approximate concentration of the chemicals of concern are known, when it is determined that the chemicals will not adversely affect exposed skin, and when the conditions for using an air-purifying respirator are met.

The following ambient or equipment conditions exclude or may exclude the use of an air-purifying respirator:

- The atmosphere contains less than 20 percent oxygen
- Concentrations of a specific substance are at the immediately dangerous to life and health (IDLH) concentration established by the Standards Completion Program
- Unidentified contaminants are present
- Concentrations of contaminants are unknown or exceed maximum use concentrations for the respirator

- Identified gases or vapors have inadequate warning properties, and the sorbent service life is not known for the particular contaminant and the sorbent has no end-of-service life indicator
- Relative humidity is high, thereby decreasing the effectiveness of the sorbent in the respirator
- Concentrations of known chemicals exceed two times the current threshold limit value (TLV) or permissible exposure limit (PEL), whichever is lower.

If the conditions are not suitable for use of an air-purifying respirator, work will be stopped and the site reevaluated because Level B would be the appropriate protection level.

The recommended equipment for Level C includes:

- Full facepiece, air-purifying canister respirator
- Chemical-resistant clothing including overalls and a long-sleeved jacket or a chemical splash suit
- Inner and outer chemical-resistant gloves
- Chemical-resistant safety boots/shoes.

7.0 SITE CONTROL

The purpose of site control is to establish the safe distance from the work area so that site visitors and workers can observe activities and perform tasks without the need of high-level personal protective equipment. Site control is also designed to prevent the migration of hazardous wastes from any contaminated areas to uncontaminated areas. Because the activities covered under this program do not involve excessive handling or removal of contaminated materials, the migration of hazardous wastes from the area is not likely. Therefore, site control will focus primarily on establishing work area boundaries.

Three terms are used to describe hazardous waste site control in this program: the exclusion zone (EZ), the hotline, and the support zone (SZ). The EZ is the area in which active construction is occurring and will be marked appropriately. The hotline is the boundary of the EZ. Entry through the hotline will be controlled by the SSO or Field Supervisor. The SZ is the outermost area of the site and is considered a noncontaminated area. The contamination reduction zone (CRZ) is placed between the exclusion zone and the support zone. This zone is sufficiently far from the investigation activities to be safe for trained personnel wearing no protective equipment and is designated as the decontamination area. All personnel and equipment leaving this area are decontaminated so that no hazardous materials are carried out into the SZ. Specific decontamination procedures will be followed to ensure that wastes are not transported off site.

7.1 SITE CONTROL DURING CONSTRUCTION

There is a risk of physical injury as well as minimal risk of chemical exposure during construction. During Level D conditions, the SSO will establish an informal boundary around Cell No. 3. This area will be defined as the EZ. The boundary line will be termed the hotline and the area outside the hotline will be the SZ. All persons inside the EZ must be fully trained in hazardous waste site activities or be accompanied by a fully trained person.

During Level C conditions, only fully trained, monitored and equipped persons will be permitted inside the EZ. The SSO will establish a formal hotline

based upon the perimeter fence. The hotline will be of sufficient distance from the site activities that the levels registered on the air monitoring equipment will be zero or background at the edge.

A CRZ will be necessary for any activities that require Level C or higher protective equipment. The CRZ will be established at the fence gate. Necessary steps in the decontamination line may vary as additional information on exposures become available.

8.0 DECONTAMINATION PROCEDURES

8.1 INTRODUCTION

The decontamination procedures described in this section are designed to remove or neutralize contaminants that have accumulated on personnel. The decontamination procedures described here are broken down into two categories: prevention of contamination and removal of contaminants.

8.2 PREVENTION OF CONTAMINATION

Hazardous waste site workers are trained in prevention of contamination and follow standard operating procedures designed to reduce personnel and equipment contact with wastes. Some general actions that can be taken to prevent contact, and therefore contamination, are listed below:

- Avoid contact with obviously contaminated materials by walking around the area, and avoid handling materials or equipment directly.
- Cover equipment and tools with plastic or removable coating.
- Wear disposable outer garments and use disposable equipment where possible.

8.3 REMOVAL OF CONTAMINANTS

A dedicated decontamination crew is not required for the work covered by this program.

Personnel decontamination will be performed each time the worker exits the EZ. Decontamination will consist of a soap and water wash of the boot covers, gloves, and any other obviously contaminated body area. The wash is followed by a clean water rinse. If the purpose of exit is for changeout of respirator cartridges, the worker may remove the outer gloves, change cartridges, don new gloves, and return to the EZ. Rest and/or refreshment breaks require the removal of boot covers, outer gloves, protective outer suits, and inner gloves before entry into the SZ.

Disposable clothing will be isolated and placed in a labeled 55-gallon drum. If waste is determined to be hazardous, the base-designated point-of-contact will specify an accumulation area on base.

All clothing worn on site must be washed before it can be worn again, either on or off site, whether it looks contaminated or not. If a member of the work party does not have sufficient clothing, overalls or other work clothes must be provided. The SSO is responsible for monitoring the status of the clothing of on-site personnel. Clothing used on hazardous waste sites will be washed separately from other household wash.

Respirators will be decontaminated before each use. When not in use, the respirators will be stored in an easily accessible area but out of the path of contamination. If respirators become dusty or otherwise in contact with potentially contaminated material, they will be washed immediately. The wash solution will consist of a respirator-cleaning detergent and drinking-quality water followed by three drinking-quality water rinses. Rinse water will not be reused. Respirators will be allowed to air dry following the final rinse.

9.0 EMERGENCY PROCEDURES

Emergencies at hazardous waste sites are a continual possibility and can be complicated by the presence of unknown hazards. An emergency can be as simple as a worker experiencing heat stress or as complicated as an explosion of flammable vapors. If an emergency develops on site, the procedure delineated here will be followed immediately. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

If an emergency condition occurs, the entire field crew will stop work until the situation is rectified.

Personnel on site will use the "buddy" system at all times. Personnel will never be sent alone to a hazardous waste site or to a potential hazardous waste site. Buddies will maintain visual contact at all times.

General emergency procedures and specific procedures for personal injury and chemical exposure are described below.

9.1 GENERAL EMERGENCY PROCEDURES

The base is equipped to handle most emergencies and is the primary contact for on-site emergencies. The base fire station will be the first to be notified; they will mobilize fire and ambulance operations.

The following chain of events will be followed if an emergency occurs:

- The victim will be removed from the hazardous area and emergency first aid will be given.
- Other on-site personnel will get help, which will include:

  Cannon AFB fire station
  USAF point of contact
  Primary contractor's project manager
  Primary contractor's health and safety manager, if appropriate.

To facilitate emergency support services, the base fire department will be notified as to where the field team will be working. In the case of most emergencies, emergency services such as an ambulance will be waited for. It is rarely of overall benefit to remove a victim in a personal vehicle.

The following hand signals will be used when signaling for help. They will be reviewed with each field team member in a safety meeting before beginning work on site:

- Hand gripping throat -- out of air, cannot breathe
- Grip partner's wrist or place both hands around waist -- leave area immediately; no debate
- Hands on top of head -- need assistance
- Thumbs up -- OK, I am all right, I understand
- Thumbs down -- No, negative.

9.2 CHEMICAL EMERGENCIES

Before administering first aid to a chemical exposure victim, the hazard information provided in Section 12.0, Hazard Evaluations, will be consulted. If any member of the field team is exposed to chemicals, the following first-aid procedures may be applicable:

- The victim will be removed from the immediate area of contamination
- Skin contact: the area will be flushed with water for at least 15 minutes
- Clothing contact: if the clothing is not stuck to the skin or open wound, it will be removed and the skin underneath flushed with water
- Clothing contact: if the clothing is stuck to the victim, the area will be flushed with water while waiting for medical attention
- Eye contact: the eye will be flushed with an emergency eye wash solution and/or water for 15 minutes.

In all cases of eye contact with hazardous substances, the victim will be checked by a physician. In cases of skin contact, a physician will be called in if the contact results in redness, swelling, or other types of reaction.

All incidences of dizziness, nausea, or other reactions to chemical exposure will be reported to and checked by a physician. All chemical emergencies will be reported using the Supervisor's Employee Injury Report in Attachment A.

9.3 PHYSICAL INJURY

For the purpose of this program, physical injuries will be categorized as slightly serious, moderately serious, or serious.

Slightly serious physical injuries include injuries that are not likely to cause adverse health effects if they are left unattended. For example, minor bumps, bruises, and cuts that can be cleaned and bandaged on site are slightly serious physical injuries.

Moderately serious physical injuries are those that require medical attention but are not immediately debilitating. Cuts that require stitches, sprains, etc. must be treated by a physician, but the victim does not need to be transported to the hospital by ambulance. However, the victim will be taken to a physician immediately and will not be permitted to go alone.

Serious physical injuries are those that require immediate emergency care. They include unconscious victims, heat injuries, broken bones, burns, etc. Victims of serious injury will be taken to a hospital immediately via base ambulance service.

In the case of physical injury, a field team member trained in appropriate procedures will administer emergency first aid. Unless the victim needs to be moved immediately, splints will not be applied by the field team; the paramedics will perform this procedure, if necessary.

For some moderately serious injuries such as cuts/wounds that may require stitches, the victim may be transported to a hospital in a personal vehicle without the aid of the base ambulance. For serious injuries such as any head injury or broken bones, the victim will be administered first aid and the ambulance will be called (telephone 4033).

At a minimum, the following procedures will be followed for any physical injury:

- The victim will be removed to a point outside the hotline to assess the extent of the injury and first aid will begin.
- Another on-site member will call for help as appropriate.
- For all moderate to serious injuries, the victim will be kept warm and still until medical attention arrives.

All work-related injuries or illnesses will be reported on IT Form 9300.0-1, "Supervisor's Employee Injury Report" (Attachment A) or equivalent, and the Project Health and Safety Manager will be notified.

9.4 FIRE EMERGENCIES

In the event a fire is discovered by site personnel, the Cannon AFB Fire Department (telephone 4117) will be immediately notified as to:

- Location of fire
- Estimated size and severity of fire
- Person reporting fire.

Contractor personnel will not attempt to fight large fires such as grass or structural fires.

Contractor personnel will utilize fire extinguishers located on site and/or on each vehicle to fight contractor vehicular fires. The Cannon AFB Fire Department and contracting officer will be notified in all fire events, regardless of the degree, location or nature of the fire.

9.5 ACCIDENT INVESTIGATION AND REPORTING

Any and all instances of accident, illness, injury, fire, spill or other emergency will be investigated by the SSO, the Project Health and Safety Manager, the Contractor Project Manager, and the Field Supervisor. The results of this investigation will be submitted to the Contracting Officer within 48 hours of the incident or accident.

10.0 HEAT STRESS, FIRST AID, AND MONITORING

Heat-related injuries are caused when the body's cooling system is overwhelmed and fails to eliminate excess heat or when large quantities of water or salt are lost and not replaced. Excessive heat may result in heat stroke, heat cramps, and heat exhaustion.

10.1 HEAT STROKE

Heat stroke is characterized by:

- Extremely high body temperature
- Hot, red, dry skin indicating failure of the body's sweating mechanism
- Strong rapid pulse.

If a member of the field team suffers heat stroke (i.e., if his or her temperature is equal to or greater than 105°F), the following first-aid procedures will be followed:

- The victim will be undressed and cool water or rubbing alcohol will be applied to bare skin or cold packs will be applied continuously or he/she will be placed in a tub of cool water.
- When the victim's temperature is 102°F, the victim will be dried off.
- Fans or air conditioners will be used to promote cooling.
- This process will be repeated if the temperature begins to rise again.
- Medical attention will be sought.
- The victim will not be given stimulants.

10.2 HEAT CRAMPS

Heat cramps are muscular pains and spasms due largely to loss of salt from the body by sweating or by inadequate intake of salt. The cramps are more severe if the victim has drunk a large quantity of tap water or soft drinks without replacing the salt deficiency. If a field team member suffers from cramps, the following first-aid measures will be taken:

- The victim will be given sips of salt water (1 teaspoon of salt per 8 ounces of water), half a glass every 15 minutes for 1 hour.
- Pressure will be exerted on the cramped muscle or it will be massaged to help relieve the cramp.

10.3 HEAT EXHAUSTION

Heat cramps may be associated with heat exhaustion. Heat exhaustion is characterized by:

- Fatigue, weakness, nausea, and collapse due to inadequate intake of water to compensate for lost fluids
- Normal body temperature
- White or pale and cool or clammy skin.

If heat exhaustion occurs, the following first-aid measures will be taken:

- A salt water solution will be given as described for heat cramps.
- The victim will be kept lying down with feet raised above the level of the head.
- The victim's clothing will be loosened and cool wet cloths applied; the victim will be fanned to aid cooling.
- If vomiting occurs, liquids will not be given. The victim will be transported to a hospital. Intravenous salt solutions may be necessary.

After an attack of heat exhaustion, the victim will be advised to rest for a few days and to keep away from abnormally warm temperatures.

10.4 MONITORING FOR HEAT STRESS

The U.S. Environmental Protection Agency's (EPA's) Standard Operating Safety Guides indicate that personnel will be monitored when the ambient temperature is 70°F or above. Monitoring will be done by the SSO or Field Supervisor, who will increase frequency when temperatures increase or if worker recovery rates are slow, establishing basic work and rest cycles based on results. When temperatures exceed 80°F, workers must be monitored for heat stress after every work period. The following information is taken from the EPA's Standard Operating Safety Guides.

There are three ways to monitor the effect of working in hot areas on the body: heart rate monitoring, oral body temperature monitoring, and body water loss. One or more of these methods of monitoring will be used to monitor heat stress when the ambient air temperature is 70°F or above.

10.4.1 Heart Rate Monitoring

In heart rate monitoring, the radial pulse is taken for 30 seconds as early as possible in the resting period. The heart rate at the beginning of the rest period should not exceed 110 beats per minute. If the heart rate is higher, the next work period will be shortened by 10 minutes (or 33 percent). The length of the resting period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work period will be shortened again by 33 percent.

10.4.2 Body Temperature Monitoring

The oral body temperature will be measured at the beginning of the rest period and should not exceed 99°F. If it does, the next work period will be shortened by 10 minutes (33 percent). The length of the rest period will stay the same. If the oral body temperature exceeds 99.7°F at the beginning of the next work period, the following work cycle will be shortened by another 33 percent. The oral body temperature will be measured again at the end of the rest period to make sure that it has dropped below 99°F.

10.4.3 Body Water Loss

Body water loss due to sweating can be used to monitor the body's response to work in hot environments. The body water loss will be measured by weighing the worker in the morning and in the evening under similar conditions. The scale will be accurate to ±1/4 pound. The body water loss should not exceed 1.5 percent of the total body weight. If it does, the workers will be instructed to increase their daily intake of fluids by the weight lost.

11.0 SPILL CONTROL

11.1 INTRODUCTION

Due to the nature of operations on this project, spills of hazardous materials are considered a very remote possibility. However, there is a possibility of spills or leaks of diesel fuel, gasoline, engine oil or hydraulic fluid from construction equipment. For this reason, the following preventive measures must be taken.

11.2 EQUIPMENT REQUIRED

The following is a list of equipment and materials required for spill control. The following items shall be kept at the site, readily available for emergency use:

- Noncombustible, nonorganic absorbent/solidifier materials, such as "SorbaSet" or equivalent and sand
- Front-end loader (optional)
- Drums (55-gallon, U.S. DOT 17-E or 17-H) approved for containment of hazardous wastes
- Shovels
- Equipment for decontamination of tools and equipment (steam cleaning is required)
- Lime to neutralize any residual acid.

Quantities are to be sufficient to contain and remediate approximately 100 gallons.

11.3 SPILL CONTROL

If a spill occurs, the following actions shall be taken:

- Notify the Contracting Officer and all applicable regulatory agencies
- Take immediate measures to control and contain the spill within the site boundaries. This shall include the following:
  - Keep unnecessary people away; isolate hazardous area and deny entry
  - Do not allow anyone to touch spilled material
  - Stay upwind; keep out of low areas
  - Allow no flares, smoking, or flames in hazard area

- Keep combustibles away from the spilled material
- Other actions as needed

- Ensure that all personnel involved in spill cleanup are at level of personal protection determined by the SSO.

Site personnel shall implement the following spill control actions:

- Small dry spills: Shovel contaminated materials into dry containers and cover; label container as to contents, and dispose of properly.

- Small liquid spills: Absorb with noncombustible, nonorganic absorbent material. Place contaminated soil into a container; cover, label, and dispose of properly off base.

- Locate and identify spill on Contractor's copy of drawings, and provide copy of drawings to the Contracting Officer at the completion of work.

Decontamination procedures will be required after cleanup to eliminate traces of the substance spilled or to reduce the traces to an acceptable level. Complete cleanup shall require removal of contaminated soils. Personal protective equipment including respirators, safety glasses, hardhats, and gloves shall be decontaminated by appropriate cleaning methods. Washing facilities shall be provided for personnel decontamination. All contaminated materials that cannot be decontaminated, including disposable clothing, solvents, garments, soil and wood, must be properly containerized, labeled, and disposed of in accordance with regulations.

The Contractor Project Manager or SSO must file a written report immediately with the Contracting Officer and with the regulatory authorities in accordance with provisions of 49 CFR 171.15 and 40 CFR 261 and 265 (see Section 9.5).

Under the sponsorship of the Chemical Manufacturers Association, 2501 M Street, NW, Washington, D.C. 20037, the Chemical Transportation Emergency Center (CHEMTREC) provides basic chemical information on a 24-hour basis. The CHEMTREC telephone number is 800-424-9300. Contact CHEMTREC should this information be required.

11.4 DISPOSAL

In compliance with Federal, State, and local regulations that require protection of the environment from mishandling and mismanagement of waste disposal practices, any waste material dumped by site personnel in an authorized and/or unauthorized area and/or causing any form of contamination shall be removed and the area(s) restored to its (their) original condition(s). Open burning shall not be used as a means to dispose of any waste products.

11.5 HAZARDOUS WASTE

Disposal practices used must avoid any potential for ground or surface water contamination and shall follow the requirements for loading, hauling, transportation and disposal specified by Federal, State, and local regulatory authorities. If a spill occurs and contaminates the ground, all contaminated soil shall be excavated, disposed of, and replaced with suitable fill material, and the area shall be compacted. All contaminated debris shall be disposed of off site in an EPA-approved disposal area. The Contracting Officer will be notified in writing within 48 hours should a spill occur, as outlined under this section.

11.6 NONHAZARDOUS WASTE

All nonhazardous waste products generated by site operations shall be removed at least once each week from the site and shall be disposed of in a licensed sanitary landfill or in a liquid industrial waste disposal site. Efforts will be made to maintain the site area in a neat, clean condition. Such housekeeping is necessary to minimize the potential for accidents at the site.

12.0 HAZARD EVALUATIONS

12.1 INTRODUCTION

The main hazards which may be encountered on this site are those common to all construction activities: fire, slips, trips and falls, etc. Regular maintenance of construction equipment and proper housekeeping will mitigate the bulk of these hazards. This section addresses the chemical hazards which may be encountered during this project.

The following section provides a detailed hazard evaluation for each operation covered by this program. The following information is presented in these hazard evaluations:

- Description of activities to take place
- Overall hazard level
- Chemical hazards
- Physical hazards
- Personal protection level
- Air monitoring and action levels.

12.2 STAGE I

Preparation of subgrade, root picking, smooth finishing and compaction of the existing cap of Cell 3.

- Physical Hazards: Moving equipment, slips, trips and falls, heat stress. Careful indoctrination of site personnel in safe operation of, and around, moving equipment will reduce the likelihood of injury. The SSO and Field Supervisor must ensure proper housekeeping, and breaks at regular intervals (see Section 10.0) to reduce slip, trip, fall and heat stress hazards.

- Chemical Hazards: Potential contact with hazardous wastes contained in the landfill. Frequent air monitoring during these activities to assess personnel exposure will ensure a rapid response to changes in the personal environment expected to be non-contaminated for site personnel.

- Level of Protection: Initial entry into the exclusion zone (EZ) (inside the Cell 3 fence designated as the hotline) will be made in Level C for monitoring purposes. Based upon the results obtained from this initial entry, it is assumed work in the EZ may be carried out in Level D with frequent monitoring. Upgrade to Level C will be made if monitoring results steadily exceed 10 parts per million (ppm) total organic vapor (TOV) or 25 percent of the ACGIH threshold limit value (TLV) of a specifically identified contaminant.

12.3 STAGE II

Excavation, loading, transportation, placement, compaction and grading of various soil layers in the final cover, including installation of polymeric membrane, geotextile fabric, and PVC venting system.

- Physical Hazards: The physical hazards are those detailed in Section 12.2, with the addition of excavations. All excavations will be barricaded, marked, fenced, or otherwise prevented from presenting a falling hazard to site personnel or the public.
- Chemical Hazards: The chemical hazards are those detailed in Section 12.2 above.
- Level of Protection: Level D, with frequent air monitoring by the SSO. Level C upgrade limits are the same as those detailed in Section 12.2 above.

12.4 STAGE III

Construction of ditches, dikes, and fences.

- Physical Hazards: The physical hazards presented in this task and procedures for mitigation are the same as those detailed in Section 12.2 above.
- Chemical Hazards: No chemical hazards are anticipated for this stage.
- Level of Protection: Level D.

12.5 SPECIFIC CHEMICALS AND THEIR HAZARDS

The following is a selected list of materials which may be encountered at this site. Relevant exposure limits are summarized for ease of use in Table 11-1. This list is not to be considered exclusive or complete. Further information will be provided based upon analytical results obtained from the Air Monitoring Program.

- **Chromium Compounds**. Chromic acid and its salts have a corrosive action on the skin and mucous membranes. The lesions are confined to the exposed parts, affecting chiefly the skin of the hands and forearms and the mumem of the nasal septum. The characteristic lesion is a deep, penetrating ulcer which for the most part does not tend to suppurate, and which is slow in healing. Small ulcers, about the size of a matchhead or end of a lead pencil may be found, chiefly around the base of the nails, on the knuckles, dorsum of the hands and forearms. These ulcers tend to be clean and progress slowly. They are frequently painless, even though quite deep. They heal slowly and leave scars. On the mucous membranes of the nasal septum,

TABLE 11-1

EXPOSURE LIMIT INFORMATION

SUBSTANCE NAME	TLV (ppm)	PEL (ppm)	STEL (ppm)	IDLH (ppm)	LEL (%)
Lead 0.15[a]	0.20[a]	N/E	Varies	N/A	HR:3
Ethylene glycol monobutyl ether	25	N/E	N/E	700	1.1
Methyl ethyl ketone	200	200	300	3000	2.0
Methylisobutyl ketone	50	100	75	N/E	1.4
Toluene 100	200	150	2000	1.3	HR:3
Cyclohexanone	25	50	N/E	N/E	1.1
Xylenes 100	100	150	10,000	1.0	HR:2
Chromate[c]	0.05[a]	100[b]	N/E	N/E	N/A

(a) mg/m^3
(b) $\mu g/^3$
(c) Chromium (VI); not expected in large proportion; other valence states display relatively innocuous health effects.
N/E = Not established.
N/A = Not applicable.
HR = Hazard rating scale 1-4.

the ulcers are usually accompanied by purulent discharge and crusting. If exposure continues, perforation of the nasal septum may result, but produces no deformity of the nose. Chromate salts are experimental and human carcinogens of the lungs, nasal cavity and paranasal sinus, also experimental carcinogens of the stomach and larynx. Hexavalent compounds are more toxic than the trivalent. Eczematous dermatitis due to trivalent chromium compounds has been reported.

- **Cyclohexanone.** CAS: 108-94-1; DOT 1915; NIOSH: GW 1050000; mf: $C_6H_{10}O$; mw: 98.16. PROP: colorless liquid, acetone-like odor; mp: -45.0°, bp: 115.6°, ulc: 35-40, lel = 1.1% @100°, flash p: 111°F, d: 0.9478 @20°/4°, autoign temp: 788°F, vap press: 10 mm @38.7°, vap d: 3.4. OSHA PEL: TWA 50 ppm. ACGIH TLV: TWA 25 ppm; DOT Classification: Flammable Liquid. THR: Moderately toxic via oral, inhalation, subcutaneous, and intraperitoneal routes. Skin and eye irritant. Human inhalation irritant. Mild narcotic properties have also been ascribed to it. See also cyclohexane. Moderate fire hazard when exposed to heat or flame; can react vigorously with oxidizing materials such as HNO_3. Slight explosion hazard in its vapor form, when exposed to flame. To fight fire, use alcohol foam, dry chemical or CO_2. When heated to decomposition it emits acrid smoke and irritating fumes. Incompatibles: Hydrogen peroxide; nitric acid.

- **Ethylene Glycol Monobutyl Ether.** HR: 2; CAS: 1/1-76-2. Formula: $CH_3(CH_2)OCH_2CH_2OH$. Mol Wt: 118.18. PROP: colorless, oily liquid, mild rancid odor. Boiling point 171.2°; d: 0.902 @20°C. Vapor pressure: 2.2 psia. Combustible. OSHA PEL: Data not available. ACGIH TLV: 25 ppm. THR: Vapor irritates eyes and nose, ingestion or skin contact causes headache, nausea, vomiting and/or dizziness. Minimal hazard. Remove to fresh air and flush affected areas with water; call physician.

- **Lead.** HR: 3. CAS: 7439-92-1; NIOSH: OF 7525000; af: Pb; aw: 207.19. PROP: Bluish-gray, soft metal, mp: 327.43°, bp: 1740°, d: 11.34 @20°/4°. Vap press: 1 mm @ 973°. SYNS: c.i. 77575 * Lead flake * Lead S2. OSHA PEL: TWA 200 ug/m^3. ACGIH BEI: Lead in blood 50 ug/100 ml. THR: See also lead compounds. Affects human central nervous system. A poison by ingestion; moderately irritating. A common air contaminant. It is a carcinogen of the lungs and kidneys and an experimental teratogen. Flammable in the form of dust when exposed to heat or flame. See also powdered metals. Moderate explosion hazard in the form of dust when exposed to heat or flame. Incompatible with NH_4NO_3; ClF_3; H_2O_2; NaN_3; Na_2C_2; Zr; disodium acetylide; oxidants. Dangerous; when heated it emits highly toxic fumes; can react vigorously with oxidizing materials.

- **Methylethyl ethyl ketone.** HR: 3. CAS: 78-93-3; formula: $CH_3COCH_2CH_3$. Mol Wt: 72.11. PROP: colorless liquid with sweet, pleasant pungent odor. Boiling Point 79.6°C. d: 0.806 @20°C. Vapor pressure: 3.5 psia. Flammable. THR: Liquid causes eye burns. Vapor irritates eyes, nose, throat; can cause dizziness, headache, nausea, weakness and loss of consciousness. Remove to fresh air,

give resuscitation and oxygen; flush affected areas with water. Call physician.

- **Methyl isobutyl ketone.** HR: 3. CAS: 108-10-1; formula: $(CH_3)_2CHCH_2COCH_3$. Mol Wt: 100.16. PROP: colorless, watery liquid with mildly pleasant odor. Boiling Point 116.2°C. d: 0.802 @20°C. Vapor pressure: 0.8 psia. Flammable. THR: Vapor causes irritation of eyes and nose; high concentrations cause anesthesia and depression. Liquid dries out skin and may cause dermatitis. Irritates eyes but does not injure them. Remove victim to fresh air and give artificial respiration if required; flush affected areas with water until irritation stops. Call physician.

- **Toluene.** HR: 3. CAS: 108-88-3; NIOSH: XS 5250000; DOT: 1294; mf: C_7H_8; Mol Wt: 92.15. PROP: colorless liquid, benzol-like odor. Flammable. Mp: -95° to -94.5°, bp: 110.4°, flash p: 40°F (CC), ulc: 75-80, lel = 1.27%, uel = 7%, d: 0.866 @ 20°/4°, autoign temp: 896°F, vap press: 36.7 mm @30°, vap d: 3.14, Insoluble in water; soluble in acetone; misc. in absolute alc, ether, chloroform. SYNS: Methylbenzene * methylbenzol * NCI-C07272 * phenylmethane. OSHA PEL: TWA 300 ppm; CL 300; Pk 500/10M. ACGIH TLV: TWA 100 ppm; STEL 150 ppm; BEI: toluene in venous blood end of shift 1 mg/L. DOT classification: Label: Flammable Liquid. THR: Poison by intraperitoneal route. Moderately toxic by inhalation and subcutaneous routes. Mutagenic data. A skin and eye irritant. Human central nervous system and psychotropic effects. Toluene is derived from coal tar, and commercial grades usually contain small amounts of benzene as an impurity. Inhalation of 200 ppm of toluene for 8 hours may cause impairment of coordination and reaction time; with higher concentrations (up to 800 ppm) these effects are increased and are observed in a shorter time. In the few cases of acute toluene poisoning reported, the effect has been that of a narcotic, the victim passing through a stage of intoxication into one of coma. Recovery following removal from exposure has been the rule. An occasional report of chronic poisoning describes an anemia and leucopenia, with biopsy showing a bone marrow hypoplasia. These effects, however, are less common in people working with toluene, and they are not as severe. At 200-500 ppm, headache, nausea, eye irritation, loss of appetite, a bad taste, lassitude, impairment of coordination and reaction time are reported, but are not usually accompanied by any laboratory or physical findings of significance. With higher concentrations, the above complaints are increased and in addition, anemia, leucopenia and enlarged liver may be found in rare cases. A common air contaminant. Combustible when exposed to heat, flame or oxidizers. Moderately explosive when exposed to flame or reacted with (H_2SO_4 + HNO_3), N_2O_4, $AgClO_4$, BrF_3, UF_6. Moderately dangerous; when heated it emits irritating fumes; can react vigorously with oxidizing materials. To fight fire, use foam, CO_2, dry chemical.

- **Xylene.** HR: 3. CAS: 1330-20-7; NIOSH: ZE 2100000; DOT: 1307 (NIOSH: ZE 2190000); mf: C_8H_{10}; mw: 106.18. PROP: A clear liquid; bp 138.5°, flash p: 100°F (TOC); d: 0.864 @20°/4°, vap press: 6.72 mm @21°. Composition: as nonaromatics 0.07%, toluene 14%, ethyl benzene 19.27%, p-xylene 7.84%, m-xylene 65.01%, o-xylene 7.63%, C9 and

aromatics 0.04%. SYNS: Aromatic hydrocarbons, mixed * NCI-C55232 * dimethlybenzene. OSHA PEL: TWA 100 ppm; ACGIH TLV: TWA (all isomers) 100 ppm; STEL 150 ppm; BEI: methyl hippuric acids in urine end of shift, 1.5 g/g cretinine. DOT classification: Flammable Liquid. THR: Poison by intraperitoneal route. Moderately toxic by inhalation, ingestion, and subcutaneous routes. A severe human eye irritant. Some temporary corneal effects are noted, as well as some conjunctival irritation by instillation. Irritation can start @200 ppm. A moderate skin irritant. Human irritant (systemic) effects. Flammable in the presence of heat or flame; can react with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and fumes.

ETHYLENE GLYCOL MONOBUTYL ETHER

EGM

Common Synonyms
2-Butoxyethanol
Butyl Cellosolve
Dowanol EB
Poly-Solv EB
Glycol butyl ether

Oily liquid — Colorless — Mild rancid odor

Floats and mixes with water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Disperse and flush

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Glycol ether
3.2 **Formula:** $CH_3(CH_2)OCH_2CH_2OH$
3.3 **IMO/UN Designation:** Not listed
3.4 **DOT ID No.:** Data Not Available
3.5 **CAS Registry No.:** 111-76-2

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild, characteristic, slightly rancid; mild ethereal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air pack or organic canister respirator; rubber gloves; goggles; clothing to prevent body contact with liquid.
5.2 **Symptoms Following Exposure:** Vapors irritate eyes and nose. Ingestion or skin contact causes headache, nausea, vomiting, dizziness.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air and call a physician. SKIN OR EYES: immediately flush with plenty of water; get medical care for eyes.
5.4 **Threshold Limit Value:** 25 ppm
5.5 **Short Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available
5.11 **IDLH Value:** 700 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 165°F O.C. 155°F C.C.
6.2 **Flammable Limits in Air:** 1.1%-10.6%
6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol-type foam for large fires
6.4 **Fire Extinguishing Agents Not to be Used:** Data not available
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 472°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 6.7 mm/min
6.10 **Adiabatic Flame Temperature:** Data Not Available
6.11 **Stoichiometric Air to Fuel Ratio:** Data Not Available
6.12 **Flame Temperature:** Data Not Available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data Not Available
7.8 **Reactivity Group:** 40

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1000 ppm/24 hr/brine shrimp/TL_m
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 26% of theoretical in 5 days, fresh water
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Commercial
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Not listed
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 118.18
12.3 **Boiling Point at 1 atm:** 340.2°F = 171.2°C = 444.4°K
12.4 **Freezing Point:** −103°F = −75°C = 198°K
12.5 **Critical Temperature:** 694°F = 368°C = 641°K
12.6 **Critical Pressure:** 470 psia = 32 atm = 3.2 MN/m^2
12.7 **Specific Gravity:** 0.902 at 20°C (liquid)
12.8 **Liquid Surface Tension:** Not pertinent
12.9 **Liquid Water Interfacial Tension:** Not pertinent
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.047
12.12 **Latent Heat of Vaporization:** 157 Btu/lb = 87.1 cal/g = 3.65×10^5 J/kg
12.13 **Heat of Combustion:** −13,890 Btu/lb = −7720 cal/g = -323×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = -0.2×10^5 J/kg
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data Not Available
12.26 **Limiting Value:** Data Not Available
12.27 **Reid Vapor Pressure:** 2.2 psia

NOTES

CYCLOHEXANONE

CCH

Common Synonyms			
Cyclohexyl Ketone Anone Hytrol O Nadone Pimelic ketone Sextone	Watery liquid Floats and mixes slowly with water	Colorless to light yellow	Sweet, peppermint odor

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with dry chemicals, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Disperse and flush.

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Ketone
3.2 Formula: $(CH_2)_5CO$
3.3 IMO/UN Designation: 3.3/1915
3.4 DOT ID No.: 1915
3.5 CAS Registry No.: 108-94-1

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to slightly yellow
4.3 Odor: Like peppermint and acetone

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Chemical goggles.
5.2 Symptoms Following Exposure: Inhalation of vapors from hot material can cause narcosis. The liquid may cause dermatitis.
5.3 Treatment of Exposure: Immediately flush eyes with plenty of water; call a physician.
5.4 Threshold Limit Value: 25 ppm
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
5.10 Odor Threshold: 0.12 ppm
5.11 IDLH Value: 5,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 129°F O.C., 111°F C.C.
6.2 Flammable Limits in Air: 1.1%-9.4%
6.3 Fire Extinguishing Agents: Water, dry chemical or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 788°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4.2 mm/min
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 18

8. WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical: 99.87%
9.2 Storage Temperature: Data not available
9.3 Inert Atmosphere: Data not available
9.4 Venting: Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-T-U

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Not listed
11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	2
Health	
Vapor irritant	3
Liquid or Solid irritant	2
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 98.15
12.3 Boiling Point at 1 atm: 312.4°F = 156.8°C = 429.0°K
12.4 Freezing Point: −24.2°F = −31.2°C = 242.0°K
12.5 Critical Temperature: 673°F = 356°C = 629°K
12.6 Critical Pressure: 560 psia = 38 atm = 3.8 MN/m²
12.7 Specific Gravity: 0.945 at 20°C (liquid)
12.8 Liquid Surface Tension: 34 dynes/cm = 0.034 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 90 dynes/cm = 0.090 N/m at 22.7°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.084
12.12 Latent Heat of Vaporization: 180 Btu/lb = 91 cal/g = 3.8×10^4 J/kg
12.13 Heat of Combustion: −15,430 Btu/lb = −8570 cal/g = -358.8×10^4 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.26 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.8 psia

NOTES

METHYL ETHYL KETONE

MEK

Common Synonyms	Liquid	Colorless	Sweet odor
MEK 2-Butanone Ethyl methyl ketone	Floats and mixes with water. Flammable. Irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Disperse and flush

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Ketone
3.2 **Formula:** $CH_3COCH_2CH_3$
3.3 **IMO/UN Designation:** 3.2/1193
3.4 **DOT ID No.:** 1193
3.5 **CAS Registry No.:** 78-93-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like acetone; pleasant; pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack, plastic gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness.
5.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: wash with plenty of water for at least 15 min and call physician.
5.4 **Threshold Limit Value:** 200 ppm
5.5 **Short Term Inhalation Limits:** 290 mg/m³ for 60 min
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 10 ppm
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 20°F C.C. 22°F O.C.
6.2 **Flammable Limits in Air:** 1.8%-11.5%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 961°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 4.1 mm/min
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 16

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5640 mg/l/48 hr/bluegill/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 214% 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** 99.5+ %
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water**
Transportation:

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 72.11
12.3 **Boiling Point at 1 atm:** 175.3°F = 79.6°C = 352.8°K
12.4 **Freezing Point:** −123.3°F = −86.3°C = 186.9°K
12.5 **Critical Temperature:** 504.5°F = 262.5°C = 535.7°K
12.6 **Critical Pressure:** 603 psia = 41.0 atm = 4.15 MN/m²
12.7 **Specific Gravity:** 0.806 at 20°C (liquid)
12.8 **Liquid Surface Tension:** Not pertinent
12.9 **Liquid Water Interfacial Tension:** Not pertinent
12.10 **Vapor (Gas) Specific Gravity:** 2.5
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.075
12.12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g = 4.44 X 10⁵ J/kg
12.13 **Heat of Combustion:** −13,480 Btu/lb = −7491 cal/g = −313.6 X 10⁵ J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 X 10⁵ J/kg
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 3.5 psia

NOTES

METHYL ISOBUTYL KETONE

MIK

Common Synonyms
4-Methyl-2-pentanone
Isobutyl methyl ketone
MIBK
Hexone
Isopropylacetone
MIK

Watery liquid — Colorless — Mild pleasant odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability.
Evacuate area.
Disperse and flush.

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Ketone
3.2 **Formula:** $(CH_3)_2CHCH_2COCH_3$
3.3 **IMO/UN Designation:** 3.2/1245
3.4 **DOT ID No.:** 1245
3.5 **CAS Registry No.:** 108-10-1

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant; mild, characteristic; sharp, non-residual; ketonic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack; rubber gloves; goggles or face shield.
5.2 **Symptoms Following Exposure:** Vapor causes irritation of eyes and nose; high concentrations cause anesthesia and depression. Liquid dries out skin and may cause dermatitis; irritates eyes but does not injure them.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air, give artificial respiration if needed; call a doctor. SKIN OR EYES: wash eyes thoroughly with water; wash skin with water until irritation stops.
5.4 **Threshold Limit Value:** 50 ppm
5.5 **Short Term Inhalation Limits:** 100 ppm for 60 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.47 ppm
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 73°F C.C., 75°F O.C.
6.2 **Flammable Limits in Air:** 1.4%-7.5%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated
6.6 **Behavior in Fire:** Vapors may travel a considerable distance and ignite
6.7 **Ignition Temperature:** 854°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** Data not available
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 18

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** (theor.) 1.8%, 0.5 day, (theor.) 12%, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** 99+%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-P-Q-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Not listed
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 100.16
12.3 **Boiling Point at 1 atm:** 241.2°F = 116.2 = 389.4°K
12.4 **Freezing Point:** −119°F = −84°C = 189°K
12.5 **Critical Temperature:** 568.9°F = 298.3°C = 571.5°K
12.6 **Critical Pressure:** 475 psia = 32.3 atm = 3.27 MN/m²
12.7 **Specific Gravity:** 0.802 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 23.6 dynes/cm = 0.0236 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 15.7 dynes/cm = 0.0157 N/m at 22.7°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.081
12.12 **Latent Heat of Vaporization:** 149 Btu/lb = 82.5 cal/g = 3.45×10^5 J/kg
12.13 **Heat of Combustion:** (est.) −10,400 Btu/lb = −5,800 cal/g = -242×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = -0.2×10^5 J/kg
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 0.8 psia

NOTES

TOLUENE

TOL

Common Synonyms	Watery liquid	Colorless	Pleasant odor
Toluol Methylbenzene Methylbenzol	Floats on water. Flammable, irritating vapor is produced		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability.
Evacuate area.

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** $C_6H_5CH_3$
3.3 **IMO/UN Designation:** 3.2/1294
3.4 **DOT ID No.:** 1294
3.5 **CAS Registry No.:** 108-88-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent; aromatic, benzene-like; distinct, pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.
5.2 **Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 600 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 **Late Toxicity:** Kidney and liver damage may follow ingestion.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.17 ppm
5.11 **IDLH Value:** 2,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 40°F C.C. 55°F O.C.
6.2 **Flammable Limits in Air:** 1.27%-7%
6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large fires
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 997°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 5.7 mm/min
6.10 **Adiabatic Flame Temperature:** Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1180 mg/l/96 hr/sunfish/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0%, 5 days; 38% (theor), 8 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research, reagent, nitration-at 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 92.14
12.3 **Boiling Point at 1 atm:** 231.1°F = 110.6°C = 383.8°K
12.4 **Freezing Point:** −139°F = −95.0°C = 178.2°K
12.5 **Critical Temperature:** 605.4°F = 318.6°C = 591.8°K
12.6 **Critical Pressure:** 596.1 psia = 40.55 atm = 4.108 MN/m²
12.7 **Specific Gravity:** 0.867 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089
12.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86.1 cal/g = 3.61 X 10^4 J/kg
12.13 **Heat of Combustion:** −17,430 Btu/lb = −9686 cal/g = −405.5 X 10^3 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 17.17 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 1.1 psia

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

m-XYLENE

XLM

Common Synonyms
1, 3-Dimethylbenzene
Xylol

Watery liquid — Colorless — Sweet odor

Floats on water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away
Call fire department
Avoid contact with liquid and vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear self-contained breathing apparatus
Extinguish with foam, dry chemical, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** $m\text{-}C_6H_4(CH_3)_2$
3.3 **IMO/UN Designation:** 3.2/1307
3.4 **DOT ID No.:** 1307
3.5 **CAS Registry No.:** 108-38-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like benzene; characteristic aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
5.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 300 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 50 to 500 g/kg
5.7 **Late Toxicity:** Kidney and liver damage.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.05 ppm
5.11 **IDLH Value:** 10,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 84°F C.C.
6.2 **Flammable Limits in Air:** 1.1%-6.4%
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 986°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 5.8 mm/min
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 22 ppm/96 hr/bluegill/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0 lb/lb, 5 days; 0% (theor.), 8 days
8.4 **Food Chain Concentration Potential:** Data not available

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research: 99.98%; Pure: 99.9%, Technical: 99.2%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 106.16
12.3 **Boiling Point at 1 atm:** 269.4°F = 131.9°C = 405.1°K
12.4 **Freezing Point:** −54.2°F = −47.9°C = 225.3°K
12.5 **Critical Temperature:** 650.8°F = 343.8°C = 617.0°K
12.6 **Critical Pressure:** 513.8 atm = 34.95 psia = 3.540 MN/m²
12.7 **Specific Gravity:** 0.864 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 28.6 dynes/cm = 0.0286 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 36.4 dynes/cm = 0.0364 N/m at 30°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071
12.12 **Latent Heat of Vaporization:** 147 Btu/lb = 81.9 cal/g = 3.43 X 10⁵ J/kg
12.13 **Heat of Combustion:** −17,554 Btu/lb = −9752.4 cal/g = −408.31 X 10⁵ J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 26.01 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 0.34 psia

NOTES

13.0 REFERENCES

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ATTACHMENT A

RECORDING AND REPORTING FORMS

INTERNATIONAL TECHNOLOGY CORPORATION

REAL TIME AIR MONITORING LOG

PROJECT NAME _____ LOCATION _____ PROJECT NO. _____

Date	Analyst	Time	Instrument (Mfg/Model/ Serial No.)	Calibration Date & Cpd.	Compound Measured	Span Set or Sens. Cal.	Conc. (Units)	Location/Activity/Comments

INTERNATIONAL TECHNOLOGY CORPORATION

AIR SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

GENERAL

Project or Facility (25): _____ Project No (10): _____
Facility Location (30): _____ Profit Center (5): _____
Area/Personnel (A or P)(1): __ Sample Date (9): __/__/___ Sample No (10): _____
Instrument (20): _____ Instrument IT Id No (8): _____
Media (30): _____ Media Lot No (25): _____
Sample/Analytical Method (55): _____
Contaminant (60): _____

EMPLOYEE

Employee Name (30): _____ Employee's PC/"SUB" (5): ____
Social Security No (14): ___-___-_____ Date of Birth (9): __/__/___
Sex (M or F)(1): _ Personnel Code (6): _____ Work Shift Duration (hrs)(2): ___
Personal Protective Gear (135): _____
Other Controls (60): _____

SAMPLING

	Time On(5)	Time Off(5)	Description(10)
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

Flow Rate (Avg of Pre and Post Cal)(8): _____ Sample Duration (min)(5): ___
Total Sample Volume-m^3(8): _____ Volume Corrected to STP (Y or N)(1): __
Sampler Name (25): _____ Activity Code (6): _____ ___ Open Code (4): _
Sample Location (60): _____
Comments (220): _____

ENVIRONMENTAL

Ambient Temp (5): _____ Barometric Press (5): _____ Windspeed/Direction (10): _____
Humidity (6): _____ Other (55): _____

CALIBRATION

Calibration Method: _____
Date Pre: ___/___/____ Date Post: ___/___/___ Temp: _____ Barometric Press: _____

Time	Flow Rate	Time	Flow Rate
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Avg Pre: _____
Avg Post: _____
Avg Pre and Post: _____
Rotometer/Counter Reading: _____
Volume: _____ Volume: _____
Pre Calibrator: _____ Post Calibrator: _____

RESULTS

Substance CAS No/Abbrev (26)	Net Analytical Quantity(12)	Concentration(12)	Guideline(12)	Percent Of Guidelin
_____	_____	_____	_____	____
_____	_____	_____	_____	____
_____	_____	_____	_____	____
_____	_____	_____	_____	____
_____	_____	_____	_____	____
_____	_____	_____	_____	____

Analytical Lab/Address (57): _____
Analysis No/Analytical Date (30): _____

Sampler Signature: _____ Reviewer Signature: _____

IT CORPORATION

INTERNATIONAL TECHNOLOGY CORPORATION

STANDARD PROCEDURE

PROCEDURE NO. 9521.1

DATE October 29, 1979

SUPERSEDES ----

APPROVED David R. Smith

David R. Smith

SUBJECT:

GasTech GX-3 Maintenance

1. Purpose: To prescribe routine inspection and preventive maintenance for the GX-3 combustible gas/oxygen indicators.

2. Reference: Instruction Manual, 0102-072977-1-10, Model GX-3 Combination Combustible Gas/Oxygen Indicator and Alarm.

3. Attachments:

   A. Inventory list, GX-3 Combustible gas/oxygen indicator; instrument diagram, GX-3

   B. Operational tests.

4. Office of Primary Responsibility:

   Corporate Director of Occupational Safety and Health

5. Discussion:

   Reliable measurements of potentially hazardous atmospheres encountered by field personnel demand optimum performance from operations test instruments. These instruments are sensitive and can get out of calibration easily. In consequence, conscientious attention to proper accomplishment of necessary inspections and scheduled maintenance is mandatory. Periodic inspections and maintenance checks are prescribed in this directive.

6. Action: Before any instrument is issued to field personnel the following procedures will be accomplished:

   A. Daily Inspection

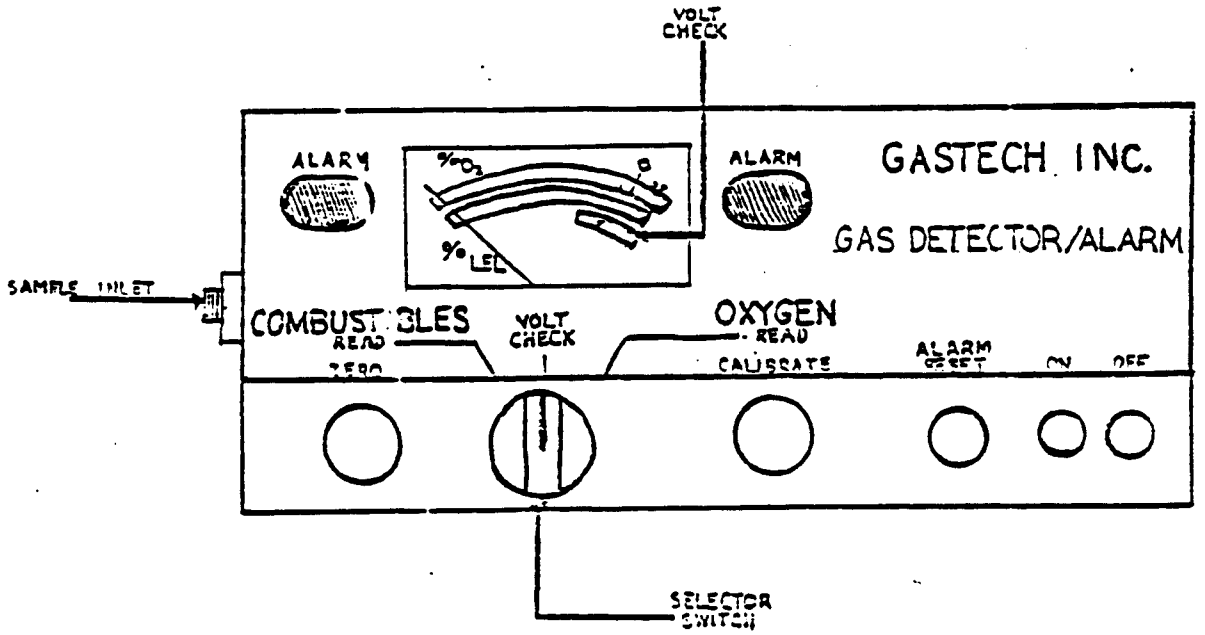
      1. The instrument shall be inspected to ensure that all items listed on the inventory list on Attachment A are with the instrument.

      2. The instrument shall be given the operations tests in Attachment B to verify proper operation.

GasTech GX-3 Inventory List

1. GX-3 complete with carrying case.
2. Instruction Manual.
3. Probe with cotton filter, 10" fiberglass.
4. Hose, 3', complete with couplings.
5. Hose, 6', complete with couplings.

Instrument Diagram



1. Operational Tests - each instrument shall be inspected to verify normal operation by the following means:

A. Check battery voltage. Turn instrument on and move selector switch to "volt check" position. Needle should rise to the black band near top of scale. Batteries should be replaced if the needle lies below the "V" on the volt check scale (see attachment A).

B. Verify pump operation. With instrument turned on, verify pump operation by holding finger over sample inlet. Pump should slow down or stop.

If pump does not slow appreciably, there is leakage at pump valves or elsewhere in system, and reliable gas indication may be impossible.

C. Inspect Sampling System

(1) Probe. Inspect 10" flexible plastic tube for general cleanliness, and remove all liquid and residue before issuing. Inspect filter unit and clean wire screen as necessary. Replace cotton plug if soiled.

(2) Hoses. Inspect both 3' and 6' hose for damage to rubber surfaces, fittings, or teflon lining. Inspect "O" rings. Replace or repair as necessary.

(3) Leak Test. Assemble sample system and attach to instrument. With instrument turned on, hold finger over hose inlet. Pump should stop or slow noticeably if there is no leak. Disassemble sample system and place it back in pouch in carrying case.

D. Check Oxygen Alarm Setting. With instrument turned on, check oxygen alarm setting by moving selector switch to "Oxygen Read" position. Needle should rise to upper portion of scale. Lift and engage "calibrate" knob and rotate counterclockwise to move the needle to 20% oxygen. The oxygen alarm light will glow and an audible alarm will sound if the instrument is properly set at 20% oxygen. Do not issue the instrument unless the oxygen alarm is properly set at 20% oxygen. Return the needle position to 21% oxygen and press "Reset" button to reset alarm circuit.

E. Check Combustibles Alarm Setting. Check combustibles alarm setting by turning selector switch to "combustibles" position. Meter should read close to zero. Lift and engage "zero" knob clockwise to move the needle to 10% LEL. The combustibles alarm light will glow and an audible alarm will sound if the instrument is properly set at 10% LEL. Return the needle to zero by rotating the zero knob counterclockwise.

2. Monthly Maintenance

   A. Thoroughly clean external surfaces of instrument and carrying case using a mild detergent and water solution.

   B. Calibrate instrument with a known concentration of methane gas using the GasTech Calibration Test Kit No. 81-0202, as per manufacturer's instructions.

   C. Perform all operations checks described in 1. above.

   D. Attach an inspection report tag indicating the date of inspection and the inspector's name.

3. Special Precautions. In addition to normal daily instrument inspection and monthly calibration checks, the following precautionary maintenance checks may be necessary for special operations:

   A. Heated Samples. Sampling spaces such as hot tanks that are warmer than the instrument may result in condensation of water vapor as the sample passes through the cool sample line. This condensation can block the flow system, corrode the flame arrestor and cause pump valve sticking. Instruments that have been used for such sampling should be inspected for evidence of water vapor condensation.

   B. Filament Poisoning. Sampling spaces that have contained leaded products such as leaded gasoline, or silicone vapors, may result in desensitization of the catalytic surface of the platinum filament.

      Instruments that have been used for such sampling should be calibrated more frequently using a known concentration of methane gas to ensure reliability of measurements.

IT CORPORATION

STANDARD PROCEDURE

PROCEDURE NO. ITC PRO 9521.2

DATE July 27, 1987

SUPERSEDES

APPROVED D R Smith
David R. Smith

SUBJECT:

Use, Calibration, and Maintenance of The HNU P1-101

I. PURPOSE

To provide direction for the use, calibration, limitations, and maintenance of the HNU.

II. REFERENCES

A. HNU Systems, Inc., Instruction Manual for Model PI 101 Photoionization Analyzer, 1975

B. E&E FIT Operation and Field Manual: HNU System PI 101 Photoionization Detector and Century Systems (Foxboro) Model OVA-128 Organic Vapor Analyzer

III. RESPONSIBILITIES

A. Corporate Director -- Health & Safety

1. Maintain this procedure, and

2. Specify training of IT employees as appropriate on the use, calibration, limitations, and maintenance of the HNU.

B. Each IT Location shall

1. Ensure that employees using the HNU are trained in use, limitations, calibration, maintenance, and interpretation of readings,

2. Implement the procedures outlined herein,

3. Maintain records of employee training and instrument calibration, and

4. Maintain HNU inventory control and accountability.

d. Check to see that the SPAN POTENTIOMETER is set at the appropriate setting for the probe being used.

e. Set the FUNCTION switch to the desired ppm range.

f. Listen for the fan operation to verify fan function.

g. Check instrument with an organic point source such as a magic marker prior to survey to verify instrument function.

2. Shut Down Procedures

a. Turn FUNCTION Switch to OFF.

b. Disconnect the probe connector.

c. Place the instrument on the charger.

B. Maintenance and Calibration Schedule

Function	Frequency
Routine Calibration	Prior to each use*
Factory Check-out & Calibration	Yearly or when malfunctioning
Wipe Down Read-Out Unit	After each use
Clean UV Light Source Window	Every month or as use and site conditions dictate
Clean the Ionization Chamber	Monthly
Recharge Battery	After each use

* It is recommended that for activities where the HNU-PI-101 is in the field for extended periods of time that calibration gas be brought into the field to check calibration. However, if necessary a single calibration conducted prior to an activity will be considered acceptable for periods up to one week.

C. Calibration Procedure 1

1. Run through start-up procedures as set forth in V.A.

2. Fill a sampling bag with HNU calibration gas (Analyzed).

3. Allow sample bag contents to be drawn into the probe and check response in ppm.

4. If the reading deviates ± 15% from the concentration of the calibration gas, the instrument requires maintenance.

b. Carbon tetrachloride-All lamps except the 11.7 eV

c. Methanol-All lamps

6. Following cleaning, reassemble by first sliding the lamp back into the lamp housing. Place the ion chamber on top of the housing making sure the contacts are properly aligned.

7. Place the end cap on top of the ion chamber and replace the two screws. Tighten the screws only enough to seal the O-ring. Do Not Overtighten.

8. Line up the pins on the base of the lamp housing with pins inside the probe shell, and slide the housing assembly into the shell. It will only fit one way.

F. Cleaning the Ionization Chamber

1. Turn the FUNCTION switch to the OFF position and disconnect the sensor/probe from the Read Out/Control unit.

2. Remove the exhaust screws located near the base of the probes. Grasp the end cap in one hand and the probe shell in the other. Separate the end cap and lamp housing from the shell.

3. Loosen the screws on the top of the end cap and separate the end cap and ion chamber from the lamp and lamp housing, taking care that the lamp does not fall out of the lamp housing.

4. The ion chamber may now be cleaned according to the following sequence:

   a. acetone rinse with agitation (10 min.)

   b. dry (preferably with oven at 100°C)

   c. methanol rinse with agitation (10 min.)

   d. dry (preferably with oven at 100°C)

5. Place the ion chamber on top of the housing making sure the contacts are properly aligned.

6. Place the end cap on top of the ion chamber and replace the two screws. Tighten the screws only enough to seal the O-ring. Do Not Overtighten.

7. Line up the pins on the base of the lamp housing with pins inside the probe shell, and slide the housing assembly into the shell. It will only fit one way.

Check to see that light source is on.

a. Check high voltage power supply.

b. Open end of probe, remove lamp and check high voltage on lamp contact ring.

c. If High voltage is present at all above points, light source has most likely failed. Consult the factory.

4. Instrument responds correctly in all positions, but signal is lower than expected.

   a. Check span setting for correct value.

   b. Clean window of light source.

   c. Double check preparation of standards.

   d. Check power supply 180 V output.

   e. Check for proper fan operation. Check fan voltage.

5. Instrument responds in all switch positions, but is noisy (erratic meter movement)

   a. Open circuit in feedback circuit. Consult the factory.

   b. Open circuit in cable shield or probe shield. Consult the factory.

6. Instrument response is slow and/or irreproducible.

   a. Fan operating improperly. Check fan voltage.

   b. Check calibration and operation. See sections 2 and 3.

IT CORPORATION

STANDARD PROCEDURE

PROCEDURE NO. ITC PRO 9521.3

DATE July 27, 1987

SUPERSEDES

APPROVED DRSmith

David R. Smith

SUBJECT:

Use, Calibration, and Maintenance of The OVA-128

I. PURPOSE

To provide direction for the use, calibration, limitations, and maintenance of the OVA.

II. REFERENCES

A. Region II FIT "Proposed Guidelines for the Organic Vapor Analyzer"

B. E&E FIT "FIT Operation and Field Manual: HNU Systems PI 101 Photoionization Detector and Century Systems (Foxboro) Model OVA-128 "Organic Vapor Analyzer"

C. Century Systems (Foxboro). "Service Procedures: Organic Vapor Analyzer; 128GC".

III. RESPONSIBILITIES

A. Corporate Director -- Health & Safety

1. Maintain this procedure, and

2. Specify training of IT employees as appropriate on the use, calibration, limitations, and maintenance of the OVA.

B. Each IT Location shall

1. Ensure that employees using the OVA are trained in use, limitations, calibration, maintenance, and interpretation of readings,

2. Implement the procedures outlined herein,

3. Maintain records of employee training and instrument calibration, and

4. Maintain OVA inventory control and accountability.

g. Turn the PUMP switch ON and check the flow system according to the procedures in Attachment 4.

h. Check that BACKFLUSH and INJECT valves are in the UP position.

i. To light the flame, depress the igniter switch until a meter deflection is observed. The igniter switch may be depressed for up to 5 seconds. Do not depress for longer than five (5) seconds, as it may burn out the igniter coil. If the instrument does not light, allow the instrument to run several minutes and repeat ignition attempt.

j. Confirm OVA operational state by sniffing an organic source, such as a magic marker.

k. Establish a background level in a clean area or by using the charcoal scrubber (depress the sample inject valve) and recording measurements referenced to background.

l. Set the alarm level, if desired.

2. Shut Down Procedures

a. Close H_2 supply valve and H_2 tank valve (Do Not Overtighten Valves).

b. Turn INSTR switch to OFF.

c. Wait until H_2 supply gauge indicates system is purged of H_2, then switch off pump.

d. Put instrument on electrical charger at completion of day's activities.

7. Switch to X100 Scale. The meter should indicate 0.4 on the 1-10 meter markings. (0.4 x 100 = 40 ppm), if the reading is off, adjust with R33 Trimpot.

8. Return to X10 Scale and adjust meter needle to 40 ppm with calibration adjust knob if necessary.

9. At the X10 Scale adjust meter to read 0.4 on the 1-10 meter markings using the calibration adjust. Switch to X1 scale. The meter should read 4 ppm. If the reading is off, adjust using the R-31 Trimpot.

D. Calibration Procedure 2

1. Fill an air sampling bag with 100 ppm (certified) methane calibration gas.

2. Connect the outlet of the air sampling bag to the air sampling line of the OVA.

3. Record the reading obtained off the meter onto the calibration record.

E. Documentation

Each regional shall develop a system whereby the following calibration information is recorded.

1. Instrument calibrated (I.D. or Serial #)
2. Date of calibration
3. Method of calibration
4. Results of the calibration
5. Identification of person who calibrated the instrument
6. Identification of the calibration gas (source, type, concentration, lot #)

F. Pump System Check-Out

1. With Pump On, hold unit upright and observe flow gauge.

2. Ball level significantly below a reading of 2 is low flow.

3. Check connections at the sample hose.

4. Clean or replace particle filters if flow is impaired or it is time for scheduled service.

5. Reassemble and retest flow.

6. If flow still low, replace pump diaphragm and valves.

7. If flow normal, plug air intake. Pump should slow and stop.

I. Trouble Shooting

Indication	Possible Causes
High Background Reading (More Than 10 ppm)	Contaminated Hydrogen Contaminated Sample Line
Continual Flameout Dirty Burner Chamber Dirty Air Filters	Hydrogen Leak
Low Air Flow Pump Malfunction Line Obstruction	Dirty Air Filter
Flame Will Not Light Ignitor Broken Hydrogen Leak Dirty Burner Chamber Air Flow Restricted	Low Battery
No Power to Pump Short Circuit	Low Battery
Hydrogen Leak (Instrument Not in Use)	Leak in Regulator Leak in Valves

J. Shipping

Since the OVA-128 contains hydrogen, it is subject to shipping restrictions.

1. As Personal Luggage

   The OVA-128 can be taken on a plane as luggage as a permit has been issued from the Department of Transportation to the manufacturer (Foxboro).

2. Federal Express

   The following labels must be affixed to both sides of the OVA case when shipping OVA by Federal Express.

   Danger - Peligro
   Flammable Gas
   Inside Container Complies with DOT regulations
   Hydrogen UN #1049
   Name and Address of Recipient

instrument. The location of these filters are indicated on the attached figure. The first filter is located in the probe assembly, and the second filter (primary filter) is located on the side pack assembly. Cleaning procedures are as follows:

1. Detach the probe assembly from the readout assembly.

2. Disassemble the probe (the components unscrew).

3. The particle filter located within the probe can be cleaned by blowing air through the filter.

4. Reassemble the probe.

5. The primary filter, located behind the sample inlet connector on the side pack assembly is accessed by removing the sample inlet connector with a thin-walled 7/16" socket wrench. Remove the filter and clean as above.

6. Reassemble the sample inlet fitting and filter to the side pack assembly.

7. Check sample flow rate.

9521-3

INTERNATIONAL TECHNOLOGY CORPORATION

REQUEST FOR ANALYSIS

R/A Control No. B1U0071

C/C Control No. _____

PROJECT NAME _____

PROJECT NUMBER _____

PROJECT MANAGER _____

BILL TO _____

PURCHASE ORDER NO. _____

DATE SAMPLES SHIPPED _____

LAB DESTINATION _____

LABORATORY CONTACT _____

SEND LAB REPORT TO _____

DATE REPORT REQUIRED _____

PROJECT CONTACT _____

PROJECT CONTACT PHONE NO. _____

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal _____ **Rush** _____ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard _____ **Flammable** _____ **Skin Irritant** _____ **Highly Toxic** _____ **Other** _____ **(Please Specify)**

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client _____ **Disposal by Lab** _____

FOR LAB USE ONLY

Received By _____ **Date/Time** _____

WHITE - Original, to accompany samples
YELLOW - Field copy

INTERNATIONAL TECHNOLOGY CORPORATION

INTERNATIONAL TECHNOLOGY CORPORATION

CHAIN-OF-CUSTODY RECORD

R/A Control No. _____

C/C Control No. 111484

PROJECT NAME/NUMBER _____ LAB DESTINATION _____

SAMPLE TEAM MEMBERS _____ CARRIER/WAYBILL NO. _____

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

Special Instructions: _____

Possible Sample Hazards: _____

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: _____

   Received By: _____

2. Relinquished By: _____

   Received By: _____

3. Relinquished By: _____

   Received by: _____

4. Relinquished By: _____

   Received By: _____

WHITE - To accompany samples
YELLOW - Field copy

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INTERNATIONAL TECHNOLOGY CORPORATION

SUPERVISOR'S EMPLOYEE INJURY REPORT

This is an official document to be initiated by the employee's supervisor. Please answer all questions completely. This report must be forwarded to the employee's Regional Health and Safety office within 24 hours of the injury.

Injured's Name _____ Sex ____ S.S. No. _____ Birthdate _____

Home Address _____ City _____ State _____ Zip _____ Phone _____

Job title _____ Employee's P.C. _____ Hire date _____ Hourly wage _____

SUPERVISOR

Date of incident _____ Time _____ Time reported _____ To whom? _____

Client name _____ Client address _____ Time shift began _____

Exact location of incident _____ Did employee leave work? ☐ No ☐ Yes When _____

Has employee returned to work? ☐ No ☐ Yes When _____ Did employee miss a regularly scheduled shift? ☐ No ☐ Yes

Doctor/Hospital name _____ Address _____

Witness name(s) _____ Statements attached? ☐ No ☐ Yes

Nature of injury _____ Exact body part _____

Medical attention: ☐ None ☐ First aid on site ☐ Doctor's office ☐ Hospital ER ☐ Hospitalized

Job assignment at time of incident _____ Job: _____ Phase: _____ Task: _____ Subtask: _____

Describe incident _____

What unsafe physical condition or unsafe act caused the incident? _____

What corrective action has been taken to prevent recurrence? _____

Supervisor/Foreman _____ (Print) _____ Signature _____ Date

MANAGER

Comments on incident and corrective action _____

Manager's name _____ (Print) _____ Signature _____ Date

HEALTH AND SAFETY

Concur with action taken? ☐ No ☐ Yes Remarks _____

OSHA Classification:

☐ Incident only ☐ First aid ☐ No lost workdays ☐ Lost workdays ☐ Restricted activity ☐ Fatality

Days away from work _____ Days restricted work _____ Total days charged _____

☐ State jurisdiction ☐ Federal L&H ☐ Date ER submitted _____ Which claims office _____

Coding: A. Injury type or illness _____ B. Injured body parts _____ C. Activity at time of accident _____ D. Injury cause code _____

E. Agent code _____ F. Safety rule violated code _____ G. Accident prevention code _____

Name _____ (Print) _____ Signature _____ Date

ITC FORM 9300.1-1 (07/86)
Refer to ITC PRO 9300.1 for reporting procedures

White: Corporate Health and Safety Yellow: Regional Health and Safety Pink: Profit/Cost Center

80A-9-85

ATTACHMENT B

MONITORING INSTRUMENT CALIBRATION FORMS

CALIBRATION LOG

PROJECT NAME _____ By _____

PROJECT NO. _____ Page ____ of ____

DATE/TIME	INSTRUMENT	STD	STD CONC ppm	METER READING	COMMENTS

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