REV. 11/90

DUPONT

CHEMICALS

P.O. Box 787
Buffalo Ave. & 26th Street
Niagara Falls, NY 14302-0787
(716) 278-5100

July 7, 1993

Mr. Michael J. Hinton, P.E.
NYS Department of Environmental Conservation*
270 Michigan Avenue
Buffalo, NY 14203-2999

Dear Mr. Hinton:

SEEP REMEDIATION PLANS (PW-36)
Ref. Letter M. J. Hinton to A. K. Masse dated 5/21/93

We are preparing to begin the construction of the trench collection system for the seeps along the west bank of Gill Creek near the brine tank. The new system will be denoted Pumping Well 36 (PW-36) of the plant Groundwater Remediation System.

The following paragraphs provide the information requested in your letter dated May 21, 1993.

Comments 1 and 2

Both the compacted clay and the granular fill excavated during the project will be disposed of off-site at a secure landfill. The waste material will be classified according to the Niagara Plant waste identification code NF-109A (see Attachment A). This characterization is based on a soil sample collected near the PW-36 installation. The soil sample was collected to characterize excavated soil for the 008 outfall relocation project.

Comment 3

The Gill Creek Safety and Health Plan has been modified to incorporate specific differences between the Gill Creek project and the PW-36 project. For example, special instructions are required to work in and near an excavation trench. Perimeter monitoring will be conducted using an OVA, and all personnel on the project that have the potential to contact groundwater will be required to wear Level B protection (full face mask, breathable air, Saranex coveralls). The Seep Remediation Safety and Health Plan is enclosed.

Comment 4

The new collection system (PW-36) will be incorporated into the plant Groundwater Remediation maintenance, operation, and sampling procedures.

Comment 5

The north end of the sheet piling barrier will be turned around the manhole portion of the seep collection system to stabilize the soil for safe excavation of the manhole. The south end of the sheet piling will be extended a few feet beyond the end of the trench system to minimize creek water infiltration into the system.

Comment 6

It is expected the maximum flow rate for the trench collection system will be 50 gpm.

Do not hesitate to call me at (716) 278-5317 if you have any questions or would like additional information. We expect to begin excavating the week of July 13.

Sincerely,

Ann K. Masse, Ph.D.
Area Engineer, Engineering
and Environmental Affairs

AKM:klf
Enc.
24557

cc: A. Wakeman - NYSDOH, Albany
A. English - NYSDEC, Albany
M. Podd - NYSDEC, Buffalo

*Two copies per letter from M. Hinton dated May 20, 1993

ATTACHMENT A

WASTE CHARACTERIZATION FORM (WCF)

I. Location Niagara — Date: 10/25/91

EPA ID # NYD002123503 — Contractor's Code X11957

EPA Code D040 D039 D032 D028 D022 D019 D018 D033 — DuPont Code NF-109A

II. Name of Waste RCRA HAZARDOUS WASTE EXCAVATIONS — State Code

Composition

A. Major Components	C. One Time or Typical Analysis	D. Concentration Range Upper	Lower	E. Exposure Limits +ACGIH	+OSHA
1. SEE ATTACHMENT I	100.0000	100.0000	0.0000		
2.					
3.					
4.					
5.					

B. Trace Components not listed above (PPM)

Ag	0.000	As	0.010	Ba	25.000	Cd	0.100	Cl*	0.000	Cn	0.000	Cr	0.000
Cu	8.000	F*	0.000	Hg	0.024	I*	0.000	N*	0.000	Ni	1.000	P*	0.000
Pb	3.000	S*	0.000	Se	0.000	Zn	10.000	CR+6	0.000	Ti	0.000		

Other SEE ATTACHMENT I

F. Does the waste contain

Sulfides	NO
Cyanides	NO
PCBs	NO
Phenolics	NO
**Dioxin	NO
**Listed Solvent	NO
***Halogenated Organic Compounds 1000 mg/l	NO
Insecticides, pesticides, herbicides, or rodenticides	NO

Indicate Test Method:

EPTOX/TCLP X TOTAL METALS X

IV. Physical State @ 25 C SOLID

- Is there a dusting hazard if containers are opened? NO
- Multiple Phases? NO Vol% of each phase 100.000 % Solid 0.000 % Liquid
- Can the waste be pumped? NO poured? NO
- % Free flowing liquid layer 0.000 (volume %)
- Pressure of container 0.000 (psig)
- % Separate phase water 0.000 Estimated Specific Gravity 1.190

V. SHIPPING CONTAINERS

Bulk 19 Roll-off/Dump truck Container Spec.

Non-Bulk

Size	Materials of Constr.	Container Specification	Approx. Weight per Container	Container Label Used
55 gal drum	steel			

VI. PROPERTIES

Flash Point F (closed cup) Btu/lb.

Color BEIGE/BROWN/GRAY — Corrosive NO — OSHA Carcinogen NO

Odor NO — pH

Reactive NO — Pyrophoric NO — Radioactive NO

Toxic YES — Explosive NO — Etiological NO

Other PH OF 1% SOLUTION 7.0 - 9.0 — Shock Sensitive NO

VII. D.O.T. Shipping Description HAZARDOUS WASTE SOLID, N.O.S.

(CONTAINS TRICHLOROETHENE, TETRACHLOROETHENE)

D.O.T. Hazard Classification ORM-E

D.O.T. Placard 9189 D.O.T. Label — EPA Haz. Subst. NO RQ

VIII. Volume Annual — Volume This Request ~~5 drums~~ 200-300 TONS — U.N. No. — N.A. No. 9189

IX. Remarks (Treatment of spills / Safety Suggestions / MSDS) Volume Per Shipment

*Organically bound **As defined in 40 CFR 261.31.

***Per 40 CFR 261.1 and 40 CFR 268 App III

Prepared by D.P. SPANFELNER

Approved By: Joseph D. Clark 4/1/93

ATTACHMENT I

NF-109A: RCRA HAZARDOUS WASTE EXCAVATIONS

COMPONENT DESCRIPTION	CONCENTRATION MINIMUM %	NOMINAL %	MAXIMUM %
1. DIRT/CLAY/STONE/ROCK/SAND	10.0	70.0	90.0
2. CONCRETE/STEEL/REBAR/METAL/ ASPHALT/BLOCK/BRICK	10.0	20.0	90.0
3. WOOD/RAILROAD TIES/LUMBER	0.0	8.5	90.0
4. MISCELLANEOUS DEBRIS	0.0	1.0	5.0
5. TYVEK SUITS/BOOTS/GLOVES/PPE	0.0	0.4	1.0
6. CHLORINATED HYDROCARBONS	0.0	0.1	2.0
7. TETRAHYDROFURAN	0.0	0.0	2.0

FOOTNOTES

1. Cyanides are not expected to be present; however, cyanide has been detected in some samples at concentrations ranging from 10-400 ppm. Results for cyanide reactivity tests were negative.

2. Some materials may contain tetrahydrofuran; however, soil does not exhibit the ignitability characteristic as defined in 40 CFR 261 and 6 NYCRR Part 371.

3. Toxicity Characteristic (40 CFR 261.24) constituents that may be present above regulatory levels are:

   Benzene (D018)
   Carbon Tetrachloride (D019)
   Chloroform (D022)
   1,2-Dichloroethane (D028)
   Hexachlorobenzene (D032)
   Hexachlorobutadiene (D033)
   Tetrachloroethene (D039)
   Trichloroethene (D040)

4. PCB's are not expected to be present; however, PCB's have been detected in some samples at concentrations ranging from 1-10 ppm.

DUPONT NIAGARA FALLS SEEP REMEDIATION PROJECT SAFETY AND HEALTH PLAN

SEEP REMEDIATION

SAFETY & HEALTH PLAN

Table of Contents

I. Introduction
II. Project Background
III. Remediation Description
IV. Site Safety & Health Planning Organization
V. 1910.120 Training Requirements
VI. Personal Protective Equipment
VII. Decontamination of PPE & Personnel
VIII. Medical
IX. Exposure Monitoring/Air Sampling
X. Contingency Plan for Remediation Air Emissions
XI. Standard Operating Procedures, Engineering Controls & Work Practices
XII. Site Control Measures
XIII. Resumes
XIV. Tables
XV. Emergency Plan
XVI. Occupational Health Care Plan
XVII. Standards, Specifications & Procedures

IV. SITE SAFETY AND HEALTH PLANNING ORGANIZATION

The following people are responsible for the administration and operation of the Site Safety and Health Plan and any and all emergencies.

TITLE	NAME	OFFICE #	HOME #	PAGER #
Project Team Leader	Jim McClincy	278-5795	745-3846	774-1812
	Ann Masse	278-5317	754-7495	
O.H. Coord. (DuPont)	Alvin Frith	278-5537	773-2508	727D
" (Sevenson)	Paul Hitcho	284-0431	773-2901	
Site Safety Super.	Abiye Obunge	278-5789	773-6942	774-1771
Security Officer	Daryl Eddings	278-5410	745-3310	
	(B30 Security Center)			
Recordkeeper	Chris Lukasik	278-5361	695-7152	
Field Team Leader	Peter Palczynski	278-5485	696-6316	774-1811
Field Team Members	Ed Lilly	278-5398	754-2854	743D
	Pete Palczynski	278-5485	695-3616	726D
	Mike Patton	278-5689	754-2606	738D
	Chuck Stroh	278-5749	691-6360	696-4221
	Sam Snyder	278-5793	745-3467	

REMEDIATION CONTRACTOR ORGANIZATION

TITLE	NAME	OFFICE #	HOME #	PAGER #
Project Manager	Mike Lock	285-4439	668-6990	
Superintendent	Wayne Kostuk	285-4439	751-6569	
Project Engineer	Rick Rizzo	285-4439	284-2026	
Safety Office	Gary Rose	285-4439	754-7359	696-8653
General Super.	Frank Fracassi	284-0431	282-0143	696-8030
Command Post Trailer		285-4437		

* See resumes in the attachments

III. REMEDIATION DESCRIPTION

The seepage could be controlled by pumping water or constructing a physical barrier to seepage. Construction of a physical barrier would entail installation of a slurry trench cutoff wall along most of the west bank of Gill Creek. In the past, such extensive trenching has been found to be unfeasible due to subsurface utilities and above ground plant process works. In addition, if a barrier to seepage to Gill Creek was constructed, most of the water prevented from discharging to Gill Creek would eventually be collected by the current GWRS. Therefore, little benefit in terms of the overall flow rate to the treatment plant would be derived from use of a barrier to seepage.

Use of a pumping well installed at the seepage face could also mitigate the seepage. However, there is a potential that withdrawal at a single location may not control all seepage points due to heterogeneities. If the six seeps observed by WCC were the result of more or less linear preferential pathways, one or more could be isolated from the cone-of-depression from a recovery well.

The proposed means to avoid this potential problem is to install a trench drain along the bank of Gill Creek above (upgradient), and parallel to, the line of seeps. Using the trench, the seeps will be directly intercepted. Because the seeps are above the normal Gill Creek elevation, the water level (hydraulic head) in the trench could be maintained at a level to mitigate the seepage, without inducing significant infiltration from Gill Creek. Infiltration from the creek should be low even when the head in the trench is below the creek level due to the compacted clay placed as part of the sediment remediation and the sheet pile barrier that will be installed to stabilize the bank and minimize infiltration of creek water.

Figure 3-1 shows the proposed trench location in plan view. Its length (30 feet) is slightly longer than the area of observed seepage. Figure 3-2 shows the proposed system in cross-section. Based on the seep elevations, the water level in the trench drain should be maintained at an elevation of approximately 562.5 feet. Based on this, the bottom of the trench should be at approximately 560 to 561.0 feet.

The flow rate from the trench drain will probably be in the range of the seepage rate estimates made during the Gill Creek sediment remediation project (10-30 gpm).

There are some constructibility concerns with the trench installation related to the slope of the bank and the characteristics of the soil. A sheet pile wall will be installed to stabilize the bank during construction of the trench system. The connecting joints of the sheet piles will be grouted to minimize creek water infiltration into the trench system.

General Site Conditions

1. Surface Water

Gill Creek enters the City of Niagara Falls at its northern corporate limits, and flows south 3.7 miles through residential, undeveloped, industrial and park areas before emptying into the Niagara River [Federal Emergency Management Agency (FEMA)]. Industrial and residential areas are located along Gill Creek on flat floodplains and low terraces. The normal stream flow of Gill Creek is estimated to be 1 to 3 cubic feet per second (cfs). This flow is maintained during non-winter months by a discharge from the New York Power Authority (NYPA) reservoir at the Robert Moses Power Station.

Non-contact cooling water from the Niachlor operation, a joint venture between Olin and DuPont, flows into the creek, adding approximately 67 cfs south of Adams Avenue.

2. Geology

Since 1895, the shoreline has encroached approximately 900 feet upon the Niagara River through filling along the shoreline. The overburden along the banks of Gill Creek has been classified into four basic material types: (1) fill, (2) alluvium, (3) glaciolacustrine deposit, and (4) till. Most of the overburden along the Niagara River is fill.

The fill at the site consists of large boulders, shot rock, cinders in mixture of sand, silt and clay and lesser amounts of brick, stone, and slag. Its thickness varies from 7 to 13 feet near Gill Creek.

Alluvial deposits, when encountered, are composed of up to 2 to 3 feet of brown silt and clay, locally containing fine sand and gravel. These deposits unconformably overlie both the glaciolacustrine and till deposits.

Two types of glacial deposits are encountered in some areas on Olin and DuPont property. The glaciolacustrine deposit, when present, is estimated to consist of less than 1 foot to about 4 feet of brown silt and red clay. This deposit also includes clay and silt, with mixtures containing sand and gravel, locally. Glacial till, the lowermost overburden deposit, is estimated to consist of up to 2 to 8 feet of material composed of brown to gray silty clay/silt, containing rock fragments and sand. The till may also consist of red--brown silt, sand, gravel and clay containing occasional boulders.

The overburden at the site is underlain by the Lockport Formation of middle Silurian age (320 to 350 million years old). The Lockport Formation is principally a dolomite (calcium-magnesium carbonate). In the vicinity of Gill Creek, the bedrock surface generally slopes to the south, having localized slope reversals. The bedrock is jointed and fissured. Top of rock elevations are generally between Elevation 557 and 560 feet.

3. Niagara River Influence

The creek water level is influenced by the water level in the Niagara River within the area to be remediated. The New York Power Authority (NYPA) has indicated that the controlled range of river level fluctuations is between Elevation 560.4 feet and 563.9 feet. The U.S. Corps of Engineers had indicated that ordinary river level fluctuations are within the range of Elevations 561.4 feet to Elevation 563.0 feet. The Niagara River level fluctuates within this range on a daily basis. According to the NYPA, the river level is controlled to limit the river level fluctuations to 1.5 feet per day.

Flow in Gill Creek is typically less than 0.4 feet per second (fps); velocities in the adjacent Niagara River are much higher (1.0 to 1.5 fps). The river bottom in this area is generally flat, with water depths in the river at about 13 feet.

II. PROJECT BACKGROUND

Seepage of clear (low turbity) water has been observed during the past few years from the middle portion of the west bank of Gill Creek (above the water surface) in the vicinity of the Niachlor return brine tank. In 1989, DuPont asked WWC for a recommendation concerning this seepage. WWC recommended installation of an additional pumping well (PW-35) to the Plant's Groundwater Remediation System (GWRS) to mitigate this seepage.

During the Gill Creek sediment remediation project, seepage was observed by WCC from a line of six seeps located midway up the creek bank. WCC estimated the flow (visually) at a total rate of approximately 11 gpm. The seeps were samples at three locations and anlyzed for the Gill Creek Indicator Chemicals. Results are presented in Table 2-1. The seepage had been visually estimated at rates up to 30 gpm by remediation personnel at various times during the project.

The two main seep locations were surveyed by Sevenson Enviromental, Inc. Elevations were reported to be 562.40 to 562.73 feet. This is above the mean Gill Creek and Niagara River water level elevations which indicates that the source of water is not likely to be the Niagara River.

The seepage of groundwater at the observed rates was limited to the west bank in the vicinity of the return brine tank. This indicates a heterogeneity within the fill material causing a preferential pathway for sub-surface flow in the area. The height of the seepage indicates possible migration in coarse fill placed above more fine-grained material. The height of the seepage also indicates relatively low hydraulic gradients, suggesting the high seepage rate is not a result of high gradient as a driving force. The alternatives are either a local zone of extremely high hydraulic conductivity, or a hydraulically close connection with a high rate of water input.

The high rate of seepage observed indicates that the source of water is not groundwater alone. Previous studies indicate vertical hydraulic gradients are downward from the overburden. Therefore, significant upward flow from the bedrock is not likely. The natural source(s) of water in the overburden are infiltration from precipitation, or potentially from the Niagara River. The elevation of the Niagara River compared to the seepage elevation suggests that infiltration from the river is probably not the source of water.

Figure 2-1 shows the potential recharge area for the A-zone groundwater in the west plant. The recharge area is drawn based on bedrock elevation and potentiometric surface data. This area is approximately 1.4 million square feet. If a recharge rate of 5 inches per year is assummed (this is a typical value used in urban environments in the area), the total potential recharge to the overburden per year is 5.8 x 10 ft . This converts to a total rate of approximately 8 gpm. Therefore, if one assumes that all recharge for the area is channeled to the vicinity of the return brine tank via preferential pathways, a highly unlikely scenario considering the ongoing groundwater withdrawal by the Groundwater Remediation System (GWRS), it still cannot account for the observed seepage rate. Consequently, WCC believes that the observed seepage is augmented by water introduced into the ground somewhere in the vicinity. DuPont has not been able to identify a source of water loss to the subsurface at the Plant. Therefore, the approach has been taken to control the seepage rather than eliminate the augmentation. A conceptual design to mitigate the seepage hydraulically by pumping groundwater (assuming subsequent treatment in the GWRS) is presented below.

SEEP REMEDIATION
SAFETY & HEALTH PLAN

I. INTRODUCTION

This document presents a safety and health plan to be adopted for Remedial Work Activities associated with Seep Remediation Project, Niagara Falls, New York. Basic requirements to be addressed by this Health and Safety Plan/Accident Prevention Program have been stipulated within the industry standards. The Health and Safety Plan/Accident Prevention Program meets the requirements of all governmental regulations. It will provide for a safe and minimal risk working environment for on-site personnel. It also provides for emergency response procedures necessary to minimize the potential of adverse impact of work activities on the general public. All site personnel will be required to comply with provisions of this Health and Safety Plan and Accident Prevention Program.

Basis

The Occupational Safety and Health Act (OSHA) and its regulations provide the basis for the safety and health program. Additional specifications within this section are in addition to the OSHA regulations and reflect the positions of the United States Environmental Protection Agency (EPA), the National Institute for Occupational Safety and Health (NIOSH), and American Conference of Governmental Industrial Hygienists (ACGIH) regarding procedures required to insure safe operations. In addition, work will be completed in accordance to all other applicable federal, state, municipality and local laws, ordinances, codes and other regulations. Where any of these are in conflict, the more stringent requirement will take precedence.

The safety and health of the public and on-site personnel and the protection of the environment will take precedence over other considerations for all project work. The Project Team Leader, Field Team Leader, Occupational Health Coordinator and Site Safety Construction Supervisor will be responsible for decisions regarding when work will be stopped or started for health or safety reasons.

E. I. du Pont de Nemours and Company, Inc. (DuPont) will be conducting the remediation of Seeps to Gill Creek in 1993.

V. 1910.120 TRAINING REQUIREMENTS

Prior to performing any job tasks required for the Seep Remediation Project personnel must receive a minimum of 40 hours of health and safety training, consistent with the requirements of OSHA 29 CFR 1910.120 and the worker's job function and responsibilities. Topics required in this 40-hour course include personal protective equipment (PPE), decontamination procedures, heat stress monitoring, and many other specific to the Seep Remediation Project. Workers shall not be permitted to work in this area until they have completed this training. Workers shall also receive a minimum of three days of on-site field experience under the direct supervision of a trained, qualified supervisor.

Employees who can show through explicit documentation, by their work experience and/or prior training, that they have had prior training equivalent to that as specified above will be considered as meeting the minimum of 40 hours of health and safety training required under OSHA 1910.120.

Workers shall also receive eight hours of refresher training annually on items specified in this Plan and other relevant topics. Documentation that workers have received required training shall be kept in contractor's and DuPont's files.

Site Supervisor Training

Supervisors directly responsible for or who supervise employees working in this operating area shall receive 40 hours initial training, three days of supervised field experience, and at least eight additional hours of specialized training at the time of job assignment as required under OSHA 1910.120.

Topics for this specialized training include safety and health program, PPE program, spill containment program, health hazard monitoring program, and other relevant topics specific to the Seep Remediation Project.

Site Specific Training

Prior to initiation of field activities, all field personnel will attend training sessions taught specifically to address the Seep Remediation. These sessions will include, but are not necessarily limited to, the following:

- Work rules and safety policies
- Proper use, storage and care of PPE
- Types of potential hazardous chemicals
- Location and use of emergency equipment
- Importance/urgency of mandatory reporting of injuries and illnesses
- Emergency procedures/medical training
- Job assignments
- Personal hygiene
- Motor vehicular equipment
- Monitoring equipment
- Decontamination procedures
- Handling, storage and labeling of hazardous material containers

VI. PERSONAL PROTECTIVE EQUIPMENT (PPE)

A PPE equipment program that complies with 29 CFR 1910.120 (g) will be developed and implemented. The program will also include the provisions of selecting and using PPE as required by 29 CFR 1910 Subpart I.

Definition of Levels of Protection

Site and task specific ensembles of PPE will be defined. Minimum requirements for this site are given below. Upgrades and downgrades of PPE must be based on appropriate action levels.

Minimum Personal Protective Equipment Requirements

Minimum PPE is as follows:

- Hard hats must be worn in all operating areas and on all plant walkways. The only exceptions are; control rooms, offices, lunchrooms and restrooms.*
- Long-sleeved shirts must be worn in all operating areas.
- Approved safety spectacles with side shields are the minimum eye protection required in all areas. The only exceptions are; control rooms, offices, lunchrooms and restrooms.*
- Leather gloves while using hand tools, operating valves or handling dry chemicals (unless restricted by other rules).

* The exceptions listed above for wearing hard hat and spectacles will be rescinded whenever work being done in these areas may create an abnormal hazard.

1. Level D shall consist of:
   - Disposable coveralls or work clothes
   - Chemical resistant leather boots
   - Leather gloves

2. Modified Level D shall consist of:
   - Saranex-coated Tyvek
   - Nitrile outer gloves and neoprene boots
   - Latex or nitrile inner gloves
   - Tape (will be used to seal the joints between coveralls and protective gloves and boots)
   - Hard hat
   - Safety glasses with side shields
   - Splash resistant goggles or a face shield (will be worn if a splash hazard exists)
   - Chemical resistant leather boots

3. Level C shall consist of:
   - Saranex-coated Tyvek
   - Nitrile outer gloves and neoprene boots
   - Latex or nitrile inner gloves
   - Tape (will be used to seal the joints between coveralls and protective gloves or boots)
   - Hard hat (shall be required when overhead hazards exist)
   - Full-face respirator and cartridges. The standard cartridges used at this site will be approved for protection in atmospheres containing less than 0.1 percent (1000 ppm) organic vapors by volume, pesticides, paint, lacquer, and enamel mists and dusts, fumes, mists, asbestos, containing dusts and mists and radionuclides.

4. Level B shall consist of:
   - Saranex-coated Tyvek with hood
   - Nitrile outer gloves and neoprene boots
   - Latex or nitrile inner gloves
   - Tape (will be used to seal the joints between coveralls and protective gloves or boots)
   - Hard hat (shall be required when overhead hazards exists)
   - Pressure-demanded, full-facepiece, self-contained breathing apparatus (SCBA) or full facepiece supplied air respirator with escape cylinder

5. Minimum levels of protection

   The following shall be initial levels of protection for specified exposures and/or areas. These requirements establish only minimum protection levels. Actual field conditions and/or air monitoring may dictate upgrades and downgrades.

   Many compounds on this site have low exposure limits or are otherwise not detected with direct reading i[Bnstruments. The contractor must verify, through integrated sampling, that airborne concentrations are below desired action levels before downgrading PPE levels.

   Additional protective equipment may be required for specific task based on site conditions.

6. Procedures for downgrades in PPE levels

   Should there be a reason to believe that PPE levels in a work area be downgraded (i.e. excavations in the area have been completed), the following procedure must be followed:
   a. Contractor shall conduct integrated air sampling in the area in which a change in PPE level is proposed.
   b. Results of the integrated air sampling shall be provided to the Project Field Team Leader (McClincy) and the Site Certified Industrial Hygienist (Frith).
   c. Project Field Team Leader and Site Certified Industrial Hygienist will review the results, and will authorize or deny the proposed change bases on the outlined PPE action levels.

do emergency work in an atmosphere containing unknown concentrations of air contaminants or in atmospheres which could be deficient in oxygen. They can also be used when breaking into a line or vessel containing organic material.

Each operator must know the location of this equipment and demonstrate their ability to use it as part of their job training. Review of SCBA use is required every six months.

SCBAs are to be inspected by the user before each use.

3. Buddy System

The buddy system is to be used to assist with the removal of SCBA equipment. Whenever a person is required to wear a SCBA, another person, equipped with all the required PPE for the work zone, will be present. This additional person will aid the person donning the SCBA when removing the SCBA. After each use, SCBAs are to be sent to the contractor Safety Office for cleaning the masks and for refilling the air tanks.

No person(s) should enter a contaminated area wearing this equipment unless a person with another SCBA readily available (should have equipment beside him) is standing by in case assistance is needed.

4. Communication Procedures

Personnel in the exclusion zone will remain in constant radio contact or line of sight with the stand by man or field team leader outside of the exclusion zone. Any failure of radio communication will require an evaluation of whether personnel should leave exclusion zone.

A separate radio channel will be designated as the radio frequency for personnel in the exclusion zone. All other communications on the site will use other channels.

DuPont will supply the contractor with the proper frequency to be used for this operation and the contractor will supply the required radios for their own people.

In the case of radio failure, the following hand signals will be used:

Hand gripping throat	Out of air - can't breathe
Grip partners wrist or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I'm alright, I understand
Thumbs down	No - negative

5. Full-face and Half-facepiece Filter and Organic Cartridge Respirators

No one may use these respirators without having first received proper training and fit testing as outlined in Standard 6.2, Respiratory Protection, of the S&H Manual.

Prior to donning, inspect respirator to be sure that:

- Respirator is clean
- Facepiece is free of cracks, tears or distortion
- Rubber inhalation and exhalation valves are in place and not stuck in closed position
- Exhalation valve cover is in position
- Filters/cartridges are secure (gasket in place is required)
- Head straps are in proper position and in good condition

Damaged respirators should be discarded. Fit testing will be required for a new respirator.

These respirators can only be worn by persons who are clean shaven in the seal area (where the rubber contacts the face).

To don respirator, follow this procedure:

- Place respirator on face with narrow end on nose and wide end under chin.

- Place bottom strap around head (under ears) and top strap around head (over ears).

- Tighten straps as necessary to obtain good seal.

- Check facepiece seal by holding hand over exhalation valve cover and exhaling rapidly several times. If air leakage is detected around the seal, tighten straps and repeat check procedure until a good seal is obtained.

The filter or cartridge elements (MSA combination cartridges type GMC-H) should be changed whenever breathing becomes difficult or the odor or taste of the contaminant is detected.

The respirator should be cleaned after each day's use or more often if necessary. To clean, remove air purifying elements, gaskets, straps, valves and valve covers. Immerse facepiece in warm water and scrub with soap and soft brush. Then rinse, dry, reassemble and inspect the respirator.

Respirators should be stored in clean, dry locations. Place in a plastic bag when not in use.

VII. DECONTAMINATION OF PPE AND PERSONNEL

PPE Decontamination

All decontamination equipment and procedures are to be in place before entering a work zone. As required under OSHA 1910.120, decontamination will take place in the work zone to isolate and remove any hazardous substances and to prevent any contaminated material from leaving the work zone.

A portable water container and a water tub are to be used for rinsing contaminated boots, gloves and other PPE while in a work zone. The water tub will contain any run off of contaminated water. After the PPE (boots, gloves, Saranex suit) has been rinsed, it can be removed. Water used for decontamination is to be handled at the Niagara Plant groundwater decontamination station (sump near B-68). If boots are grossly contaminated, they should be removed very carefully (gloves should remain on person removing the boots) and placed in a plastic bag which is to be sealed and carried to a proper drum used for disposal of PPE.

Contaminated gloves and Saranex suits are to be removed very carefully after they have been rinsed off with clean water so as not to cause any exposure of contaminants to the skin. The suits and gloves should be taken off inside out. They should then be placed in plastic bags and transported to a proper drum used for disposal of PPE.

Personnel Decontamination

Exposure to chemicals can occur in several ways:
1. Contact through inhalation.
2. Contact through skin.
3. Contact through ingestion.

Injuries from chemical inhalation can only be treated by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract this effect. First aid treatment usually involves flooding other affected area with water for at least 15 minutes.

Anyone getting wet to the skin with groundwater must wash the affected area immediately. If clothes in touch with the skin are wet, they must be changed. Any skin contact with groundwater should be dealt with immediately and as completely as possible. If irritation or redness develops, medical attention should be sought immediately. When protective clothing is grossly contaminated, contaminants may be transferred to the wearer or to treatment personnel and cause injuries. Unless severe medical problems could be created by splashing, the protective clothing should be washed off as rapidly as possible and carefully removed.

Anyone contacting any materials in this area through ingestion should seek medical help immediately. Personnel shall then be taken to the Niagara Falls Memorial Medical Center Occupational Health Care Clinic.

As required under OSHA 1910.120 regulations, all employees that may have been potentially exposed to groundwater or the organics must take a shower when they leave the area.

Shower facilities, containing changing rooms separated by the showers, will be located in the east side of Gill Creek. The first change room is used to change out of work clothes and the second change room or "clean room" is used to store clean street clothes. This type of shower facility is spelled out in the OSHA 1910.120 regulations.

b. First Aid

Immediately move the victim to a cool and shady area. Remove all protective outerwear and loosen/remove clothing. Lay them on their back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool them without chilling them to the point where shock is induced. Give no stimulants. Call professional medical personnel immediately.

2. Prevention of Heat Stress

One of the major causes of heat casualties is the depletion of body fluids. Personnel should replace water and salt loss from sweating. Salts can be replaced either by 0.1 percent salt solution, heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.

The recommended work/rest guideline for personnel using a respirator with supplied air or SCBA while wearing a Saranex suit is a follows:

Ambient Temperatures	Maximum Wearing Time
Above 90° F	1/2 hour
80° - 90° F	1 hour
70° - 80° F	2 hours
60° - 70° F	3 hours
50° - 60° F	4 hours
40° - 50° F	5 hours
30° - 40° F	6 hours
Below 30° F	8 hours

A sufficient period will be allowed for personnel to "cool down".

3. Heat Stress Monitoring

Heat stress monitoring will be performed periodically by the contractor safety personnel once the ambient temperature is 70° F or above for those employees required to wear Saranex suits and/or SCBAs during their work shift.

VIII MEDICAL

If treatment is needed beyond the capability of the on-site first aid personnel, the injured will be transported to Niagara Falls Memorial Medical Center.

All personnel working within those areas of the Seep Remediation Project where remediation activities are being conducted shall be trained in accordance with OSHA 1910.120. Medical surveillance will be instituted for all employees directly involved in the excavation and processing of contaminated soil or water. Medical surveillance will consist of an examination conducted before work commences and at the completion of the job. Examination details are listed below:

- Completion of health history questionnaire
- Examination by a physician
- Posterior-anterior chest x-ray (not required if x-ray has been taken within six months and results are available)
- Urinalysis (albumin and sugar)
- White blood cell count and hemoglobin or hematocrit
- A series of blood chemistry tests which determine glucose, SGOT, alkaline phosphotase, bilirubin, creatinine, or BUN
- Electrocardiogram
- Pulmonary function studies

Medical Surveillance Requirements

1. Baseline Monitoring

   As regulated by OSHA 1910.120, employees working in this area must have had a pre-employment medical examination to establish the individual's state of health and baseline physiological data and ability to wear PPE. The medical examination shall be based on many parameters determined by the attending physician. Employee's medical examination records must be kept on file in the DuPont Niagara Contracts Department.

2. Periodic Monitoring

   Employees must be in a periodic medical monitoring program. The frequency and type of examination to be conducted is determined by medical personnel knowledgeable in the area of toxicology and occupational exposure.

3. Non-Routine Monitoring

   Whenever an incident occurs which may pose a significantly increased health risk to personnel or whenever personnel exhibit an apparent job-related medical condition, the supervisor shall recommend that any such individual consult with the examining physician or physician group for examination and treatment in accordance with good medical practice.

Heat Stress

In addition to protection against chemical exposure, PPE will decrease body ventilation potentially resulting in heat stress. Heat stress can result in serious injury or death. As part of the 40 hour safety and health training required under OSHA 1910.120, area personnel are instructed in the identification of symptoms of heat stress, the first-aid treatment procedures for the victim, and the prevention of heat stress casualties.

1. Identification and Treatment

Symptoms potentially indicative of the onset of heat stress include elevated heart beat, profuse perspiration, muscle cramps, or fatigue. Heat stress, if allowed to persist, may result in the dangerous conditions described below.

Heat Exhaustion

a. Symptoms
Usually begins with muscular weakness, dizziness, nausea and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, their skin is clammy and they may perspire profusely. The pulse is weak and fast, their breathing is shallow. They may faint unless they lie down. This may pass, but sometimes it remains and death could occur.

b. First Aid
Immediately move the victim to a cool and shady area with good air circulation. Remove all protective outerwear. Take measures as necessary to cool the victim, including spraying or splashing with water. Call a physician. Treat the victim for shock. (Make them lie down and raise their feet 6-12 inches). If the victim is conscious, it may be helpful to give them sips of a salt water solution (1 teaspoon of salt to 1 glass of water). Transport victim to a medical facility as soon as possible.

Heat Stroke

a. Symptoms
This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107°-110°F. First there is often pain in the head, dizziness,, nausea, oppression, and the skin is dry, red, and hot. Unconsciousness follows quickly and death is imminent if exposure continues. The attacks will usually appear to occur suddenly. Lack of perspiration may differentiate heat stroke from heat exhaustion.

IX. EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Personnel Monitoring

A reading is defined as the average concentration monitored over a 15 minute period. Both direct reading (real-time) air monitoring instruments (PID and OVA) and integrated time-weighted average (TWA) air sampling shall be employed. Direct reading instruments selected for use will be listed and a discussion of the instrument's sensitivity, selectivity, and interferences shall be included. National Institute of Occupational Health and Safety (NIOSH) sampling methodologies will be used to conduct integrated sampling. Integrated samples considered to be representative of an employee's exposure will be analyzed by a laboratory participating in and meeting the requirements of the American Industrial Hygiene Association's (AIHA) Proficiency Analytical Testing (PAT) or Laboratory Accreditation program. Results of personnel exposure monitoring will be used to select the appropriate combination of engineering controls, work practices and personal protective equipment to reduce and maintain employee exposure levels at or below the permissible exposure limits for substances specified in 29 CFR 1910 and at or below published exposure limits for substances not regulated by 29 CFR 1910.

Monitoring of the worker's breathing zone must be conducted periodically throughout the project to verify employee exposures. The following monitoring procedures must be followed as a minimum.

1. Photo Ionization Detector (PID) or Organic Vapor Analyzer (OVA)

   A PID or OVA will initially be used during all intrusive activities to determine personnel exposure levels to organic contaminants. Continuous monitoring of the work site and a minimum of one documented reading every 15 minutes for one hour in the breathing zone of the worker with the greatest potential for exposure will be required during the start of all intrusive activities. The PID or OVA will also be used to monitor emission levels at the exclusion zone boundary. Personnel and boundary monitoring frequency will be reduced, based on experience, to a minimum of once every two hours and less if readings indicate a known source or decreased exposure level.

2. Integrated Sampling

   A minimum of six 8-hour time-weighted average sample will be collected in the breathing zone of remediation workers. Samples will be analyzed by a laboratory to determine employee exposures to all potential chemical contaminants. Initial samples must be collected during the start of

of intrusive activities. All six samples will be taken during the first half of the remediation project's life. If necessary, additional sampling will be done in order to determine whether more engineering controls or more protective equipment is required. The following methods should be used to document exposures to certain potential contaminants:

COMPOUND	SAMPLING METHODOLOGY
Hexachlorabutadiene	NIOSH 307
Vinyl Chloride	NIOSH 1007
Benzene Hydrocarbons	NIOSH 1500
Chlorinated Biphenyls	NIOSH 5503
1,1,2,2-Tetrachloroethane	NIOSH 1019
Tetrachloroethane	NIOSH 1003

Also, twice every five working days in the Seep Area, integrated sampling for the preceding compounds at the exclusion zone's (EZ) downwind perimeter will be done. Furthermore, other compounds crossing the EZ perimeter above 10 ppm in air will be specifically identified. The site Certified Industrial Hygienist or other plant Occupational Health person will review the data and determine if any corrective action is needed and evaluate the impact, if any, on site personnel and the public utilizing the Robert Moses Parkway.

Action Levels for Remediation Workers

Acceptable limits for contaminants on this site are those recommended in the most recent Permissible Exposure Limits listed Bin 29 CFR 1910.1000 and/or American Conference of Governmental Industrial Hygienists "Threshold LImit Values for Chemical Substances and Physical Agents and Biological Exposure Indices". Action levels will be set at the more restrictive value [PEL or TLV or DuPont's Acceptable Exposure Limit (AEL)]. Remediation workers minimum action levels for changes in PPE levels and for stop work requirements are presented below. The site Occupational Health Coordinator (a certified industrial hygienist) will evaluate on site conditions and determine whether revisions to these action levels are necessary.

MONITORING METHOD	COMPOUND	LEVEL C	LEVEL B	STOP WORK
PID or OVA	Volatile Organics	1 ppm-50 ppm	50 ppm-500 ppm	500 ppm
Integrated	Vinyl Chloride	Not allowed	0.5 ppm-500 ppm	500 ppm
Integrated	Hexachloro-butadiene	Not allowed	0.01 ppm-500 ppm	500 ppm
Integrated	Benzene	Not allowed	0.5 ppm-500 ppm	500 ppm
Integrated	Chlorinated Biphenlys	0.25 ppm-15 ppm	15 ppm-500 ppm	500 ppm
Integrated	1,1,2,2-Tetrachloro ethane	0.5 ppm-25 ppm	25 ppm 500 ppm	500 ppm

Air Monitoring - Response Levels

Continuous PID/OVA readings will be taken at the EZ downwind perimeter, during the construction of the trench system. These readings will determine whether to initiate contingency actions if above the levels prescribed in the contingency plan shown below. Thereafter, chemical specific results from a portable GC will determine follow up actions. The readings will be taken to protect the public and site personnel.

SEEP REMEDIATION - AIR MONITORING PROGRAM

The following types of air monitoring will be conducted during this project:

1. Real time for volatile organic compounds, respirable particulate, mercury, and, if necessary, percent oxygen, hydrogen sulfide, and percent of lower explosive limits.

2. Integrated (personal) sampling to determine employee exposure to the selected indicator compounds - hexachlorobutadiene, vinyl chloride, benzene hydrocarbone, 1,1,2,2, - tetrachloroethane, and tetrachloroethane.

3. Integrated (perimeter) sampling downwind at Area 1 for the selected indicator compounds,

The attached table summarized the air monitoring program.

SPILLS/RELEASES TO THE ENVIRONMENT

General Information

Many hazardous materials will be handled during the Seep Remediation Project. Although the project has been designed in such a way to prevent relasses and spills to the environment, the potential for an accidental release exists. Since the Seep Project is not a process area, the responsibility for estimating the quantity released during an event will involve both Construction and the Duty Person.

Construction Responsibilities

Construction will initiate the call to the Duty Person and will provide an estimate of the quantity released, location, and description of the material released.

Duty Person Responsibilities

As for all releases, the Duty Person will be paged and will report any exceedance of a reportable quantity (RQ) to the appropriate agencies. Guidance for determining if a reportable quantity has been exceeded follows. Refer to the attached figures for identifying the various areas associated with the project.

Seep Envirnomental Team

One of the Seep team members (Masse or Dutch) will be available to review the estimated release upon notification by the Duty Person first thing the next morning. The Seep team member will assist with the final air emission calculation if requested.

SPILLS/RELEASE TO THE ENVIRONMENT

1. Spill or release of sediment waste:

WASTE CODE	SOURCE OF WASTE	REPORTABLE QUANTITY	MAIN CONTAMINANTS
NF109A	West Bank Gill Creek	500 lb.	Same as NF109A

2. Volatile Air Emmisions

Ground Level Emissions

Ground level monitoring is being done on a regular basis. If monitoring detects unacceptable levels of air emissions, the Duty Person will be called by Construction. Guidance and responsibilities for reqporting an emission based on ground monitoring is attached.

3. Emergency Response

General Information

In the event of an emergency situation at the project, which will include air emissions that affect the Robert Moses Parkway or other offsite impact, response will be as oulined below. Other emergencies such as fire or explosion are unlikely, but should they occur, the Duty Person would assume normal Emergency Response responsibilities. The Emergency Scene direction will be provided by Niagara Engineering personnel.

Construction Responsibilities

Constrution will notify the Security Center of the emergency situation.

Duty Person Responsibilities

The Duty Person will contact DEC Hotline, EPA, Niagara Falls County Health Department and LEPC as usual. For offsite air releases, the contaminants may not be known for several hours, but it is likely that the contaminants are those indicated in the attached air emission guidance.

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The Duty Person will contact DEC Hotline, EPA, Niagara Falls County Health Department and LEPC as usual. For offsite air releases, the contaminants may not be known for several hours, but it is likely that the contaminants are those indicated in the attached air emission guidance.

As is the practice for all releases and emissions, when there is a reason to believe that an RQ could have been exceeded, the Duty Person will make the agency notifications within 2 hours. Duty Person will then follow up with more information when it is available for final reporting.

4. Discharge to the Gill Creek

General Information

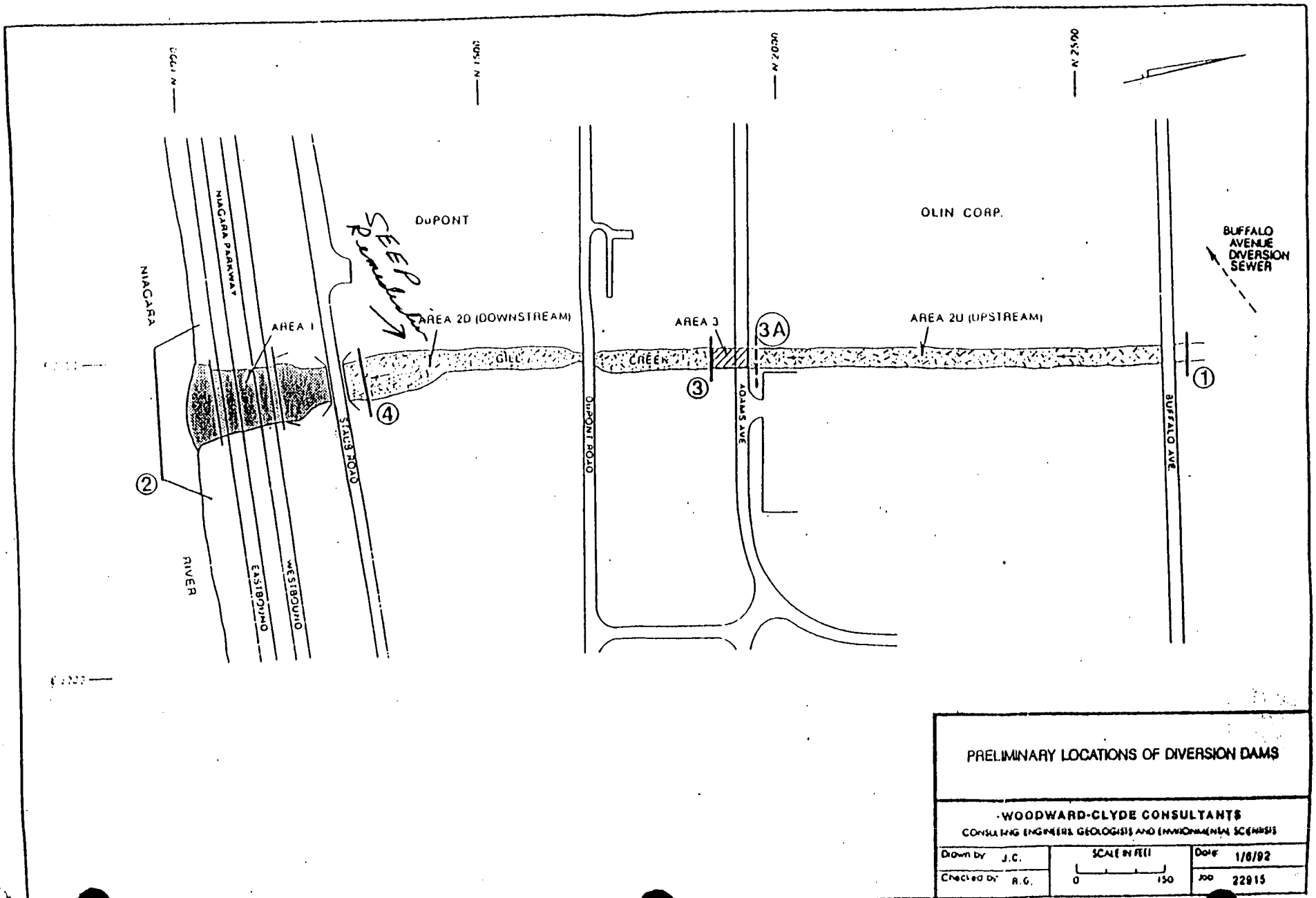
Turbidity to Gill Creek must be minimized. Fabric silt dams will be employed at the creek edge and hay bales will be used along the creek bank.

Construction Responsibilities

If a visible turbid plume originates from construction activities, seeps, or the excavated trench, all construction shall cease until the turbidity is stopped.

Duty Person Responsibilities

The duty person will be notified immediately if the RQ for NF109A (500 lbs) is discharged to Gill Creek.



PRELIMINARY LOCATIONS OF DIVERSION DAMS

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

Drawn by J.C.	SCALE IN FEET 0 150	Date 1/8/92
Checked by R.G.		Job 22915

ENVIRONMENTAL DUTY PERSON
SEEP PROJECT RESPONSE PROCEDURES
VOLITILE EMISSIONS

General Information

As described in this section procedure, there will be ground-level air monitoring during the project whenever a potential for an air emission exists. More detailed information regarding the air monitoring plan with action levels (critical air emission reading levels) and response levels for the Seep Project is attached.

These additional duty person procedures have been developed to ensure that the appropriate agency notifications are made within a two-hour period. These procedures are to be incorporated into the Seep Safety and Health Plan.

THESE PROCEDURES WILL APPLY SHOULD THERE BE A POTENTIAL FOR A SUBSTANTIAL VOLATILE GROUND-LEVEL AIR EMISSION TO CROSS THE SEEP EXCLUSION ZONE BOUNDARY, CREATING A POTENTIAL HAZARD TO PLANT EMPLOYEES AND/OR MEMBERS OF THE COMMUNITY WHO ARE NOT EQUIPPED WITH ADDITONAL RESPIRATORY PPE.

Criteria for Initiating These Procedures

PID/OVA reading exceeds 5 ppm at the Exclusion Zone Boundary.

Construction Response

Downwind monitoring will begin and containment steps will be initiated. Construction will notify the Duty Person within 15 minutes after Response Level I is initiated and provide information on the field-measured ppm levels above background, the source of the release and the affected area. Construction will fill out the emission procedure checklist, which has been included in this package as well.

Duty Person Response

Duty Person should have the emission procedure checklist in hand when responding to a volatile ground emission page to make sure that Construction relays all of the necessary information from the checklist. This is critical, as the information provided by Construction is needed to make an initial estimate of the release quantity, and to determine whether a regulatory RQ has been exceeded. Unlike practice for plant process area-related releases, the DUTY PERSON has the responsibility for making the initial release calculations for this project.

The following instructions are to be used for determining:

- initial estimated release quantities based on field monitoring equipment (OVA/PID readings); and

- more accurate release quantities based on analytical GC/MS results.

Calculation of Release Quantity

A published air emission release quantity estimation equation will be used. This equation assumes that the release is a "wall" at the exclusion zone boundary which is perpendicular to the wind direction. The wall is infinitely thin, with only height and width. Height will be assumed to be a constant 10 feet for all calculations. Width must be determined by monitoring personnel's additional air monitoring (outlined on emission procedure chekclist).

$$Q = \frac{PPM \times MW \times HEIGHT \times WIDTH \times SPEED \times DURATION \times 2.49}{24.45 \times 453{,}600}$$

Q: release quantity in pounds. This is the value you are solving for.

ppm: concentration in ppm. For initial estimate, ppm is the PID/OVA reading. For accurate calculation, ppm is the analytical GC/MS result.

MW: molecular weight of the material released. The molecular weights of Gill Creek compounds which might be present in an air emission are provided in the attached supporting documentation

height: assumed to be a constant of 10 feet

width: width of emission perpendicular to the wind direction in feet

speed: wind speed in miles per hour

duration: duration of release in minutes

You will need to extract the following information from the emission procedure checklist in order to calculate release quantities using the above equation:

ppm:_____ (AVERAGE) concentration (ppm) from PID readings at the Contaminant Reduction Zone and downwind areas. To determine the average concentration of the emission readings, average the values.

duration:____ how long the emission lasted in minutes. If emission is still on-going, use the time elapsed since the first 5 ppm reading was taken

speed:_____ wind speed in miles per hour

height: 10 height of emission--assumed a constant 10 feet

ROUGH ESTIMATION OF QUANTITY and MATERIAL RELEASED

For initial 2 hour notification purposes, the duty person should consider the PID/OVA reading (ppm) to be benzene (if possible, obtain PID readings, as PID instruments are calibrated to benzene) to estimate whether a RQ is exceeded. When the molecular weight of benzene (78.1) and the assumed emission height of 10 feet are substituted into our equation and the constant conversion factors evaluated, the calculation simplifies to the following:

$$Q = 1.746e-04 \times ppm \times width \times speed \times duration$$

The resulting Q is the pounds of benzene released, assuming benzene is the only compound present.

Criteria for Immediate Reporting

If more than 10 pounds (RQ for benzene) is the quantity estimated then we will assume that a reportable event has occurred for benzene.

Otherwise, if the amount calculated is between 1 and 10 pounds, we will consider the event to be a reportable release of vinyl chloride, as the RQ is 1 pound. Benzene and vinyl chloride have similar molecular weights and represent the most-likely worst-case releases.

Information for Immediate Reporting

For a reportable event contact the appropriate authorities as indicated in the Duty Person manual and provide the following general information:

1. Calculated Q of 1.00 - 10.00 pounds: Report a potential release of vinyl chloride from the DuPont/Olin Gill Creek Remediation Project. Emphasize that we are not certain that the RQ has been exceeded; we have not yet identified the compounds released with certainty but that we are providing a worst-case estimate until we have the information needed to ascertain the compounds and the amount released. We are certain that a release of organics has occurred and are taking precautions to prevent further release. It is possible that the release is not vinyl chloride and that the regulatory RQ was not exceeded. More detailed information on the actual compounds and quantities released will be available within the next 12 hours. Include information about the source of release (sediments exposed in the creekbed) and other required information, such as if there was off-plant impact.

2. Calculated Q greater than 10.00 pounds: Report a potential release of benzene. Include all the other information from item 1 above. Communicate that vinyl chloride was potentially released.

ESTIMATION OF RELEASE BASED ON LAB RESULTS:

A 20/20 spreadsheet (available from Joe Clark) was created to simplify release quantity calculations for all of the compounds of concern for Gill Creek air emissions. Printouts from the spreadsheet that may also be used to check the estimation are attached for Duty Person's reference.

To calculate more accurate release quantities based on analytical results, the information provided from Construction (taken from the emission procedure checklist), analytical results, as well as the molecular weight and regulatory RQ for each compound detected (molecular wieghts and RQs are listed on the attached tables) must be available.

Since the analytical results will be available AFTER the initial report was made, the Duty Person may want to contact a Gill Creek team member or Joe Clark for assistance with the final calculation.

The quantity emitted (for each compound) can be calculated by two methods: Direct calculation by using the air emission calculation, or by systematically comparing the actual emission conditions to a base case example.

A. DIRECT CALCULATION USING AIR EMISSION FORMULA (same formula used for estimating initial release quantities).

1. Manual evaluation.

If Duty Person is at home or cannot access a terminal equipped with 20/20, the Duty person may opt to evaluate the release quantities manually. In this case, the following air emission formula (The formula has been simplified by assuming 10 foot height and by evaluating the various conversion factors) must be used for eachcompound detected by GC/MS:

$$Q = 2.25e\text{-}06 \times \frac{PPM \times MW \times WIDTH \times SPEED \times DURATION}{}$$

Q: release quantity in pounds
ppm: concentration in ppm based on GC/MS analytical results
MW: molecular weight of compound (listed in attached tables)
width: width of emission in feet (taken from emission procedure checksheet)
speed: windspeed in mph (taken from emission procedure checksheet)
duration: duration of emission in minutes (taken from emission procedure checksheet)

2.25e-06: multiplier, evaluated using units cnversion factors and an assumed emission height of 10 feet

Manual Calculation - continued

a. For each particular emission event, the width, wind speed and duration associated with the emission will be the same in this calculation.

b. The only items that change are the ppm and MW for each compound of interest. The calculation must be performed for each compound detected by GC/MS.

c. If Duty Person will be doing calculations manually, it is recommended that the width, speed, and duration be substituted into the above equation and evaluated, to save input steps into one's calculatory.

d. Compare the calculated release quantity to the regulatory RQs listed in the attached tables.

2. Evaluation using 20/20 spreadsheet.

The air emission calculation has been programmed into a 20/20 spreadsheet to speed up and simplify repetitive cacluations. If Duty Person chooses to use the 20/20 speadsheet to perform direct calculations:

a. Input the actual emission conditions (wind speed, width, height of 10 feet, duration) into the spreadsheet conditions table.

b. Input the concentrations measured by GC/MS into the column with the heading "GC/MS PPM**"

c. The spreadsheet will calculate the quantity emitted in pounds. This value will appear in the column with the heading "QUANTITY EMITTED (LBS.)***".

d. Compare the calculated quantity emitted with the regulatory RQ, listed in the column with the heading "REGULATORY RQ" to determine if there were any RQ exceedances.

B. ESTIMATION BY COMPARISON TO A BASE CASE EXAMPLE:

For personnel unfamiliar/uncomfortable with manipulating 20/20 spreadsheets, or opposed to performing repetitive manual calculations,another method of determining if a RQ is exceeded is available. Duty person will need to use the enclosed spreadsheet example.

In the spreadsheet example, certain conditions associated with an example emission have been assumed (area of emission, duration, windspeed). Using the regulatory RQs, known molecular weights, and example incident-specific conditions, the concentration that would lead to an exceedance of the RQ has been calculated. This concentration is referred to a the threshold concentration, and is labelled as such in the attached speadsheet. This approach can be used as a quick comparison of potential compounds that may NOT have exceeded their RQ and enable a quick calculation for those that may have.

The actual quantity emitted in a real emission can be determined by using the results from the example for the ACTUAL ppm, area, wind speed and duration, calculating necessary correction factors based on a comparision of the actual conditions to the example, and adjusting the values as necesary.

EXAMPLE:

1. Spreadsheet "Base Case" Conditions:

The following information was used in in the spreadsheet calculation for this Base Case event:

Area	=	10' high x 35' wide = 350 sq.ft.
Wind Speed	=	10 mph
Duration	=	15 minutes
Concentrations	=	0.3 ppm for all compounds, assumed to be reported from the lab results

Example spreadsheet tables using the same area, wind speed and duration were evaluated at concentrations of 1, 5, and 10 ppm as well. See attached.

ATTACHMENT C-5.2-1

Earth-Moving Equipment Inspection

Check equipment to be inspected: Dump Truck _____ Front-end Loader ✓
Backhoe _____ Bulldozer _____ Motor Grader _____
Other _____

Equipment identification number BXL 565 RS 484 KOMATSU WA 250

ITEMS	CONDITION good	rejected	n/a	REMARKS
1. Access & Egress*	✓			
2. Backup Alarms*	✓		✓	
3. Body				
4. Boom Excess Movement*	✓		✓	
5. Boom Pins*				
6. Brakes*	✓			
7. Bulk Head Partition*			✓	
8. Clutch*	✓			
9. Cotter Pins/Hardened Pins*			✓	
10. Cover	✓			
11. Fire Extinguisher	✓			
12. Frame	✓			
13. Fuel Systems*	✓			
14. Glass*	✓			
15. Guards*	✓			
16. Horn*		✓		HORN DOES NOT WORK. DO NOT USE UNTIL HORN IS FIXED.
17. Hydraulic System* (no leaks)	✓			
18. Levers All Labeled*	✓			
19. Lights	✓			
20. Lugs	✓			
21. Muffler & Exhaust Pipe*	✓			
22. Muffler Guards*	✓			
23. Outriggers*			✓	
24. Parking Brakes*	✓			
25. Platform Decking	✓			
26. Positive Dump Bed Latch*			✓	
27. Rear View Mirror	✓			
28. Rollover Protection*	✓			
29. Seat Belts*	✓			
30. Side Mirrors (Both)*			✓	
31. Steering Mechanism*	✓			
32. Tracks, Tires, Wheels*	✓			
33. Turn Signals			✓	
34. Windshield Wipers	✓			

* If any of these are rejected, the equipment shall not be used.

J. G. Smith
Inspected by

05/07/91
Date

SAFETY
HEALTH
ENVIRONMENT

ISSUED	5/91
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 2

EARTH-MOVING EQUIPMENT

1.0 SCOPE

This procedure provides minimum requirements for inspecting and operating earth-moving equipment. This procedure covers equipment such as dump trucks, front-end loaders, buildozers, graders, backhoes, and tracked and rubber-tired hydraulic excavators, such as Gradalls.

2.0 DEFINITIONS

Earth-Moving Equipment – All rubber-tired, self-propelled scrapers, rubber-tired front-end loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler tractors, crawler-type loaders, and motor graders, with or without attachments, that are used in construction work.

Engineer – The person who requests the work and is responsible for the safety, quality, and timing of the work requested.

Qualified Inspector – An experienced craftsperson or engineer (Du Pont or contractor) who has demonstrated his or her ability or competency to inspect equipment to the site manager and/or the Du Pont Fleet Operations designee.

Qualified Operator – An experienced craftsperson who has received training and demonstrated competency to operate a specific piece of equipment.

Site Manager – The highest level Engineering employee responsible for work conducted on the site.

3.0 GENERAL

3.1 Inspection of Earth-Moving Equipment

A qualified inspector must inspect all contractor-owned or company-owned earth-moving equipment before its use on site and at least quarterly thereafter. (Rental equipment is considered contractor-owned.) The inspector should use an Earth-Moving Equipment Inspection form (Attachment C-5.2-1) or its equivalent.

3.2 Qualification of Operators

Only qualified operators may operate earth-moving equipment.

Before an operator uses earth-moving equipment on site, the operator's employer must furnish to the site manager a description of how the operator has been qualified. In addition, the operator's employer must submit an Equipment Operator Qualification form (Attachment C-5.2-2) or its equivalent to the site manager and/or designee.

3.3 Permits

Permits should be site-specific and handled according to site procedures.

3.4 Operation

Operate earth-moving equipment according to the posted safe speed limit.

Equipment operated on public roadways must meet the requirements of the local governing body.

Earth-moving equipment may carry only as many people as there are factory-installed seat belts. If equipment is not equipped with factory-installed seat belts, and local, state, or government regulations allow this equipment to be operated without seat belts, then only the operator should be allowed to ride the equipment.

During refueling of this equipment the engine must be shut off, and a fire extinguisher must be present.

Any earth-moving equipment operated after dark and/or under limited lighting must be equipped with factory-installed lighting or equivalent lighting subject to the qualified inspector's or site manager's approval.

Flammable and explosive environmental classifications must be considered before using earth-moving equipment in any operating area. For more information on classifications, see SHE A-21.1.

Personnel must not occupy excavators or loader buckets during the operation of the equipment.

nen using continuous-tracked equipment, place protection on paved road surfaces to prevent damage.

3.5 Hydraulic Lines

Hydraulic lines must be maintained to prevent leakage. If catastrophic failure of a hydraulic system occurs, the spill must be cleaned up according to site, local, state, and governmental regulations. Sites should have a written procedure to respond to this type of spill.

3.6 Backhoes

"Walking" and/or straddling a backhoe across an open trench should be avoided. If walking or straddling is necessary, the engineer must plan the job.

Backhoes must not be used for any operations exceeding the manufacturer's recommendations or the capability of the equipment (e.g., unloading a truck with a backhoe boom instead of a crane). If the manufacturer permits the use of a backhoe as a "crane," rigging must be according to the site standards and must be attached to the bucket according to the manufacturer's recommendations, and load charts showing load and radius capacities must be in the backhoe.

3.7 Trucks with Dumping Beds

If the cab of a dump truck is equipped with vertical and horizontal protection (designed to withstand the impact of the material being loaded), all personnel may remain in the cab of the dump truck during the loading of the dump bed with materials less than 3 inches (7.5 centimeters) in diameter. If the cab has insufficient protection and/or the materials are larger than 3 inches (7.5 centimeters) in diameter, then all personnel must leave the truck during loading and must wear all required site-specific safety equipment (i.e., hard hats and safety glasses) when they are outside the vehicle.

Personnel must not be transported in the bed of any dump truck that has the capability to dump.

When dumping a load, follow the manufacturer's recommendation on ground conditions. These recommendations give the "acceptable" slope of the terrain when operating the dump bed.

Dumping operations must be performed on stable, compacted areas. When dumping loads on the elevated edges of "new fill" areas, the engineer should develop a plan to prevent the dump truck from entering the area of unstable material.

Refer to SHE E-14.1 and SHE E-15.1 for removal of material from a Du Pont site.

Before and during the operation of a dump truck with the bed in the "up" position, the operator must verify and check the overhead clearances during forward and backward movements. The engineer must be sure that the dumping operation does not conflict with the requirements of SHE B-1.18 and SHE C-10.1.

Use a positive bed lock when any work is required under the dumping bed when the bed is in an "up" position.

3.8 Rollover Protection Systems

All earth-moving equipment except dump trucks and hydraulic excavators requires rollover protection. All backhoes require rollover protection except a backhoe attachment mounted on a tractor of less than 20 horsepower.

4.0 REFERENCES

4.1 SHE A-21.1, *Planning Work in Plant Areas*

SHE B-1.18, *Use of Mobile Equipment Near Exposed Electric Lines*

SHE C-10.1, *Mobile Equipment Work Near Hazardous/Critical Pipe Lines*

SHE E-14.1, *Federal Environmental Regulations (CERCLA, RCRA, and SARA)*

SHE E-15.1, *Storage, Handling, and Disposal of Hazardous Materials*

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HEALTH
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ISSUED	5/91
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 2

PERSONAL PROTECTIVE EQUIPMENT

1.0 SCOPE

This procedure outlines the guidelines pertaining to the issue and use of personal protective equipment (PPE), including safety shoes, hard hats, gloves, hearing protection, and eye protection.

2.0 DEFINITIONS

This procedure contains no unique definitions.

3.0 GENERAL

All personal protective equipment must meet or exceed all local, state, and federal regulations.

3.1 Safety Shoes

All employers must require all employees to wear safety shoes whenever feet are exposed to potential hazards. Safety shoes may be readily available through stock, shoemobile, or special order at cost to employees. All safety shoes must meet the requirements of the current issue of ANSI Z41.

3.2 Hard Hats

Employees must wear hard hats in all Du Pont construction areas and when plant operational procedures require hard hats. Office employees and visitors must also wear hard hats when they go to field sites and shops. Individual sites must specify where hard hats are NOT required.

Hard hats must conform to the current issue of ANSI Z89.1. Hard hats must be worn with the brim in the front except when an employee is welding or performing other similar activities. Metal hard hats are not permitted. Hard hats must be inspected for cracks or other evidence that the hard hat needs to be replaced.

3.3 Gloves

All Du Pont construction employees are expected to possess and use good quality gloves appropriate to their work. Gloves must not be worn when performing tasks where glove use would increase the possibility of injury, such as work involving rotating equipment. Gloves must be provided for unusual jobs as deemed appropriate by site management.

3.4 Hearing Protection

Hearing protection must be worn by employees exposed to noise levels that exceed 90 dbA, 8-hour time-weighted average (TWA). A continuing, effective hearing conservation program must be provided for each employee exposed to noise levels of more than 90 dbA, 8-hour TWA. Hearing protection and hearing conservation programs must meet the requirements of SHE E-6.1.

3.5 Eye Protection

All employees performing work requiring eye protection must wear safety glasses with side shields. The frames, lenses, and side shields must meet the requirements of the current issue of ANSI Z87.1. Additional types of eye protection may be required, depending on the hazard involved. Other types of eye protection must be provided for unusual jobs as deemed appropriate by site management. For more information on eye protection, see SHE F-2.1.

3.6 Other Protective Equipment

Other types of personal protective equipment items such as safety belts, respirators, and face shields must be maintained for issue as deemed appropriate by site management. For information on safety belts, respirators, and face shields, refer to SHE B-8.1, SHE E-8.1, and SHE F-2.1, respectively.

3.7 Cleaning

All personal protective equipment, such as safety glasses, hard hats, rubber boots, and respirators, must be sterilized prior to reissue.

4.0 REFERENCES

4.1 SHE B-8.1, *Continuous Fall Protection*

SHE E-6.1, *Noise Control and Hearing Conservation*

SHE E-8.1, *Respiratory Protection*

SHE F-2.1, *Eye and Face Protection*

4.2 ANSI Z41, *Safety-Toe Footwear*

ANSI Z87.1, *Occupational and Educational Eye and Face Protection, Practice for*

ANSI Z89.1, *Industrial Workers, Protective Headwear for*

5.0 FOR FURTHER INFORMATION

5.1 SHE B-1.4, *Work On or Near Energized Electrical Services and/or Equipment*

SHE B-1.8, *Energized Motor Control Centers*

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HEALTH
ENVIRONMENT

ISSUED	5/91
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 2

EYE AND FACE PROTECTION

1.0 SCOPE

This procedure outlines eye and face protection requirements for Engineering function personnel and visitors.

2.0 DEFINITIONS

Engineering Function Personnel – For the purposes of this procedure, all personnel assigned to the Engineering function site organization and all contractor personnel performing construction and construction-related services under contracts being administered by the Engineering function site organization.

3.0 GENERAL

All personnel must be equipped with eye and face protection appropriate for the task being performed or as required by site policy. Engineering function personnel must wear approved safety glasses. Visitors who do not have safety glasses must wear approved visitors' glasses or goggles.

3.1 Eye Protection

3.1.1 Requirements for Safety Glasses – All safety glasses must have side shields and comply with the current issue of ANSI Z87.1. Side shields may be permanently attached or detachable. Use only detachable side shields made of rigid material that can be secured to the glasses.

Lenses of all safety glasses must be marked with the manufacturer's trademark. Frames must have "Z87" stamped on the front and both temple pieces.

3.1.2 Safety Glasses – All personnel must wear approved safety glasses in locations and during activities such as the following:

- in all construction shops
- in fabrication areas adjacent to shops
- in any additional areas designated by specific plant requirements
- while drilling, chipping, pouring concrete, hitting steel on steel, driving nails, power sawing, and performing similar tasks

The site manager can designate an entire Engineering function site as a 100-percent eye protection area.

3.1.3 Visitors' Glasses – All visitors must wear ANSI-approved visitors' glasses provided by the site unless they are wearing safety glasses that comply with ANSI Z87.1.

3.1.4 Prescription Glasses – All prescription glasses worn in lieu of safety glasses must comply with ANSI Z87.1 and must have side shields as specified in section 3.1.1 of this procedure.

3.2 Face Protection

3.2.1 Face Shields – Always wear face shields during activities such as the following:

- grinding
- cad welding
- handling chemicals, corrosive liquids, or molten materials
- chain sawing
- chipping

Always wear safety glasses with face shields. Face shields protect only the face and do not meet ANSI Z87.1 requirements for eye protection.

3.2.2 Mono Goggles – Always wear mono goggles during activities such as the following:

- handling corrosive liquids or solvents (use acid goggles)
- power chipping or breaking
- overhead drilling
- sanding

NOTE: *Site procedures should address plant requirements on whether to use vented or unvented mono goggles.*

3.3 **Welding Shields** – Use an approved welding shield with no less than a #10 filter plate and safety lenses on both sides during all welding operations. Refer to Engineering Standard S4H, Table 1, and SHE B-1.14 for further information.

3.2.4 **Burning Goggles** – Use an approved burning goggle with no less than a #4 filter plate and safety lenses on both sides during all burning operations. Refer to Engineering Standard S4H, Table 1, and SHE D-5.1 for further information on required eye protection.

4.0 REFERENCES

4.1 SHE B-1.14, *Electric Welding and Portable Generators*

SHE D-5.1, *Welding, Cutting, Burning, Heating, or Melting*

4.2 Engineering Standard S4H, *Eye Protection*

4.3 ANSI Z87.1, *Practice for Occupational and Educational Eye and Face Protection*

10. Is the dump system operating properly? Will it dump when released?
11. Are all control systems operational?
12. Are all safety systems operational?
13. Are safeguards in place to protect personnel if the equipment becomes damaged; for instance, if a hose bursts, releasing corrosive chemicals or flammable liquids?
14. Do you know the location of emergency medical aid?
15. Have you inspected the pressure gauges, and are they in good working order? (Gauges should have a scale range at least 50 percent above maximum working pressure.)
16. Have you obtained all necessary permits and clearances?

NOTE: The practices listed in items 2, 3, 4, 6, 7, 8, 9, 10, 11, 13, and 14 are recommended by the United States Water Jet Technology Association in the *Recommended Practices Manual*.

For more information on the recommended practices for high-pressure water jetting, see Standard Engineering Specification SZ5B and M&C Procedure PP18. For a more complete checklist, see M&C Procedure PP18.

4.0 REFERENCES

4.1 Standard Engineering Specification SZ5B, *Power Water Cleaning*

Maintenance and Construction Procedure PP18, *High Pressure Water Cleaning Above 3,000 psig*

4.2 *Recommended Practices Manual*, 1987, United States Water Jet Technology Association (U.S.W.J.T.A.)

Forms may be copied or obtained from the Standards Group, Louviers Bldg, Wilmington, DE.

Name and Description of Equipment to be cleaned: _____

Location: _____ Date: _____

TO BE COMPLETED BY REP. OF THOSE PERFORMING THE WORK:

Signature Indicates Completed

1. All operators have 6 months HPWC experience and are trained in compliance with this procedure. Any operators with less than 6 months experience have been trained, are identified as "apprentices" below, and are under an experienced operator's close monitoring/control. _____
2. Personal protective equipment available/adequate. _____
3. Work site barricaded, hearing protection signs posted when required and free of tripping hazards. _____
4. Hoses checked for condition, secured, properly arranged and rated for a minimum $2^1/_2$ times the highest working pressure. _____
5. High-pressure hose connections tightened and have safety chains or equivalent. _____
6. "Failsafe" valves in proper location (two required on shotguns) and functioning. _____
7. Relief device rating checked against the lowest rated components. (See 6.1.) _____
8. Equipment guards in place (trigger guards, rotational guards). _____
9. Hose safety shroud in place. _____
10. Proper lance and jet nozzle (back thrust not to exceed approximately one-third of the operator's body weight in manual shotgun cleaning). _____
11. Lance hand guard deflector installed. _____
12. High-pressure system tested at operating pressure. _____
13. Footing conditions are firm. _____
14. Lighting is adequate. _____
15. Under no circumstances should the HPWC personnel hook up to plant utilities before receiving approval of Du Pont. _____

I have reviewed the above prejob checks and requirements before beginning the high-pressure cleaning work

Signatures of:

TRAINED AND (6 MONTHS) EXPERIENCED OPERATORS

_____ _____ _____

_____ _____ _____

APPRENTICES, TRAINED WITH LESS THAN 6 MONTHS EXPERIENCE

_____ _____ _____

TO BE COMPLETED BY THE DU PONT JOB REPRESENTATIVE:

Signature

16. Equipment to be cleaned is properly dismantled, isolated, and tagged. _____
17. Tank entry permit, if required. _____
18. Prejob checklist items 1 thru 17 have been addressed by those performing the work. _____

APPROVED FOR HPWC WORK TO BEGIN: _____

Du Pont Job Rep.

FIGURE 1 – TYPICAL HIGH-PRESSURE WATER CLEANING CHECKLIST

DUPONT

AIR ANALYSIS

(WITH FORCED VENTILATION SHUT OFF)

TIME INITIAL	OXYGEN	FLAME	TOXIC

☐ CONTINUOUS AIR TESTING (WHEN PERSON IS IN CHAMBER)

SIGNATURE PERSON(S) ENTERING	SAFETY PERSON(S)	CALL PERSON(S)

★ WAIVER REQUIRED: (EXPLAIN BELOW)

AUTHORIZATION

★WAIVER AUTHORIZATION

SHIFT 1

SHIFT 2

SHIFT 3

SAFETY

AREA

UNIT MGR/SUPT

Operating Supervisor

Entering Person's Supervisor(s)

PERMIT IS VALID FOR 24 HOURS ONLY: MUST BE SIGNED EACH SHIFT.

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HEALTH
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ISSUED 1/91
REAFFIRMED
PG. REVISED
PAGE 1 OF 2

HIGH-PRESSURE WATER JETTING

1.0 SCOPE

This procedure supplements Standard Engineering Specification SZ5B. It applies to all water jetting, including the use of additives or abrasives, at pressures above 1,000 psi (6,900 kPa).

CAUTION: The lower limit of 1,000 psi (6,900 kPa) does not mean that pressures below 1,000 psi (6,900 kPa) cannot cause injury, or that they require any less attention to the principles outlined in Maintenance and Construction (M&C) Procedure PP18. Use adequate precautions at **all** pressures.

2.0 DEFINITIONS

High-Pressure Water Cleaning – The use of high-pressure water, with or without the addition of other liquids or solid particles, at a liquid pressure above 1,000 psi (6,900 kPa) at the orifice, to remove unwanted matter from various surfaces.

High-Pressure Water Cutting – The use of high-pressure water, with or without the addition of other liquids or solid particles, at a liquid pressure above 1,000 psi (6,900 kPa), to penetrate and cut a material.

High-Pressure Water Jet Systems – Water jet systems that spray water through nozzles or openings that increase the speed of the water. Solid particles or chemicals may be added to the water, but in all cases the liquid sprays in a free stream. These systems include pumps (pressure-reducing devices), hoses, lances, nozzles, valves, and safety devices, as well as any attached heating elements or injection systems.

Line Moling – The use of a self-propelled jet nozzle (mole) and a high-pressure hose hooked up to a high-power water jet system to clean the inside of piping systems.

3.0 GENERAL

3.1 Inspection and Testing

Each site must develop and implement a program for inspecting and testing hoses at least quarterly. The program must include audits, such as test witnessing. For more information on implementing such a program, including equipment set-up, inspection, and testing guidelines, see M&C Procedure PP18.

3.2 Personnel Qualifications

Any person operating or maintaining high-pressure water jetting equipment must be trained per M&C Procedure PP18 and must have demonstrated the ability and knowledge to operate the equipment.

3.3 Recommended Practices

Check the following items before performing each job:

1. Are necessary controls in place for excess water run-off? Are operating areas and equipment protected? Have you considered the possibility of environmental contamination? If run-off water encapsulating is required by federal, state, or local regulation, are appropriate procedures in place?
2. Have you protected electrical equipment?
3. Are the pressure ratings of all fittings correct and in good operating condition?
4. Have you taken precautions to prevent line mole reversal?
5. Is there a minimum 20 psi (140 kPa) clean water supply at the pump suction?
6. Is the filter on the pump suction clean and in good operating condition?
7. Have you flushed and removed air from the system before installing the nozzle?
8. Are all nozzles free from plugs and in good operating condition?
9. Have you taken precautions to prevent the system from freezing?

ATTACHMENT B-24.1-2

Vessel or Confined Space Entry Log

All employees entering this vessel or confined space have been instructed about potential hazards, necessary safety precautions, and protective emergency equipment requirements.

Y-1 P.P. Column
Vessel Name

4th Floor - Y-1 - C.P.
Area and Building

Name (Person Entering)	Date	Time In (Initial)	Time Out (Initial)
L. D. Rich	6/17/91	LDR 5:00 PM	LDR 6:30 PM
Y. Smith	6/17/91	Y.S. 5:00 PM	Y.S. 6:30 PM

CLOSED CHAMBER ENTRY PERMIT

CHAMBER: _____

PERMIT DATE & TIME: _____

PERMIT EXPIRES DATE & TIME: _____

★ SEE BACK OF PERMIT IF APPLICABLE

PREPARATIONS	YES	NO
Forced Ventilation	☐	☐
Breathing Air (full face & escape cylinder)	☐	☐
Acid Suit	☐	☐
Vapor Proof Suit	☐	☐
Coverall Goggles	☐	☐
Harness and Life Line	☐	★
Air Analyzer Test Calibrate	☐	★
Chemical Gloves	☐	☐
Ear Protection	☐	☐
Lighting Flashlight	☐	☐
Barricades	☐	☐
Safety Shower Checked	☐	☐
Scaffold (inside vessel)	☐	☐
Entry Ladder	☐	☐
_____	☐	☐
_____	☐	☐

HAZARDS	YES	NO
Rotating Motion	☐	☐
Toxic Material	☐	☐
Flammable Material	☐	☐
Hot Material	☐	☐
Welding Burning	☐	☐
Internal Plugs	☐	☐
External Fume Source	☐	☐
External Fire Source	☐	☐
_____	☐	☐
_____	☐	☐

ELECTRICAL	YES	NO
Ground Vessel	☐	☐
Ground Fault Interrupter	☐	★
Vapor Proof Lighting	☐	☐
Disconnect Elect. Tracing	☐	☐

EVACUATION	YES	NO
Safety Person - No. Req'd. _____		
Call Person - No. Req'd. _____		
Breathing Air (SCBA)	☐	★
Escape Respirator	☐	★
Air Horn	☐	★
Flashlight	☐	☐
Hoist/Pulley	☐	☐
Litter/Stretcher	☐	☐
"Dummy" Rescue	☐	★
Emergency Radios	☐	☐

ISOLATION (Mark N/A when not applicable)	YES	NO
Lock Out Valves	☐	★
Disconnect Pipes	☐	★
Blank Pipes	☐	★
Disconnect Agitator Coupling	☐	☐
Pull Fuses	☐	☐
Disconnect Motor Leads	☐	★
Remove Charging Chute	☐	★
Remove Slack	☐	★
_____	☐	☐
_____	☐	☐

DISPLAY ON SITE

ATTACHMENT B-24.1-1

Vessel or Confined Space Entry Permit

1. Name of Vessel or Confined Space Y-1 P.P. Column
2. Location 4th Floor - Y-1 - C.P.
3. Purpose of Entry Inspect Vessel Walls
4. Date 6/17/91
5. Groups Entering Vessel or Confined Space Plant & Const.

	Yes	No	Signature
6. Preparation			
A. Has the V/CS been cleaned?	✓		Y. Smith
B. Has the V/CS been isolated?	✓		Y. Smith
C. Has all electric/air/hydraulic equipment been disconnected?	✓		Y. Smith
D. Have radiation sources been removed or shielded and locked?	✓		Y. Smith
E. Has a special job plan been written?	✓		Y. Smith

7. Hazard Analysis
   - A. What service has the V/CS been used for? Dacron Process
   - B. What potentially hazardous gases or toxic materials may be present or generated? None - Vessel Clean

NOTE: Tests required and results below.

Test Required	Test	Time/Date	Initials	Radiation Test
Oxygen (19.5-23.5%)	20%	1600/6/17/91	YS	Y.S. Prior to Initial Entry
Explosibility (0%)	0	1600/6/17/91	YS	
Other	N/A			Y. Smith Signature
Oxygen				
Explosibility (0%)				
Other				

Continued on

8. **Preventive measures required at all times** (any deviation from required preventive measures must have management approval):

   A. All electrical equipment must be 12-volt or used with a GFCI.

   B. The entry standby person must be adequately trained.

   C. A second person must be within calling distance.

   D. The 30-minute SCBA or air-supplied respirator must be equipped with escape provisions and available at the entry point.

   E. Mechanical ventilation or fresh air breathing equipment must be worn for weld/burn.

   F. The rescue plan must be reviewed with all personnel entering the V/CS and all standby personnel.

   G. Safety belts, body, or wrist harness must be worn inside the V/CS.

   H. A secured lifeline must be worn when entering the V/CS.

   I. A flashlight must be available when artificial lighting is required in the V/CS.

9. **Optional preventive measures:**

	Yes	No	Signature
A. Fresh Air Mask Inside	✓		
B. Ladder		✓	
C. Personal Protective Equipment		✓	
D. Additional Ventilation	✓		
E. Distress Alarm at Entry	✓		
F. Chemical Hazard Film Badges		✓	
G. Mechanical Means of Rescue	✓		
H. Special Tools		✓	
I. Fire Extinguisher	✓		
J. Pneumatic Tools		✓	

10. **Approvals to enter vessel or confined space:**

	Time/Date
John Smith — Area/Owner	1600-6/17/91
Jack Brown — Engineering Function Engineer	1600-6/17/91
Tom Jones — Craft Supervisor	1600-6/17/91
N/A — Other Supervisor	

VESSEL AND CONFINED SPACE ENTRY

.4 Training

All personnel entering a V/CS, standby personnel, and back-up standby personnel must be instructed in the nature of possible hazards, the precautions to be taken to avoid incidents, and the use of protective and emergency equipment.

3.5 Process Isolation

All pipe lines to the V/CS must be physically disconnected or blanked before entry. For more information on process isolation, see SHE B-1.3.

3.6 Lock and Tag

Follow the steps outlined in SHE B-1.3 for locking, tagging, trying, and clearing process systems before entry into a V/CS.

The V/CS drive or agitator must be taken out of service by uncoupling the drive, removing belts, or disconnecting the motor leads. For more information on electrical locking and tagging, see SHE B-1.3.

Radioactive sources must be shielded, locked and tagged, or removed. For more information on radiation control, see SHE E-18.1.

3.7 Personal Safety and Escape Equipment

Personnel who work inside a V/CS, including all standby personnel, must be aware of personal safety, escape procedures, and equipment.

3.7.1 Grounding Cable – If the V/CS is equipped with a grounding cable, it must be Megger® tested to confirm the existence of a firm mechanical joint.

3.7.2 Low-Voltage Lighting and Electrical Equipment – Low-voltage (12-volt) lighting is preferred for use inside a V/CS. All other lighting sources must be protected by an approved ground fault current interrupter (GFCI). All electrical tools used inside a V/CS must be protected by an approved GFCI.

Lighting and tools should be on separate circuits. The GFCI, transformer, and disconnects must be located outside the V/CS. For more information on using GFCIs, see SHE B-1.15.

3.7.3 Safety Belts – All persons entering a V/CS must wear a safety belt. Where the entrance is too restricted to allow removal of a person equipped with a waist-type safety belt, use a shoulder-type safety harness or a wrist harness.

3.7.4 Lifelines – Because of the configuration of a V/CS or the large number of people involved, it may not be practical to keep lifelines attached. In such cases, the safety belt or harness must be worn, and the lifeline must be kept ready at the V/CS exit point in case of emergency.

3.7.5 Air Masks/Respirators – Consider the need for 5-minute escape air masks for personnel entering the V/CS. A 30-minute SCBA or air-supplied respirator equipped with escape provisions must be available at the entrance to the V/CS in case rescue assistance is needed.

3.7.6 Standby Person – At least one standby person must be at each point used to enter the V/CS. The standby person must have a 30-minute SCBA or air-supplied respirator equipped with escape provisions, a flashlight, and an air horn or some other reliable method for summoning additional assistance. The standby person's primary responsibility is to be attentive to the personnel inside the vessel.

3.7.7 Training and Certification – The standby person must be trained and certified in the use of the 30-minute SCBA and the air-supplied respirator with escape provisions.

3.7.8 Back-Up Standby Person – In case of emergency during V/CS entry, a back-up standby person must be available to assist the standby person.

3.7.9 Continuous Monitoring for Oxygen – Consider continuous monitoring for oxygen with an audio alarm monitoring system. For more information on portable oxygen analyzers, see Engineering Standard S6T.

3.8 V/CS Environment

Review the V/CS and its previous contents to ensure that the necessary ventilation, protective clothing, respiratory equipment, and fire prevention precautions have been specified and provided.

3.8.1 Protective Clothing and Equipment – If entry is required to clean the V/CS, provide appropriate protective clothing and equipment, and use appropriate test methods. For more information on protective clothing and equipment, see Engineering Standard S16G.

3.8.2 Breathable Atmosphere – Maintain a breathable atmosphere by either natural draft or forced ventilation. Compressed air must not be blown into a V/CS.

Air-supplied respiratory equipment with escape provisions is required when entering a V/CS where there is any oxygen deficiency (less than 19.5 percent).

3.8.3 Testing the Atmosphere – The atmosphere in the V/CS must be tested by a qualified person prior to entry, and special care must be taken to ensure that all accessible areas of the V/CS are sampled. The qualified person must do periodic tests in the vicinity of the work, and must agree upon and note the frequency of the sampling.

The atmosphere must meet the following conditions:

- oxygen – 19.5 percent minimum, 23.5 percent maximum
- flammable gases – 0 percent maximum
- toxic gases – 0 percent maximum or non-detectable
- radioactivity – not to exceed state regulations

If the above atmospheric conditions are not attainable, ensure that a special job plan is written. The job plan must be approved by site management.

If work being performed inside the vessel could generate flammable vapors or produce an oxygen-deficient atmosphere, test continuously while work is being performed. For more information on vapor and gas detectors, see Engineering Standard F6J.

Consult the Engineering function safety specialist for required toxicity and explosive information.

3.9 Welding and Burning

Personnel involved in welding and burning inside a V/CS must consider personal safety, equipment requirements, and potentially hazardous conditions.

3.9.1 Shell Material – Consider the possibility of flammable, explosive, or toxic materials being absorbed in the shell material prior to burning or welding.

3.9.2 Stripping Toxic Coatings – Strip all surfaces covered with toxic preservatives of all toxic coatings at least 2 feet (0.6 meters) from the area of heat application. If toxic coatings are not stripped, protect employees by air-supplied respirators and, if applicable, protective clothing.

3.9.3 Burning/Welding Procedures – When burning inside a V/CS, locate all cylinders **outside** the V/CS. Check hose connections for leakage prior to entry. When welding inside a V/CS, locate welding machines **outside** the V/CS. Remove all hoses from the V/CS at the end of the work shift unless multi-shift work is in progress.

3.10 Fume Releases

The V/CS permit is automatically cancelled in the event of a major emergency alarm, any fume alarm, or area fire alarm (except a test alarm). Personnel inside the V/CS must exit the V/CS and follow emergency procedures. When the "all-clear" is sounded, V/CS permits can be reinstated after atmospheric tests are retaken and the results are noted on the permit.

4.0 REFERENCES

4.1 SHE B-1.3, *Lock, Tag, Try, and Test (LT-3)*

SHE B-1.15, *Ground Fault Circuit Interrupters*

SHE E-18.1, *Radiation Control*

4.2 Engineering Standard S16G, *Vessel and Confined Space Entry*

Engineering Standard S6T, *Portable Oxygen Analyzers*

Engineering Standard F6J, *Portable Combustible Vapor and Gas Detectors*

5.0 FOR FURTHER INFORMATION

5.1 Standard Engineering Specification SW50W, *Welding, Thermal Cutting, and Related Procedures, Minimum Safe Practices*

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ISSUED	10/91
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 1

EQUIPMENT DECONTAMINATION BEFORE SHIPPING OFF SITE

1.0 SCOPE

This procedure outlines the requirements for decontamination and preparation of equipment prior to shipment off site.

2.0 DEFINITIONS

Decontamination – Methods used to remove contaminants and hazardous chemicals to a safe working level. Decontamination may involve steaming, sandblasting, water washing, neutralizing chemicals, removing asbestos or other respirable fibers, draining oil, or other methods.

Equipment – Any vessel, pipe, pump, or instrument that has been removed from service for repair, alteration, or scrap.

Material Safety Data Sheet (MSDS) – A technical product information sheet that details hazardous properties, health hazards, and handling precautions. The MSDS is available from the product manufacturer and/or distributor.

Supervisor – The person who oversees, directs, or manages the work and is ultimately responsible for the work performed.

3.0 GENERAL

3.1 Supervisor's Responsibility

The supervisor responsible for shipment of any equipment or materials to an off-site location must ensure that the equipment is completely decontaminated or made safe by containment prior to shipment. The equipment or materials must not expose any person, carrier, or vendor to possible injury caused by harmful chemicals or materials.

3.2 On-Site Responsibility

This procedure does not address equipment to remain on site or the decontamination or cleanup of the equipment for on-site personnel to perform revisions or alterations. However, the manufacturing group must verify that the equipment has been cleaned, decontaminated, and made safe for work to be performed on site. For further information on decontamination and cleanup, see SHE B-1.3 and SHE B-41.1.

3.3 Manufacturing Group

Consult the manufacturing group regarding the best way to decontaminate and prepare equipment to be shipped off site. The manufacturing group must verify that the equipment is adequately cleaned and safe for the intended modification (e.g., handling, cutting, grinding, and welding). The manufacturing group must also verify that the vendor to whom the equipment is shipped to is qualified, and that the shipment meets Department of Transportation (DOT) and Remember How You Treat Hazardous Material (RHYTHM) requirements. For further information on welding and cutting, see Standard Engineering Specification SW50W and SHE D-5.1.

3.4 MSDS Required

Any equipment to be shipped off site by Engineering must be accompanied by a Material Safety Data Sheet (MSDS). Any known hazards associated with the vendor's work must be communicated in writing to the vendor.

3.5 Required Labeling

Follow the labeling requirements in SHE E-7.1 when preparing material to be shipped off site.

4.0 REFERENCES

4.1 SHE B-1.3, *Lock, Tag, Try, and Test (LT-3)*

SHE B-41.1, *Isolation from Plant Processes*

SHE D-5.1, *Welding, Cutting, Burning, Heating, or Melting*

SHE E-7.1, *Hazards Communications*

4.2 Standard Engineering Specification SW50W, *Welding, Thermal Cutting, and Related Procedures, Minimum Safe Practices*

SAFETY
HEALTH
ENVIRONMENT

ISSUED	1/92
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 3

VESSEL AND CONFINED SPACE ENTRY

1.0 SCOPE

This procedure outlines the minimum safety requirements for work inside a vessel or confined space (V/CS). This procedure also lists requirements for protecting individuals in a V/CS from hazards such as oxygen deficiency, hazardous materials, moving parts, and blocked escape routes.

2.0 DEFINITIONS

Back-up Standby Person – A person whose primary responsibility is to provide immediate assistance to a standby person. The back-up standby person must be available by means of verbal contact, two-way radio, or PA system to help the standby person in an emergency.

Entry – Breaking the plane of the vessel opening with any part of the body.

Hands and Arms Entry – Breaking the plane of the vessel opening with hands and arms only.

Standby Person – A person who must be in continual visual or hearing contact with personnel inside the V/CS. A standby person must be adequately trained to monitor the activities of personnel inside the V/CS.

Vessel or Confined Space (V/CS) – Any enclosure with limited access that presents a hazard to anyone entering. Examples include tanks, tank cars, vessels, vessel skirts, hoppers, open vessels, trenches, or pits deeper than 5 feet (1.5 meters), diked areas with walls higher than 5 feet (1.5 meters), vaults, pipe lines, tunnels, duct work, and manholes.

3.0 GENERAL

3.1 Permit and Entry Log Requirements

Prior to V/CS entry, supervision must sign a permit authorizing entry into the V/CS and outlining specific requirements. See Attachment B-24.1-1 for a sample V/CS entry permit. The permit is valid only for the job, location, and time period specified. For V/CS work in an operating area, the permit must be approved by all concerned (the area/owner Engineering function engineer, craft supervisor, and any other supervisor involved).

Exceptions to the V/CS permit and alternate measures must be individually identified and described on the permit.

All persons entering the V/CS, standby personnel, and back-up standby personnel must review and sign a V/CS entry log. See Attachment B-24.1-2 for a sample V/CS entry log.

Both the V/CS permit and the entry log must be posted near the entry point of the V/CS.

3.2 Rescue Plan

A rescue plan must be developed and reviewed with all personnel entering the V/CS and all standby personnel. The rescue plan must include the following:

- who and how to call for assistance in case of emergency
- how persons are to be removed from the V/CS case of an emergency

3.3 Rescue Procedure

If a person inside a V/CS is unconscious, the standby person should not enter the vessel, but should try to remove the person by using the safety belt or harness. As a last resort, the standby person may don self-contained breathing apparatus (SCB or an air-supplied respirator with escape bottle, an remove the person. The standby person should no enter the vessel until a back-up standby person is the entrance of the V/CS.

SAFETY
HEALTH
ENVIRONMENT

ISSUED	3/91
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 2

WORKING OVER OR NEAR WATER

1.0 SCOPE

This procedure governs the activities of personnel who must work directly above or near water where the danger of drowning exists. The procedure states the minimum requirements for working near waterways or large bodies of water.

This procedure does **not** apply to work on ice nor does it address marine operations or equipment. For information on marine operations and equipment, see OSHA 29 CFR 1926.605.

2.0 DEFINITIONS

This procedure contains no unique definitions.

3.0 GENERAL

3.1 Fall Protection

Use appropriate work platforms, such as complete scaffolds, for any work over water. Work in appropriate positions that provide level, stable footing. Place protective or warning barricades 5 feet (1.5 meters) from the water's edge.

3.2 Fall-Arresting Devices

Always use fall-arrest systems in areas where complete work platforms or protective barricades cannot be provided. Consider using safety nets for any work over water.

Lifelines should be designed to keep workers clear of the water in case of a fall.

3.3 Personal Flotation Devices and Water-Rescue Equipment

3.3.1 Life Jackets – When working over or near water, wear life jackets or buoyant work vests approved by a recognized local or national agency such as the U.S. Coast Guard. Before and after each use, inspect buoyant work vests and life jackets for defects that might affect their strength or buoyancy. Destroy, repair, or remove from the site all flotation devices found to be defective.

For information on personal protective and lifesaving equipment, see OSHA 29 CFR 1926.106.

Life jackets and buoyant work vests differ in one important feature: a life jacket keeps an unconscious person's face out of the water. A work vest does not provide this protection.

3.3.2 Ring Buoys – Ring buoys must be readily available for emergency rescue operations. Use ring buoys with at least 90 feet (27 meters) of line. Place ring buoys less than 200 feet (61 meters) from the work location.

3.3.3 Rescue Boat – At least one lifesaving boat must be immediately available when working over or adjacent to water where the danger of drowning exists.

3.3.4 Weight of Equipment – The weight of equipment can affect buoyancy, even with flotation devices. Consider the weight of tools and personal protective equipment.

3.3.5 Transportation – Consider how to transport a drowning victim from the shore to a treatment facility in the event of an accident.

3.3.6 Rescue Plan – When the expected activity will expose personnel to significant water hazards, write a rescue plan and perform a practice rescue to prove the effectiveness of the plan.

3.4 Personnel Qualifications

3.4.1 Required Training – Personnel working over or near water must be trained to recognize and respond to the hazards associated with this work. Specific training may include artificial resuscitation and water rescue.

3.4.2 Work in an Isolated Setting – All work in an isolated setting should be performed by at least two people. The work activity should be monitored so that if a problem occurs, at least one person will be capable of initiating the rescue plan.

3.5 Electrical Safety

All electrically driven equipment should be protected by ground fault circuit interrupters (GFCIs).

WORKING OVER OR NEAR WATER

4.0 REFERENCES

4.1 OSHA 29 CFR 1926.106, *Working Over or Near Water*

OSHA 29 CFR 1926.605, *Marine Operations and Equipment*

ISSUED	8/91
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 2

ACCESS/EGRESS IN CONSTRUCTION AREAS

1.0 SCOPE

This procedure provides basic guidance for planning and constructing access and egress for personnel in construction areas.

2.0 DEFINITIONS

Working Slab – A temporary rough-poured concrete working surface that will be removed or covered.

3.0 GENERAL

3.1 Planning Personnel Pathways

When planning personnel pathways into work areas, consider the following:

- Clearly mark entrances to barricaded work areas with "gate" signs or equivalent.
- Where appropriate, post signs at the job site entrance warning of hazardous conditions.
- Ensure that all personnel pathways (both interior and exterior) and stairs are well lighted. For more information on lighting, see Design Standards, Section DE-F, and specifically Design Standard DE2.2F.
- Always anticipate emergency considerations. Establish emergency escape routes (primary and secondary means of access/egress), and keep them clear.
- Be aware that pathways are often altered during the course of a job.
- When planning personnel pathways, make provisions to locate stored material as close as possible to work areas.
- Isolate hoses and cords from walking surfaces. Hoses and cords should be kept 7 feet (2.1 meters) above walkways if possible.
- To minimize pooling, provide drainage for surface water in work areas.
- Provide a means for people to scrape mud or moisture from the soles of their shoes at the base of ladders and stairs.
- Use abrasive paints or other nonskid materials on walking surfaces.
- Provide oil-dry absorbent on oily, slippery surfaces.
- Provide canisters for salt or sand when ice and snow are present.
- Bring people in early to clear ice and snow before the start of the shift.
- Use "crusher-run" (gravel) in muddy or sandy areas.

Caution: "Crusher-run" sometimes contains stone too large for a good walking surface and must be raked down.

3.2 Planning Below-Grade Access/Egress

When planning and/or constructing below-grade personnel pathways, consider the following:

- Make drainage provisions if the excavation is to remain open for a period of time.
- Obtain a Vessel or Confined Space (V/CS) Entry permit if necessary. For information on V/CS entry, see SHE B-24.1.
- Use a working slab if conditions warrant.
- Determine if the excavation requires shoring or sloping that affects access/egress. For more information on excavations, see SHE B-5.1.
- Provide required protective or warning barricades. For more information on handrails and guards, see Engineering Standard S1C.
- Provide an emergency evacuation plan. Include provisions for removing injured or incapacitated personnel.
- Properly secure ladders used for personnel access. Locate ladders no more than 50 feet (15.2 meters) apart. Travel distance to any ladder must not exceed 25 feet (7.6 meters). For more information on portable ladders, see SHE B-4.1 and Engineering Standard S3C.
- Ensure that any bridge crossing a ditch has handrails and midrails, is anchored on either side of the ditch, and is sufficiently strong to carry the intended loads.

3.3 Planning Above-Grade Access/Egress

When planning elevated work, consider the following:

- Employ engineering resources to attempt to eliminate all fall hazards. Use personal fall protection as a last resort.
- Determine the location of relief valves or emergency alarms.
- Provide a sufficient number of ladders to allow adequate personnel escape time in the event of an emergency. Take into account travel distance between ladders.
- Provide an emergency evacuation plan. Include information on respiratory protection devices to use during emergency escapes. For more information on respiratory protection, see SHE E-8.1.
- Plan response to medical emergency. Ensure the availability of special devices for evacuation of injured or incapacitated personnel.
- Use standby personnel if necessary.
- Use permanent or temporary stairways, ramps, or runways whenever possible.
- Use properly placed and secured portable ladders or fixed ladders if they are available. For more information on portable ladders, see SHE B-4.1 and Engineering Standard S3C. For more information on fixed ladders, see Engineering Standard B2W. For more information on cages for ladders, see Engineering Standard B3W.
- Use aerial lifts and crane baskets as work platforms if required. For more information on crane-suspended work platforms, see SHE B-3.1.

For more information on elevated work requirements, see SHE B-8.1. For more information on cable tray work safety, see SHE B-1.20.

4.0 REFERENCES

4.1 SHE B-1.20, *Cable Tray Work*

SHE B-3.1, *Crane-Suspended Work Platforms*

SHE B-4.1, *Portable Ladders – Control and Inspection*

SHE B-5.1, *Excavations*

SHE B-8.1, *Continuous Fall Protection*

SHE B-24.1, *Vessel and Confined Space Entry*

SHE E-8.1, *Respiratory Protection*

4.2 Engineering Standard B2W, *Fixed Ladder, Details*

Engineering Standard B3W, *Cages for Ladders*

Engineering Standard S1C, *Stairways, Ramps, Handrails, and Guards, Dimensions and Other Requirements*

Engineering Standard S3C, *Selection and Use of Portable Ladders*

Design Standards, Section DE-F, *Lighting*

Design Standard DE2.2F, *Illumination Levels for Lighting Design, Manufacturing and Process Areas*

5.0 FOR FURTHER INFORMATION

5.1 SHE C-2.1, *Aerial Lifts and Bucket Trucks*

5.2 Maintenance and Construction Procedure PV3, *Scaffolds, General Specifications and Rules*

5.3 OSHA 29 CFR 1926.56, *Illumination*

PILE DRIVING

1.0 SCOPE

This procedure provides minimum requirements and considerations for sheet, soldier, tube, timber, concrete, auger, and similar pile-driving activities.

2.0 DEFINITIONS

Apron – The horizontal structure connecting the bottom of the lead to the crane carriage.

Electrical Source – Items such as equipment, cables, lines, or busbars that are used to conduct electrical current.

Engineer – The person who requests the work and is responsible for the safety, quality, and timing of the work requested.

Fixed Lead – A lead connected to a crane at two points: at the boom point and at the crane carriage.

Lead – The frame structure used to guide the hammer or auger.

Qualified Inspector – An experienced craftsperson or engineer (Du Pont or contractor) who has demonstrated his or her ability or competency to inspect equipment to the site manager and/or the Du Pont Fleet Operations designee.

Qualified Operator – An experienced craftsperson who has received training and demonstrated competency to operate a specific piece of equipment.

Site Manager – The highest level Engineering employee responsible for work conducted on the site.

3.0 GENERAL

3.1 Equipment Inspection

A qualified inspector must inspect cranes according to the guidelines in SHE C-1.1. The crane operator must also visually inspect equipment daily to ensure safe operation of the equipment.

3.2 Hoses

Hoses supplying power to a hammer, auger, or vibrator are commonly routed up the crane boom or lead and are subject to separating during operation. Secure each hose from a location on the hose approximately 12 inches (30.5 centimeters) from the coupler to an independent point (on the boom or lead) in a manner that will restrain the powered hose if it separates.

3.3 Operator Qualifications

Crane operators must meet the requirements of SHE C-1.1. Only qualified personnel may operate leads, hammers, augers, and vibrators. The operator's employer furnishes proof of competency to the Engineering site representative.

3.4 Planning

3.4.1 Health Hazards – When planning an auger or pile-driving job, the engineer must consider analyzing subsurface soil and water for potential contaminants that could present health hazards. Appropriate techniques must be employed to protect personnel from exposure to any identified health hazards.

3.4.2 Other Hazards – Additional hazards that must be considered include underground physical interferences (i.e., underground pipelines and underground electric cables), above-ground physical interferences (i.e., above-ground pipelines and electric cables), the effects of vibration on adjacent facilities (see SHE A-21.1), and the effects of noise on personnel. For more information on hazards, see SHE B-1.18, B-5.1, and C-10.1.

3.4.3 Environmental Classifications – Flammable and environmental classifications must be considered before performing pile-driving activities in any operating area. For more information on classifications, see SHE A-21.1.

3.4.4 Permits – Each site should develop a site-specific permit for pile-driving activities. Items for consideration on the permit include vibration, noise, excavation requirements, subsurface health hazards, disposition of waste materials, securing of supply hose, and type of lead used.

3.5 Equipment

3.5.1 Overhead Protection – Overhead protection that does not interfere with the operator's vision must be provided. Protection must be the equivalent of 2-inch (5-centimeter) planking or other solid material of equivalent strength. For additional information, refer to OSHA 29 CFR 1926.603(a)(3).

3.5.2 Fixed Leads – Using fixed leads is the preferred method of pile driving. The site manager must approve the use of any other type of lead.

3.6 Work Practices

3.6.1 Fall Protection – Continuous positive fall protection, such as a lifeline, a rope grab, and complete standard guardrails, must be used when a person is on a vertical lead or an apron. Every effort must be made to eliminate the need for personnel to occupy the top of a pile. Examples of such efforts include employing mechanical pile threaders and remote release shackles. Prior planning (including positive fall protection) and approval of the site manager are required for any work requiring personnel to occupy the top of a pile.

3.6.2 Access to Elevated Work Locations – Ladders and aerial platforms (see SHE C-2.1) are the preferred means of access to elevated work locations. When using a crane to elevate personnel, use only approved personnel baskets. For more information on personnel baskets, see SHE B-3.1.

3.6.3 Precautions – The following guidelines must be observed when pile driving:

- Only personnel essential to the operation are allowed within a radius equal to the undriven length of the pile being installed.
- Personnel are not allowed near a turning auger. Hand tools may not be used near a turning auger.
- Noise levels must be determined. High noise boundaries must be posted, and appropriate personnel protection techniques must be used.
- Personnel must avoid skin contact with piles coated or treated with chemicals. Refer to the manufacturer's Material Safety Data Sheet (MSDS). Use protective barrier creams and protective clothing.
- Personnel must use a face shield and safety glasses when power sawing treated timber pile. For more information on personal protective equipment to use with chain saws, see SHE B-42.1.
- When work is to be performed over or in immediate proximity to a body of water where the potential for drowning exists, plan for personal flotation devices and rescue procedures. For more information on working over or near water, see SHE B-11.1.
- If any part of the equipment or load must come within 15 feet (4.5 meters) of an electrical source, follow the guidelines in SHE B-1.18.
- A fire extinguisher must be available during refueling.

3.7 Pile Extraction

Use a vibrator when extracting installed piles.

3.8 Environmental Precautions

3.8.1 Handling of Material – Use, storage, hauling, and disposal of material (such as spoils and treated pile wastes) must be in accordance with site, local, state, and governmental regulations.

3.8.2 Hydraulic Lines – Hydraulic lines must be maintained to prevent leakage. If catastrophic failure of a hydraulic system occurs, the spill must be cleaned up according to site, local, state, and governmental regulations. Sites should have a written procedure to respond to this type of spill.

4.0 REFERENCES

4.1 SHE A-21.1, *Planning Work in Plant Areas*

SHE B-1.18, *Use of Mobile Equipment Near Exposed Electric Lines*

SHE B-3.1, *Crane-Suspended Work Platforms*

SHE B-5.1, *Excavations - Inspection, Protective Systems, and Permitting*

SHE B-11.1, *Working Over or Near Water*

SHE B-42.1, *Lawn Mowers, Weed Cutters, and Chain Saws*

SHE C-1.1, *Mobile Cranes*

SHE C-2.1, *Aerial Lifts and Bucket Trucks*

SHE C-10.1, *Mobile Equipment Work Near Hazardous/Critical Pipe Lines*

4.2 OSHA 29 CFR 1926.603, *Pile Driving Equipment*

ATTACHMENT B-5.1-2

Part 4: Competent person completes this section before excavation.

Soil Classification (check one): ☐ Stable Rock ☐ Type A ☐ Type B ☒ Type C

	YES	NO	N/A
Have all SHE B-5.1 requirements been met and the required data documented?	☑	☐	☐
Is the excavation close to utilities, buildings, footings, pilings, or sources of vibration?	☑	☐	☐
Have the owners of utility, service, and transmission piping been contacted?	☑	☐	☐
Has detection equipment been used to locate all underground interferences?	☑	☐	☐
Has a check has been made for previously disturbed ground?	☑	☐	☐
Has the adequacy and availability of all equipment been checked, including personal protective equipment, shoring material, signs, barricades, and machinery?	☑	☐	☐
Has a check has been made for other obstructions (e.g., footing concrete encasements)?	☑	☐	☐

If other obstructions have been found, list them. None Found

Allowable slope: 1½:1

Comments:

Part 5: Competent person completes this section during excavation.

Size of Excavation: depth 15' width 45' length 200'

	YES	NO	N/A
Have changing ground conditions been checked, particularly after rainfall?	☑	☐	☐
Has monitoring been performed to check for possible oxygen deficiency or gaseous conditions?	☐	☐	☑
Has the adequacy of shoring and/or sloping been checked as work progresses?	☑	☐	☐
Do vehicular and machinery operation patterns need to be changed?	☐	☑	☐
Are water removal operations or equipment needed?	☑	☐	☐
Has the adequacy of portable trench boxes or trench shields been checked?	☐	☐	☑

Entrance and exit facilities: ☑ stairway ☑ ladders ☐ ramp

If the depth of the excavation is 5 feet (1.5 meters) or more, check the applicable OSHA appendix below:

- ☑ B - Sloping and Benching
- ☐ C - Timber Shoring for Trenches
- ☐ D - Aluminum Hydraulic Shoring for Trenching
- ☐ E - Alternatives to Timber Shoring
- ☐ F - Selection of Protective Systems

NOTE: *Sloping or benching for excavations deeper than 20 feet (6 meters) deep must be designed by a registered professional engineer.*

Part 6: Competent person completes this section if no protective system is needed.

The excavation requires no protective systems for the following reasons (list):

Competent Person Mike R Sears Date: 11/2/92

ATTACHMENT B-5.1-3

Daily Excavation Inspection Report

Site Stine / Haskell Research Facility

Location of Excavation N.W. Corner of Building 190

Depth 15'

Soil Type C

ITEMS	CONDITION good	rejected	n/a	REMARKS
Slope Ratio	✓			
Shoring			✓	
Shielding			✓	
Barricades	✓			
Water Removal	✓			
Traffic Control	✓			
Spoil Pile	✓			

Atmosphere	O_2	Time	Explosimeter
	20.0 %	1/2/92 7:30 a.m.	0 %
	%		%
	%		%
	%		%
	%		%
	%		%
	%		%
	%		%
	%		%
	%		%

Competent Person Mike R. Sein

Date 1/2/92 Time 7:30 a.m.

ATTACHMENT B-5.1-1

Excavation Safety Checklist

Job Site

	YES	NO	N/A
Prior to starting the job, were utilities notified and underground services located?	☑	☐	☐
Were overhead transmission lines noted and precautions taken to ensure that equipment does not come in contact with them?	☑	☐	☐
Have adequate signs been posted and barricades provided?	☑	☐	☐
Are the workers wearing reflective vests if necessary?	☐	☐	☑
Are vehicles, equipment, and spoil piles correctly placed to allow for the safe passage of traffic and the progress of construction?	☑	☐	☐
Has traffic control (fire departments, etc.) been notified?	☑	☐	☐
Is the appropriate safety gear on site?	☑	☐	☐

Excavation

	YES	NO	N/A
Have the supervisors and workers been trained in excavation safety laws and procedures?	☑	☐	☐
Have buildings, utility poles, trees, and any other surface encumbrances or destabilizing forces been taken into consideration?	☑	☐	☐
Has soil classification been done?	☑	☐	☐
Has the appropriate means of safeguarding the excavation by OSHA requirements been determined?	☑	☐	☐
For excavations 4 feet (1.2 meters) deep or more, are ladders, steps, or ramps available within 25 feet (7.6 meters) of lateral travel?	☑	☐	☐
Are spoil piles at least three feet (one meter) from the edge of the excavation and properly sloped?	☑	☐	☐
Have confined-space atmospheric hazards been considered? (For more information on confined-space entry, see SHE B-24.1.)	☑	☐	☐
Have undermined structures been shored, braced, or underpinned, or has a registered professional engineer determined that such measures are not necessary?	☐	☐	☑
Do bridges and walkways have standard guardrails?	☐	☐	☑
Are utilities crossing the excavation supported from above, and does protection from falling material exist?	☑	☐	☐
Have means been provided to remove water from the excavation?	☑	☐	☐
Are all open pits or shafts either covered or barricaded?	☑	☐	☐
Is a competent person available to make at least daily inspections?	☑	☐	☐

NOTE: *Shoring and shielding must be removed in a manner that ensures the safety of workers, and excavations must be backfilled as soon as work is completed.*

ATTACHMENT B-5.1-2

Excavation Permit

Part 1: Initiator completes this section.

Work Performed By: W.B. Cloud - Civil Supt. Reference Drawing: W-51727

Location of Excavation: 30' off N.W. Corner of Building 190
(Use coordinates outside buildings or column lines inside buildings)

Reason for Excavation: Install new sewer line

Start Date: 1/2/92 Permit Expiration Date: 1/9/92

Initiator Name: Joe B. Safe Date: 1/1/92 Phone: 451-0808

Part 2: Construction engineer completes this section.

Utilities	Present in Excavation Area	Comments
Power Service Lines:		
– Water	☐	
– Sewer	☐	
– Gas	☐	
Electrical Lines	☒	12 KVA - Insulated - Cannot be de-energized
Fire Lines	☒	Notify plant Fire Marshall Daily
Process Lines	☐	
Equipment	☐	

Reference Drawing: W-51729

Special Precautions and Safety Requirements (check those required on the excavation site):

- ☒ Electrical Observer
- ☐ Explosion Testing
- ☐ Standby Person
- ☒ Barricades
- ☐ Testing for Fume or Gas
- ☒ Competent Person (See Reverse Side)
- ☐ Grounding of Tools
- ☐ Special Clothing
- ☐ Other (Specify)

Comments:

Part 3: Construction engineer is responsible for obtaining the relevant approval signatures in this section.

W.B. Gray — Site Engineering

C.H. Goodman — Operating Supervision

H.L. Energy — Power Services Supervision

Dan B. Sykes — Electrical Supervision

Larry W. Farmer — Fire Protection Supervision

W.B. Murphy — Construction Maintenance

Joe B. Safe — Construction Engineer

Tom T. Hall — Contractor Superintendent

Clyde Farmer — Pipe Superintendent

Fred Stacks — Electrical Superintendent

Mike P. Sees — Excavation Competent Person

Continued on

When shoring and shielding systems are not based on the soil classifications for Type A, B, or C soils, they must be designed by a registered professional engineer.

3.3 Ensuring the Stability of Adjacent Structures

When the stability of adjoining buildings, walls, sidewalks and pavements, or other structures is endangered by excavation operations, use support systems or other protective measures such as shoring, bracing, or underpinning to ensure their stability and to protect employees.

Do not excavate below the level of the base or footing of any foundation or retaining wall unless the excavation is in stable rock, or unless one of the following precautions has been taken:

- A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure.
- A registered professional engineer has determined that the structure is far enough away from the excavation so as not to be affected by the excavation activity.
- A registered professional engineer has determined that such excavation work will not pose a hazard to employees.

3.4 Installing and Removing Protective Systems

Install protective support systems from the top down, and securely connect all components of the support system.

When temporary removal of individual members is necessary, install other structural members to carry loads imposed on the support system.

As soon as the work is completed, dismantle the protective systems, working slowly from the bottom up. Backfilling and removal of support systems must progress together.

NOTE: ***Do not use plywood as a structural member.*** *Use it only for the prevention of local raveling (sloughing of trench faces) between shores.*

3.5 Materials and Equipment

To minimize employee exposure to hazards, follow the manufacturer's recommendations for using and maintaining manufactured materials and equipment. A competent person must examine all materials and equipment to ensure that they are adequately maintained, free from defects, and suitable for continued use.

3.6 Water Accumulation

Do not work in excavations where water has accumulated or is accumulating unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation.

The competent person must inspect excavations subject to run-offs from heavy rains and monitor for proper use of water-removal equipment.

Use diversion ditches, dikes, or other suitable means to prevent surface water from entering an excavation and provide adequate drainage of adjacent areas.

3.7 Hazardous Atmospheres

Hazards associated with confined space entry apply to many excavations. For more information on confined space entry, see SHE B-24.1.

A qualified person must test the atmosphere in excavations deeper than 4 feet (1.2 meters) where oxygen deficiency or a hazardous atmosphere could be expected to exist, such as a landfill area or areas where hazardous substances are stored or manufactured, or when the work could create a hazardous atmosphere.

Consider the appropriateness of using respiratory protection, ventilation, and emergency rescue equipment. For more information about respiratory protection, see SHE E-8.1.

Each employee working in bell-bottom pier holes or similar deep and confined footing excavations must wear a full-body harness with a securely attached lifeline, and must be attended at all times by a standby who can carry out rescue if necessary. A method of communication must be ensured, and in most cases a mechanical lifting device must be used.

EXCAVATIONS

3.8 Access and Egress

Provide safe access and egress for all excavations.

For excavations 4 feet (1.2 meters) deep or more, ladders, steps, or ramps for safe access and egress must be provided within 25 feet (7.6 meters) of lateral travel.

Structural ramps used only for the access or egress of people must be designed by a competent person. Structural ramps for the access or egress of equipment must be designed by a competent person qualified in structural design and must be constructed according to the design. (The competent person mentioned in this paragraph may not necessarily be the excavation competent person.)

When employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails must be provided. For more information on standard guardrails, see SHE B-6.1.

4.0 REFERENCES

4.1 SHE B-6.1, *Perimeter and Opening Protection – Floors, Walls, and Roof Edges*

SHE B-24.1, *Vessel and Confined Space Entry*

SHE E-8.1, *Respiratory Protection*

4.2 OSHA 29 CFR 1926.650, Subpart P, *Excavations*

4.3 Underground Services, Inc.
P.O. Box 39
West Chester, PA 19381
(215) 696-9220

5.0 FOR FURTHER INFORMATION

5.1 *Construction Standards for Excavations*, The Associated General Contractors of America

Tabulated Data – Tables and charts from OSHA 29 CFR 1926, Subpart P and Appendices A through E, or tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench – A narrow excavation (in relation to its length) made below the surface of the ground. The width of a trench is less than 15 feet (4.6 meters), and the depth is generally greater than its width.

3.0 GENERAL

Many excavation accidents are the direct result of inadequate initial planning. The construction engineer is responsible for planning the job. He or she must involve the site's competent person in planning and in all phases of the work. Every effort should be made during the design stage of the excavation to ensure safety by providing the necessary soil classifications and protective systems.

Some state OSHA programs require that the competent person be physically located at the work location when personnel are in an excavation. The construction engineer at each site should be aware of specific requirements in that site's jurisdiction.

3.1 Planning

3.1.1 Site Conditions – Before an excavation begins, the construction engineer must consider specific site conditions such as the following:

- presence of a competent person
- traffic
- vibrations in the vicinity of the worksite
- proximity of structures and their conditions
- soil
- surface water and groundwater
- chemical contamination of soil or water
- water table
- overhead and underground utilities
- weather

If desired, the construction engineer can use the attached sample safety checklist (see Attachment B-5.1-1) to help plan excavation safety.

3.1.2 Minimum Precautions – Before beginning the job, the construction engineer or a designee must initiate an excavation permit. (For a sample permit, see Attachment B-5.1-2.) The permit must be signed by a competent person. Its purpose is to ensure that all interferences that might be encountered during underground digging are identified and located before the work begins. The use of detection equipment is the preferred method for locating underground interferences. One company that provides this service, using the Soft Dig® method, is Underground Services, Inc. (For the company's address and phone number, see section 4.3.)

Where underground electrical interferences are anticipated and all means of positive locating and de-energization have been exhausted, consider additional precautions such as the following:

- Use a fiberglass-handled, round-point shovel for hand digging. The person digging should have adequately rated and currently inspected lineman's gloves and/or must stand on a rubber blanket.
- Provide a Nomex® suit with a hood for the person digging.
- Equip powered tools or equipment (e.g., backhoes or jackhammers) with a ground installed by a qualified electrician.
- Use an additional ground person ("spotter") to watch for and signal the backhoe operator.

3.1.3 Minimum Precautions – Before beginning an excavation, the construction engineer or designee must take the following additional minimal precautions:

- Provide warning vests for employees exposed to vehicular traffic.
- Remove or stabilize all surface encumbrances that create hazards to employees such as trees, spoil dirt, or boulders.
- Erect either warning barricades or rigid, protective barricades to avoid leaving an excavation hazard unprotected. If warning barricades are used, place them a minimum of 5 feet (1.5 meters) from the excavation edge. A spoil pile at least 3 feet (1 meter) high can be used as a barricade on one side of the excavation. Barricades must be marked with battery-powered flashing warning lights if they are in or near walkways or roadways.
- Provide warning systems such as barricades, hand or mechanical signals, or stop logs to alert operators of mobile equipment that they are approaching the edge of excavations.

- Keep spoil dirt and any material or equipment that may fall into an excavation at least 3 feet (1 meter) from the edge.
- Remove loose rock or soil that could fall from the face of an excavation.
- Protect, support, or remove underground installations (e.g., electrical duct banks, water lines, sewer lines, or fire lines) as necessary to protect employees and the environment.
- Prohibit employees from working or passing under the loads of lifting or digging equipment.
- Provide support systems such as shoring, bracing, or underpinning to ensure the stability of adjoining buildings, walls, or other structures endangered by excavation operations.
- Ensure that a competent person performs inspections of excavations, adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions. These inspections must be performed at least daily, and more frequently if conditions warrant. For a sample daily inspection report form, see Attachment B-5.1-3.

3.2 Protective Systems (Sloping, Benching, Shoring, and Shielding)

3.2.1 Choosing Appropriate Protective Systems – For soil depths up to 20 feet (6 meters), soil classification determines the sloping, shoring, and shielding requirements, as explained in sections 3.2.2 and 3.2.3. Soil classification must be performed by a competent person.

Protective systems for excavations deeper than 20 feet (6 meters) must be designed by a registered professional engineer.

Protective systems are not required in the following situations:

- when an excavation is made entirely in stable rock
- when an excavation is less than 5 feet (1.5 meters) deep, and a competent person has examined the ground and found no potential for a cave-in

The competent person must document, on the excavation permit, the basis for any decision not to provide a protective system (see Attachment B-5.1-2, part 6).

3.2.2 Sloping and Benching – When excavating in an area where the soil has been classified, sloping is based on the following three types of soil classification:

- Type A soil includes cohesive soils with unconfined compressive strength of 1.5 tons per square foot (126 kilograms per square meter) or greater (unless the soil is fissured subject to vibration, or has been previously disturbed or subject to other factors that would require it to be classified as a less stable material). When excavating in Type A soil, the maximum allowable slope is 3/4 horizontal to 1 vertical (53°).
- Type B soil includes cohesive soil with an unconfined compressive strength greater than 0.5 tons per square foot (42 kilograms per square meter) but less than 1.5 tons per square foot (126 kilograms per square meter). When excavating in Type B soil, the maximum allowable slope is 1 horizontal to 1 vertical (45°).
- Type C soil includes cohesive soil with an unconfined compressive strength of 0.5 tons or less per square foot (42 kilograms per square meter). When excavating in Type C soil, the maximum allowable slope is 1-1/2 horizontal to 1 vertical (34°).

When sloping and benching protective systems are not based on the soil classifications for Type A, B, or C soils, they must be designed by a registered professional engineer or sloped at an angle no steeper than 1-1/2 horizontal to 1 vertical.

Designs of sloping or benching systems using tabulated data must be in written form, must be approved by a registered professional engineer, and must be maintained at the job site during construction of the protective system.

3.2.3 Shoring and Shielding – For information on timber shoring, refer to OSHA 29 CFR 1926.650. When using hydraulic shoring, trench jacks, air shores, and shields, follow all of the manufacturer specifications, recommendations, and limitations.

All tabulated data must be maintained at the job site during the construction of protective systems. The design of support systems, shield systems, or protective systems (other than a manufacturer's design) must be approved by a registered professional engineer.

ATTACHMENT C-5.2-2

Equipment Operator Qualification

(Please check appropriate equipment.)

Backhoe ____

Bulldozer ____

Dump Truck ____

Front-end Loader ✓

Grader ____

Hydraulic Excavator ____

Other ____

John R. Jones employed by
(Operator's Name)

V G Construction, Inc. is authorized to
(Employer's Name)

operate this equipment Komatsu WA 250
(Equipment Make/Model)

and for the specific equipment to be operated:

- has the physical and mental abilities required to operate the equipment.
- has read the specific equipment manufacturer's operating manual.
- has received and successfully completed specific written and/or oral training and instructions on the equipment to be operated.
- has demonstrated proficiency in the safe operation of the equipment to be operated.

Verified by William S. Holden 05/07/91
Employer Representative Date

John R. Jones 05/07/91
Employee's Signature Date

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PAGE 1 OF 5	

EXCAVATIONS

1.0 SCOPE

This procedure describes the safety precautions and protective systems that help protect workers from excavation hazards.

2.0 DEFINITIONS

Bell-bottom Pier Hole – A type of shaft or footing excavation in which the bottom is made larger than the cross section above to form a belled shape.

Benching – A system that protects employees from excavation cave-ins by cutting the sides of an excavation to form horizontal levels or steps, with vertical or nearly vertical surfaces between the levels.

Competent Person – For the purposes of this procedure, one who has specific training in soil analysis and the use of protective systems; knows the requirements of OSHA 29 CFR 1926, Subpart P; can identify and predict hazards or working conditions that are unsanitary, hazardous, or dangerous to employees; and is authorized to take prompt corrective measures to eliminate them.

Excavation – Any manmade cut, cavity, trench, or depression in an earth surface that is formed by earth removal.

Hazardous Atmosphere – An atmosphere that is explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful and may cause death, illness, or injury.

Protective System – For the purposes of this procedure, a method of protecting employees from excavation cave-ins, material that could fall or roll from an excavation face or into an excavation, or the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp – An inclined walking or working surface made from earth or structural materials such as steel or wood.

Registered Professional Engineer – A person who is registered as a professional engineer in the state where the work is to be performed. For the purposes of this procedure, a professional engineer registered in any state is considered a "registered professional engineer" when approving either designs for manufactured protective systems or tabulated data for interstate commerce.

Shielding – A system that protects employees from excavation cave-ins by erecting a structure that can withstand the forces imposed on it during a cave-in. Shields can be either permanent structures or portable structures that are moved as the work progresses. They can be either premanufactured or job-built in accordance with OSHA 29 CFR 1926.652, Section (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring – A metal hydraulic, mechanical, or timber structure that supports the sides of an excavation and is designed to prevent cave-ins.

Sloping – A system that protects employees from excavation cave-ins by forming sides of an excavation that are inclined at an angle away from center. The angle of the incline required to prevent a cave-in varies with differences in soil type, environmental conditions of exposure, and the application of additional weight on the walls from external sources, such as stored excavated materials, operating equipment, or traffic.

Soil Classification – A method of classifying soil and rock deposits as stable rock, Type A, Type B, or Type C (in decreasing order of stability). Categories are based on the properties and performance characteristics of the deposits and on environmental exposure conditions.

Structural Ramp – A ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

ATTACHMENT C-5.2-1

Earth-Moving Equipment Inspection

Check equipment to be inspected: Dump Truck _____ Front-end Loader ✓
Backhoe _____ Bulldozer _____ Motor Grader _____
Other _____

Equipment identification number BXL 565 RS 484 KOMATSU WA 250

ITEMS	CONDITION good	rejected	n/a	REMARKS
1. Access & Egress*	✓			
2. Backup Alarms*	✓		✓	
3. Body				
4. Boom Excess Movement*	✓		✓	
5. Boom Pins*				
6. Brakes*	✓			
7. Bulk Head Partition*			✓	
8. Clutch*	✓			
9. Cotter Pins/Hardened Pins*			✓	
10. Cover	✓			
11. Fire Extinguisher	✓			
12. Frame	✓			
13. Fuel Systems*	✓			
14. Glass*	✓			
15. Guards*	✓			
16. Horn*		✓		HORN DOES NOT WORK. DO NOT USE UNTIL HORN IS FIXED.
17. Hydraulic System* (no leaks)	✓			
18. Levers All Labeled*	✓			
19. Lights	✓			
20. Lugs	✓			
21. Muffler & Exhaust Pipe*	✓			
22. Muffler Guards*	✓			
23. Outriggers*			✓	
24. Parking Brakes*	✓			
25. Platform Decking	✓			
26. Positive Dump Bed Latch*			✓	
27. Rear View Mirror	✓			
28. Rollover Protection*	✓			
29. Seat Belts*	✓			
30. Side Mirrors (Both)*			✓	
31. Steering Mechanism*	✓			
32. Tracks, Tires, Wheels*	✓			
33. Turn Signals			✓	
34. Windshield Wipers	✓			

* If any of these are rejected, the equipment shall not be used.

J. G. Smith
Inspected by

05/07/91
Date

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	PAGE 1 OF 2

EARTH-MOVING EQUIPMENT

1.0 SCOPE

This procedure provides minimum requirements for inspecting and operating earth-moving equipment. This procedure covers equipment such as dump trucks, front-end loaders, bulldozers, graders, backhoes, and tracked and rubber-tired hydraulic excavators, such as Gradalls.

2.0 DEFINITIONS

Earth-Moving Equipment – All rubber-tired, self-propelled scrapers, rubber-tired front-end loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler tractors, crawler-type loaders, and motor graders, with or without attachments, that are used in construction work.

Engineer – The person who requests the work and is responsible for the safety, quality, and timing of the work requested.

Qualified Inspector – An experienced craftsperson or engineer (Du Pont or contractor) who has demonstrated his or her ability or competency to inspect equipment to the site manager and/or the Du Pont Fleet Operations designee.

Qualified Operator – An experienced craftsperson who has received training and demonstrated competency to operate a specific piece of equipment.

Site Manager – The highest level Engineering employee responsible for work conducted on the site.

3.0 GENERAL

3.1 Inspection of Earth-Moving Equipment

A qualified inspector must inspect all contractor-owned or company-owned earth-moving equipment before its use on site and at least quarterly thereafter. (Rental equipment is considered contractor-owned.) The inspector should use an Earth-Moving Equipment Inspection form (Attachment C-5.2-1) or its equivalent.

3.2 Qualification of Operators

Only qualified operators may operate earth-moving equipment.

Before an operator uses earth-moving equipment on site, the operator's employer must furnish to the site manager a description of how the operator has been qualified. In addition, the operator's employer must submit an Equipment Operator Qualification form (Attachment C-5.2-2) or its equivalent to the site manager and/or designee.

3.3 Permits

Permits should be site-specific and handled according to site procedures.

3.4 Operation

Operate earth-moving equipment according to the posted safe speed limit.

Equipment operated on public roadways must meet the requirements of the local governing body.

Earth-moving equipment may carry only as many people as there are factory-installed seat belts. If equipment is not equipped with factory-installed seat belts, and local, state, or government regulations allow this equipment to be operated without seat belts, then only the operator should be allowed to ride the equipment.

During refueling of this equipment the engine must be shut off, and a fire extinguisher must be present.

Any earth-moving equipment operated after dark and/or under limited lighting must be equipped with factory-installed lighting or equivalent lighting subject to the qualified inspector's or site manager's approval.

Flammable and explosive environmental classifications must be considered before using earth-moving equipment in any operating area. For more information on classifications, see SHE A-21.1.

Personnel must not occupy excavators or loader buckets during the operation of the equipment.

.hen using continuous-tracked equipment, place protection on paved road surfaces to prevent damage.

3.5 Hydraulic Lines

Hydraulic lines must be maintained to prevent leakage. If catastrophic failure of a hydraulic system occurs, the spill must be cleaned up according to site, local, state, and governmental regulations. Sites should have a written procedure to respond to this type of spill.

3.6 Backhoes

"Walking" and/or straddling a backhoe across an open trench should be avoided. If walking or straddling is necessary, the engineer must plan the job.

Backhoes must not be used for any operations exceeding the manufacturer's recommendations or the capability of the equipment (e.g., unloading a truck with a backhoe boom instead of a crane). If the manufacturer permits the use of a backhoe as a "crane," rigging must be according to the site standards and must be attached to the bucket according to the manufacturer's recommendations, and load charts showing load and radius capacities must be in the backhoe.

3.7 Trucks with Dumping Beds

If the cab of a dump truck is equipped with vertical and horizontal protection (designed to withstand the impact of the material being loaded), all personnel may remain in the cab of the dump truck during the loading of the dump bed with materials less than 3 inches (7.5 centimeters) in diameter. If the cab has insufficient protection and/or the materials are larger than 3 inches (7.5 centimeters) in diameter, then all personnel must leave the truck during loading and must wear all required site-specific safety equipment (i.e., hard hats and safety glasses) when they are outside the vehicle.

Personnel must not be transported in the bed of any dump truck that has the capability to dump.

When dumping a load, follow the manufacturer's recommendation on ground conditions. These recommendations give the "acceptable" slope of the terrain when operating the dump bed.

Dumping operations must be performed on stable, compacted areas. When dumping loads on the elevated edges of "new fill" areas, the engineer should develop a plan to prevent the dump truck from entering the area of unstable material.

Refer to SHE E-14.1 and SHE E-15.1 for removal of material from a Du Pont site.

Before and during the operation of a dump truck with the bed in the "up" position, the operator must verify and check the overhead clearances during forward and backward movements. The engineer must be sure that the dumping operation does not conflict with the requirements of SHE B-1.18 and SHE C-10.1.

Use a positive bed lock when any work is required under the dumping bed when the bed is in an "up" position.

3.8 Rollover Protection Systems

All earth-moving equipment except dump trucks and hydraulic excavators requires rollover protection. All backhoes require rollover protection except a backhoe attachment mounted on a tractor of less than 20 horsepower.

4.0 REFERENCES

4.1 SHE A-21.1, *Planning Work in Plant Areas*

SHE B-1.18, *Use of Mobile Equipment Near Exposed Electric Lines*

SHE C-10.1, *Mobile Equipment Work Near Hazardous/Critical Pipe Lines*

SHE E-14.1, *Federal Environmental Regulations (CERCLA, RCRA, and SARA)*

SHE E-15.1, *Storage, Handling, and Disposal of Hazardous Materials*

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PERSONAL PROTECTIVE EQUIPMENT

1.0 SCOPE

This procedure outlines the guidelines pertaining to the issue and use of personal protective equipment (PPE), including safety shoes, hard hats, gloves, hearing protection, and eye protection.

2.0 DEFINITIONS

This procedure contains no unique definitions.

3.0 GENERAL

All personal protective equipment must meet or exceed all local, state, and federal regulations.

3.1 Safety Shoes

All employers must require all employees to wear safety shoes whenever feet are exposed to potential hazards. Safety shoes may be readily available through stock, shoemobile, or special order at cost to employees. All safety shoes must meet the requirements of the current issue of ANSI Z41.

3.2 Hard Hats

Employees must wear hard hats in all Du Pont construction areas and when plant operational procedures require hard hats. Office employees and visitors must also wear hard hats when they go to field sites and shops. Individual sites must specify where hard hats are NOT required.

Hard hats must conform to the current issue of ANSI Z89.1. Hard hats must be worn with the brim in the front except when an employee is welding or performing other similar activities. Metal hard hats are not permitted. Hard hats must be inspected for cracks or other evidence that the hard hat needs to be replaced.

3.3 Gloves

All Du Pont construction employees are expected to possess and use good quality gloves appropriate to their work. Gloves must not be worn when performing tasks where glove use would increase the possibility of injury, such as work involving rotating equipment. Gloves must be provided for unusual jobs as deemed appropriate by site management.

3.4 Hearing Protection

Hearing protection must be worn by employees exposed to noise levels that exceed 90 dbA, 8-hour time-weighted average (TWA). A continuing, effective hearing conservation program must be provided for each employee exposed to noise levels of more than 90 dbA, 8-hour TWA. Hearing protection and hearing conservation programs must meet the requirements of SHE E-6.1.

3.5 Eye Protection

All employees performing work requiring eye protection must wear safety glasses with side shields. The frames, lenses, and side shields must meet the requirements of the current issue of ANSI Z87.1. Additional types of eye protection may be required, depending on the hazard involved. Other types of eye protection must be provided for unusual jobs as deemed appropriate by site management. For more information on eye protection, see SHE F-2.1.

3.6 Other Protective Equipment

Other types of personal protective equipment items such as safety belts, respirators, and face shields must be maintained for issue as deemed appropriate by site management. For information on safety belts, respirators, and face shields, refer to SHE B-8.1, SHE E-8.1, and SHE F-2.1, respectively.

3.7 Cleaning

All personal protective equipment, such as safety glasses, hard hats, rubber boots, and respirators, must be sterilized prior to reissue.

.0 REFERENCES

.1 SHE B-8.1, *Continuous Fall Protection*

SHE E-6.1, *Noise Control and Hearing Conservation*

SHE E-8.1, *Respiratory Protection*

SHE F-2.1, *Eye and Face Protection*

4.2 ANSI Z41, *Safety-Toe Footwear*

ANSI Z87.1, *Occupational and Educational Eye and Face Protection, Practice for*

ANSI Z89.1, *Industrial Workers, Protective Headwear for*

5.0 FOR FURTHER INFORMATION

5.1 SHE B-1.4, *Work On or Near Energized Electrical Services and/or Equipment*

SHE B-1.8, *Energized Motor Control Centers*

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	PAGE 1 OF 2

EYE AND FACE PROTECTION

1.0 SCOPE

This procedure outlines eye and face protection requirements for Engineering function personnel and visitors.

2.0 DEFINITIONS

Engineering Function Personnel – For the purposes of this procedure, all personnel assigned to the Engineering function site organization and all contractor personnel performing construction and construction-related services under contracts being administered by the Engineering function site organization.

3.0 GENERAL

All personnel must be equipped with eye and face protection appropriate for the task being performed or as required by site policy. Engineering function personnel must wear approved safety glasses. Visitors who do not have safety glasses must wear approved visitors' glasses or goggles.

3.1 Eye Protection

3.1.1 Requirements for Safety Glasses – All safety glasses must have side shields and comply with the current issue of ANSI Z87.1. Side shields may be permanently attached or detachable. Use only detachable side shields made of rigid material that can be secured to the glasses.

Lenses of all safety glasses must be marked with the manufacturer's trademark. Frames must have "Z87" stamped on the front and both temple pieces.

3.1.2 Safety Glasses – All personnel must wear approved safety glasses in locations and during activities such as the following:

- in all construction shops
- in fabrication areas adjacent to shops
- in any additional areas designated by specific plant requirements
- while drilling, chipping, pouring concrete, hitting steel on steel, driving nails, power sawing, and performing similar tasks

The site manager can designate an entire Engineering function site as a 100-percent eye protection area.

3.1.3 Visitors' Glasses – All visitors must wear ANSI-approved visitors' glasses provided by the site unless they are wearing safety glasses that comply with ANSI Z87.1.

3.1.4 Prescription Glasses – All prescription glasses worn in lieu of safety glasses must comply with ANSI Z87.1 and must have side shields as specified in section 3.1.1 of this procedure.

3.2 Face Protection

3.2.1 Face Shields – Always wear face shields during activities such as the following:

- grinding
- cad welding
- handling chemicals, corrosive liquids, or molten materials
- chain sawing
- chipping

Always wear safety glasses with face shields. Face shields protect only the face and do not meet ANSI Z87.1 requirements for eye protection.

3.2.2 Mono Goggles – Always wear mono goggles during activities such as the following:

- handling corrosive liquids or solvents (use acid goggles)
- power chipping or breaking
- overhead drilling
- sanding

NOTE: *Site procedures should address plant requirements on whether to use vented or unvented mono goggles.*

EYE AND FACE PROTECTION

2.3 **Welding Shields** – Use an approved welding shield with no less than a #10 filter plate and safety lenses on both sides during all welding operations. Refer to Engineering Standard S4H, Table 1, and SHE B-1.14 for further information.

3.2.4 **Burning Goggles** – Use an approved burning goggle with no less than a #4 filter plate and safety lenses on both sides during all burning operations. Refer to Engineering Standard S4H, Table 1, and SHE D-5.1 for further information on required eye protection.

4.0 REFERENCES

4.1 SHE B-1.14, *Electric Welding and Portable Generators*

SHE D-5.1, *Welding, Cutting, Burning, Heating, or Melting*

4.2 Engineering Standard S4H, *Eye Protection*

4.3 ANSI Z87.1, *Practice for Occupational and Educational Eye and Face Protection*

Is the dump system operating properly? Will it dump when released?

11. Are all control systems operational?

12. Are all safety systems operational?

13. Are safeguards in place to protect personnel if the equipment becomes damaged; for instance, if a hose bursts, releasing corrosive chemicals or flammable liquids?

14. Do you know the location of emergency medical aid?

15. Have you inspected the pressure gauges, and are they in good working order? (Gauges should have a scale range at least 50 percent above maximum working pressure.)

16. Have you obtained all necessary permits and clearances?

NOTE: The practices listed in items 2, 3, 4, 6, 7, 8, 9, 10, 11, 13, and 14 are recommended by the United States Water Jet Technology Association in the *Recommended Practices Manual.*

For more information on the recommended practices for high-pressure water jetting, see Standard Engineering Specification SZ5B and M&C Procedure PP18. For a more complete checklist, see M&C Procedure PP18.

4.0 REFERENCES

4.1 Standard Engineering Specification SZ5B, *Power Water Cleaning*

Maintenance and Construction Procedure PP18, *High Pressure Water Cleaning Above 3,000 psig*

4.2 *Recommended Practices Manual,* 1987, United States Water Jet Technology Association (U.S.W.J.T.A.)

Forms may be copied or obtained from the Standards Group, Louviers Bldg, Wilmington, DE.

Name and Description of Equipment to be cleaned: _____

Location: _____ Date: _____

TO BE COMPLETED BY REP. OF THOSE PERFORMING THE WORK:

Signature Indicates Completed

1. All operators have 6 months HPWC experience and are trained in compliance with this procedure. Any operators with less than 6 months experience have been trained, are identified as "apprentices" below, and are under an experienced operator's close monitoring/control. _____
2. Personal protective equipment available/adequate. _____
3. Work site barricaded, hearing protection signs posted when required and free of tripping hazards. _____
4. Hoses checked for condition, secured, properly arranged and rated for a minimum $2^1/_2$ times the highest working pressure. _____
5. High-pressure hose connections tightened and have safety chains or equivalent. _____
6. "Failsafe" valves in proper location (two required on shotguns) and functioning. _____
7. Relief device rating checked against the lowest rated components. (See 6.1.) _____
8. Equipment guards in place (trigger guards, rotational guards). _____
9. Hose safety shroud in place. _____
10. Proper lance and jet nozzle (back thrust not to exceed approximately one-third of the operator's body weight in manual shotgun cleaning). _____
11. Lance hand guard deflector installed. _____
12. High-pressure system tested at operating pressure. _____
13. Footing conditions are firm. _____
14. Lighting is adequate. _____
15. Under no circumstances should the HPWC personnel hook up to plant utilities before receiving approval of Du Pont. _____

I have reviewed the above prejob checks and requirements before beginning the high-pressure cleaning work.

Signatures of:

TRAINED AND (6 MONTHS) EXPERIENCED OPERATORS

_____ _____ _____

_____ _____ _____

APPRENTICES, TRAINED WITH LESS THAN 6 MONTHS EXPERIENCE

_____ _____ _____

TO BE COMPLETED BY THE DU PONT JOB REPRESENTATIVE:

Signature

16. Equipment to be cleaned is properly dismantled, isolated, and tagged. _____
17. Tank entry permit, if required. _____
18. Prejob checklist items 1 thru 17 have been addressed by those performing the work. _____

APPROVED FOR HPWC WORK TO BEGIN: _____

Du Pont Job Rep.

FIGURE 1 – TYPICAL HIGH-PRESSURE WATER CLEANING CHECKLIST

AIR ANALYSIS

(WITH FORCED VENTILATION SHUT OFF)

TIME INITIAL	OXYGEN	FLAME	TOXIC

☐ CONTINUOUS AIR TESTING (WHEN PERSON IS IN CHAMBER)

SIGNATURE PERSON(S) ENTERING	SAFETY PERSON(S)	CALL PERSON(S)

★ WAIVER REQUIRED: (EXPLAIN BELOW)

AUTHORIZATION

★ WAIVER AUTHORIZATION

SHIFT 1		SAFETY
SHIFT 2		AREA
SHIFT 3		UNIT MGR/SUPT
Operating Supervisor	Entering Person s Supervisor(s)	

PERMIT IS VALID FOR 24 HOURS ONLY: MUST BE SIGNED EACH SHIFT.

HIGH-PRESSURE WATER JETTING

1.0 SCOPE

This procedure supplements Standard Engineering Specification SZ58. It applies to all water jetting, including the use of additives or abrasives, at pressures above 1,000 psi (6,900 kPa).

CAUTION: The lower limit of 1,000 psi (6,900 kPa) does not mean that pressures below 1,000 psi (6,900 kPa) cannot cause injury, or that they require any less attention to the principles outlined in Maintenance and Construction (M&C) Procedure PP18. Use adequate precautions at **all** pressures.

2.0 DEFINITIONS

High-Pressure Water Cleaning – The use of high-pressure water, with or without the addition of other liquids or solid particles, at a liquid pressure above 1,000 psi (6,900 kPa) at the orifice, to remove unwanted matter from various surfaces.

High-Pressure Water Cutting – The use of high-pressure water, with or without the addition of other liquids or solid particles, at a liquid pressure above 1,000 psi (6,900 kPa), to penetrate and cut a material.

High-Pressure Water Jet Systems – Water jet systems that spray water through nozzles or openings that increase the speed of the water. Solid particles or chemicals may be added to the water, but in all cases the liquid sprays in a free stream. These systems include pumps (pressure-reducing devices), hoses, lances, nozzles, valves, and safety devices, as well as any attached heating elements or injection systems.

Line Moling – The use of a self-propelled jet nozzle (mole) and a high-pressure hose hooked up to a high-power water jet system to clean the inside of piping systems.

3.0 GENERAL

3.1 Inspection and Testing

Each site must develop and implement a program for inspecting and testing hoses at least quarterly. The program must include audits, such as test witnessing. For more information on implementing such a program, including equipment set-up, inspection, and testing guidelines, see M&C Procedure PP18.

3.2 Personnel Qualifications

Any person operating or maintaining high-pressure water jetting equipment must be trained per M&C Procedure PP18 and must have demonstrated the ability and knowledge to operate the equipment.

3.3 Recommended Practices

Check the following items before performing each job:

1. Are necessary controls in place for excess water run-off? Are operating areas and equipment protected? Have you considered the possibility of environmental contamination? If run-off water encapsulating is required by federal, state, or local regulation, are appropriate procedures in place?
2. Have you protected electrical equipment?
3. Are the pressure ratings of all fittings correct and in good operating condition?
4. Have you taken precautions to prevent line mole reversal?
5. Is there a minimum 20 psi (140 kPa) clean water supply at the pump suction?
6. Is the filter on the pump suction clean and in good operating condition?
7. Have you flushed and removed air from the system before installing the nozzle?
8. Are all nozzles free from plugs and in good operating condition?
9. Have you taken precautions to prevent the system from freezing?

ATTACHMENT B-24.1-2

Vessel or Confined Space Entry Log

All employees entering this vessel or confined space have been instructed about potential hazards, necessary safety precautions, and protective emergency equipment requirements.

Y-1 P.P. Column
Vessel Name

4th Floor - Y-1 - C.P.
Area and Building

Name (Person Entering)	Date	Time In (Initial)	Time Out (Initial)
L. D. Rich	6/17/91	LDR 5:00 PM	LDR 6:30 PM
Y. Smith	6/17/91	Y.S 5:00 PM	Y.S 6:30 PM

CLOSED CHAMBER ENTRY PERMIT

CHAMBER _____

PERMIT DATE & TIME _____

PERMIT EXPIRES DATE & TIME _____

★ SEE BACK OF PERMIT IF APPLICABLE

PREPARATIONS	YES	NO
Forced Ventilation	☐	☐
Breathing Air (full face & escape cylinder)	☐	☐
Acid Suit	☐	☐
Vapor Proof Suit	☐	☐
Coverall Goggles	☐	☐
Harness and Life Line	☐	★
Air Analyzer (Test Calibrate)	☐	★
Chemical Gloves	☐	☐
Ear Protection	☐	☐
Lighting Flashlight	☐	☐
Barricades	☐	☐
Safety Shower Checked	☐	☐
Scaffold (inside vessel)	☐	☐
Entry Ladder	☐	☐
_____	☐	☐
_____	☐	☐

HAZARDS	YES	NO
Rail Car Motion	☐	☐
Toxic Material	☐	☐
Flammable Material	☐	☐
Hot Material	☐	☐
Welding Burning	☐	☐
Internal Plugs	☐	☐
External Fume Source	☐	☐
External Fire Source	☐	☐
_____	☐	☐
_____	☐	☐

ELECTRICAL	YES	NO
Ground Vessel	☐	☐
Ground Fault Interrupter	☐	★
Vapor Proof Lighting	☐	☐
Disconnect Elect. Tracing	☐	☐

EVACUATION	YES	NO
Safety Person - No. Req'd. _____		
Call Person - No. Req'd. _____		
Breathing Air (SCBA)	☐	★
Escape Resoirator	☐	★
Air Horn	☐	★
Flashlight	☐	☐
Hoist/Pulley	☐	☐
Litter/Stretcher	☐	☐
"Dummy" Rescue	☐	★
Emergency Radios	☐	☐

ISOLATION (Mark N/A when not applicable)	YES	NO
Lock Out Valves	☐	★
Disconnect Pipes	☐	★
Blank Pipes	☐	★
Disconnect Agitator Cooling	☐	☐
Pull Fuses	☐	☐
Disconnect Motor Leads	☐	★
Remove Charging Chute	☐	★
Remove Stack	☐	★
_____	☐	☐
_____	☐	☐

DISPLAY ON SITE

ATTACHMENT B-24.1-1

Vessel or Confined Space Entry Permit

1. Name of Vessel or Confined Space Y-1 P.P. Column
2. Location 4th Floor - Y-1 - C.P.
3. Purpose of Entry Inspect Vessel Walls
4. Date 6/17/91
5. Groups Entering Vessel or Confined Space Plant & Const.

6. Preparation	Yes	No	Signature
A. Has the V/CS been cleaned?	✓		
B. Has the V/CS been isolated?	✓		
C. Has all electric/air/hydraulic equipment been disconnected?	✓		
D. Have radiation sources been removed or shielded and locked?	✓		
E. Has a special job plan been written?	✓		

7. Hazard Analysis
   - A. What service has the V/CS been used for? Dacron Process
   - B. What potentially hazardous gases or toxic materials may be present or generated? None - Vessel Clean

NOTE: Tests required and results below.

Test Required	Test	Time/Date	Initials	Radiation Test
Oxygen (19.5-23.5%)	20%	1600/6/17/91	YS	YS. Prior to Initial Entry
Explosibility (0%)	0	1600/6/17/91	YS.	
Other	N/A			
Oxygen				Signature
Explosibility (0%)				
Other				

Continued on

8. **Preventive measures required at all times** (any deviation from required preventive measures must have management approval):

   A. All electrical equipment must be 12-volt or used with a GFCI.

   B. The entry standby person must be adequately trained.

   C. A second person must be within calling distance.

   D. The 30-minute SCBA or air-supplied respirator must be equipped with escape provisions and available at the entry point.

   E. Mechanical ventilation or fresh air breathing equipment must be worn for weld/burn.

   F. The rescue plan must be reviewed with all personnel entering the V/CS and all standby personnel.

   G. Safety belts, body, or wrist harness must be worn inside the V/CS.

   H. A secured lifeline must be worn when entering the V/CS.

   I. A flashlight must be available when artificial lighting is required in the V/CS.

9. **Optional preventive measures:**

	Yes	No	Signature
A. Fresh Air Mask Inside	✓		
B. Ladder		✓	
C. Personal Protective Equipment		✓	
D. Additional Ventilation	✓		
E. Distress Alarm at Entry	✓		
F. Chemical Hazard Film Badges		✓	
G. Mechanical Means of Rescue	✓		
H. Special Tools		✓	
I. Fire Extinguisher	✓		
J. Pneumatic Tools		✓	

10. **Approvals to enter vessel or confined space:**

	Time/Date
John Smith — Area/Owner	1600-6/17/91
Jack Brown — Engineering Function Engineer	1600-6/17/91
Tom Jones — Crew Supervisor	1600-6/17/91
N/A — Other Supervisor	Time/Date

VESSEL AND CONFINED SPACE ENTRY

3.4 Training

All personnel entering a V/CS, standby personnel, and back-up standby personnel must be instructed in the nature of possible hazards, the precautions to be taken to avoid incidents, and the use of protective and emergency equipment.

3.5 Process Isolation

All pipe lines to the V/CS must be physically disconnected or blanked before entry. For more information on process isolation, see SHE B-1.3.

3.6 Lock and Tag

Follow the steps outlined in SHE B-1.3 for locking, tagging, trying, and clearing process systems before entry into a V/CS.

The V/CS drive or agitator must be taken out of service by uncoupling the drive, removing belts, or disconnecting the motor leads. For more information on electrical locking and tagging, see SHE B-1.3.

Radioactive sources must be shielded, locked and tagged, or removed. For more information on radiation control, see SHE E-18.1.

3.7 Personal Safety and Escape Equipment

Personnel who work inside a V/CS, including all standby personnel, must be aware of personal safety, escape procedures, and equipment.

3.7.1 Grounding Cable – If the V/CS is equipped with a grounding cable, it must be Megger® tested to confirm the existence of a firm mechanical joint.

3.7.2 Low-Voltage Lighting and Electrical Equipment – Low-voltage (12-volt) lighting is preferred for use inside a V/CS. All other lighting sources must be protected by an approved ground fault current interrupter (GFCI). All electrical tools used inside a V/CS must be protected by an approved GFCI.

Lighting and tools should be on separate circuits. The GFCI, transformer, and disconnects must be located outside the V/CS. For more information on using GFCIs, see SHE B-1.15.

3.7.3 Safety Belts – All persons entering a V/CS must wear a safety belt. Where the entrance is too restricted to allow removal of a person equipped with a waist-type safety belt, use a shoulder-type safety harness or a wrist harness.

3.7.4 Lifelines – Because of the configuration of a V/CS or the large number of people involved, it may not be practical to keep lifelines attached. In such cases, the safety belt or harness must be worn, and the lifeline must be kept ready at the V/CS exit point in case of emergency.

3.7.5 Air Masks/Respirators – Consider the need for 5-minute escape air masks for personnel entering the V/CS. A 30-minute SCBA or air-supplied respirator equipped with escape provisions must be available at the entrance to the V/CS in case rescue assistance is needed.

3.7.6 Standby Person – At least one standby person must be at each point used to enter the V/CS. The standby person must have a 30-minute SCBA or air-supplied respirator equipped with escape provisions, a flashlight, and an air horn or some other reliable method for summoning additional assistance. The standby person's primary responsibility is to be attentive to the personnel inside the vessel.

3.7.7 Training and Certification – The standby person must be trained and certified in the use of the 30-minute SCBA and the air-supplied respirator with escape provisions.

3.7.8 Back-Up Standby Person – In case of emergency during V/CS entry, a back-up standby person must be available to assist the standby person.

3.7.9 Continuous Monitoring for Oxygen – Consider continuous monitoring for oxygen with an audio alarm monitoring system. For more information on portable oxygen analyzers, see Engineering Standard S6T.

3.8 V/CS Environment

Review the V/CS and its previous contents to ensure that the necessary ventilation, protective clothing, respiratory equipment, and fire prevention precautions have been specified and provided.

3.8.1 Protective Clothing and Equipment – If entry is required to clean the V/CS, provide appropriate protective clothing and equipment, and use appropriate test methods. For more information on protective clothing and equipment, see Engineering Standard S16G.

3.8.2 Breathable Atmosphere – Maintain a breathable atmosphere by either natural draft or forced ventilation. Compressed air must not be blown into a V/CS.

Air-supplied respiratory equipment with escape provisions is required when entering a V/CS where there is any oxygen deficiency (less than 19.5 percent).

3.8.3 Testing the Atmosphere – The atmosphere in the V/CS must be tested by a qualified person prior to entry, and special care must be taken to ensure that all accessible areas of the V/CS are sampled. The qualified person must do periodic tests in the vicinity of the work, and must agree upon and note the frequency of the sampling.

The atmosphere must meet the following conditions:

- oxygen – 19.5 percent minimum, 23.5 percent maximum
- flammable gases – 0 percent maximum
- toxic gases – 0 percent maximum or non-detectable
- radioactivity – not to exceed state regulations

If the above atmospheric conditions are not attainable, ensure that a special job plan is written. The job plan must be approved by site management.

If work being performed inside the vessel could generate flammable vapors or produce an oxygen-deficient atmosphere, test continuously while work is being performed. For more information on vapor and gas detectors, see Engineering Standard F6J.

Consult the Engineering function safety specialist for required toxicity and explosive information.

3.9 Welding and Burning

Personnel involved in welding and burning inside a V/CS must consider personal safety, equipment requirements, and potentially hazardous conditions.

3.9.1 Shell Material – Consider the possibility of flammable, explosive, or toxic materials being absorbed in the shell material prior to burning or welding.

3.9.2 Stripping Toxic Coatings – Strip all surfaces covered with toxic preservatives of all toxic coatings at least 2 feet (0.6 meters) from the area of heat application. If toxic coatings are not stripped, protect employees by air-supplied respirators and, if applicable, protective clothing.

3.9.3 Burning/Welding Procedures – When burning inside a V/CS, locate all cylinders **outside** the V/CS. Check hose connections for leakage prior to entry. When welding inside a V/CS, locate welding machines **outside** the V/CS. Remove all hoses from the V/CS at the end of the work shift unless multi-shift work is in progress.

3.10 Fume Releases

The V/CS permit is automatically cancelled in the event of a major emergency alarm, any fume alarm, or area fire alarm (except a test alarm). Personnel inside the V/CS must exit the V/CS and follow emergency procedures. When the "all-clear" is sounded, V/CS permits can be reinstated after atmospheric tests are retaken and the results are noted on the permit.

4.0 REFERENCES

4.1 SHE B-1.3, *Lock, Tag, Try, and Test (LT-3)*

SHE B-1.15, *Ground Fault Circuit Interrupters*

SHE E-18.1, *Radiation Control*

4.2 Engineering Standard S16G, *Vessel and Confined Space Entry*

Engineering Standard S6T, *Portable Oxygen Analyzers*

Engineering Standard F6J, *Portable Combustible Vapor and Gas Detectors*

5.0 FOR FURTHER INFORMATION

5.1 Standard Engineering Specification SW50W, *Welding, Thermal Cutting, and Related Procedures, Minimum Safe Practices*

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	PAGE 1 OF :

EQUIPMENT DECONTAMINATION BEFORE SHIPPING OFF SITE

1.0 SCOPE

This procedure outlines the requirements for decontamination and preparation of equipment prior to shipment off site.

2.0 DEFINITIONS

Decontamination – Methods used to remove contaminants and hazardous chemicals to a safe working level. Decontamination may involve steaming, sandblasting, water washing, neutralizing chemicals, removing asbestos or other respirable fibers, draining oil, or other methods.

Equipment – Any vessel, pipe, pump, or instrument that has been removed from service for repair, alteration, or scrap.

Material Safety Data Sheet (MSDS) – A technical product information sheet that details hazardous properties, health hazards, and handling precautions. The MSDS is available from the product manufacturer and/or distributor.

Supervisor – The person who oversees, directs, or manages the work and is ultimately responsible for the work performed.

3.0 GENERAL

3.1 Supervisor's Responsibility

The supervisor responsible for shipment of any equipment or materials to an off-site location must ensure that the equipment is completely decontaminated or made safe by containment prior to shipment. The equipment or materials must not expose any person, carrier, or vendor to possible injury caused by harmful chemicals or materials.

3.2 On-Site Responsibility

This procedure does not address equipment to remain on site or the decontamination or cleanup of the equipment for on-site personnel to perform revisions or alterations. However, the manufacturing group must verify that the equipment has been cleaned, decontaminated, and made safe for work to be performed on site. For further information on decontamination and cleanup, see SHE B-1.3 and SHE B-41.1.

3.3 Manufacturing Group

Consult the manufacturing group regarding the best way to decontaminate and prepare equipment to be shipped off site. The manufacturing group must verify that the equipment is adequately cleaned and safe for the intended modification (e.g., handling, cutting, grinding, and welding). The manufacturing group must also verify that the vendor to whom the equipment is shipped to is qualified, and that the shipment meets Department of Transportation (DOT) and Remember How You Treat Hazardous Material (RHYTHM) requirements. For further information on welding and cutting, see Standard Engineering Specification SW50W and SHE D-5.1.

3.4 MSDS Required

Any equipment to be shipped off site by Engineering must be accompanied by a Material Safety Data Sheet (MSDS). Any known hazards associated with the vendor's work must be communicated in writing to the vendor.

3.5 Required Labeling

Follow the labeling requirements in SHE E-7.1 when preparing material to be shipped off site.

4.0 REFERENCES

4.1 SHE B-1.3, *Lock, Tag, Try, and Test (LT-3)*

SHE B-41.1, *Isolation from Plant Processes*

SHE D-5.1, *Welding, Cutting, Burning, Heating, or Melting*

SHE E-7.1, *Hazards Communications*

4.2 Standard Engineering Specification SW50W, *Welding, Thermal Cutting, and Related Procedures, Minimum Safe Practices*

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	PAGE 1 OF 3

VESSEL AND CONFINED SPACE ENTRY

1.0 SCOPE

This procedure outlines the minimum safety requirements for work inside a vessel or confined space (V/CS). This procedure also lists requirements for protecting individuals in a V/CS from hazards such as oxygen deficiency, hazardous materials, moving parts, and blocked escape routes.

2.0 DEFINITIONS

Back-up Standby Person – A person whose primary responsibility is to provide immediate assistance to a standby person. The back-up standby person must be available by means of verbal contact, two-way radio, or PA system to help the standby person in an emergency.

Entry – Breaking the plane of the vessel opening with any part of the body.

Hands and Arms Entry – Breaking the plane of the vessel opening with hands and arms only.

Standby Person – A person who must be in continual visual or hearing contact with personnel inside the V/CS. A standby person must be adequately trained to monitor the activities of personnel inside the V/CS.

Vessel or Confined Space (V/CS) – Any enclosure with limited access that presents a hazard to anyone entering. Examples include tanks, tank cars, vessels, vessel skirts, hoppers, open vessels, trenches, or pits deeper than 5 feet (1.5 meters), diked areas with walls higher than 5 feet (1.5 meters), vaults, pipe lines, tunnels, duct work, and manholes.

3.0 GENERAL

3.1 Permit and Entry Log Requirements

Prior to V/CS entry, supervision must sign a permit authorizing entry into the V/CS and outlining specific requirements. See Attachment B-24.1-1 for a sample V/CS entry permit. The permit is valid only for the job, location, and time period specified. For V/CS work in an operating area, the permit must be approved by all concerned (the area/owner. Engineering function engineer, craft supervisor, and any other supervisor involved).

Exceptions to the V/CS permit and alternate measures must be individually identified and described on the permit.

All persons entering the V/CS, standby personnel, and back-up standby personnel must review and sign a V/CS entry log. See Attachment B-24.1-2 for a sample V/CS entry log.

Both the V/CS permit and the entry log must be posted near the entry point of the V/CS.

3.2 Rescue Plan

A rescue plan must be developed and reviewed with all personnel entering the V/CS and all standby personnel. The rescue plan must include the following:

- who and how to call for assistance in case of emergency
- how persons are to be removed from the V/CS in case of an emergency

3.3 Rescue Procedure

If a person inside a V/CS is unconscious, the standby person should not enter the vessel, but should try to remove the person by using the safety belt or harness. As a last resort, the standby person may don self-contained breathing apparatus (SCBA) or an air-supplied respirator with escape bottle, and remove the person. The standby person should not enter the vessel until a back-up standby person is at the entrance of the V/CS.

ACCESS/EGRESS IN CONSTRUCTION AREAS

3 Planning Above-Grade Access/Egress

When planning elevated work, consider the following:

- Employ engineering resources to attempt to eliminate all fall hazards. Use personal fall protection as a last resort.
- Determine the location of relief valves or emergency alarms.
- Provide a sufficient number of ladders to allow adequate personnel escape time in the event of an emergency. Take into account travel distance between ladders.
- Provide an emergency evacuation plan. Include information on respiratory protection devices to use during emergency escapes. For more information on respiratory protection, see SHE E-8.1.
- Plan response to medical emergency. Ensure the availability of special devices for evacuation of injured or incapacitated personnel.
- Use standby personnel if necessary.
- Use permanent or temporary stairways, ramps, or runways whenever possible.
- Use properly placed and secured portable ladders or fixed ladders if they are available. For more information on portable ladders, see SHE B-4.1 and Engineering Standard S3C. For more information on fixed ladders, see Engineering Standard B2W. For more information on cages for ladders, see Engineering Standard B3W.
- Use aerial lifts and crane baskets as work platforms if required. For more information on crane-suspended work platforms, see SHE B-3.1.

For more information on elevated work requirements, see SHE B-8.1. For more information on cable tray work safety, see SHE B-1.20.

4.0 REFERENCES

4.1 SHE B-1.20, *Cable Tray Work*

SHE B-3.1, *Crane-Suspended Work Platforms*

SHE B-4.1, *Portable Ladders – Control and Inspection*

SHE B-5.1, *Excavations*

SHE B-8.1, *Continuous Fall Protection*

SHE B-24.1, *Vessel and Confined Space Entry*

SHE E-8.1, *Respiratory Protection*

4.2 Engineering Standard B2W, *Fixed Ladder, Details*

Engineering Standard B3W, *Cages for Ladders*

Engineering Standard S1C, *Stairways, Ramps, Handrails, and Guards, Dimensions and Other Requirements*

Engineering Standard S3C, *Selection and Use of Portable Ladders*

Design Standards, Section DE-F, *Lighting*

Design Standard DE2.2F, *Illumination Levels for Lighting Design, Manufacturing and Process Areas*

5.0 FOR FURTHER INFORMATION

5.1 SHE C-2.1, *Aerial Lifts and Bucket Trucks*

5.2 Maintenance and Construction Procedure PV3, *Scaffolds, General Specifications and Rules*

5.3 OSHA 29 CFR 1926.56, *Illumination*

SAFETY
HEALTH
ENVIRONMENT

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	PAGE 1 OF 2

WORKING OVER OR NEAR WATER

1.0 SCOPE

This procedure governs the activities of personnel who must work directly above or near water where the danger of drowning exists. The procedure states the minimum requirements for working near waterways or large bodies of water.

This procedure does **not** apply to work on ice nor does it address marine operations or equipment. For information on marine operations and equipment, see OSHA 29 CFR 1926.605.

2.0 DEFINITIONS

This procedure contains no unique definitions.

3.0 GENERAL

3.1 Fall Protection

Use appropriate work platforms, such as complete scaffolds, for any work over water. Work in appropriate positions that provide level, stable footing. Place protective or warning barricades 5 feet (1.5 meters) from the water's edge.

3.2 Fall-Arresting Devices

Always use fall-arrest systems in areas where complete work platforms or protective barricades cannot be provided. Consider using safety nets for any work over water.

Lifelines should be designed to keep workers clear of the water in case of a fall.

3.3 Personal Flotation Devices and Water-Rescue Equipment

3.3.1 Life Jackets – When working over or near water, wear life jackets or buoyant work vests approved by a recognized local or national agency such as the U.S. Coast Guard. Before and after each use, inspect buoyant work vests and life jackets for defects that might affect their strength or buoyancy. Destroy, repair, or remove from the site all flotation devices found to be defective.

For information on personal protective and lifesaving equipment, see OSHA 29 CFR 1926.106.

Life jackets and buoyant work vests differ in one important feature: a life jacket keeps an unconscious person's face out of the water. A work vest does not provide this protection.

3.3.2 Ring Buoys – Ring buoys must be readily available for emergency rescue operations. Use ring buoys with at least 90 feet (27 meters) of line. Place ring buoys less than 200 feet (61 meters) from the work location.

3.3.3 Rescue Boat – At least one lifesaving boat must be immediately available when working over or adjacent to water where the danger of drowning exists.

3.3.4 Weight of Equipment – The weight of equipment can affect buoyancy, even with flotation devices. Consider the weight of tools and personal protective equipment.

3.3.5 Transportation – Consider how to transport a drowning victim from the shore to a treatment facility in the event of an accident.

3.3.6 Rescue Plan – When the expected activity will expose personnel to significant water hazards, write a rescue plan and perform a practice rescue to prove the effectiveness of the plan.

3.4 Personnel Qualifications

3.4.1 Required Training – Personnel working over or near water must be trained to recognize and respond to the hazards associated with this work. Specific training may include artificial resuscitation and water rescue.

3.4.2 Work in an Isolated Setting – All work in an isolated setting should be performed by at least two people. The work activity should be monitored so that if a problem occurs, at least one person will be capable of initiating the rescue plan.

3.5 Electrical Safety

All electrically driven equipment should be protected by ground fault circuit interrupters (GFCIs).

3.5 Equipment

3.5.1 **Overhead Protection** – Overhead protection that does not interfere with the operator's vision must be provided. Protection must be the equivalent of 2-inch (5-centimeter) planking or other solid material of equivalent strength. For additional information, refer to OSHA 29 CFR 1926.603(a)(3).

3.5.2 **Fixed Leads** – Using fixed leads is the preferred method of pile driving. The site manager must approve the use of any other type of lead.

3.6 Work Practices

3.6.1 **Fall Protection** – Continuous positive fall protection, such as a lifeline, a rope grab, and complete standard guardrails, must be used when a person is on a vertical lead or an apron. Every effort must be made to eliminate the need for personnel to occupy the top of a pile. Examples of such efforts include employing mechanical pile threaders and remote release shackles. Prior planning (including positive fall protection) and approval of the site manager are required for any work requiring personnel to occupy the top of a pile.

3.6.2 **Access to Elevated Work Locations** – Ladders and aerial platforms (see SHE C-2.1) are the preferred means of access to elevated work locations. When using a crane to elevate personnel, use only approved personnel baskets. For more information on personnel baskets, see SHE B-3.1.

3.6.3 **Precautions** – The following guidelines must be observed when pile driving:

- Only personnel essential to the operation are allowed within a radius equal to the undriven length of the pile being installed.
- Personnel are not allowed near a turning auger. Hand tools may not be used near a turning auger.
- Noise levels must be determined. High noise boundaries must be posted, and appropriate personnel protection techniques must be used.
- Personnel must avoid skin contact with piles coated or treated with chemicals. Refer to the manufacturer's Material Safety Data Sheet (MSDS). Use protective barrier creams and protective clothing.
- Personnel must use a face shield and safety glasses when power sawing treated timber pile. For more information on personal protective equipment to use with chain saws, see SHE B-42.1.
- When work is to be performed over or in immediate proximity to a body of water where the potential for drowning exists, plan for personal flotation devices and rescue procedures. For more information on working over or near water, see SHE B-11.1.
- If any part of the equipment or load must come within 15 feet (4.5 meters) of an electrical source, follow the guidelines in SHE B-1.18.
- A fire extinguisher must be available during refueling.

3.7 Pile Extraction

Use a vibrator when extracting installed piles.

3.8 Environmental Precautions

3.8.1 **Handling of Material** – Use, storage, hauling, and disposal of material (such as spoils and treated pile wastes) must be in accordance with site, local, state, and governmental regulations.

3.8.2 **Hydraulic Lines** – Hydraulic lines must be maintained to prevent leakage. If catastrophic failure of a hydraulic system occurs, the spill must be cleaned up according to site, local, state, and governmental regulations. Sites should have a written procedure to respond to this type of spill.

4.0 REFERENCES

4.1 SHE A-21.1, *Planning Work in Plant Areas*

SHE B-1.18, *Use of Mobile Equipment Near Exposed Electric Lines*

SHE B-3.1, *Crane-Suspended Work Platforms*

SHE B-5.1, *Excavations - Inspection, Protective Systems, and Permitting*

SHE B-11.1, *Working Over or Near Water*

SHE B-42.1, *Lawn Mowers, Weed Cutters, and Chain Saws*

SHE C-1.1, *Mobile Cranes*

SHE C-2.1, *Aerial Lifts and Bucket Trucks*

SHE C-10.1, *Mobile Equipment Work Near Hazardous/Critical Pipe Lines*

4.2 OSHA 29 CFR 1926.603, *Pile Driving Equipment*

ACCESS/EGRESS IN CONSTRUCTION AREAS

1.0 SCOPE

This procedure provides basic guidance for planning and constructing access and egress for personnel in construction areas.

2.0 DEFINITIONS

Working Slab – A temporary rough-poured concrete working surface that will be removed or covered.

3.0 GENERAL

3.1 Planning Personnel Pathways

When planning personnel pathways into work areas, consider the following:

- Clearly mark entrances to barricaded work areas with "gate" signs or equivalent.
- Where appropriate, post signs at the job site entrance warning of hazardous conditions.
- Ensure that all personnel pathways (both interior and exterior) and stairs are well lighted. For more information on lighting, see Design Standards, Section DE-F, and specifically Design Standard DE2.2F.
- Always anticipate emergency considerations. Establish emergency escape routes (primary and secondary means of access/egress), and keep them clear.
- Be aware that pathways are often altered during the course of a job.
- When planning personnel pathways, make provisions to locate stored material as close as possible to work areas.
- Isolate hoses and cords from walking surfaces. Hoses and cords should be kept 7 feet (2.1 meters) above walkways if possible.
- To minimize pooling, provide drainage for surface water in work areas.
- Provide a means for people to scrape mud or moisture from the soles of their shoes at the base of ladders and stairs.
- Use abrasive paints or other nonskid materials on walking surfaces.
- Provide oil-dry absorbent on oily, slippery surfaces.
- Provide canisters for salt or sand when ice and snow are present.
- Bring people in early to clear ice and snow before the start of the shift.
- Use "crusher-run" (gravel) in muddy or sandy areas.

Caution: "Crusher-run" sometimes contains stone too large for a good walking surface and must be raked down.

3.2 Planning Below-Grade Access/Egress

When planning and/or constructing below-grade personnel pathways, consider the following:

- Make drainage provisions if the excavation is to remain open for a period of time.
- Obtain a Vessel or Confined Space (V/CS) Entry permit if necessary. For information on V/CS entry, see SHE B-24.1.
- Use a working slab if conditions warrant.
- Determine if the excavation requires shoring or sloping that affects access/egress. For more information on excavations, see SHE B-5.1.
- Provide required protective or warning barricades. For more information on handrails and guards, see Engineering Standard S1C.
- Provide an emergency evacuation plan. Include provisions for removing injured or incapacitated personnel.
- Properly secure ladders used for personnel access. Locate ladders no more than 50 feet (15.2 meters) apart. Travel distance to any ladder must not exceed 25 feet (7.6 meters). For more information on portable ladders, see SHE B-4.1 and Engineering Standard S3C.
- Ensure that any bridge crossing a ditch has handrails and midrails, is anchored on either side of the ditch, and is sufficiently strong to carry the intended loads.

ATTACHMENT B-5.1-3

Daily Excavation Inspection Report

Site Stine / Haskell Research Facility

Location of Excavation N.W. Corner of Building 190

Depth 15'

Soil Type C

ITEMS	CONDITION good	rejected	n/a	REMARKS
Slope Ratio	✓			
Shoring			✓	
Shielding			✓	
Barricades	✓			
Water Removal	✓			
Traffic Control	✓			
Spoil Pile	✓			

Atmosphere	O_2	Time	Explosimeter
	20.0 %	1/2/92 7:30 a.m.	0 %
	%		%
	%		%
	%		%
	%		%
	%		%
	%		%
	%		%
	%		%
	%		%

Competent Person Mike R. Sein

Date 1/2/92 Time 7:30 a.m.

PILE DRIVING

1.0 SCOPE

This procedure provides minimum requirements and considerations for sheet, soldier, tube, timber, concrete, auger, and similar pile-driving activities.

2.0 DEFINITIONS

Apron – The horizontal structure connecting the bottom of the lead to the crane carriage.

Electrical Source – Items such as equipment, cables, lines, or busbars that are used to conduct electrical current.

Engineer – The person who requests the work and is responsible for the safety, quality, and timing of the work requested.

Fixed Lead – A lead connected to a crane at two points: at the boom point and at the crane carriage.

Lead – The frame structure used to guide the hammer or auger.

Qualified Inspector – An experienced craftsperson or engineer (Du Pont or contractor) who has demonstrated his or her ability or competency to inspect equipment to the site manager and/or the Du Pont Fleet Operations designee.

Qualified Operator – An experienced craftsperson who has received training and demonstrated competency to operate a specific piece of equipment.

Site Manager – The highest level Engineering employee responsible for work conducted on the site.

3.0 GENERAL

3.1 Equipment Inspection

A qualified inspector must inspect cranes according to the guidelines in SHE C-1.1. The crane operator must also visually inspect equipment daily to ensure safe operation of the equipment.

3.2 Hoses

Hoses supplying power to a hammer, auger, or vibrator are commonly routed up the crane boom or lead and are subject to separating during operation. Secure each hose from a location on the hose approximately 12 inches (30.5 centimeters) from the coupler to an independent point (on the boom or lead) in a manner that will restrain the powered hose if it separates.

3.3 Operator Qualifications

Crane operators must meet the requirements of SHE C-1.1. Only qualified personnel may operate leads, hammers, augers, and vibrators. The operator's employer furnishes proof of competency to the Engineering site representative.

3.4 Planning

3.4.1 Health Hazards – When planning an auger or pile-driving job, the engineer must consider analyzing subsurface soil and water for potential contaminants that could present health hazards. Appropriate techniques must be employed to protect personnel from exposure to any identified health hazards.

3.4.2 Other Hazards – Additional hazards that must be considered include underground physical interferences (i.e., underground pipelines and underground electric cables), above-ground physical interferences (i.e., above-ground pipelines and electric cables), the effects of vibration on adjacent facilities (see SHE A-21.1), and the effects of noise on personnel. For more information on hazards, see SHE B-1.18, B-5.1, and C-10.1.

3.4.3 Environmental Classifications – Flammable and environmental classifications must be considered before performing pile-driving activities in any operating area. For more information on classifications, see SHE A-21.1.

3.4.4 Permits – Each site should develop a site-specific permit for pile-driving activities. Items for consideration on the permit include vibration, noise, excavation requirements, subsurface health hazards, disposition of waste materials, securing supply hose, and type of lead used.

ATTACHMENT B-5.1-2

Excavation Permit

Part 1: Initiator completes this section.

Work Performed By: W.B. Cloud - Civil Supt. Reference Drawing: W-51729

Location of Excavation: 30' off N.W. Corner of Building 190
(Use coordinates outside buildings or column lines inside buildings)

Reason for Excavation: Install new sewer line

Start Date: 1/2/92 Permit Expiration Date: 1/9/92

Initiator Name: Joe B. Safe Date: 1/1/92 Phone: 451-0808

Part 2: Construction engineer completes this section.

Utilities	Present in Excavation Area	Comments
Power Service Lines:		
– Water	☐	
– Sewer	☐	
– Gas	☐	
Electrical Lines	☒	12 KVA - Insulated - Cannot be de-energized
Fire Lines	☒	Notify plant FM; Marshall Dailey
Process Lines	☐	
Equipment	☐	

Reference Drawing: W-51729

Special Precautions and Safety Requirements (check those required on the excavation site):

- ☒ Electrical Observer
- ☐ Explosion Testing
- ☐ Standby Person
- ☒ Barricades
- ☐ Testing for Fume or Gas
- ☒ Competent Person (See Reverse Side)
- ☐ Grounding of Tools
- ☐ Special Clothing
- ☐ Other (Specify)

Comments:

Part 3: Construction engineer is responsible for obtaining the relevant approval signatures in this section.

W B Gray
Site Engineering

C.H. Goodman
Operating Supervision

H.J. Energy
Power Services Supervision

Dan B Sykes
Electrical Supervision

Larry W. Farmer
Fire Protection Supervision

W.B. Murphy
Construction Maintenance

Joe B. Safe
Construction Engineer

Tom T. Hall
Contractor Superintendent

Clyde Farmer
Pipe Superintendent

Fred Stacks
Electrical Superintendent

Mike P. Seer
Excavation Competent Person

Continued

Part 4: Competent person completes this section before excavation.

Soil Classification (check one): ☐ Stable Rock ☐ Type A ☐ Type B ☒ Type C

	YES	NO	N/A
Have all SHE B-5.1 requirements been met and the required data documented?	☑	☐	☐
Is the excavation close to utilities, buildings, footings, pilings, or sources of vibration?	☑	☐	☐
Have the owners of utility, service, and transmission piping been contacted?	☑	☐	☐
Has detection equipment been used to locate all underground interferences?	☑	☐	☐
Has a check has been made for previously disturbed ground?	☑	☐	☐
Has the adequacy and availability of all equipment been checked, including personal protective equipment, shoring material, signs, barricades, and machinery?	☑	☐	☐
Has a check has been made for other obstructions (e.g., footing concrete encasements)?	☑	☐	☐

If other obstructions have been found, list them. None Found

Allowable slope: 1 1/2 : 1

Comments:

Part 5: Competent person completes this section during excavation.

Size of Excavation: depth 15' width 45' length 200'

	YES	NO	N/A
Have changing ground conditions been checked, particularly after rainfall?	☑	☐	☐
Has monitoring been performed to check for possible oxygen deficiency or gaseous conditions?	☐	☐	☑
Has the adequacy of shoring and/or sloping been checked as work progresses?	☑	☐	☐
Do vehicular and machinery operation patterns need to be changed?	☐	☑	☐
Are water removal operations or equipment needed?	☑	☐	☐
Has the adequacy of portable trench boxes or trench shields been checked?	☐	☐	☑

Entrance and exit facilities: ☑ stairway ☑ ladders ☐ ramp

If the depth of the excavation is 5 feet (1.5 meters) or more, check the applicable OSHA appendix below:

- ☑ B - Sloping and Benching
- ☐ C - Timber Shoring for Trenches
- ☐ D - Aluminum Hydraulic Shoring for Trenching
- ☐ E - Alternatives to Timber Shoring
- ☐ F - Selection of Protective Systems

NOTE: *Sloping or benching for excavations deeper than 20 feet (6 meters) deep must be designed by a registered professional engineer.*

Part 6: Competent person completes this section if no protective system is needed.

The excavation requires no protective systems for the following reasons (list):

Competent Person Mike R Scott Date: 12/2/92

3.8 Access and Egress

Provide safe access and egress for all excavations.

For excavations 4 feet (1.2 meters) deep or more, ladders, steps, or ramps for safe access and egress must be provided within 25 feet (7.6 meters) of lateral travel.

Structural ramps used only for the access or egress of people must be designed by a competent person. Structural ramps for the access or egress of equipment must be designed by a competent person qualified in structural design and must be constructed according to the design. (The competent person mentioned in this paragraph may not necessarily be the excavation competent person.)

When employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails must be provided. For more information on standard guardrails, see SHE B-6.1.

4.0 REFERENCES

4.1 SHE B-6.1, *Perimeter and Opening Protection – Floors, Walls, and Roof Edges*

SHE B-24.1, *Vessel and Confined Space Entry*

SHE E-8.1, *Respiratory Protection*

4.2 OSHA 29 CFR 1926.650, Subpart P, *Excavations*

4.3 Underground Services, Inc.
P.O. Box 39
West Chester, PA 19381
(215) 696-9220

5.0 FOR FURTHER INFORMATION

5.1 *Construction Standards for Excavations*, The Associated General Contractors of America

ATTACHMENT B-5.1-1

Excavation Safety Checklist

Job Site

	YES	NO	N/A
Prior to starting the job, were utilities notified and underground services located?	☑	☐	☐
Were overhead transmission lines noted and precautions taken to ensure that equipment does not come in contact with them?	☑	☐	☐
Have adequate signs been posted and barricades provided?	☑	☐	☐
Are the workers wearing reflective vests if necessary?	☐	☐	☑
Are vehicles, equipment, and spoil piles correctly placed to allow for the safe passage of traffic and the progress of construction?	☑	☐	☐
Has traffic control (fire departments, etc.) been notified?	☑	☐	☐
Is the appropriate safety gear on site?	☑	☐	☐

Excavation

	YES	NO	N/A
Have the supervisors and workers been trained in excavation safety laws and procedures?	☑	☐	☐
Have buildings, utility poles, trees, and any other surface encumbrances or destabilizing forces been taken into consideration?	☑	☐	☐
Has soil classification been done?	☑	☐	☐
Has the appropriate means of safeguarding the excavation by OSHA requirements been determined?	☑	☐	☐
For excavations 4 feet (1.2 meters) deep or more, are ladders, steps, or ramps available within 25 feet (7.6 meters) of lateral travel?	☑	☐	☐
Are spoil piles at least three feet (one meter) from the edge of the excavation and properly sloped?	☑	☐	☐
Have confined-space atmospheric hazards been considered? (For more information on confined-space entry, see SHE B-24.1.)	☑	☐	☐
Have undermined structures been shored, braced, or underpinned, or has a registered professional engineer determined that such measures are not necessary?	☐	☐	☐
Do bridges and walkways have standard guardrails?	☐	☐	☐
Are utilities crossing the excavation supported from above, and does protection from falling material exist?	☑	☐	☐
Have means been provided to remove water from the excavation?	☑	☐	☐
Are all open pits or shafts either covered or barricaded?	☑	☐	☐
Is a competent person available to make at least daily inspections?	☑	☐	☐

NOTE: *Shoring and shielding must be removed in a manner that ensures the safety of workers, and excavations must be backfilled as soon as work is completed.*

EXCAVATIONS

- Keep spoil dirt and any material or equipment that may fall into an excavation at least 3 feet (1 meter) from the edge.
- Remove loose rock or soil that could fall from the face of an excavation.
- Protect, support, or remove underground installations (e.g., electrical duct banks, water lines, sewer lines, or fire lines) as necessary to protect employees and the environment.
- Prohibit employees from working or passing under the loads of lifting or digging equipment.
- Provide support systems such as shoring, bracing, or underpinning to ensure the stability of adjoining buildings, walls, or other structures endangered by excavation operations.
- Ensure that a competent person performs inspections of excavations, adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions. These inspections must be performed at least daily, and more frequently if conditions warrant. For a sample daily inspection report form, see Attachment B-5.1-3.

3.2 Protective Systems (Sloping, Benching, Shoring, and Shielding)

3.2.1 Choosing Appropriate Protective Systems – For soil depths up to 20 feet (6 meters), soil classification determines the sloping, shoring, and shielding requirements, as explained in sections 3.2.2 and 3.2.3. Soil classification must be performed by a competent person.

Protective systems for excavations deeper than 20 feet (6 meters) must be designed by a registered professional engineer.

Protective systems are not required in the following situations:

- when an excavation is made entirely in stable rock
- when an excavation is less than 5 feet (1.5 meters) deep, and a competent person has examined the ground and found no potential for a cave-in

The competent person must document, on the excavation permit, the basis for any decision not to provide a protective system (see Attachment B-5.1-2, part 6).

3.2.2 Sloping and Benching – When excavating in an area where the soil has been classified, sloping is based on the following three types of soil classification:

- Type A soil includes cohesive soils with unconfined compressive strength of 1.5 tons per square foot (126 kilograms per square meter) or greater (unless the soil is fissured subject to vibration, or has been previously disturbed or subject to other factors that would require it to be classified as a less stable material). When excavating in Type A soil, the maximum allowable slope is 3/4 horizontal to 1 vertical (53°).
- Type B soil includes cohesive soil with an unconfined compressive strength greater than 0.5 tons per square foot (42 kilograms per square meter) but less than 1.5 tons per square foot (126 kilograms per square meter). When excavating in Type B soil, the maximum allowable slope is 1 horizontal to 1 vertical (45°).
- Type C soil includes cohesive soil with an unconfined compressive strength of 0.5 tons or less per square foot (42 kilograms per square meter). When excavating in Type C soil, the maximum allowable slope is 1-1/2 horizontal to 1 vertical (34°).

When sloping and benching protective systems are not based on the soil classifications for Type A, B, or C soils, they must be designed by a registered professional engineer or sloped at an angle no steeper than 1-1/2 horizontal to 1 vertical.

Designs of sloping or benching systems using tabulated data must be in written form, must be approved by a registered professional engineer, and must be maintained at the job site during construction of the protective system.

3.2.3 Shoring and Shielding – For information on timber shoring, refer to OSHA 29 CFR 1926.650. When using hydraulic shoring, trench jacks, air shores, and shields, follow all of the manufacturer's specifications, recommendations, and limitations.

All tabulated data must be maintained at the job site during the construction of protective systems. The design of support systems, shield systems, or protective systems (other than a manufacturer's design) must be approved by a registered professional engineer.

EXCAVATIONS

When shoring and shielding systems are not based on the soil classifications for Type A, B, or C soils, they must be designed by a registered professional engineer.

3.3 Ensuring the Stability of Adjacent Structures

When the stability of adjoining buildings, walls, sidewalks and pavements, or other structures is endangered by excavation operations, use support systems or other protective measures such as shoring, bracing, or underpinning to ensure their stability and to protect employees.

Do not excavate below the level of the base or footing of any foundation or retaining wall unless the excavation is in stable rock, or unless one of the following precautions has been taken:

- A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure.
- A registered professional engineer has determined that the structure is far enough away from the excavation so as not to be affected by the excavation activity.
- A registered professional engineer has determined that such excavation work will not pose a hazard to employees.

3.4 Installing and Removing Protective Systems

Install protective support systems from the top down, and securely connect all components of the support system.

When temporary removal of individual members is necessary, install other structural members to carry loads imposed on the support system.

As soon as the work is completed, dismantle the protective systems, working slowly from the bottom up. Backfilling and removal of support systems must progress together.

NOTE: ***Do not use plywood as a structural member.*** *Use it only for the prevention of local raveling (sloughing of trench faces) between shores.*

3.5 Materials and Equipment

To minimize employee exposure to hazards, follow the manufacturer's recommendations for using and maintaining manufactured materials and equipment.

A competent person must examine all materials and equipment to ensure that they are adequately maintained, free from defects, and suitable for continued use.

3.6 Water Accumulation

Do not work in excavations where water has accumulated or is accumulating unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation.

The competent person must inspect excavations subject to run-offs from heavy rains and monitor for proper use of water-removal equipment.

Use diversion ditches, dikes, or other suitable means to prevent surface water from entering an excavation and provide adequate drainage of adjacent areas.

3.7 Hazardous Atmospheres

Hazards associated with confined space entry apply to many excavations. For more information on confined space entry, see SHE B-24.1.

A qualified person must test the atmosphere in excavations deeper than 4 feet (1.2 meters) where oxygen deficiency or a hazardous atmosphere could be expected to exist, such as a landfill area or areas where hazardous substances are stored or manufactured, or when the work could create a hazardous atmosphere.

Consider the appropriateness of using respiratory protection, ventilation, and emergency rescue equipment. For more information about respiratory protection, see SHE E-8.1.

Each employee working in bell-bottom pier holes or similar deep and confined footing excavations must wear a full-body harness with a securely attached lifeline, and must be attended at all times by a standby who can carry out rescue if necessary. A method of communication must be ensured, and in most cases a mechanical lifting device must be used.

EXCAVATIONS

1.0 SCOPE

This procedure describes the safety precautions and protective systems that help protect workers from excavation hazards.

2.0 DEFINITIONS

Bell-bottom Pier Hole – A type of shaft or footing excavation in which the bottom is made larger than the cross section above to form a belled shape.

Benching – A system that protects employees from excavation cave-ins by cutting the sides of an excavation to form horizontal levels or steps, with vertical or nearly vertical surfaces between the levels.

Competent Person – For the purposes of this procedure, one who has specific training in soil analysis and the use of protective systems; knows the requirements of OSHA 29 CFR 1926, Subpart P; can identify and predict hazards or working conditions that are unsanitary, hazardous, or dangerous to employees; and is authorized to take prompt corrective measures to eliminate them.

Excavation – Any manmade cut, cavity, trench, or depression in an earth surface that is formed by earth removal.

Hazardous Atmosphere – An atmosphere that is explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful and may cause death, illness, or injury.

Protective System – For the purposes of this procedure, a method of protecting employees from excavation cave-ins, material that could fall or roll from an excavation face or into an excavation, or the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp – An inclined walking or working surface made from earth or structural materials such as steel or wood.

Registered Professional Engineer – A person who is registered as a professional engineer in the state where the work is to be performed. For the purposes of this procedure, a professional engineer registered in any state is considered a "registered professional engineer" when approving either designs for manufactured protective systems or tabulated data for interstate commerce.

Shielding – A system that protects employees from excavation cave-ins by erecting a structure that can withstand the forces imposed on it during a cave-in. Shields can be either permanent structures or portable structures that are moved as the work progresses. They can be either premanufactured or job-built in accordance with OSHA 29 CFR 1926.652, Section (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring – A metal hydraulic, mechanical, or timber structure that supports the sides of an excavation and is designed to prevent cave-ins.

Sloping – A system that protects employees from excavation cave-ins by forming sides of an excavation that are inclined at an angle away from center. The angle of the incline required to prevent a cave-in varies with differences in soil type, environmental conditions of exposure, and the application of additional weight on the walls from external sources, such as stored excavated materials, operating equipment, or traffic.

Soil Classification – A method of classifying soil and rock deposits as stable rock, Type A, Type B, Type C (in decreasing order of stability). Categories are based on the properties and performance characteristics of the deposits and on environmental exposure conditions.

Structural Ramp – A ramp built of steel or wood, usually used for vehicle access. Ramps made of earth or rock are not considered structural ramps.

Tabulated Data – Tables and charts from OSHA 29 CFR 1926, Subpart P and Appendices A through E, or tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench – A narrow excavation (in relation to its length) made below the surface of the ground. The width of a trench is less than 15 feet (4.6 meters), and the depth is generally greater than its width.

3.0 GENERAL

Many excavation accidents are the direct result of inadequate initial planning. The construction engineer is responsible for planning the job. He or she must involve the site's competent person in planning and in all phases of the work. Every effort should be made during the design stage of the excavation to ensure safety by providing the necessary soil classifications and protective systems.

Some state OSHA programs require that the competent person be physically located at the work location when personnel are in an excavation. The construction engineer at each site should be aware of specific requirements in that site's jurisdiction.

3.1 Planning

3.1.1 Site Conditions – Before an excavation begins, the construction engineer must consider specific site conditions such as the following:

- presence of a competent person
- traffic
- vibrations in the vicinity of the worksite
- proximity of structures and their conditions
- soil
- surface water and groundwater
- chemical contamination of soil or water
- water table
- overhead and underground utilities
- weather

If desired, the construction engineer can use the attached sample safety checklist (see Attachment B-5.1-1) to help plan excavation safety.

3.1.2 Minimum Precautions – Before beginning the job, the construction engineer or a designee must initiate an excavation permit. (For a sample permit, see Attachment B-5.1-2.) The permit must be signed by a competent person. Its purpose is to ensure that all interferences that might be encountered during underground digging are identified and located before the work begins. The use of detection equipment is the preferred method for locating underground interferences. One company that provides this service, using the Soft Dig® method, is Underground Services, Inc. (For the company's address and phone number, see section 4.3.)

Where underground electrical interferences are anticipated and all means of positive locating and de-energization have been exhausted, consider additional precautions such as the following:

- Use a fiberglass-handled, round-point shovel for hand digging. The person digging should have adequately rated and currently inspected lineman's gloves and/or must stand on a rubber blanket.
- Provide a Nomex® suit with a hood for the person digging.
- Equip powered tools or equipment (e.g., backhoes or jackhammers) with a ground installed by a qualified electrician.
- Use an additional ground person ("spotter") to watch for and signal the backhoe operator.

3.1.3 Minimum Precautions – Before beginning an excavation, the construction engineer or designee must take the following additional minimal precautions:

- Provide warning vests for employees exposed to vehicular traffic.
- Remove or stabilize all surface encumbrances that create hazards to employees such as trees, spoil dirt, or boulders.
- Erect either warning barricades or rigid, protective barricades to avoid leaving an excavation hazard unprotected. If warning barricades are used, place them a minimum of 5 feet (1.5 meters) from the excavation edge. A spoil pile at least 3 feet (1 meter) high can be used as a barricade on one side of the excavation. Barricades must be marked with battery-powered flashing warning lights if they are in or near walkways or roadways.
- Provide warning systems such as barricades, hand or mechanical signals, or stop logs to alert operators of mobile equipment that they are approaching the edge of excavations.

SAFETY
HEALTH
ENVIRONMENT

ISSUED	7/91
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 2

AIR COMPRESSORS AND THE USE OF COMPRESSED AIR

1.0 SCOPE

This procedure provides minimum requirements for inspecting and operating air compressors and using compressed air. Local operating rules, if more stringent, must be followed when air compressors and/or hoses are attached to operating area air supplies.

This procedure does **not** provide guidelines for using breathing air systems.

2.0 DEFINITIONS

Electrical Source – Items such as equipment, cables, lines, or busbars that are used to conduct electrical current.

Qualified Inspector – An experienced craftsperson or engineer (Du Pont or contractor) who has demonstrated his or her ability or competency to inspect equipment to the site manager and/or the Du Pont Fleet Operations designee.

3.0 GENERAL

3.1 Equipment Inspection

A qualified inspector must inspect all air compressors before they are operated on site and at least quarterly thereafter.

3.2 Operation of Equipment

3.2.1 **Modifications** – Do not modify or alter an air compressor without prior written authorization from the manufacturer.

3.2.2 **Couplings** – Check couplings daily before use. Use only couplings designed for compressed air services. Provide all hose couplings with a positive locking device.

3.2.3 **Hoses** – Check hoses daily before use. Use only hoses designed for compressed air services. When using compressed air hoses, take precautions that include the following:

- Before assembling the system, check all hoses for cuts, breaks, and loose connections.
- Never crimp, couple, or uncouple a pressurized hose.
- Unless the equipment has quick change connectors (with internal check valves), shut off the air at the air supply valve ahead of the hose before making adjustments or changing air tools. Bleed the hose at the tools before breaking the connection.
- When possible, run air lines and hoses through areas with little or no vehicular or pedestrian traffic. If possible, avoid laying air lines and hoses across roads. When air lines and hoses must cross roadways, provide protection for the air lines and hoses. When air lines and hoses cross pedestrian walkways, suspend them at least 7 feet (2 meters) off the ground or floor, or provide trip protection.
- All hoses exceeding 1/2-inch (1.3-centimeter) inner diameter must have a safety device (an excess flow valve) at the source of supply or branch line to reduce pressure in case of hose failure. All air hose connections over 1 inch (2.5 centimeters) in diameter must be equipped with safety chains that must be secured when the connection is made.
- Hoses equipped with special connections require special tightening techniques or equipment. One example is hammer union connections, which must be tightened with a hammer. Another example is spanner wrench connections, which must be tightened with a spanner wrench. Do not tighten these or similar connections by hand.
- Secure hose connections before turning on air valves.
- Do not point an open air hose at anyone.

Air hose connections that are designed to accept wire must be fitted with wire in the holes provided to prevent disconnections.

- When hanging an air hose in the vertical position, hose connections must be supported above and below the connections to prevent the weight of the hose pulling the connection apart or pulling the connection out of the hose.

3.2.4 **Compressed Air for Cleaning** – Compressed air for cleaning must not exceed 30 psi. Use monogoggles or a face shield over safety glasses when cleaning with compressed air. For more information on cleaning with compressed air, see SHE B-28.1.

3.2.5 **Relief Valve** – Each compressor must be equipped with a properly sized relief valve maintained according to local, state, and federal regulations. For more information on pressure-relief valves, see SHE B-40.1.

3.2.6 **Ear Protection** – If the air compressor and/or the compressed air create a noise level over 90 decibels, provide hearing protection. For more information on hearing protection, see SHE E-6.1.

3.2.7 **Refueling** – Shut off air compressors for refueling. Ensure that a fire extinguisher is accessible during refueling.

3.2.8. **Additional Precautions** – Take the following precautions when using air compressors:

- Flammable and explosive classifications must be considered before using an air compressor in an operating area. For more information on classifications, see SHE A-21.1.
- If any part of the equipment could possibly come within 15 feet (4.5 meters) of an electrical source, follow the guidelines in SHE B-1.18.

4.0 REFERENCES

4.1 SHE A-21.1, *Planning Work in Plant Areas*

SHE B-1.18, *Use of Mobile Equipment Near Exposed Electric Lines*

SHE B-28.1, *Shop Equipment and Facilities*

SHE B-40.1, *Pressure-Relief Valves*

SHE E-6.1, *Noise Measurement and Hearing Conservation*

COMPRESSED GAS CYLINDERS

1.0 SCOPE

This procedure establishes safe practices for identifying, handling, and storing compressed gas cylinders whether empty or full.

2.0 DEFINITIONS

Flame-Resistant Material – A material that burns slowly or is self-extinguishing after the external source of ignition is removed.

3.0 GENERAL

For information on using compressed gas cylinders on foreign sites, refer to local rules and regulations.

3.1 Identification

Do not accept any compressed gas cylinder from the distributor or supplier unless the cylinder is clearly identified with a visible and proper manufacturer's label. For more information on compressed gas cylinders, see Engineering Standard F10J. The local supplier can supply specific local requirements on labeling and color coding.

3.2 Inspection

Site management must assign an inspector to periodically inspect both vendor-supplied and site-owned cylinders. The inspector must determine the condition of the cylinders and verify that testing required by the Department of Transportation (DOT) or local regulating authority has been conducted. For more information about how to inspect compressed gas cylinders, see Engineering Standard F10J.

Tag defective cylinders, identify them as defective, and segregate them from other cylinders. Site management should establish a policy for exchanging or disposing of defective cylinders.

3.3 Handling

Move or transport cylinders in the upright position. Use racks or cradles to prevent them from tipping, falling, or dropping. Use enclosed cages or carrying cradles to lift cylinders from one level to another. Do not use rope or chain slings.

When transporting cylinders on trucks or trailers, cylinders must be stored and secured upright in a cage or cradle.

3.4 Storage

3.4.1 Policies and Practices – Store and use compressed gas cylinders in the upright position. Fasten or tie the cylinders with a noncombustible material to prevent them from falling and to provide maximum stability. Do not secure cylinders by their valves or collars.

Segregate cylinders by the type and amount of their contents. Store full and empty cylinders separately. Store cylinders of oxygen or other oxidizing gases separate from fuel-gas cylinders and other flammable materials by a minimum of 20 feet (6 meters), unless a suitable, 1/2-hour rated, flame-resistant partition is provided.

Smoking, spark-producing work, and open flame are not permitted within 20 feet (6 meters) of any cylinder storage area containing cylinders of flammable gas. Post signs prohibiting these activities in cylinder storage areas.

Store cylinders so they can be used in the order they are received.

Because plants vary in allowing storage and use in operating areas, establish a policy with the operating areas and the plant fire marshal regarding storage of cylinders in buildings.

.4.2 **Facilities** – The bulk storage facility should be a minimum of 50 feet (15 meters) from adjacent buildings and easily accessible for pickup and delivery of cylinders. The storage rack or facility should have a ramp with a 1:12 maximum pitch so that cylinders can be lifted or rolled off forklifts without dropping or chipping them. Consider installing ramps on bottle racks to eliminate the need to manually lift cylinders in or out of the racks.

Compressed gas cylinders that are used daily, such as skid-mounted racks and bottle carts, may be stored closer than 50 feet (15 meters) to adjacent buildings as determined by site management and the plant fire marshal.

Store cylinders in a covered storage shelter when necessary to protect the valve housings from ice and snow and to protect the cylinders from direct sunlight.

4.0 REFERENCES

4.1 Engineering Standard F10J, *Compressed Gas Cylinders*

ELECTRIC WELDING AND PORTABLE GENERATORS

Install two leads to the work location. Do not use building steel as the return path for the welding current. When welding to building steel, connect the return lead to the same steel part where welding is proceeding.

NOTE: *Pipelines and equipment containing flammable or combustible materials must not be a part of the welding path.*

Do not support welding leads with tie wire. To prevent possible damage to welding lead insulation, support leads with nonconductive materials or insulated wire. Install welding leads so that they are not potential tripping hazards.

To eliminate the possibility of partially exposing a connection while installing the leads, male and female connectors of welding leads may need to be taped or otherwise restrained from separating. Welding leads should not be tied in a knot.

Totally insulate electrode holders except for the contact point with the welding rod.

Remove the rod from the holder when unattended.

3.3 Portable Welding Machines and Generators

A "driven ground rod" is not required for mechanically driven welding machines.

When a portable welding machine includes a receptacle for convenience power, the receptacle must be replaced with a ground fault circuit interrupter (GFCI) if the voltage is alternating current. If the voltage is direct current, the receptacle should be removed or otherwise disabled and must not be used.

3.4 Welding Machine Inspection

Inspect welding machines on a quarterly basis. Pay special attention to the following:

- insulation integrity of supply-side conductors
- adequacy of supply-side conductor terminations
- proper overcurrent protection for the welding machine
- adequacy of the equipment grounding conductor
- indications of weather or water damage

For information on record-keeping requirements, see SHE B-1.17.

3.5 Multi-arc Welding Machines

Do not use multi-arc welding machines to supply welding power of different polarity. Connect each power source to supply only single-polarity welding. Modify each unit as needed to provide a method for connecting the welding return cable to the unit source. For more information, refer to Figure 1D, Engineering Standard E1.3P.

Use a different type of connector for each conductor function of multi-arc welding machines. For instance, the work lead should use a connector that cannot be inserted into a return lead connector. It must be impossible to connect either the work lead or the return lead into the conductors supplying the resistor unit.

3.6 Dual-Polarity Welding

To ensure that a person cannot contact both polarities at the same time, keep the exposed electrode holders of different polarities at least 10 feet (3 meters) from each other and from the work, or otherwise separate the electrode holders from each other and from the work by a physical barrier.

When two single-phase welding machines of different polarity are installed in close proximity to each other, connect them to the same phase of the three-phase power supply. Be certain to minimize possible differences in welding lead voltage that may result from supply-power phase relationships.

Identify reverse-polarity welding machines and welding leads by color code. (The reverse-polarity color code is normally red. The straight-polarity color code is normally yellow.)

3.7 High-Frequency Welding Machines

The potential for electrical shock is greater with high-frequency welding than with direct-current welding.

Both the work and return welding leads from high-frequency welding machines must be as short as possible to prevent possible radio frequency interference with electronic equipment.

3.8 Welding on Suspended Loads (Cranes and Chainfalls)

Welding on material or equipment suspended by a metallic support mechanism (choker, chainfall, loadline) is undesirable because of the possibility of damage to the choker or the loadline. When such an operation is required, the support must include an insulating element to eliminate the possibility of welding current flowing through the support.

4.0 REFERENCES

4.1 SHE B-1.17, *Construction Electrical Tools and Electrical Equipment Inspection and Control*

SHE D-4.1, *Tarpaulins and Welding Curtains – Fire-Retardant Properties*

SHE D-5.1, *Welding, Cutting, Burning, Heating, or Melting*

4.2 Engineering Standard E1.3P, *Ground Connections and Hazards, Arc-Welding Equipment*

5.0 FOR FURTHER INFORMATION

5.1 Engineering Standard E11J, *Wiring Data for Arc-Welding Equipment*

ATTACHMENT C-9.1-1

Drilling Equipment Inspection

Equipment identification number: _____

ITEMS	CONDITION good	rejected	n/a	REMARKS
1. Access & Egress*				
2. Backup Alarms				
3. Body				
4. Brakes*				
5. Clutch*				
6. Control & Levers Labeled*				
7. Cotter Pins/Hardened Pins*				
8. Cover				
9. Data Nameplate				
10. Frame				
11. Fuel & Gas Systems*				
12. Glass				
13. Guards*				
14. Horn*				
15. Hydraulic System (no leaks)*				
16. Lights				
17. Lugs				
18. Muffler & Exhaust Pipe*				
19. Muffler Guards*				
20. Outriggers*				
21. Parking Brakes*				
22. Platform Decking				
23. Rear View Mirror				
24. Seat Belts*				
25. Side Mirrors (both)*				
26. Steering Mechanism				
27. Tracks, Tires, Wheels*				
28. Turn Signals				
29. Windshield Wipers				

* If any of these are rejected, the equipment shall not be used.

Inspected by _____ Date _____

ELECTRIC WELDING AND PORTABLE GENERATORS

1.0 SCOPE

This procedure explains how to safely connect and use electric welding machines, welding leads, and small portable generators.

This procedure does **not** address fire prevention and burn hazards associated with welding operations. For information on these hazards, see SHE D-4.1 and SHE D-5.1.

This procedure does **not** cover portable generators other than those supplying 110-volt ac convenience power. Generators supplying voltages other than 110 volts are considered to be separately derived sources and require installation according to applicable overcurrent protection (fuses or circuit breakers) and grounding requirements of the Du Pont Standards.

2.0 DEFINITIONS

Dual-Polarity Welding – Two or more welding operations occurring simultaneously when the stinger (welding end lead) is positive in at least one instance and negative in at least one other instance (i.e., both straight and reverse).

Electric Welding Machine – An electric welding device powered either by rectifying electric current or by mechanical means (such as a gasoline engine).

Ground – An electrical connection to earth; an electrically continuous path to earth.

Multi-arc Welding – A welding operation in which the source of the welding voltage supports several stingers. Current is controlled by individual resistors located either in a single enclosure or in individual enclosures.

Portable Welding Machine – A gasoline-driven welding machine or similar equipment.

Small Portable Generator – A mechanically driven electrical generator, usually 10 kW or smaller, used to supply temporary convenience power for an operation.

Welding Leads – A set of electrical conductors connected to the welding source that supplies welding voltage to the work. Welding leads consist of two individual conductors (a work lead and a work return lead).

3.0 GENERAL

3.1 Incoming Power

Inspect welding machines prior to installation to ensure that the conductor terminations are adequate.

Each electric welding machine must be supplied from a properly sized switch with properly sized overcurrent protection and cable. Supply-voltage and current requirements should be printed on the nameplate of the machine.

When power is supplied by a plug and receptacle, the supply side of the connection must be a female connector interlocked to make it impossible to disconnect the plug while energized. The male end of the plug must be de-energized when disconnected.

The power supply conductors must include an equipment ground (four-pronged plug). Power supply conductors may be either four-conductor cords (with ground wire included within the cord), or three-conductor cords (with an external ground wire).

3.2 Welding Leads

Inspect welding leads prior to use to ensure that the insulation is not damaged and that the conductor is not exposed. Repair or discard damaged cord sets.

Connect welding leads to the welding machine by a male plug. Ensure that the female portion of the connector is the energized part of the set.

To avoid accidental contact, provide guards as needed on all connection points on the welding machine.

DRILLING EQUIPMENT

During the drilling process, any emulsions or other materials brought to the site by the contractor must be brought onto site and removed according to site, local, state, and government regulations. Keep the area around the drilling operation clear of spoils, tools, and debris.

Use the appropriate personal protective equipment if any health hazards exist.

3.6 Environmental Considerations

Hydraulic lines must be maintained to prevent leakage. If a leak or failure occurs in a hydraulic system, the spill must be cleaned up according to site, local, state, and government regulations. Sites should have a written procedure to respond to this type of spill.

4.0 REFERENCES

4.1 SHE A-21.1, *Planning Work in Plant Areas*

SHE B-1.18, *Use of Mobile Equipment Near Exposed Electric Lines*

SHE B-5.1, *Excavations*

SHE B-8.1, *Fall Prevention*

SHE C-10.1, *Mobile Equipment Work Near Hazardous/Critical Pipelines*

SHE E-6.1, *Noise Measurement and Hearing Conservation*

ATTACHMENT C-9.1-1

Drilling Equipment Inspection

Equipment identification number: GMC TR #24

ITEMS	CONDITION good	rejected	n/a	REMARKS
1. Access & Egress*	✓			
2. Backup Alarms		✓		does not operate
3. Body	✓			
4. Brakes*	✓			
5. Clutch*	✓			
6. Control & Levers Labeled*	✓			
7. Cotter Pins/Hardened Pins*	✓			
8. Cover	✓			
9. Data Nameplate	✓			
10. Frame	✓			
11. Fuel & Gas Systems*	✓			
12. Glass	✓			
13. Guards*	✓			
14. Horn*	✓			
15. Hydraulic System (no leaks)*	✓			
16. Lights	✓			
17. Lugs	✓			
18. Muffler & Exhaust Pipe*	✓			
19. Muffler Guards*			✓	
20. Outriggers*	✓			
21. Parking Brakes*	✓			
22. Platform Decking		✓		misc. materials to be cleared up
23. Rear View Mirror	✓			
24. Seat Belts*	✓			
25. Side Mirrors (both)*	✓			
26. Steering Mechanism	✓			
27. Tracks, Tires, Wheels*	✓			
28. Turn Signals	✓			
29. Windshield Wipers	✓			

* If any of these are rejected, the equipment shall not be used.

Michael Thomas
Inspected by

2/14/92
Date

ATTACHMENT E-8.1-3

Respirator Training/Fit Test Record

Name _____ Age _____ Date _____

S.S.# _____ Badge# _____ Craft _____

Contractor _____ Supervisor _____

Test Method _____

Training Completed (Date) _____

Signatures: Fit Tester _____

Trainer _____

Employee _____

Respirator	Size	Leaks Detected (Indicate yes or no)	Comments	Approved For Use	Date Issued

SAFETY
HEALTH
ENVIRONMENT

ISSUED	4/92
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 2

DRILLING EQUIPMENT

1.0 SCOPE

This procedure establishes guidelines for safely operating power drilling equipment used for soil sampling, test well and shallow well drilling, and drill foundation installation. This procedure does not include equipment for deep well drilling.

2.0 DEFINITIONS

Attachment – Any device that can be added to a basic or main piece of equipment.

Electrical Source – Items such as equipment, cables, lines, or busbars that are used to conduct electrical current.

Engineer – The person who requests the work and is responsible for the safety, quality, and timing of the work requested.

Manufacturer – The company responsible for the design and assembly of a piece of equipment. Distributors and sales organizations are not considered manufacturers.

3.0 GENERAL

3.1 Equipment Inspection

A qualified inspector or designee must inspect all drilling equipment prior to its use on site and at least quarterly thereafter. For a sample equipment inspection form, see Attachment C-9.1-1.

3.2 Planning

When planning drilling operations, the engineer must consider sub-surface soil and water for potential contaminants and use appropriate techniques to protect personnel from exposure to any identified health hazards. Coordinate this planning with the operating area SHEA office.

Also consider additional hazards that may result from physical interferences, either above or below ground, such as pipelines or electric cables. When any part of the equipment or load could come within 15 feet (4.5 meters) of an electrical source or hazardous pipes during the planned swing radius, the requirements in SHE B-1.18 or SHE C-10.1 must be met.

3.3 Permits

An excavation permit, following site standards, must be issued for drilling operations. The permit must be obtained or issued by the engineer. For a sample permit and more information about excavation, see SHE B-5.1.

3.4 Attachments

Follow these guidelines when using attachments:

- Whenever possible, use manufacturer-supplied attachments.
- Use only attachments that are engineered, designed, and manufactured for the specific drilling equipment on which they are installed.
- Use attachments only for their designed and intended purposes.

3.5 Operations

Consider the flammable and explosive classifications before using drilling equipment in an operating area. For more information on classifications, see SHE A-21.1.

When using rotational drill equipment, do not allow nonessential personnel to work near the turning drill. Exercise extreme caution when it is necessary to use hand tools close to a turning drill.

Determine noise levels during equipment operation. High noise boundaries must be posted, and appropriate personal protection devices must be used. For more information about noise measurement and hearing conservation, see SHE E-6.1.

After drilling, if holes are not filled, provide either hole covers or barricades. Erect barricades around holes according to site procedures.

Maintain safe means of access and egress at all times. When it is necessary to climb drilling rigs, continuous fall protection must be provided. For more information on continuous fall protection, see SHE B-8.1.

ATTACHMENT E-8.1-1

Confidential Medical Questionnaire for Annual Respirator Approval

Name _____ Age _____ Date _____

S.S.# _____ Badge# _____ Craft _____

Contractor _____ Supervisor _____

Please complete this questionnaire to better determine your ability to safely wear a respirator.

	YES	NO
• Have you ever worn a respirator?	____	____
• Have you ever had or do you currently have:		
Diabetes?	____	____
Heart Problems (heart attack, chest pain, angina)?	____	____
Lung Problems (asthma, pneumonia, tuberculosis, silicosis, asbestosis, bronchitis, emphysema, pleurisy, collapsed lung)?	____	____
Difficulty in breathing while wearing a respirator or at any other time?	____	____
Any other problems while wearing a respirator?	____	____
High blood pressure?	____	____
Fainting spells, blackouts, seizures or epilepsy, or any periods of unconsciousness?	____	____
Fear of narrow or enclosed spaces (claustrophobia)?	____	____
Heat illness/Heat intolerance?	____	____
Skin problems (especially on the face)?	____	____
Any other illness?	____	____
• In the past year, have you had a prolonged absence due to injury, illness, or major surgery?	____	____
• Are you taking any medications?	____	____
• Do you wear glasses or contact lenses?	____	____
• Do you currently smoke tobacco products?	____	____

If yes, for how long have you been smoking? _____ years
Check all that apply: cigarettes _____ cigars _____ pipe _____
If cigarettes or cigars, how many per day? _____ packs of cigarettes _____ cigars

• Are you a former smoker?	____	____

If yes, for how long did you smoke? _____ years
Check all that apply: cigarettes _____ cigars _____ pipe _____
If cigarettes or cigars, how many per day? _____ packs of cigarettes _____ cigars
If you no longer smoke, in what year did you quit? _____

• Do you know of any reason why you are not able to wear a respirator?	____	____

If yes, explain: _____

I understand the questions above and have answered to the best of my knowledge.

Employee signature _____

Medical Evaluation for Respirator Approval (Review Medical Record and Questionnaire)

Comments _____

Approved _____ Limited Use _____ Not approved _____

Date _____ Physician _____

ATTACHMENT E-8.1-2

Respirator and Medical Approval Form

Name _____ Age _____ Date _____

S.S.# _____ Badge# _____ Craft _____

Contractor _____ Supervisor _____

To be completed by employer (in consultation with respiratory protection coordinator or designee):

I. Respirator (Type and expected daily hours used)

Air Purifying (Hrs.) _____
Air Supplied (Hrs.) _____
Air Supplied Suit (Hrs.) _____
SCBA (Hrs.) _____

Used in Normal _____ Elevated _____ Temperature & Humidity
Type of Task: Routine _____ Nonroutine _____ Emergency _____
Type of Work While Wearing Resp.: Light _____ Moderate _____ Heavy _____ Very Heavy _____

II. Type of Usual Work

Light Work _____
(performing desk work, light assembly, lab work, control room work, bench work, driving light vehicles, operating automated equipment)

Moderate Work _____
(sweeping, nailing, bricklaying, machine fitting, light shoveling, working in a stockroom, driving heavy equipment, working in a sitting position using heavy arm and leg motions)

Heavy Work _____
(pushing a heavy wheelbarrow; lifting weights from floor to waist; using pick and shovel; loading a mixer; digging trenches; sawing wood; drilling wood by hand; scrubbing; forging; fast-paced working; working as a process operator, mechanic, or in construction activities)

Very Heavy Work _____
(climbing stairs or ladders, planing wood, removing slag, lifting weights from floor to shoulder, lumbering, tending furnaces, working with an ax, working as a hazardous waste operator, working in emergency response and rescue activities, performing jobs requiring the wearing of an acid or chemical suit for prolonged periods)

III. Special Work Considerations

High Places _____ Confined Space Entry _____
Highly Toxic Materials (list here) _____

Medical Approval

Respiratory Protection Fed. Std. 29 CFR 1910.134 (b) (10)

_____ Employee/applicant is physically capable of wearing any type of respirator.
_____ Employee/applicant cannot wear the following respirator(s):
AirP _____ AirS _____ AirS.Suit _____ SCBA _____ (Explain restrictions below)
_____ Employee/applicant is not capable of wearing any respiratory equipment (Explain below

Comments _____

Date _____ Physician _____

ATTACHMENT E-8.1-2

Respirator and Medical Approval Form

Name M. B. Beffie Age 40 Date 4-6-92

S.S.# 000-xxxx-000 Badge# 11491 Craft Carpenter

Contractor Contractor, Inc. Supervisor C. Harmon

To be completed by employer (in consultation with respiratory protection coordinator or designee):

I. Respirator (Type and expected daily hours used)

Air Purifying (Hrs.) 2
Air Supplied (Hrs.) ____
Air Supplied Suit (Hrs.) ____
SCBA (Hrs.) ____

Used in Normal ____ Elevated ✓ Temperature & Humidity
Type of Task: Routine ✓ Nonroutine ____ Emergency ____
Type of Work While Wearing Resp.: Light ____ Moderate ____ Heavy ✓ Very Heavy ____

II. Type of Usual Work

Light Work ____
(performing desk work, light assembly, lab work, control room work, bench work, driving light vehicles, operating automated equipment)

Moderate Work ____
(sweeping, nailing, bricklaying, machine fitting, light shoveling, working in a stockroom, driving heavy equipment, working in a sitting position using heavy arm and leg motions)

Heavy Work ✓
(pushing a heavy wheelbarrow; lifting weights from floor to waist; using pick and shovel; loading a mixer; digging trenches; sawing wood; drilling wood by hand; scrubbing; forging; fast-paced working; working as a process operator, mechanic, or in construction activities)

Very Heavy Work ____
(climbing stairs or ladders, planing wood, removing slag, lifting weights from floor to shoulder, lumbering, tending furnaces, working with an ax, working as a hazardous waste operator, working in emergency response and rescue activities, performing jobs requiring the wearing of acid or chemical suit for prolonged periods)

III. Special Work Considerations

High Places ____ Confined Space Entry ____
Highly Toxic Materials (list here) ____

Medical Approval

Respiratory Protection Fed. Std. 29 CFR 1910.134 (b) (10)

✓ Employee/applicant is physically capable of wearing any type of respirator.
____ Employee/applicant cannot wear the following respirator(s):
AirP ____ AirS ____ AirS.Suit ____ SCBA ____ (Explain restrictions below)
____ Employee/applicant is not capable of wearing any respiratory equipment (Explain below

Comments ____

Date 4-7-92 Physician M. Tamadox

ATTACHMENT E-8.1-3

Respirator Training/Fit Test Record

Name M.B. Beffie Age 40 Date 4-6-92

S.S.# 000-XXXX-000 Badge# 11491 Craft Carpenter

Contractor Contractor, Inc. Supervisor C. Harmon

Test Method Qualitative using isoamyl acetate

Training Completed (Date) 4-7-92

Signatures: Fit Tester Joe Johns

Trainer Joe Johns

Employee M.B. Beffie

Respirator	Size	Leaks Detected (Indicate yes or no)	Comments	Approved For Use	Date Issued
MSA COMFO II	6	NO	Good fit obtained	yes	4-7-92

personal use must clean their respirators at least daily when used, or more frequently if necessary. Governmental regulations may require that for certain kinds of respirator use (e.g., asbestos work), respirators must be cleaned or decontaminated each time the users remove them from the face.

Respirators used for emergency purposes (such as rescues) and escape must be inspected after each use and at least monthly. Ensure that these respirators are protected from the elements.

A qualified person must conduct frequent random respirator inspections to ensure that respirators are properly selected, used, stored, cleaned, and maintained. These inspections should be documented, and the records should be maintained.

Ensure that replacement of respirator components and all respirator adjustments or repairs conform to the manufacturer's recommendations. Only qualified persons may repair respirators.

Store respirators in original shipping containers, in sealed plastic bags, or in containers with tight-fitting lids. To ensure proper functioning, store respirators so the facepiece and exhalation valves do not become distorted. Do not hang respirators by their straps. Store in a cool, dry location with moderate temperatures.

3.5 Breathing Air Cylinders and Compressors

For details on breathing air systems and compressor requirements for breathing air systems, see SHE E-17.1.

3.6 Air Volume-Pressure Requirements

Air volume-pressure requirements for breathing air vary with the type of respiratory equipment. Observe the following requirements:

- Constant-flow air-supplying respirators should deliver not less than 4 cubic feet (0.1 cubic meters) per minute, measured at the facepiece, with a maximum air-line length of 300 feet (91 meters), and a maximum permissible inlet pressure of 125 psig (860 kPa).
- Demand-type air-supplying respirators must be capable of delivering not less than 4 cubic feet (0.1 cubic meters) per minute and not more that 15 cubic feet (0.4 cubic meters) per minute.
- Hoods, helmets, and suits must deliver 6 to 15 cubic feet (0.17 to 0.4 cubic meters) per minute.
- Hoods, helmets, and suits equipped with Vortex air cooler/heaters require air pressure of 60 to 80 psig (414 to 550 kPa) and 15 to 20 cubic feet (0.4 to 0.6 cubic meters) per minute of respirable air for operation.

For more information on air distribution systems for air masks and chemical air suits, see Engineering Standard S1H.

Ensure that PAPRs deliver the required air flow of not less than 6 cubic feet (0.2 cubic meters) per minute to a loose-fitting helmet or hood and not less than 4 cubic feet (0.1 cubic meters) per minute to a tight-fitting face piece.

4.0 REFERENCES

4.1 SHE E-17.1, *Breathing Air Systems*

4.2 Engineering Standard S1H, *Air Distribution System for Air Masks and Chemical Air Suits*

Engineering Standard S8H, *Fit Testing of Respiratory Protective Equipment*

5.0 FOR FURTHER INFORMATION

5.1 Engineering Standard S2H, *Respiratory Protective Equipment*

Engineering Standard S9H, *Air-Purifying Respirators Guidelines for Canister/Cartridge Use*

5.2 ANSI Z88.2, *Practices for Respiratory Protection*

ANSI Z88.6, *Physical Qualifications for Respirator Use*

5.3 OSHA 29 CFR 1910.134, *Respiratory Protection*

ATTACHMENT E-8.1-1

Confidential Medical Questionnaire for Annual Respirator Approval

Name M. B. Beffie Age 40 Date 4-6-92

S.S.# 000-XXX-000 Badge# 11491 Craft Carpenter

Contractor Contractor, Inc. Supervisor C. Harmon

Please complete this questionnaire to better determine your ability to safely wear a respirator.

	YES	NO
• Have you ever worn a respirator?	✓	
• Have you ever had or do you currently have:		
Diabetes?		✓
Heart Problems (heart attack, chest pain, angina)?		✓
Lung Problems (asthma, pneumonia, tuberculosis, silicosis, asbestosis, bronchitis, emphysema, pleurisy, collapsed lung)?		✓
Difficulty in breathing while wearing a respirator or at any other time?		✓
Any other problems while wearing a respirator?		✓
High blood pressure?		✓
Fainting spells, blackouts, seizures or epilepsy, or any periods of unconsciousness?		✓
Fear of narrow or enclosed spaces (claustrophobia)?		✓
Heat illness/Heat intolerance?		✓
Skin problems (especially on the face)?		✓
Any other illness?		✓
• In the past year, have you had a prolonged absence due to injury, illness, or major surgery?		✓
• Are you taking any medications?	✓	
• Do you wear glasses or contact lenses?	✓	
• Do you currently smoke tobacco products?		✓
If yes, for how long have you been smoking? ____ years		
Check all that apply: cigarettes ____ cigars ____ pipe ____		
If cigarettes or cigars, how many per day? ____ packs of cigarettes ____ cigars		
• Are you a former smoker?	✓	
If yes, for how long did you smoke? 15 years		
Check all that apply: cigarettes ✓ cigars ____ pipe ____		
If cigarettes or cigars, how many per day? 1 packs of cigarettes ____ cigars		
If you no longer smoke, in what year did you quit? 1987		
• Do you know of any reason why you are not able to wear a respirator?		✓

If yes, explain: ____

I understand the questions above and have answered to the best of my knowledge.

Employee signature M. B. Beffie

Medical Evaluation for Respirator Approval (Review Medical Record and Questionnaire)

Comments ____

Approved ✓ Limited Use ____ Not approved ____

Date 4-7-92 Physician M. Zamadox

- observation (e.g., through air monitoring) of workplace conditions and the degree of employee exposure
- a physician's approval to assign a worker to an activity requiring the use of a respirator
- regular inspection and evaluation of the continued effectiveness of the program

All respiratory protection systems must have MSHA/NIOSH approval. To determine which components are approved by NIOSH, check with the manufacturer. Substituting parts other than those approved by the manufacturer violates the NIOSH approval. (For example, an approved air-supplied respirator includes the hose and harness assembly; it cannot be interchanged with other harnesses or hose assemblies.) Respirator air-line hose connector fittings must be incompatible with any other fittings on site to make it impossible to connect to any service except breathing air.

3.2 Medical History Questionnaire and Pulmonary Function-Vital Capacity (PF-VC) Check

The physician determines the medical process necessary to qualify employees for respirator use.

Typical medical requirements for employee qualification include a completed medical history and a satisfactory PF-VC check conducted prior to start of work and evaluated at least annually. Employees must complete a Confidential Medical Questionnaire for Annual Respirator Approval (Attachment E-8.1-1 or equivalent), and a pulmonary function-vital capacity (PF-VC) check before being assigned to tasks requiring respirator use. For a sample Respirator and Medical Approval Form, see Attachment E-8.1-2. The PF-VC check must be made by a qualified person.

3.3 Respirator Classes

Respirators are divided into Class 1, Class 2, and Class 3.

3.3.1 Class 1 – Air-Purifying Devices – Air-purifying devices are used to cleanse a contaminated atmosphere. When the wearer breathes, air is drawn through either a chemical filter (to remove specific gases and vapors) or a mechanical filter (to remove particulate matter including dusts, mists, metal fumes, and smoke). Examples of air-purifying devices include dust masks, half masks, full-face masks, and powered air-purifying respirators (PAPRs). The air-purifying element must be approved for the type of contaminant that is present. Consult the industrial hygienist, safety specialist, or respirator manufacturer for the type of air-purifying element to use in a specific situation.

Air-purifying devices must meet the following requirements:

- NIOSH approval
- the wearer must be medically certified (have a medical examination and PF-VC check)
- the wearer must have the mask fit tested
- the wearer must be trained in the use of the mask

Air-purifying devices have the following restrictions:

- They must **not** be used in IDLH atmospheres.
- They must **not** be used in atmospheres containing less than 19.5 percent oxygen.
- They must **not** be used for protection against gases or vapors with inadequate warning properties (e.g., odor or taste).

3.3.2 Class 2 – Atmosphere- or Air-Supplying Devices – These devices provide the wearer with a respirable atmosphere, independent of the ambient air. Types of atmosphere- or air-supplying devices include the following:

- supplied-air respirators
- self-contained breathing apparatus (SCBA)
- combination SCBA and supplied-air respirators

Supplied-air respirators deliver breathing air through a supply hose connected to the wearer's facepiece or enclosure. These devices should be used only in non-IDLH atmospheres. There are three types of supplied-air respirators – A, B, and C.

- Type A – hose masks with blower
- Type B – hose masks without a blower
- Type C – air-line respirators. The air-line respirator is connected to a compressed air source by a hose so Grade D or better air is delivered in sufficient volume to meet the wearer's breathing requirements.

There are three basic classes of air-line respirators: constant- or continuous-flow, demand-flow, and pressure-demand-flow.

- Constant-flow (or continuous-flow) respirators have a regulated amount of air fed to the facepiece and are normally used where there is an ample air supply (e.g., from a compressor).
- Demand-flow respirators deliver airflow only during inhalation. They are normally used when the air supply is restricted to high-pressure compressed air cylinders.
- Pressure-demand-flow respirators are used when the possibility of inward leakage is unacceptable and/or where there cannot be a relatively high air consumption.

Air-line respirators have the following restrictions:

- They must **not** be used in IDLH atmospheres.
- They must **not** be used in atmospheres containing less than 19.5 percent oxygen.
- They must **not** be used for protection against gases or vapors with inadequate warning properties (e.g., odor or taste).

There are four basic types of SCBAs:

- oxygen-cylinder rebreathing
- self-generating types
- demand – all consist of a high-pressure air cylinder, a demand regulator, a facepiece and tube assembly with an exhalation valve/valves and a method of mounting the complete apparatus on the body.
- pressure-demand – same principle as the pressure-demand air-line respirators and is approved and used where the toxicity is such that the potential facepiece leakage of demand apparatus is not tolerable.

3.3.3 Class 3 – Combination Air-Purifying and Atmosphere-Supplying Devices – These devices combine an air-line respirator and an auxiliary air-purifying attachment for use if the air supply fails. They are used in isolated situations such as asbestos abatement.

Combination air-purifying and atmosphere-supplying devices have the following restrictions:

- They must **not** be used in IDLH atmospheres.
- They must **not** be used in atmospheres of less than 19.5 percent oxygen.
- They must **not** be used for protection against gases or vapors with inadequate warning properties (e.g., odor or taste).

3.4 Respirator Use

3.4.1 Training – A qualified person must train each respirator user in proper respirator use and care, respirator limitations, and hazard recognition. Personnel must be re-trained annually. (Training must precede fit testing. For more information on fit testing, see section 3.4.2.) The instruction program must include a demonstration of proper fitting techniques and sufficient practice in wearing and adjusting respirators. The training must be documented and signed by the trainer and the trainee. A sample Respirator Training/Fit Test Record is included as Attachment E-8.1-3.

3.4.2 Fit Test – A qualified person must give each respirator user a facepiece fit test.

Normally only qualitative fit testing is required. Quantitative fit testing is required in special situations (e.g., asbestos work, which requires a protection factor of greater than 10 times the exposure limit). Refer to Engineering Standard S8H for more information on qualitative and quantitative fit testing.

Fit tests must be done at least annually, except when regulations require more frequent testing (e.g., when respirators are used for protection against asbestos and lead). The fit tests must be documented and signed by the trainer and the trainee. A sample Respirator Training/Fit Test Record is included as Attachment E-8.1-3.

3.4.3 Maintenance and Inspection – The respiratory protection program coordinator is responsible for ensuring that respirators are properly stored, maintained, inspected, and cleaned according to manufacturer's recommendations. Individuals who have respirators assigned for their

ATTACHMENT C-1.3-2

Dragline/Clamshell Operator Qualification

_____ employed by
(Operator's Name)

_____ is authorized to operate
(Employer's Name)

this dragline/clamshell _____, and for the
(Dragline/Clamshell Make/Model)

specific dragline/clamshell to be operated:

- has the required physical and mental abilities required to operate the dragline/clamshell.
- has read the specific dragline/clamshell manufacturer's operating manual.
- has received and successfully completed specific written and/or oral training and instructions on the dragline/clamshell to be operated.
- has demonstrated proficiency in the safe operation of the dragline/clamshell to be operated.

Verified by _____ _____
(Employer Representative) Date

_____ _____
Employee's Signature Date

RESPIRATORY PROTECTION

1.0 SCOPE

This procedure outlines the minimum acceptable requirements for a respiratory protection program and describes the three classes of respirators. Follow applicable local regulations when they are more restrictive.

2.0 DEFINITIONS

Breathing Air Cylinders – Cylinders tested, maintained, and marked according to prescribed regulations and used for the storage and supply of compressed air for breathing purposes.

Immediately Dangerous to Life or Health (IDLH) – A descriptive term for conditions that pose an immediate threat to life or health; conditions that pose an immediate threat of severe exposure to contaminants (such as radioactive materials) likely to have delayed adverse effects on health.

Qualified Person – One who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve or resolve problems relating to the subject matter, the work, or the project and is designated by supervision to perform the specific task.

Respiratory Protection Coordinator – A qualified person designated by site management to coordinate the respiratory protection program.

Vortex Air Cooler/Heater – A device, without moving parts and using only compressed air, that is capable of converting an ordinary supply of compressed air into two streams, one hot and one cold. The proportions of hot and cold flow and their temperatures can be varied over a wide range.

3.0 GENERAL

3.1 Respiratory Protection Program

Each site must develop a written respiratory protection program, including the name of the qualified person designated to coordinate the program. The respiratory protection program coordinator is responsible for carrying out all phases of the respiratory protection program.

If an individual wears a respirator on the site (even if it is for comfort and not required by job assignment), he or she must meet all the qualifications of the respiratory protection program.

The respiratory protection program should include a written statement of site policy, including assignment of responsibility, accountability, and authority for required activities of the respiratory protection program. The program must also include recognition and resolution of special problems as they affect respirator use (e.g., facial hair, eyeglasses, and wearing of contact lenses with full-face respirators).

An effective respiratory protection program must include the following elements:

- written standard operating procedures governing the selection and use of respirators
- respirator selection criteria (from MSHA/NIOSH-approved and -certified models) based on the hazards to which the worker is exposed
- respirator fit testing
- user training in the proper use and limitations of respirators
- a method (e.g., audit) of evaluating the level of skill and knowledge achieved by workers through user training
- regular cleaning and disinfecting of respirators
- storage of respirators in convenient, clean, and sanitary locations
- routine inspection of respirators designated for emergency use after each use and at least monthly

ATTACHMENT C-1.3-1a

Dragline/Clamshell Operator Medical Examination

Date of Examination _____

Name _____ Social Security Number _____

Date of Birth _____ Height _____ Weight (Pounds) _____

Health History

Yes	No		Yes	No	
____	____	Diabetes	____	____	Lung Disorders (Asthma, Tuberculosis, Shortness of Breath)
____	____	Muscular Disease	____	____	Cardiovascular Disease (Rheumatic Fever, Scarlet Fever, Diphtheria)
____	____	Mental Disorder	____	____	Nervous System Disorders (Dizziness, Epilepsy, Syphilis)
____	____	Arthritis	____	____	Currently Under a Physician's Care
____	____	Kidney Disease	____	____	Suffering from Any Other Disease
____	____	Liver Disorder	____	____	Permanent Impairment from Illness, Disease, or Injury
____	____	Serious Injuries			

General

General Appearance and Development: ____Good ____Fair ____Poor

Hearing: Right Ear_____ Left Ear _____ Disease or Injury _____

Thorax: Heart _____

Blood Pressure: Systolic _____ Diastolic _____

Pulse: Before Exercise _____ Immediately After Exercise _____

Abdomen: Scars _____ Abnormal Masses _____ Tenderness _____

Reflexes: Accommodation: Right _____ Left _____

Knee Jerks: Right: ____ Normal ____ Increased ____ Absent Left: ____ Normal ____ Increased ____ Absent

Remarks: _____

Extremities: Upper _____ Lower _____ Spine _____

Eyes: For Distance: Right 20/____ Left 20/____ Without Corrective Lenses____ With Corrective Lenses, if Worn____

Evidence of Disease or Injury: Right ____ Left ____ Color Test (Jaegers J1): _____

Horizontal Field of Vision: Right _____ Left _____

Rhomberg _____ Pupillary _____ Light: Right ____ Left ____

Remarks: _____

_____

_____

_____

_____ _____ Check Here if the Operator Has Not Passed this Examination ____

Name of Examining Doctor (Please Print) Signature

_____

Address of Examining Doctor

Note: This form meets the minimum medical examination requirements for mobile crane operators set forth in ANSI/ASME B30.5, 5-3.1.2.

ATTACHMENT C-1.3-1b

Dragline/Clamshell Operator Medical Qualification

Instructions to Examining Physician

1. Send this Medical Qualification form (Attachment C-1.3-1b) to the site manager's designee, who is responsible for verifying that dragline/clamshell operators meet minimum operator qualifications, e.g., North American Crane Bureau, Inc.

2. If an employee does not wish to have his/her Medical Examination form (Attachment C-1.3-1a) released to the person at the site responsible for qualifying dragline/clamshell operators, this form may be released in its place.

Name _____

Social Security Number _____

Location _____

I examined the above on (date) _____ and find the person (qualified) (not qualified) medically to operate dragline/clamshell based on the findings in the Dragline/Clamshell Operator Medical Examination.

Examining Physician _____ Date _____

ATTACHMENT C-1.3-1b

Dragline/Clamshell Operator Medical Qualification

Instructions to Examining Physician

1. Send this Medical Qualification form (Attachment C-1.3-1b) to the site manager's designee, who is responsible for verifying that dragline/clamshell operators meet minimum operator qualifications, e.g., North American Crane Bureau, Inc.

2. If an employee does not wish to have his/her Medical Examination form (Attachment C-1.3-1a) released to the person at the site responsible for qualifying dragline/clamshell operators, this form may be released in its place.

Name Sam W. Smith

Social Security Number 229-xx-2638

Location Orange, Tx

I examined the above on (date) 2/10/92 and find the person (qualified) (not qualified) medically to operate dragline/clamshell based on the findings in the Dragline/Clamshell Operator Medical Examination.

Examining Physician Malcom C. Scott Date 2/12/92

ATTACHMENT C-1.3-2

Dragline/Clamshell Operator Qualification

Sam W. Smith employed by
(Operator's Name)

Dunn Equipment Inc. is authorized to operate
(Employer's Name)

this dragline/clamshell Manitowoc 3900 W, and for the
(Dragline/Clamshell Make/Model)

specific dragline/clamshell to be operated:

- has the required physical and mental abilities required to operate the dragline/clamshell.
- has read the specific dragline/clamshell manufacturer's operating manual.
- has received and successfully completed specific written and/or oral training and instructions on the dragline/clamshell to be operated.
- has demonstrated proficiency in the safe operation of the dragline/clamshell to be operated.

Verified by Floyd Doyle 2/10/97
(Employer Representative) Date

Sam W. Smith 2/10/97
Employee's Signature Date

DRAGLINES AND CLAMSHELLS

- Make sure the dragline or clamshell buckets are sized according to the load capacity of the crane.
- Lower the load or bucket to the ground before leaving the controls so that it does not remain suspended while the crane is inactive.

4.0 REFERENCES

4.1 SHE A-21.1, *Planning Work in Plant Areas*

SHE B-1.18, *Use of Mobile Equipment Near Exposed Electric Lines*

SHE C-1.1, *Mobile Cranes*

SHE C-10.1, *Mobile Equipment Work Near Hazardous/Critical Pipelines*

SHE D-2.1, *Fire Extinguishing Equipment*

4.2 ANSI/ASME B30.5, *Mobile and Locomotive Truck Cranes*

ATTACHMENT C-1.3-1a

Dragline/Clamshell Operator Medical Examination

Date of Examination 2/10/92

Name Sam W. Smith Social Security Number 229-XX-2635

Date of Birth 1/16/61 Height 6'0" Weight (Pounds) 190

Health History

Yes	No		Yes	No	
___	✓	Diabetes	___	✓	Lung Disorders (Asthma, Tuberculosis, Shortness of Breath)
___	✓	Muscular Disease	___	✓	Cardiovascular Disease (Rheumatic Fever, Scarlet Fever, Diphtheria)
___	✓	Mental Disorder	___	✓	Nervous System Disorders (Dizziness, Epilepsy, Syphilis)
___	✓	Arthritis	___	✓	Currently Under a Physician's Care
___	✓	Kidney Disease	___	✓	Suffering from Any Other Disease
___	✓	Liver Disorder	___	✓	Permanent Impairment from Illness, Disease, or Injury
___	✓	Serious Injuries			

General

General Appearance and Development: ✓ Good ___ Fair ___ Poor

Hearing: Right Ear Adequate Left Ear Adequate Disease or Injury none apparent

Thorax: Heart normal

Blood Pressure: Systolic 104 Diastolic 66

Pulse: Before Exercise 72 Immediately After Exercise ___

Abdomen: Scars none Abnormal Masses none Tenderness none

Reflexes: Accommodation: Right normal Left normal

Knee Jerks: Right: ✓ Normal ___ Increased ___ Absent Left: ✓ Normal ___ Increased ___ Absent

Remarks: —

Extremities: Upper normal Lower normal Spine normal

Eyes: For Distance: Right 20/35 Left 20/30 Without Corrective Lenses ✓ With Corrective Lenses, if Worn ___

Evidence of Disease or Injury: Right none Left none Color Test (Jaegers J1): pass

Horizontal Field of Vision: Right ___ Left ___

Rhomberg negative Pupillary ___ Light: Right normal Left normal

Remarks: high frequency hearing deficit bilat

Malcom C. Scott — Malcom C. Scott

Name of Examining Doctor (Please Print) — Signature — Check Here if the Operator Has Not Passed this Examination ___

1438 Poco Dr., Orange TX, 29403

Address of Examining Doctor

Note: This form meets the minimum medical examination requirements for mobile crane operators set forth in ANSI/ASME B30.5, 5-3.1.2.

SAFETY HEALTH ENVIRONMENT

ISSUED	4/92
REAFFIRMED	
PG. REVISED	
	PAGE 1 OF 3

DRAGLINES AND CLAMSHELLS

1.0 SCOPE

This procedure establishes guidelines for inspecting and safely operating draglines and clamshells. It also outlines the qualifications for dragline and clamshell operators.

2.0 DEFINITIONS

Boom Angle – The angle above true horizontal of a line drawn through the boom hinge pin and the center line of the shaft of the main boom tip sheave.

Electrical Source – Items such as equipment, cables, lines, or busbars that are used to conduct electrical current.

Operating Radius – The horizontal distance from the axis of rotation to the center of gravity of the freely suspended load.

Qualified Inspector – An experienced craftsperson or engineer (Du Pont or contractor) who has demonstrated his or her ability or competency to inspect equipment to the site manager and or the Du Pont Fleet Operations designee.

3.0 GENERAL

A dragline is a crane that has a dragline fairlead assembly. The boom and hoist are used to raise and lower an excavator bucket. The dragline fairlead assembly is used to drag the bucket to fill it. It can then be hoisted and its contents dumped in another location.

A clamshell is a crane that has a clamshell assembly. The boom and hoist are used to raise and lower a clamshell bucket.

3.1 Inspection

A qualified inspector must inspect all cranes used with draglines and clamshells prior to their use on site and at least quarterly thereafter. For sample forms and more information on crane inspections, see SHE C-1.1.

Before using a crane, the operator must inspect the work location for any unsafe conditions and report them to the supervisor immediately so they can be corrected.

The operator must test all controls, safety devices, and wire rope before beginning work each day. If any of the controls do not operate properly, they must be repaired before the crane is operated.

All mechanical and control repairs made to a crane must be performed according to the manufacturer's recommendations and approvals.

3.2 Environmental Considerations

Hydraulic lines must be maintained to prevent leakage. If a leak or failure occurs in a hydraulic system, the spill must be cleaned up according to site, local, state, and governmental regulations. Sites should have a written procedure to respond to this type of spill.

3.3 Operator Qualifications

The site manager must ensure that a testing program exists for crane operators. All crane operators must meet the following minimum requirements:

- They must pass an annual medical examination given by a licensed physician. See Attachments C-1.3-1a and C-1.3-1b for sample medical forms for crane operators. The physician's report becomes a part of the operator's file.
- They must pass a written/oral test on general crane operation at a maximum interval of every two years.
- They must demonstrate satisfactory operating skills at a maximum interval of every two years for each specific crane they will use.

When operators have successfully passed the medical and written/oral examinations and demonstrated that they can operate the cranes they will use, documentation is placed in their files stating that they are qualified to operate a crane on a Du Pont site. For a sample qualification form see C-1.3-2.

DRAGLINES AND CLAMSHELLS

3.4 Equipment Requirements

Every crane must be equipped with a legible, durable load and range chart that shows the manufacturer's recommended load configurations and maximum load weights. The chart must be securely attached to the cab and easily visible to operators when they are seated at the control station.

A class BC fire extinguisher (of a minimum size of 5 pounds [2.3 kilograms]) must be kept in the crane's cab. For more information on fire extinguishers, see SHE D-2.1.

3.5 Operation

A crane operator must observe the following minimum safety precautions:

- Maintain continuous contact, either visual or vocal, with a qualified signalperson. (If for any reason that contact is lost, the crane operator must stop all operations until full contact is restored.)
- Store items such as tools, oil cans, and waste materials in a toolbox. (Do not leave any loose items in the cab.)
- Be constantly alert to the effects of dynamic loading when swinging, hoisting, and lowering the load or when moving the crane.
- Prior to moving a crane into an area, evaluate underground conditions for crane stability and for the possibility of damage to underground facilities or injury to personnel.
- Make sure the hoist line is vertical at all times.
- Barricade the swing radius of the counterweight. Use other barricades according to site procedures.
- Know the radius of the load at all times.
- Keep the load directly under the trolley at all times.
- Make sure the crane hooks' safety latches are in good working order and are used properly.
- Follow the manufacturer's instructions for entering and exiting the crane's cab. (The only acceptable alternative to these instructions is using a straight ladder that has been tied to the crane.)
- Do not operate cranes when wind speeds exceed 35 mph (56 kph).
- Lower booms when storm or winds exceed the limits in the manufacturer's recommendations.
- Make sure cranes are able to weather vane in high winds and when left overnight or unattended.
- Use tag lines to control loads at all times.
- Make sure the crane is level to within 1 percent of grade before operations begin. (When the crane is not level, high side loads are transmitted into the boom, causing an unsafe condition.)
- Make sure that when the crane is loading or unloading trucks, the truck's cab is unoccupied.
- Do not leave the controls when the load is suspended.
- Make sure that no one walks or stands between the dragline or clamshell load and a bank, high wall, spoil, or other nearby obstacle.
- Do not allow anyone else on the crane when it is in use.
- Keep the loading/unloading areas clear of personnel.
- Keep the swing path clear.
- Follow the manufacturer's recommendations for maximum allowable loads and maximum boom lengths. (Remember that the weights of hooks, hook blocks, balls, slings, and all other load-handling devices are considered part of the load.)
- When any part of the equipment or load could come within 15 feet (4.5 meters) of an electrical source or hazardous pipes during the planned swing radius, the requirements in SHE B-1.18 or SHE C-10.1 must be met.
- Consider flammable and explosive classifications before using a crane in an operating area. For more information on classifications, see SHE A-21.1.
- Make sure that the equipment is shut down and a fire extinguisher is available during refueling.
- Consider soil stability before using a dragline or clamshell. (Unstable soil could cause the dragline or clamshell to tip or overturn during operations. Using metal or wood mats may help improve crane stability.)
- Prevent the bucket and its contents from striking the boom.

EVACUATION PLAN
General Procedures

As part of an evacuation plan:

1. Extinguish all cigarettes and flames. No smoking or heat producing work will be performed until authorized.

2. Always walk across wind, never down wind, during an evacuation.

3. Assemble in your working crews, report to your Foreman.

4. Do Not attempt to drive vehicles or mobile equipment from the affected area. Operator should shut down equipment, without blocking roadways or access routes, and walk to assembly area.

5. Foreman or Lead Man shall report for his crew and sub-contractor crews as noted above.

6. All work permits are considered void once a Plant Emergency or Fume Release signal is activated and must be reissued after the all clear has sounded.

HEAD COUNT PHONE NUMBERS

DAY (M-F) - 5122 or 5474

OFF HOURS - 5713 or 5200

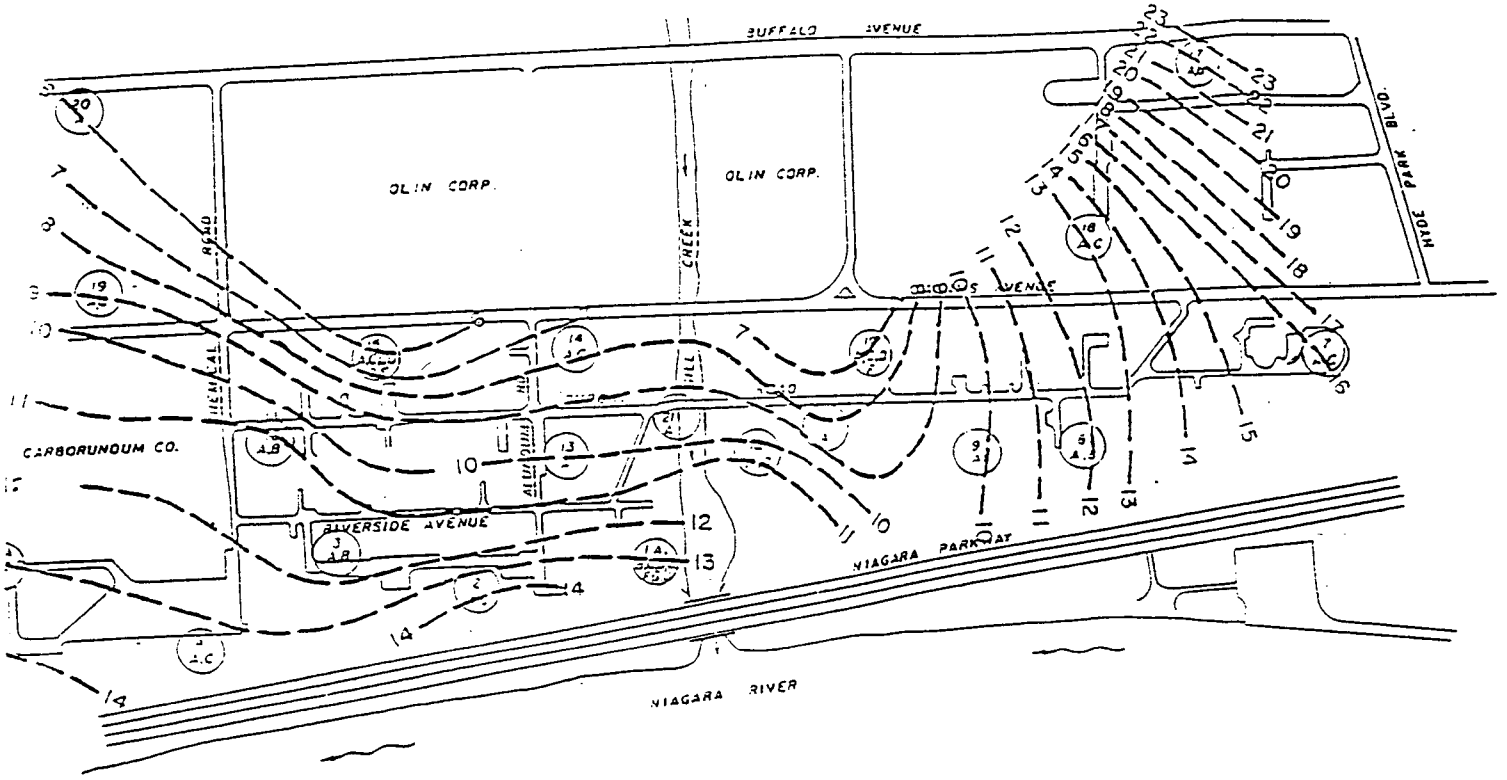
IN CASE OF FUME ALARM, PLANT EMERGENCY OR FIRE ALARM IN YOUR AREA, REPORT TO SAFEST ASSEMBLY POINT BASED ON FUME SOURCE LOCATION AND WIND DIRECTION.

TEST

All area tests other than Sodium area tests are designated by three horn or siren blasts. Sodium area tests are designated by loudspeaker announcement. **Never assume that an alarm is a test unless you hear three (3) preceding blasts.**

Area Emergency Alarm Test Schedule

ALARM SYSTEM	TEST DAYS (TIME)
Main Fume Release / Fire Alarm	Monday & Thursday (6:45 a.m., 8:30 p.m.)
Fire Box (boxes located throughout the plant)	Monday & Thursday (8:30 a.m.)
Sodium Siren	Friday (10:30 a.m.)
Niachlor Siren	Friday (11:00 a.m.)



LEGEND:

- WELL CLUSTER NUMBER (NO.)
- WELL TYPE (LETTER)

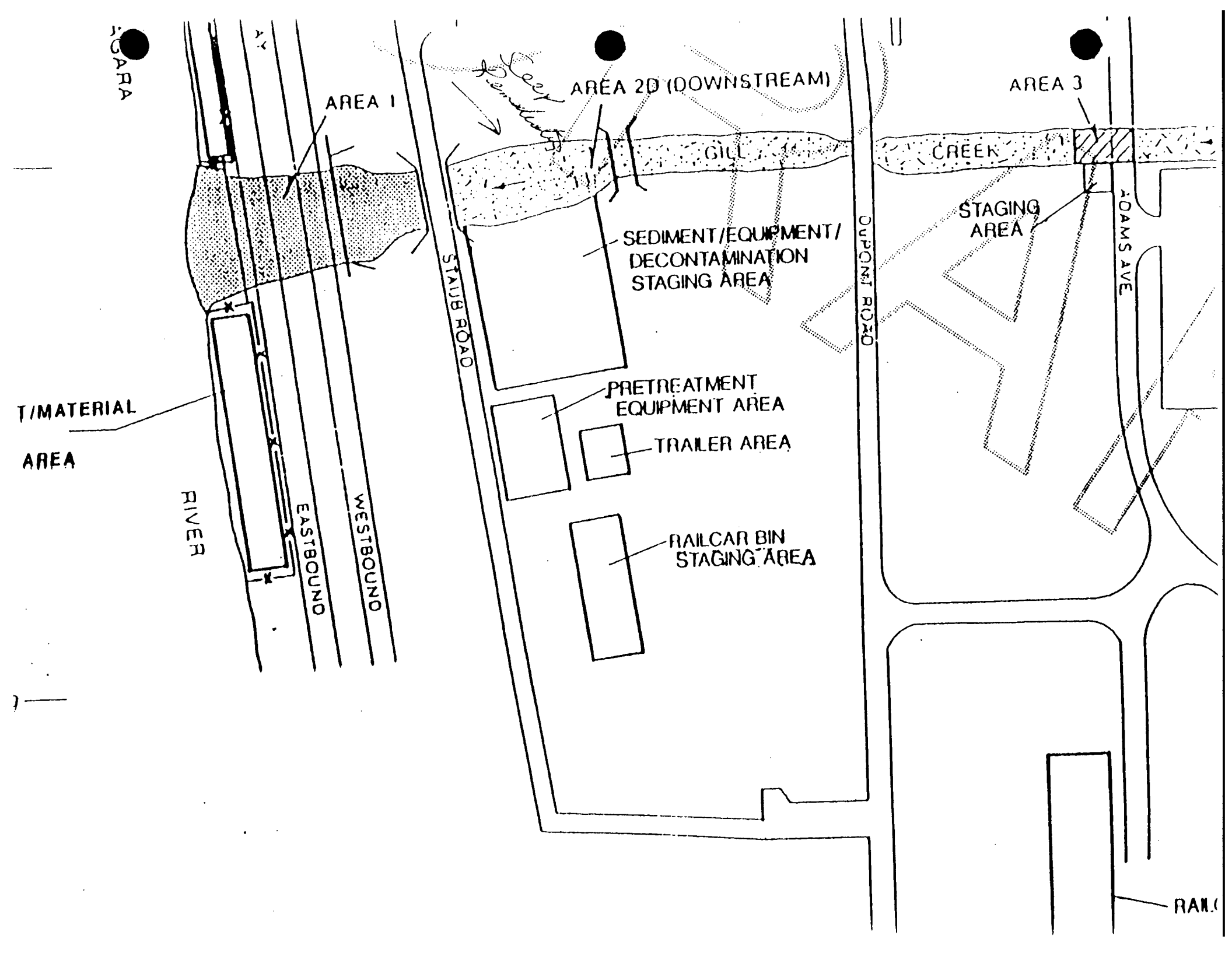
CONTOUR INTERVAL = 1 FOOT

ISOPACH MAP OF FILL/OVERBURD

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENT

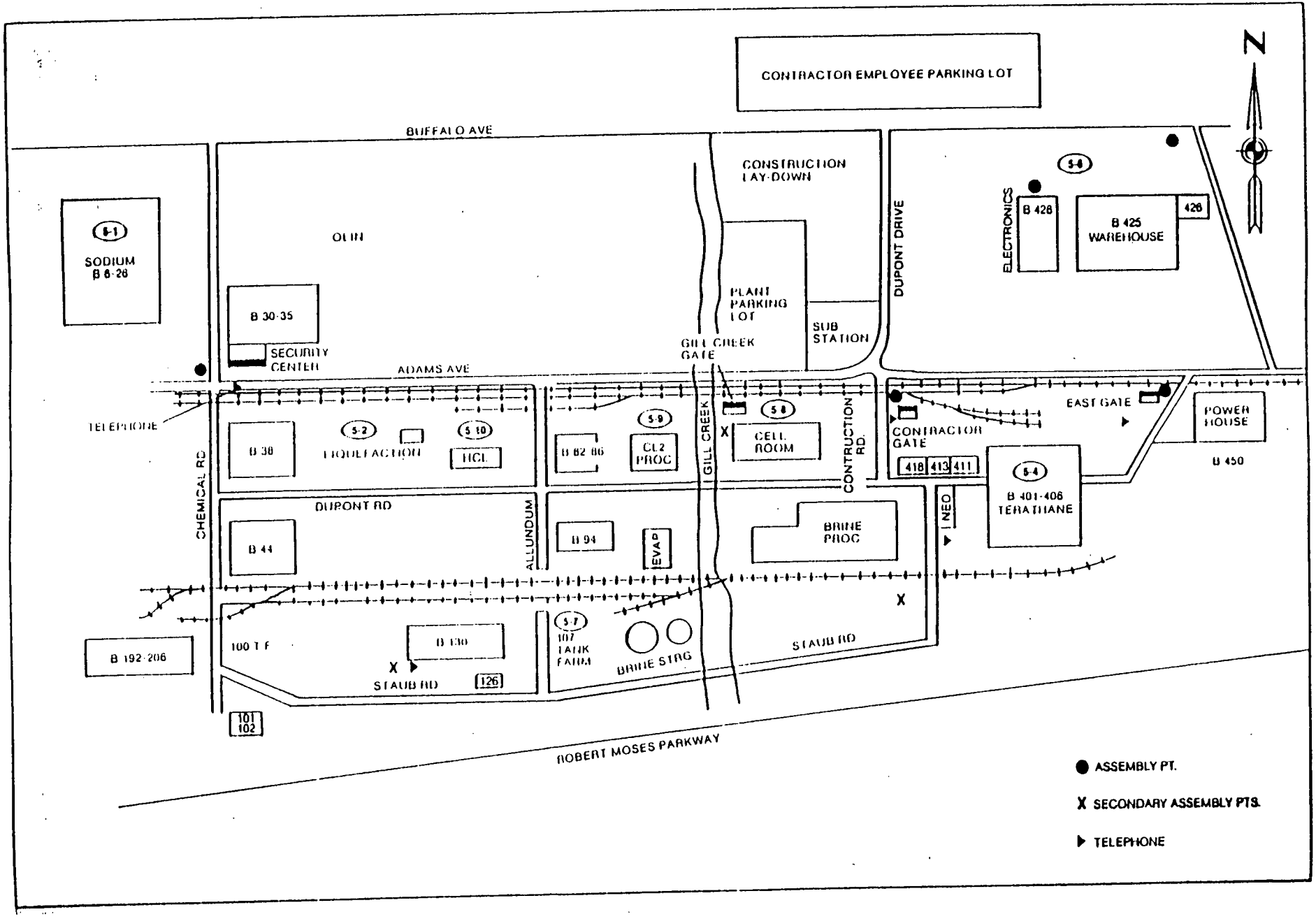
DRAWN BY: T.P.	SCALE in FEET	DATE
CHECKED : L.R.P.	0 300	


AREA 1
AREA 2D (DOWNSTREAM)
AREA 3
GILL
CREEK
STAGING AREA
ADAMS AVE
SEDIMENT/EQUIPMENT/ DECONTAMINATION STAGING AREA
STAUB ROAD
DUPONT ROAD
PRETREATMENT EQUIPMENT AREA
TRAILER AREA
RAILCAR BIN STAGING AREA
T/MATERIAL
AREA
RIVER
EASTBOUND
WESTBOUND

FUME ALARMS AND ASSEMBLY POINTS

5-3 UNKNOWN SOURCE

5-5 PLANT EMERGENCY



TURNED OFF.

c. PERSONNEL SHALL DETERMINE FUME SOURCE LOCATION AND WIND DIRECTION, THEN IMMEDIATELY EVACUATE THEIR WORK AREAS AND PROCEED TO THE SAFEST ASSEMBLY POINT. ASSEMBLY POINT LOCATIONS ARE SHOWN ON THE ABOVE SKETCH.

d. THE ENTIRE PLANT BECOMES A "NO SMOKING" AREA.

e. AN ACCOUNTING (HEADCOUNT) OF ALL SITE PERSONNEL MUST BE MADE.

2. <u>HEADCOUNT- REGULAR SHIFT</u>

a. TO OBTAIN AN ACCURATE HEADCOUNT OF ALL NIAGARA ENGINEERING (NEO) CONTRACTOR EMPLOYEES, A DAILY LISTING OF ALL ON-SITE PERSONNEL IS REQUIRED. THIS IS ACCOMPLISHED BY REQUIRING EMPLOYEES TO SIGN IN AND OUT OF THE PLANT.

b. IN THE EVENT OF A FUME ALARM, ALL PERSONNEL MUST REPORT TO THE SAFEST ASSEMBLY POINT, ASSEMBLY BY CONTRACTOR, AND REPORT TO SUPERVISION.

c. CONTRACTOR SUPERVISION MUST CONDUCT THE HEADCOUNT FOR THEIR EMPLOYEES AND THEIR SUBCONTRACTOR EMPLOYEES. SUPERVISION MUST CALL 5122 (NE HEADCOUNT CENTER NUMBER) OR 5474 (NE HEADCOUNT CENTER BACK-UP NUMBER), AND GIVE THE FOLLOWING INFORMATION:

1. YOUR NAME
2. CONTRACTOR NAME
3. NUMBER OF YOUR EMPLOYEES ACCOUNTED FOR.
4. NAMES AND LAST KNOWN LOCATION OF ANY MISSING EMPLOYEES.

THE SAME INFORMATION IS REQUIRED FOR ALL SUBCONTRACTORS WORKING FOR PRIMARY CONTRACTORS. IT IS THE SUBCONTRACTOR'S RESPONSIBILITY TO PROVIDE THIS INFORMATION TO THE NE HEADCOUNT CENTER.

d. IF CRAFTSMEN BECOME SEPARATED FROM THEIR SUPERVISION, THEY ARE RESPONSIBLE FOR ACCOUNTING FOR THEMSELVES. THEY MUST CALL 5122 OR 5474 AND GIVE THEIR NAME AND THE NAME OF THEIR EMPLOYER.

e. ALL EMPLOYEES MUST REMAIN AT THE ASSEMBLY POINT UNTIL THE "ALL CLEAR" SOUNDS.

f. THE NE HEADCOUNT CENTER MUST COMMUNICATE BY PHONE OR RADIO WITH THE CONTRACTOR GATE TO RECONCILE HEADCOUNT INFORMATION WITH GATE LOGS.

g. THE NE HEADCOUNT CENTER MUST COMPILE ALL INFORMATION RECEIVED FROM THE FIELD AND GATE LOGS, THEN REPORT RESULTS TO THE PLANT HEADCOUNT CENTER AT 5200.

3. HEADCOUNT - OFF-HOURS, WEEKENDS AND HOLIDAYS

a. IN THE EVENT OF A FUME ALARM, ALL PERSONNEL MUST REPORT TO THE SAFEST ASSEMBLY POINT AND CONDUCT THE HEADCOUNT AS DESCRIBED ABOVE.

b. THE OFF-HOURS, WEEKENDS AND HOLIDAYS NE HEADCOUNT CENTER IS THE CONTRACTOR GATE. THE PHONE NUMBER IS 5713. CONTRACTOR HEADCOUNT INFORMATION MUST BE CALLED INTO THE CONTRACTOR GATE GUARD 5713 OR PLANT HEADCOUNT CENTER 5200.

c. THE CONTRACTOR GATE GUARD MUST REPORT THE HEADCOUNT INFORMATION TO THE PLANT HEADCOUNT CENTER 5200.

REVISED 2/92.

III. FIRE ALARM SYSTEM AND PROCEDURE

a. FIRE ALARM BOXES

RED FIRE ALARM BOXES ARE LOCATED THROUGHOUT THE PLANT SITE. EACH FIRE ALARM BOX HAS ITS OWN TWO DIGIT NUMBER. IN THE EVENT OF A FIRE, THEN THE FIRE ALARM BOX LOCATION NEAREST THE FIRE WILL BE ACTIVATED. THE PLANT ALARM SIGNAL SYSTEM WILL SOUND THE APPROPRIATE TWO DIGIT NUMBER TO IDENTIFY THE LOCATION OF THE FIRE. THE FIRE ALARM BOX LOCATIONS ARE LISTED BELOW.

b. PERSONNEL RESPONSE

1. EMPLOYEES WORKING IN THE AREA EXPERIENCING THE DIRE SHALL EVACUATE THE AREA SO AS NOT TO INHIBIT FIRE FIGHTING OPERATIONS BY THE LOCAL FIRE DEPARTMENT.

2. EMPLOYEES WORKING IN UNAFFECTED AREAS SHOULD CONTINUE WORKING.

3. IF THE FIRE IS SERIOUS, THE PLANT EMERGENCY ALARM, 5-5, WILL BE SOUNDED, WHICH REQUIRED ALL SITE PERSONNEL TO REPORT TO ASSEMBLY POINTS AND PARTICIPATE IN THE HEADCOUNT PROCEDURE. SEE SECTION IV.B.

IV. FUME ALARM SYSTEM AND PROCEDURE

a. THERE ARE 10 DIFFERENT FUME ALARM SIGNALS FOR THE PLANT SITE. IN THE EVENT OF A FUME RELEASE BEYOND THE CONTROL OF THE PLANT AREA INVOLVED, THE APPROPRIATE FUME ALARM SIGNAL WILL BE ACTIVATED. PLANT AREAS AND THEIR ASSIGNED FUME ALARM SIGNALS ARE SHOWN BELOW.

IF THE 5-1, 5-2, 5-3, 5-4, 5-6, 5-7, 5-8- 5-9, OR 5-10 ALARM IS SOUNDED, THERE IS A FUME RELEASE IN A SPECIFIC PLANT AREA.

b. PERSONNEL RESPONSE - FOR ANY FUME ALARM SIGNAL

1. GENERAL

a. ALL WORK IN ALL LOCATIONS STOPS. ALL PERMITS GOVERNING WORK ACTIVITY ARE CANCELED.

b. PORTABLE EQUIPMENT SHALL BE TURNED OFF. MOBILE EQUIPMENT AND VEHICLES SHALL BE LOCATED OUT OF ROADS AND IGNITION

BARRICADES AND HAZARDOUS AREA SIGNS

Rules for entry: Rope-off

Observe the following rules for entering a roped-off area.

IF the Hazardous Area sign...	THEN...
says "DO NOT ENTER"	Obtain verbal permission for entry from • the person who erected the rope-off, • that person's immediate supervisor, or • the Proprietor of the area (if work group personnel are not on the plant).
does not specifically prohibit entry	Enter the area if you understand the hazard described on the sign and take proper precautions to protect yourself against the hazard.

Date issued

Date issued: 2/86 Date revised: 1/91

Approval of standard

Approved: _____ Date

NIAGARA ENGINEERING
PROCEDURE NO. 12.

EMERGENCY AND HEADCOUNT PROCEDURE

PURPOSE:

THIS PROCEDURE ESTABLISHES SPECIFIC ACTIONS AND RESPONSIBILITIES OF CONTRACTOR EMPLOYEES IN THE EVENT OF A PLANT EMERGENCY.

I. PLANT EMERGENCY

EMERGENCIES MAY RESULT FROM SUCH THINGS AS OPERATIONAL UPSETS, EQUIPMENT FAILURE, HUMAN ERROR OR EXTERNAL CAUSES. PLANT EMERGENCIES WILL USUALLY INVOLVE A FIRE OR FUME RELEASE THAT IS BEYOND THE CAPABILITY OF THE AFFECTED AREA TO CONTROL. THE LOCAL FIRE DEPARTMENT WILL FIGHT ALL PLANT FACILITY FIRES AND PLANT PERSONNEL WILL HANDLE ALL RESCUE OPERATIONS ASSOCIATED WITH A PLANT EMERGENCY.

II. ALARM SIGNAL SYSTEM

a. AREA ALARM

SIRENS ARE USED TO ALERT AREA PERSONNEL IN THE EVENT OF A FUME RELEASE IN LIQUEFACTION, CHLORINE PUMPING AND TERATHANE AREAS. IF THE FUME RELEASE MAY AFFECT OTHER PLANT AREAS, THEN THE APPROPRIATE PLANT FUME ALARM SIGNAL WILL BE ACTIVATED.

b. PLANT ALARMS

THE PLANT ALARM SIGNAL SYSTEM CONSISTS OF A SERIES OF AIR HORN BLASTS. THE NUMBER OF BLASTS IDENTIFIES THE LOCATION AND NATURE OF THE EMERGENCY. ALL PLANT ALARM NUMBERS CONSIST OF TWO DIGITS. THE NUMBER OF AIR HORN BLASTS CORRESPONDS TO THE TWO DIGIT NUMBER.

EXAMPLE: FIRE ALARM NO. 46 WOULD BE FOUR SHORT BLASTS, A PAUSE, THEN SIX SHORT BLASTS.

c. ALL CLEAR AND TEST

THREE (3) SHORT BLASTS ARE USED TO DESIGNATE THE "ALL CLEAR" ONCE A PLANT EMERGENCY HAS BEEN IDENTIFIED AND BROUGHT UNDER CONTROL. THREE (3) SHORT BLASTS ARE ALSO USED TO IDENTIFY A TEST OF THE ALARM SIGNAL SYSTEM. TESTS ARE CONDUCTED ON MONDAYS AND THURSDAYS AT 6:30 A.M., 8:30 A.M. AND 8:30 P.M. THE THREE SHORT BLASTS ARE SOUNDED, THEN A FIRE OR FUME ALARM SIGNAL IS SOUNDED. NO RESPONSE IS REQUIRED FOR A TEST OF THE ALARM SIGNAL SYSTEM.

BARRICADES AND HAZARDOUS AREA SIGNS

Hazardous Area signs

Definition: Hazardous Area signs are red and white signs which warn against immediate or potential hazards. They are available in Stores.

When to use: Use Hazardous Area signs with both physical barricades and rope-offs.

Required information: Show the following information on the signs:

- the hazard
- special instructions or precautions, if applicable
- the group erecting the barricade or rope-off
- the responsible supervisor's phone number, and
- the date erected.

Where to post: Post all sides of the barricaded or roped off area.

Responsibility for erecting barricades

An adequate physical barricade or rope-off may be erected by

- the area in which the hazard exists, or
- the group conducting the potentially hazardous work.

SAFETY NOTE: When immediate action is needed, any person who notices the hazard shall

- erect or arrange for a rope-off to protect others, and then
- notify the Proprietor.

Responsibility for maintaining barricades

The group responsible for putting up a physical barricade or rope-off must maintain it and remove it promptly when the hazard is eliminated.

Continued on next page

BARRICADES AND HAZARDOUS AREA SIGNS

Erecting barricades

Observe the following rules for erecting barricades.

TYPE OF BARRICADE	RULE
Physical barricades and rope-offs	• Enclose the hazard completely • Do not attach to/enclose safety equipment such as fire hydrants, safety showers, fire alarm boxes, emergency exits, etc., unless other facilities are provided
Physical barricade	Write "Do Not Enter" on Hazardous Area sign
Physical barricades erected in poorly lighted areas	Have warning lights visible from all directions. Important: This is particularly critical on roadways.

Rule for entry: Physical barricade

Do not enter a physically barricaded area without permission from

- the person who erected the barricade,
- that person's immediate supervisor, or
- area proprietor

Continued on next page

WHAT TO LOOK FOR WHEN INSPECTING A RESPIRATOR

1. FACEPIECE

- Is it dirty?
- Is it torn, cracked, or distorted from improper storage and/or cleaning?
- Is the lens cracked, pitted or badly scratched? (full face respirators).
- Are the cartridge holders cracked or broken, Do they have badly worn threads or missing gaskets?
- Does it have the correct exhalation valve?
  - Air-supplied respirator facepiece must have a spring-loaded exhalation valve (gold color).
  - Air-purifying respirator facepiece exhalation valve is not spring-loaded (black color).

2. HEADSTRAPS/HARNESS

- Are they broken?
- Have they lost their elasticity?
- Are the fastenings malfunctioning/broken?
- Please note that excessively worn serrations on the head harness of a full face mask might permit slippage and/or loosening of the mask.

3. EXHALATION VALVE

- Is it present and properly placed in the valve body?
- Is the valve seat free of "foreign material" such as dust/dirt particles, detergent residue or human hair?
- Is it torn, cracked, curled or otherwise distorted?
- Is the exhalation vlave cover defective or missing?
- Is the exhalation valve body inserted correctly in the facepiece?
- Is the sealing surface of the exhalation valve body free of cracks, breaks or chips?

4. INHALATION VALVES

- Are they present and properly installed?
- Are they torn, cracked, curled or otherwise distorted?
- Are they clean?

5. FILTERS. CARTRIDGES. CANISTERS

- Are they the proper brand for the facepiece? For Example: MSA cartridges must only be used with an MSA facepiece or the mask loses its approval.
- Are the air-purifying elements correct for the hazard(s) for which protection is required?
- Are they correctly installed? (There must not be any loose connections, missing or worn gaskets or cross-threading in the holder).

Continued on next page

WHAT TO LOOK FOR WHEN INSPECTING A RESPIRATOR
(Continued)

5. FILTERS, CARTRIDGES, CANISTERS (Continued)

- Is the outside case cracked or dented?
- Has the expiration date been reached?
- Is there evidence of prior use - absence of sealing material over inlet?

6. CORRUGATED BREATHING TUBE

- Is it deteriorated? Are there cracks or holes? (This can be easily determined by stretching the tube and examining carefully.)
- Does it have broken or missing end connectors?

7. HARNESS (FOR GAS MASK CANISTER)

- Are the straps or fastenings malfunctioning/broken?
- Is there damage or wear which may prevent the canister from being held securely in place?

8. REGULATOR GAUGE (AIR-SUPPLYING RESPIRATORS)

- Is pressure $\geq$2200 psig for SCBA?
- Does escape apparatus (ELSA/North) gauge read "FULL"?

AIR SUPPLYING RESPIRATORS, Continued

Cylinders

Do not use a breathable air cylinder unless the "Oxygen Content Checked" sticker is

- present
- initialed, and
- dated.

Note: The Stores/Receiving Section checks all cylinders except SCBA cylinders. The Safety Section services SCBA cylinders.

MAINTENANCE OF RESPIRATORS

Introduction

The following is a list of responsibilities for maintenance of all respirators, including

- cleaning
- storing
- marking, and
- recordkeeping.

Cleaning of respirators

Employees must clean their respirator after each day's use or more often if necessary.

Respirators used by more than one employee must be cleaned and disinfected after each use.

Each area provides respirator cleaning facilities, including

- a sink with hot water
- soap
- scrub brush, and
- disinfectant.

Storage of respirators

Respirators must be stored in a clean and sanitary location without distortion or temperature extremes.

Marking of respirators

An individually assigned respirator must be marked permanently with the name of the employee to whom it is assigned.

MAINTENANCE OF RESPIRATORS, Continued

Record-keeping

Each area will maintain records sent by the Occupational Health Group, summarizing the following:

- respirator training
- fit testing
- medical determination, and
- types of respirators used by each employee.

Piping

- Do not use a breathing air piping system unless "oxygen content checked" ticker is:
  - present
  - initialed, and
  - dated within the last 6 months.
- Each line including connection points, branch piping, drains, vents, and main headers will be identified as breathing air.
- Contractors must use their own breathing air equipment, thus they will not connect to plant breathable air systems without
  - a safety rule waiver, and
  - only Du Pont employee makes the connection/disconnection. (Note: This responsibility will not be delegated).

AIR PURIFYING RESPIRATORS, Continued

Inspecting respirators

Employees must inspect air purifying respirators before each use; supervisors must inspect monthly.

When inspecting respirators, use - "What To Look For When Inspecting a Respirator" as a guide (see end of this standard).

AIR SUPPLYING RESPIRATORS

When to use

Use air supplying respirators to supply breathable air when you are

- unsure of the oxygen level in the work areas, or
- in an IDLH (immediate danger for life and health) atmosphere.
- escaping from an emergency condition

Types of respirators

The table below describes three types of air supplying respirators. All types require full-face masks.

TYPE	DESCRIPTION
SCBA (self-contained breathing apparatus)	A self-contained breathing apparatus with a positive pressure face mask and a 20-25 minute supply of air.
Airline	Breathable air is supplied through a cylinder or approved separate breathing air compressor system. Do not use the plant compressed air system. Note: Each person must have a 5 minute escape pack. (This is not an ELSA or North escape apparatus).
Escape Apparatus (ELSA or North)	Self-contained 5 minute breathing apparatus for emergency escape. Note: Not suitable for operations-designed for escape only.

AIR SUPPLYING RESPIRATORS, Continued

Training

Training is required

- annually for airline respirators
- every 6 months for SCBA's and escape apparatus (must include donning respirators).

Inspecting respirators

The following table indicates who is responsible for inspecting each type of air supplying respirators.

IF the respirator type is...	THEN it must be inspected by...
SCBA	• the user before each use, and • the Safety section on a monthly basis. Note: The Proprietor is responsible for replacing SCBA's when they have been used.
Airline-supplied respirators	• the user before each use, and • the Proprietor who must maintain inspection records and perform preventive maintenance.
Airline-supplied hoods	• the user before each use, and • area supervisors on a monthly basis.
Escape apparatus (ELSA or North)	• the user before each use, and • the Proprietor who must maintain inspection records and perform preventative maintenance. Note: The Proprietor is responsible for replacing escape apparatus when they have been used.

Continued on next page

AIR PURIFYING RESPIRATORS

Description

Air-purifying respirators pass inhaled air through a filter, cartridge or canister.

When to use

Use an air purifying respirator only in atmospheres where the oxygen content is at least 19.5%.

When not to use

Do not use the air purifying respirator in an IDLH (immediate danger for life and health) atmosphere.

Do not use escape respirators for any type of work.

Types of respirators

The table below describes the three types of air-purifying respirators.

TYPE	DESCRIPTION
Full facepiece	• Covers the nose, mouth and eyes • Cartridge or canister
Half facepiece	• Covers the nose and mouth • Cartridge
Disposable dust mask	• Covers the nose and mouth • Single use mask

Continued on next page

AIR PURIFYING RESPIRATORS, Continued

Cartridge/ canister coding

The table below describes the meaning of each code on a cartridge or canister. Color combinations show the cartridge serves the function of each color shown.

IF the code is...	THEN the cartridge/canister is for...
yellow	combination acid gases and organic vapors.
purple (magenta)	high efficiency particulate filtering of dust, fumes and mists.
green	ammonia gas.
white	acid gas.
black	organic vapors. Note: This is for spray painting only.
white with a one-half inch yellow stripe completely around the canister bottom	chlorine.

Place the date on cartridges/ canisters

Place the expiration date on each cartridge or canister when canister when it is removed from its plastic bag or otherwise placed in service.

Replacing cartridges/ canisters

Each cartridge or canister must be replaced

- one year from the date it is removed from its plastic bag.
- sooner than one year if
  - breathing becomes difficult with its use, or
  - an odor or taste of a contaminant is detected.

Note: Escape respirator cartridges are good for 18 months after removal from plastic bag if not used.

Training:

Training is required

- annually for air-purifying respirators used for work
- every six months for escape respirators

Table C-1

Minimum Illumination Intensities in Foot-Candles

Foot-Candles	Area or Operation
5	General site areas
3	Excavation and waste areas, accessways, active storage areas, loading areas, loading platforms, refueling and field maintenance areas.
5	Indoors: warehouses, corridors, hallways and exitways
5	Tunnels, shafts, and general underground work areas
10	General shops (e.g., mechanical and electrical equipment rooms, active storerooms, barracks or living quarters, locker or dressing rooms, dining areas, and indoor toilets and workrooms.)
30	First-aid station, infirmaries, and offices.

GENERAL RULES

Introduction

This standard describes respiratory protection requirements for personnel in plant work areas.

Overall safety objective

The objective of this standard is to protect employees from exposure to airborne contaminants or a hazardous/oxygen deficient environment through the use of approved respiratory protection.

Additonal guidelines

Consult your Area Rules and operating procedures for additional requirements for respiratory protection.

Types of respirators

There are two types of respiratory protection equipment; air purifying respirators and air supplying respirator.

Fit testing and training

Follow these rules for respirator fit testing and training.

- Do not use or assign someone to use a respirator unless they have been
  - fit tested and trained by the Occupational Health group, and
  - medically certified by the plant physician.
- All employees to be fit tested or who may be required to wear a respirator at any time, must be clean shaven in the facepiece to face seal area.
- Nothing shall interfere with a proper seal between the face piece and the face seal area, e.g. glasses temple bars.
- Fit testing is required annually.

In this section

This section contains information on the following topics.

TOPIC	PAGE
Air Purifying Respirators	2
Air Supplying Respirators	4
Maintenance of Respirators	6

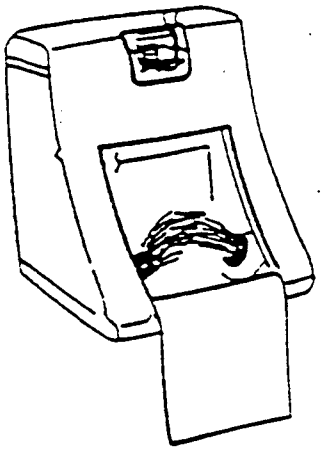


Figure 4A – Electrically Heated and Insulated Type

Type produced by: Fend-all
2222 W Diversey Parkway
Chicago, IL 60647

(Also available without heating and insulation.)

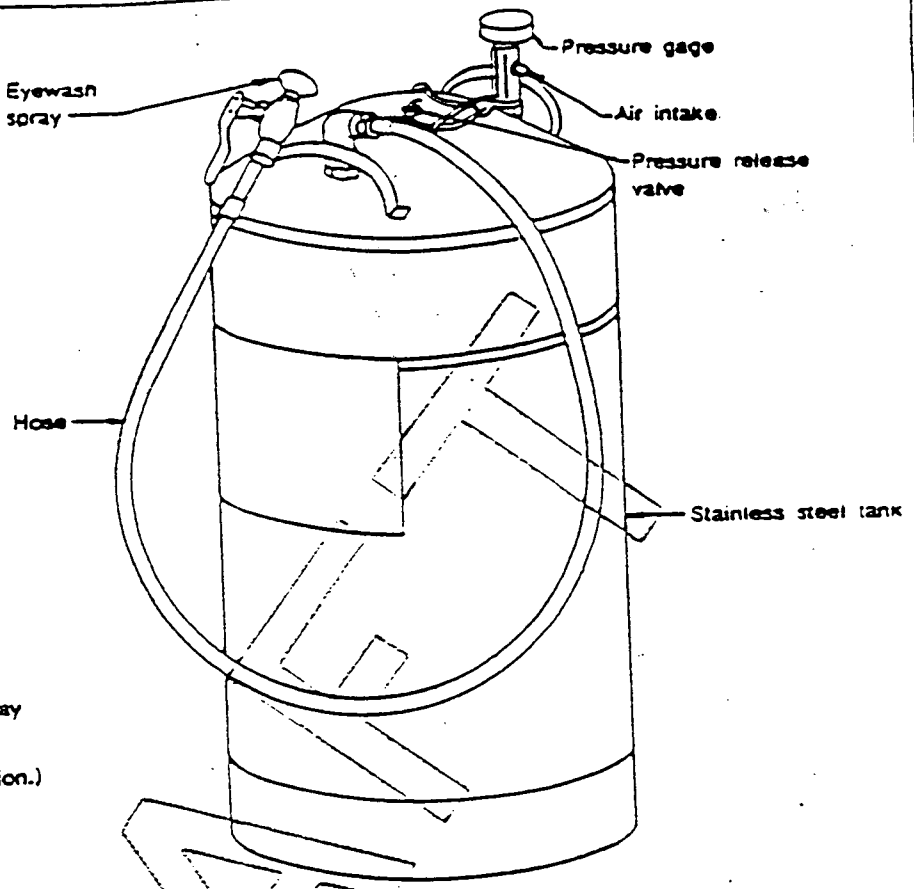


Figure 4B – Pressure Tank Type

Type produced by: Speakman Co
Wilmington, DE 19899

FIGURE 4 – PORTABLE EYEWASH UNITS

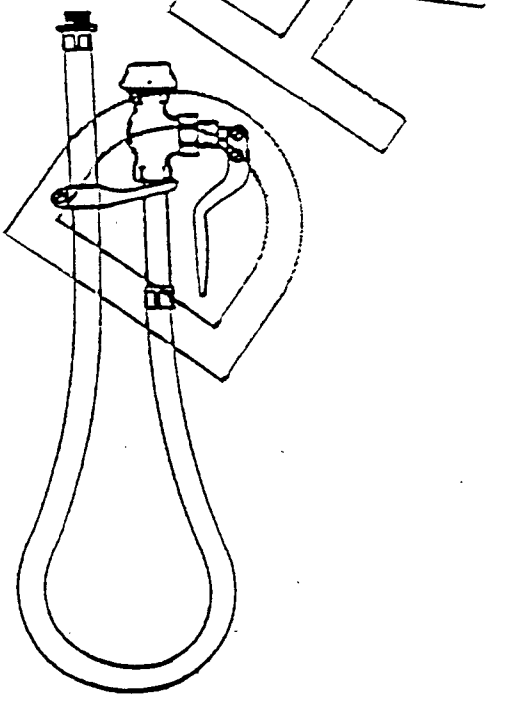


FIGURE 5 – DRENCH HOSE

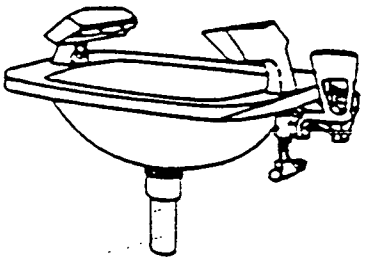


FIGURE 6 – EYE/FACE WASH

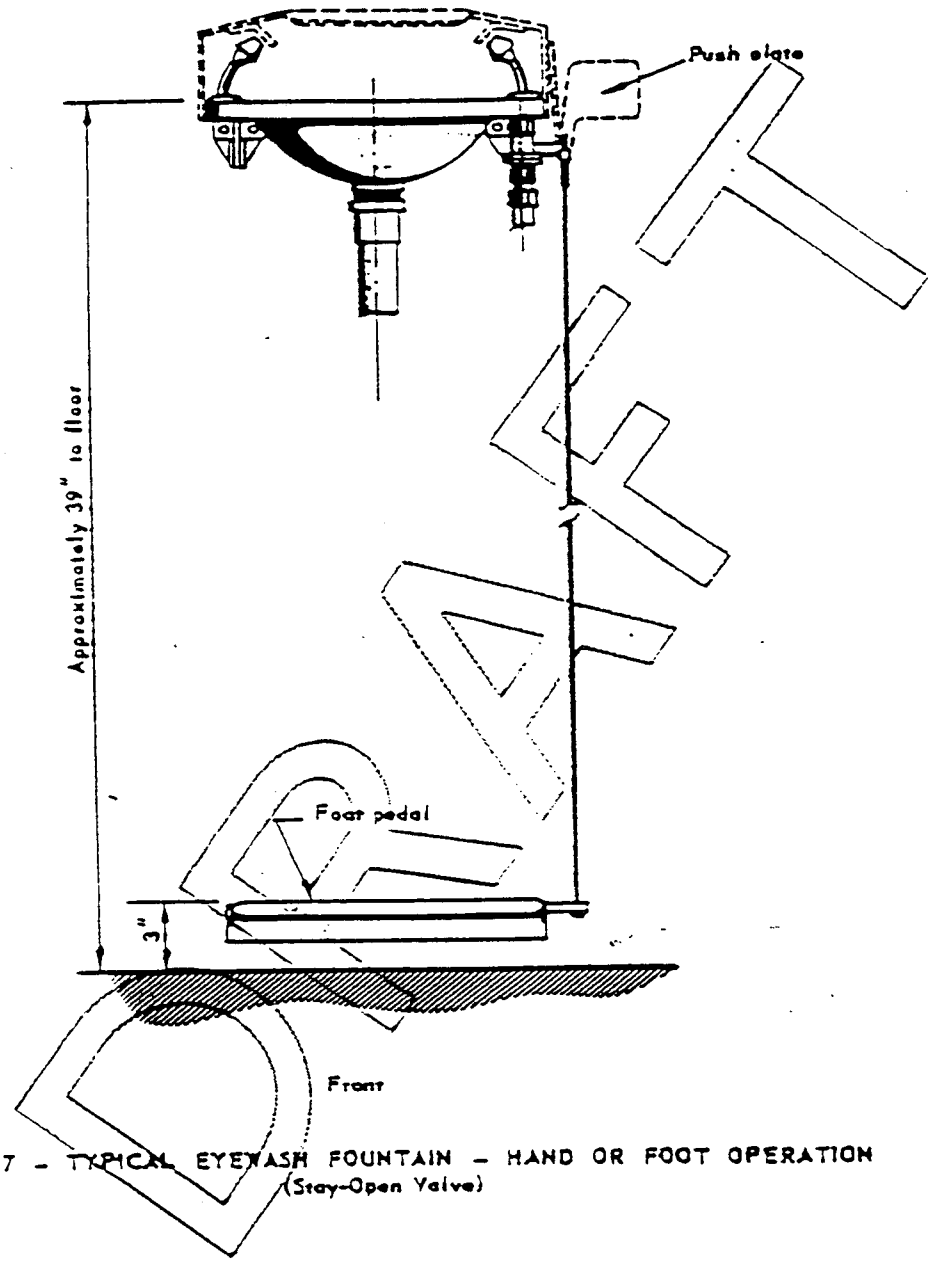


FIGURE 7 - TYPICAL EYEWASH FOUNTAIN - HAND OR FOOT OPERATION
(Stay-Open Valve)

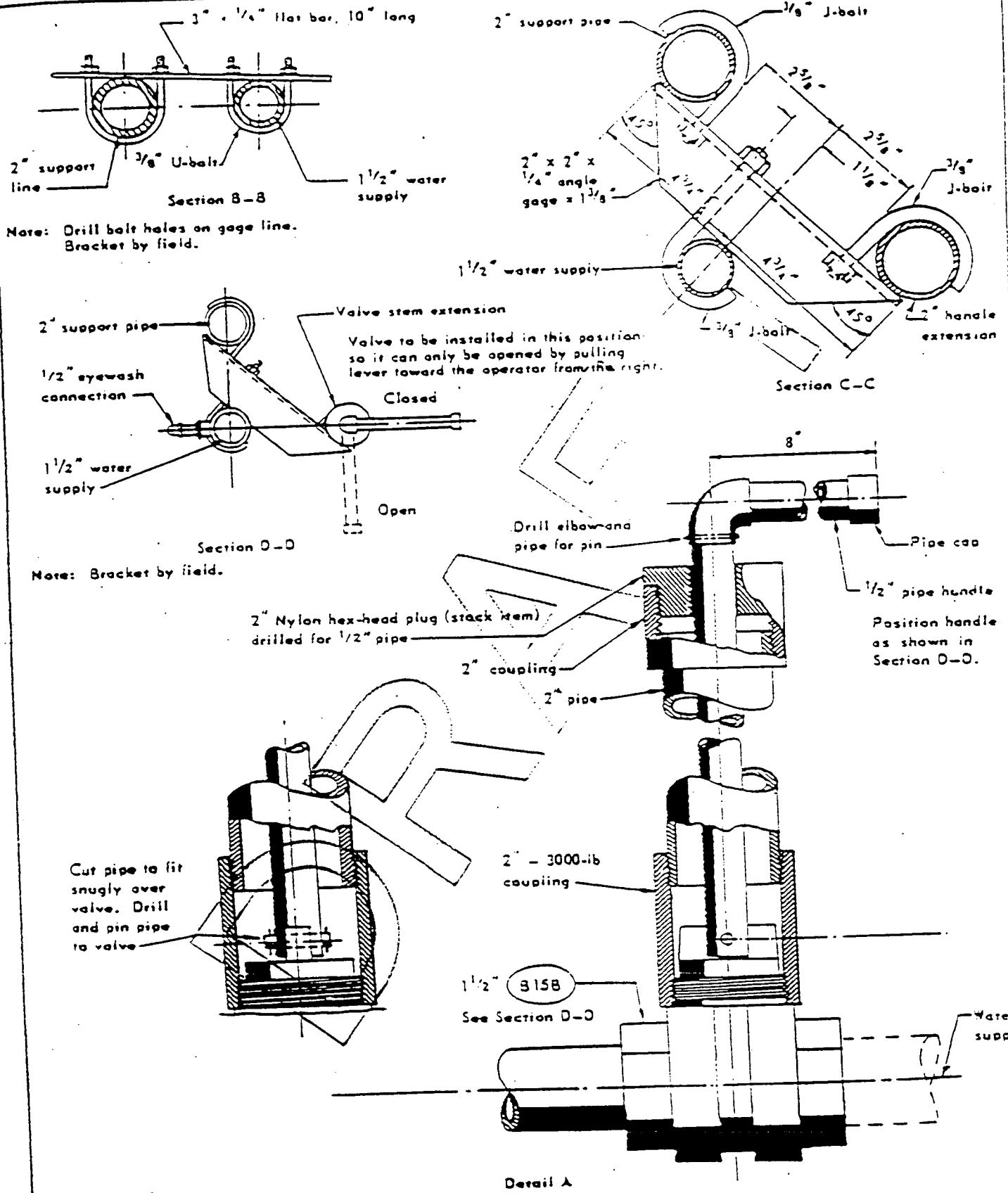


FIGURE 2 — TYPICAL SAFETY SHOWER WITH EYEWASH — UNHEATED AREAS (CONT'D)
(Underground Water Supply. See Figure 18 for Overhead Supply)

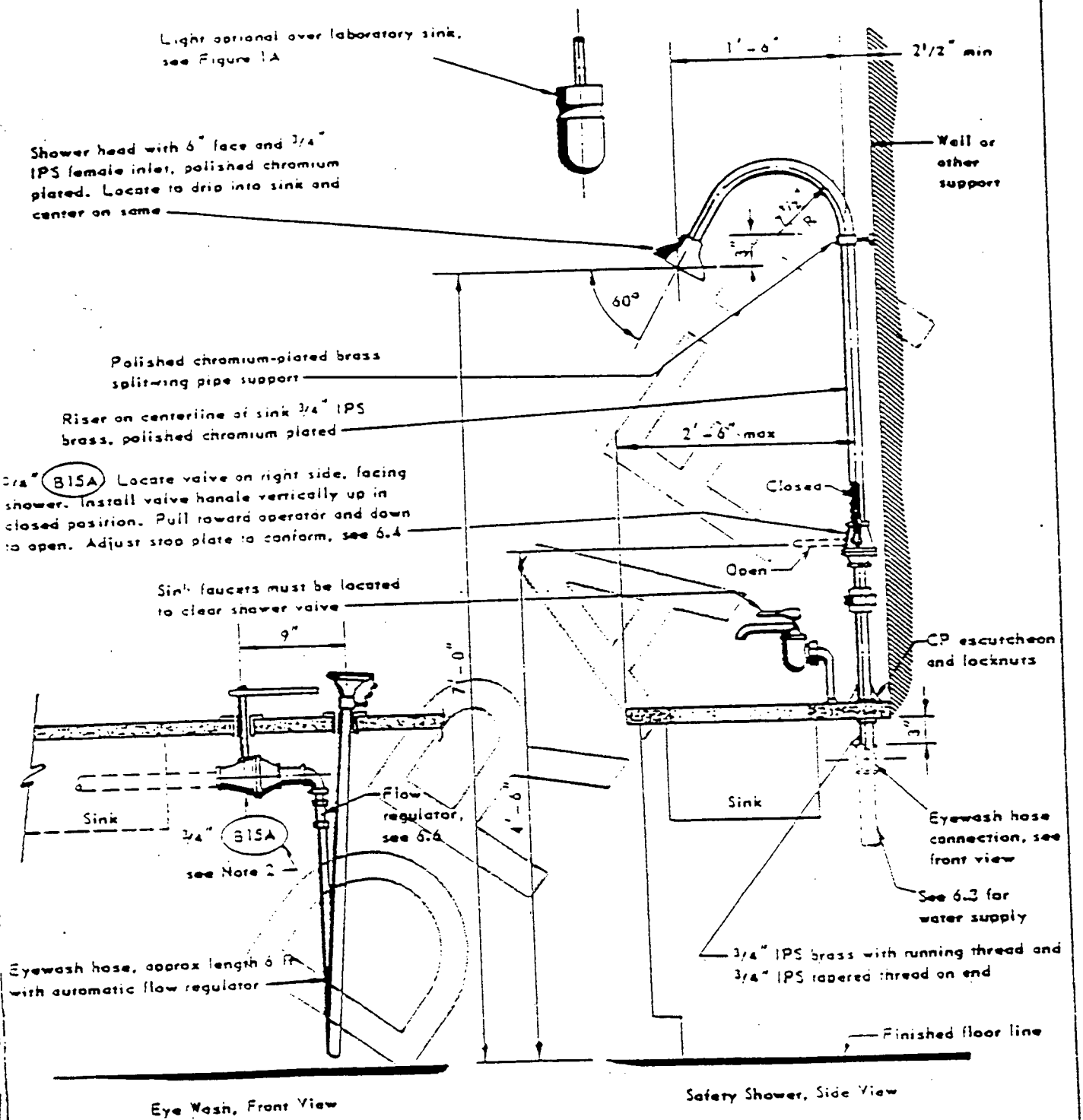


FIGURE 3 – LABORATORY SINK – TYPICAL SAFETY SHOWER AND EYEWASH

Notes:

1. Details through bench top or wall must be specified.
2. For combination valve with extension and handle, specify Speakman SE–914–RS (03–0423–RCP) or Rockwood 509–0713. The Smith valve is equally acceptable but the extension assembly must be specified. The length of the extension must be specified for all three valves.

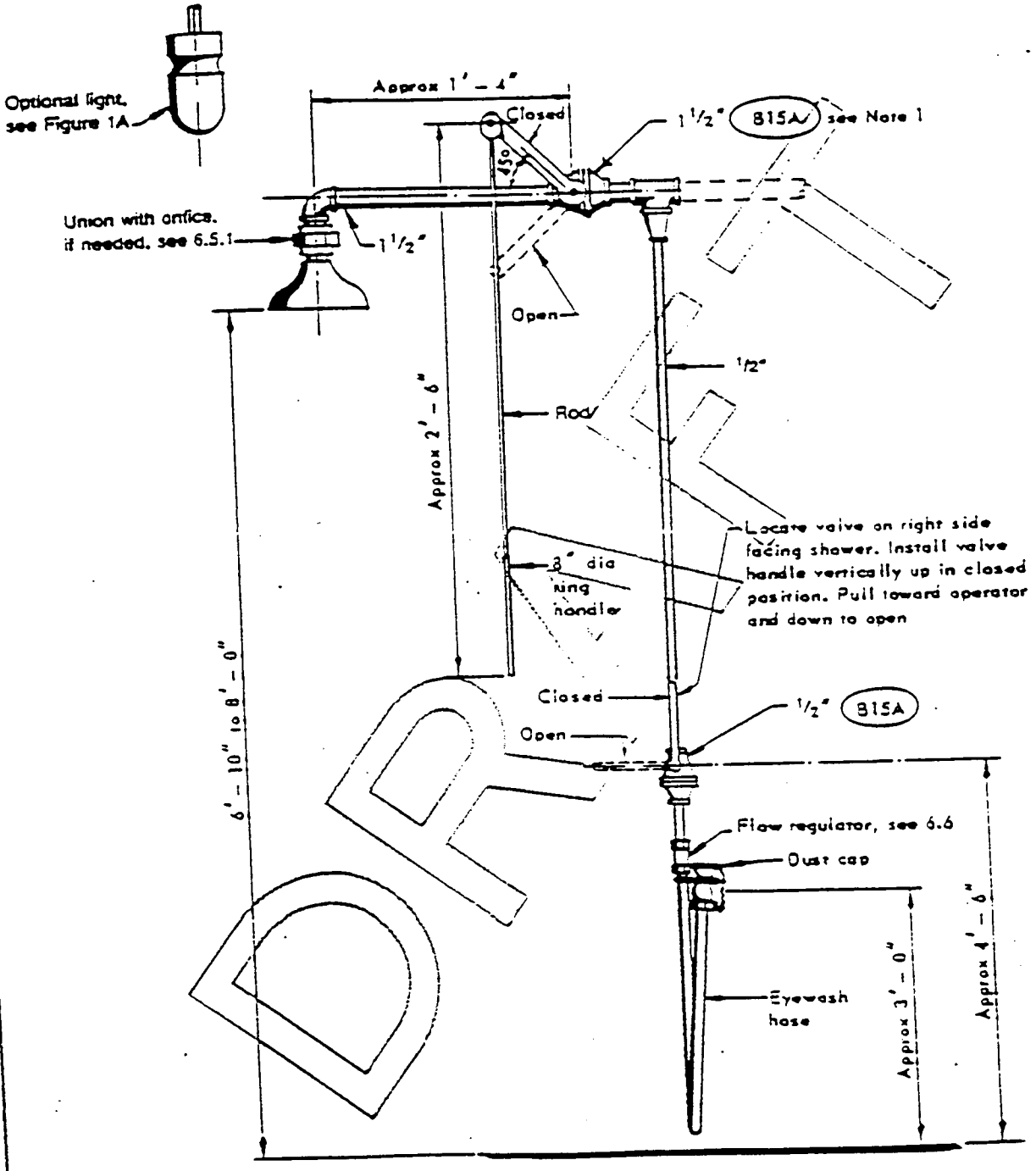


Figure 1B – Valve Mounted Overhead

FIGURE 1 – TYPICAL SAFETY SHOWER WITH EYEWASH – HEATED AREAS (Cont'd)

Notes: For combination valve and pull rod assembly, specify Speakman SE – 912 – T – PR or Rockwood 509 – 3716. The Smith valve is equally acceptable. Hole must be drilled in its handle for a field-fabricated pull rod.

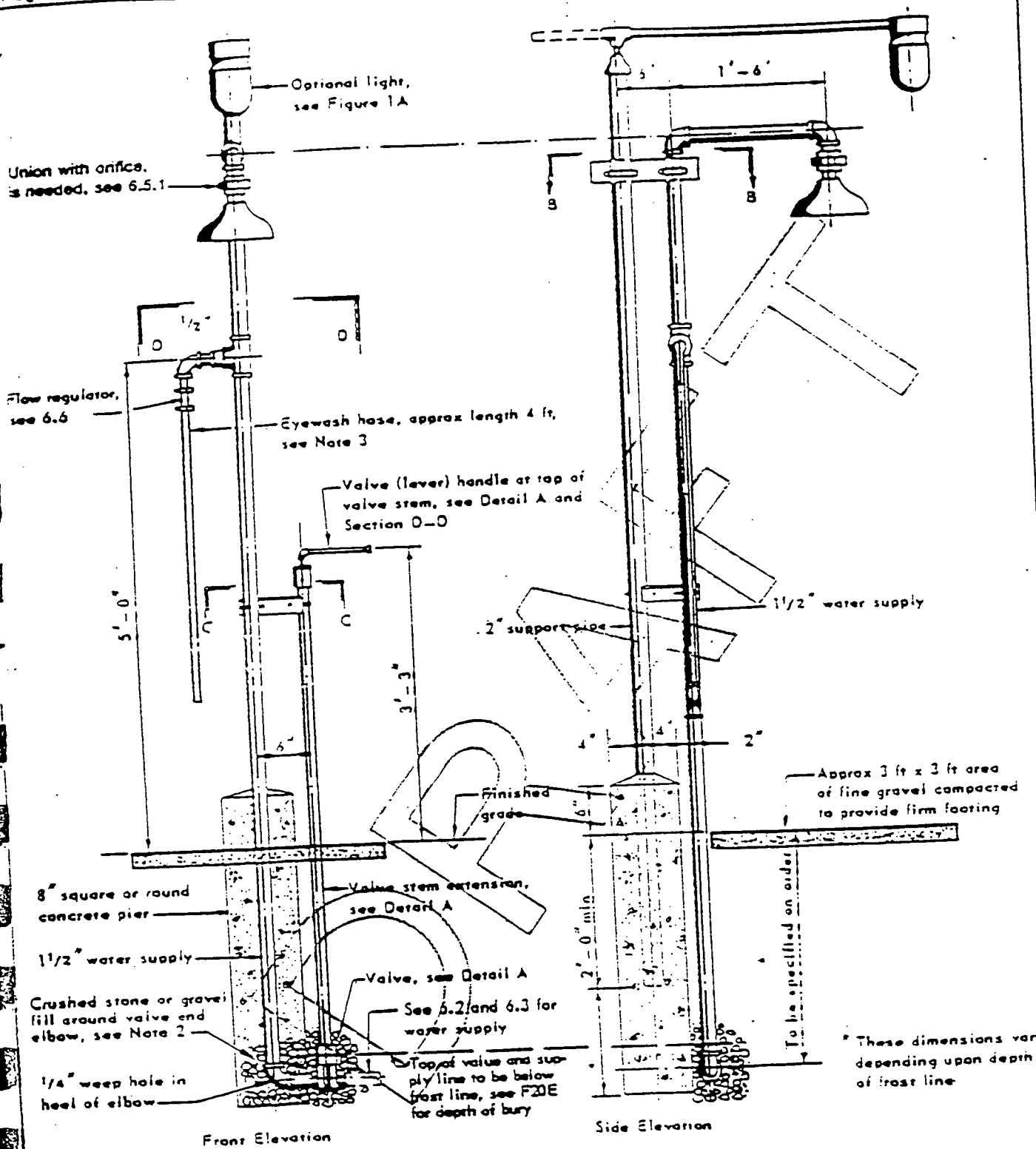


FIGURE 2 – TYPICAL SAFETY SHOWER WITH EYEWASH – UNHEATED AREAS
(Underground Water Supply. See Figure 1B for Overhead Supply. See Page 7 for Sections and Details)

Notes:

1. Where shower is installed adjacent to wall or other structure, omit pipe support and concrete pier and support shower and light independently on such structure.
2. Soil percolation equal to a one-inch drop in water level every 2 or 3 minutes is required (see P60). Where soil percolation is inadequate, this arrangement shall not be used.
3. Use of an open ended (no fitting) eyewash hose is recommended in unheated areas.

6. DESIGN CONSIDERATIONS

6.1 Figures 1 through 3 show various shower configurations used within the Company. Individual components and complete prefabricated assemblies including heat tracing and insulation are available from the following and other vendors:

Encon Manufacturing Co
4914 Dickson Street
Houston, TX 77001

Speakman Co
P. O. Box 191
Wilmington, DE 19899

Prefabricated units must meet the requirements of ANSI Z358.1.

6.2 Water supplies shall be potable. If potable water is not available, filtered water may be used; however, potential for contamination from process tie-ins shall be minimized by design, using check valves or other appropriate devices, and procedural features. (See S23G.)

6.3 Piping design shall permit a minimum flow through the safety shower of 30 gpm. A minimum flow of 20 gpm from a laboratory safety shower is acceptable.

6.3.1 Shower piping should be 1 1/2 inch minimum to provide support rigidity.

6.3.2 Laboratory shower head inlet piping should not be less than 3/4 inch.

6.3.3 Piping to shower and eyewash units shall be in accordance with site pipe specifications. Where no specification is available the following is suggested:

a. For sites where water piping is galvanized – SP42U.

b. Where water piping is steel – SP11U.

c. Where water piping is copper – SP40P.

6.4 The various arrangements shown on Figures 1 through 3 require the valve handle to open the valve in either a clockwise or counter-clockwise direction and the valve to be installed in several positions. The B15A valve specified for this service has been designed specifically for Du Pont safety showers to meet the above requirements. The handle and stop can be modified in the field to suit. However, it is recommended that the required position and valve handle actuation be specified in the purchase order.

6.5 A device to control the proper flow to a shower head is recommended where possible simultaneous safety shower use would cause water flow differences at one or more of the shower head inlets and is available from Dole Flow Control Division, Eaton Corp, Carol Stream, IL 60187.

6.5.1 An orifice may be needed ahead of the shower head to balance the flow when used in conjunction with the eyewash.

6.6 Eyewash units shall provide a minimum flow of 0.4 gpm for 15 minutes. A pressure/flow regulator (available from vendors in 6.1) is required in the eyewash piping to regulate the flow for high pressures. See Figures 1, 2, 3, 4, and 7.

6.7 Combination eye/face wash units shall provide a minimum flow of 3.0 gpm for 15 minutes. See Figure 6. Hand held drench hoses (see Figure 5) shall provide a minimum flow of 3.0 gpm.

6.8 Eyewash hoses or combination eye/face wash hoses shall be at least four feet in length, or reach within six inches of the ground or floor, and shall provide a flow velocity such that a "fountain" four to twelve inches in height is created when the discharge end is pointed vertically upward.

6.9 The water system (e.g., in a building) shall be capable of supplying all safety shower/eyewash facilities which may be required to operate simultaneously as a result of anticipated building incidents. This number will vary depending upon building population, processes, chemicals present, and other factors. Combinations of the anticipated number of showers that might be flowing simultaneously and other water demands on the common supply should be tested to assure adequate flow to the showers. (See 6.3).

6.10 Safety showers located outdoors may need to be protected from freezing. See F10E for burial depth of supply piping. Aboveground piping should be electrically or steam traced with appropriate measures to limit water temperature to a maximum of 95°F.

6.10.1 Engineering Standard E10K gives details on methods for electrically tracing safety shower and eyewash units.

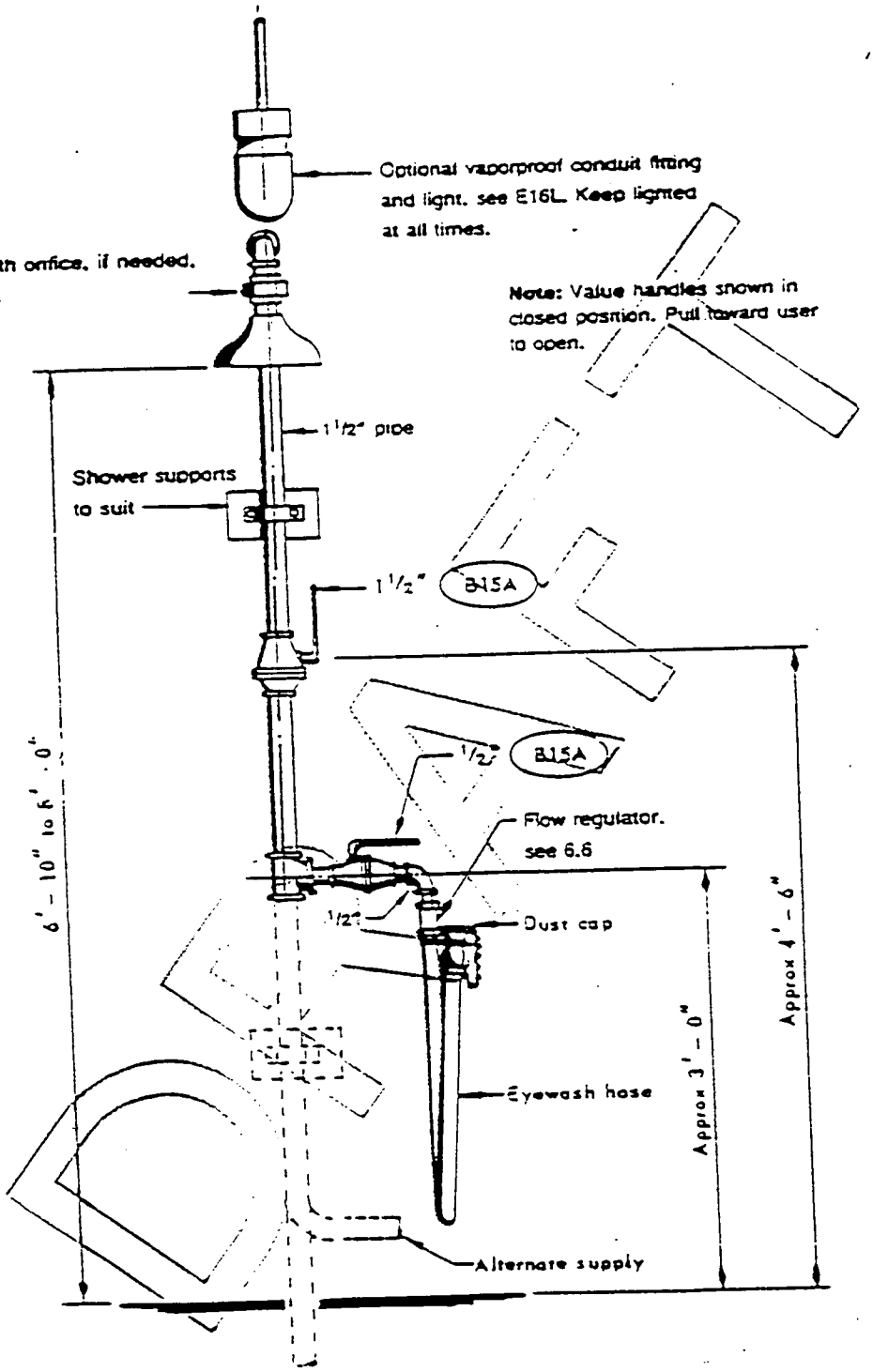


Figure 1A – Valve Mounted Vertically

FIGURE 1 – TYPICAL SAFETY SHOWER WITH EYEWASH – HEATED AREAS (Cont'd on page 5)

SAFETY SHOWER AND EYEWASH FACILITIES

SAFETY ENGINEERING STANDARD

ISSUED	1931	S 1 E
THIS PAGE REVISED	MAY 1990	
STANDARD REAFFIRMED	MAY 1990	Page 1 of 10

This standard includes requirements of the Occupational Safety and Health Act of 1970 (OSHA) as published in the Federal Register. OSHA information is printed in red.

1. SCOPE

This standard describes various types of safety shower and eyewash facilities for indoor, outdoor, and laboratory locations.

2. GENERAL

2.1 Standard Z358.1 of the American National Standards Institute (ANSI) "Emergency Eyewash and Shower Equipment" provides greater detail and may be consulted for additional information. To provide more definitive data on safety shower performance, a test program was conducted at the Engineering Test Center in February 1983 (Engineering Department Accession Report No. 16835). Comparative performance data was determined on six different shower heads from three manufacturers and a home shower head including: percent wash-off, effective flow, effective force at three flow rates (20, 30, and 40 gpm). Mannequin wash-off results compared favorably with human-subject wash-off results. Overall results confirm the adequacy of 30 gpm flow and help to put into perspective the duration of wash-off. Based upon this test program, shower heads were ranked in their performance effectiveness. Comments on improving shower head design are also discussed.

2.2 Where the eyes or body of any person may be exposed to injurious corrosive, toxic, or flammable materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

2.3 Training and periodic retraining of employees in the proper use of safety showers and eyewash facilities is essential. The following shall be emphasized in this training:

- Safety shower use

  Time is vital: get under shower as quickly as possible

  Remove contaminated clothing as quickly as possible while showering

  Call for assistance

  Remain under shower until all affected body areas are thoroughly flushed. This will vary with the type of material and exposure and should be discussed by the trainer

  After showering do not put on contaminated clothing

  Secure medical attention

- Eyewash use

  Time is vital: flush eye(s) as quickly as possible

  Call for assistance

  Eye(s) must be held open for an effective flush

  Flush eye(s) for a minimum of 15 minutes

2.4 The water temperature at safety showers and eyewash facilities should not exceed 95°F nor be lower than 60°F. Tempered water systems may be required to meet the 60°F minimum temperature. Sites should provide controls, such as temperature monitoring, insulation, and/or automatic bleed devices to maintain the desired temperature range in areas where water supply temperature may be affected by sun exposure, adjacent hot piping or reactors, extreme cold, etc.

2.4.1 Water temperature need not be constant during shower or eyewash use. The water system should supply at least a 10 – 15 minute supply in the 60 – 95°F temperature range for the number of shower/eyewash units which may be simultaneously in use (see 6.4 and 6.7).

2.5 Because shock may result from the chemical exposure or low water temperature (or both), either indoors or out, there shall be available for use after showering one or more blankets or large towels. Emergency clothing and footwear (disposable items are suggested) to put on afterward such as a lab coat or coveralls may also be needed. These items shall be stored so they are kept clean and dry. Centrally located emergency blanket and

Portions printed in red are from OSHA regulations, Section 1910.151.

ing stations may be sufficient where there are rous safety showers such as in laboratories.

2.5 For new safety shower installations, eyewash facilities shall also be provided. The eyewash unit at these installations shall be capable of flushing both eyes. A single water outlet providing this capability is permissible.

2.7 Standardization of shower arrangements is desirable, preferably on a plant-wide, or at least on an area-wide basis. Items which should be standardized include:

- Color. (The safety shower and support or the area behind the shower should be marked a high visibility yellow or other distinctive color.)
- Valve operating height.
- Valve handle location (right-hand location).
- Valve operation (pull to open).
- Shower light and color (E16L).
- Shower head height (82 – 96 inches) from walking surface.

A flow alarm signaling that the shower or eyewash is in use should be provided, since a person using either will need additional assistance. This is particularly important in remote, high hazard areas where occupancy is low.

2.9 Shower enclosures may be desirable. Enclosures, whether rigid or a curtain type, shall have a minimum unobstructed area under the shower head of 34 inches in diameter. Curtains shall be open whenever the shower is not in use. Enclosures should be lighted and glazing should conform to S10G. Flow alarms are required on showers and eyewash units in rigid enclosures.

2.10 The laboratory safety shower, Figure 3, because of the size of supply pipe, type of shower head, and angle of discharge, does not give the same complete drenching effect as does the standard overhead safety shower. The person using it cannot wash the entire body without considerable turning. Its use is accepted where protection is required only for frontal exposure of the upper body, such as bench-scale work in a general chemical laboratory. Even then, standard overhead safety showers should be considered for backup.

3. PORTABLE SAFETY SHOWER/EYEWASH UNITS

3.1 Portable or self-contained eyewash units shall provide 0.4 gpm for 15 minutes of flushing time. They may be used in low hazard or temporary work locations where limited protection is needed or where permanently installed facilities are temporarily out of service. Units are available with thermostatically controlled electric heaters. (See 2.4 for temperature limits.)

3.2 Portable or self-contained safety showers shall flow 20 gpm for a minimum of 15 minutes.

3.3 Water quality in portable eyewash/safety shower units shall be maintained by one of the following methods:

1. Adding methylparaben to the water at the concentration recommended on the product label to inhibit bacteria growth and changing water 2 to 3 times per year. In warm locations, more frequent change is recommended.

2. Using potable water without additives and changed at least weekly.

3. Water should be periodically sampled and analyzed for bacteria content to determine optimum storage life in portable safety shower/eyewash units at a given location.

4. LOCATION

4.1 **General Chemical Operations.** In areas where toxic, corrosive, or flammable materials are processed, safety showers and eyewash facilities should be accessible within 50 feet travel distance from any point and required no more than 10 seconds to reach them.

4.2 **Tank Car, Tank Truck Loading and Unloading; Sampling Stations, etc.** At such locations where personnel could be exposed to toxic, corrosive, or flammable materials, safety showers and eyewash facilities should be located within 25 feet, but not less than 10 feet, of the point of potential exposure. Consideration should be given to locating a shower on loading or unloading platforms to meet these distance requirements.

4.3 See E3R for safety/shower eyewash requirements at battery charger installations.

5. TESTING AND INSPECTION

5.1 Each site shall establish a schedule for testing safety showers and eyewash facilities. A readily accessible means of test verification shall be provided.

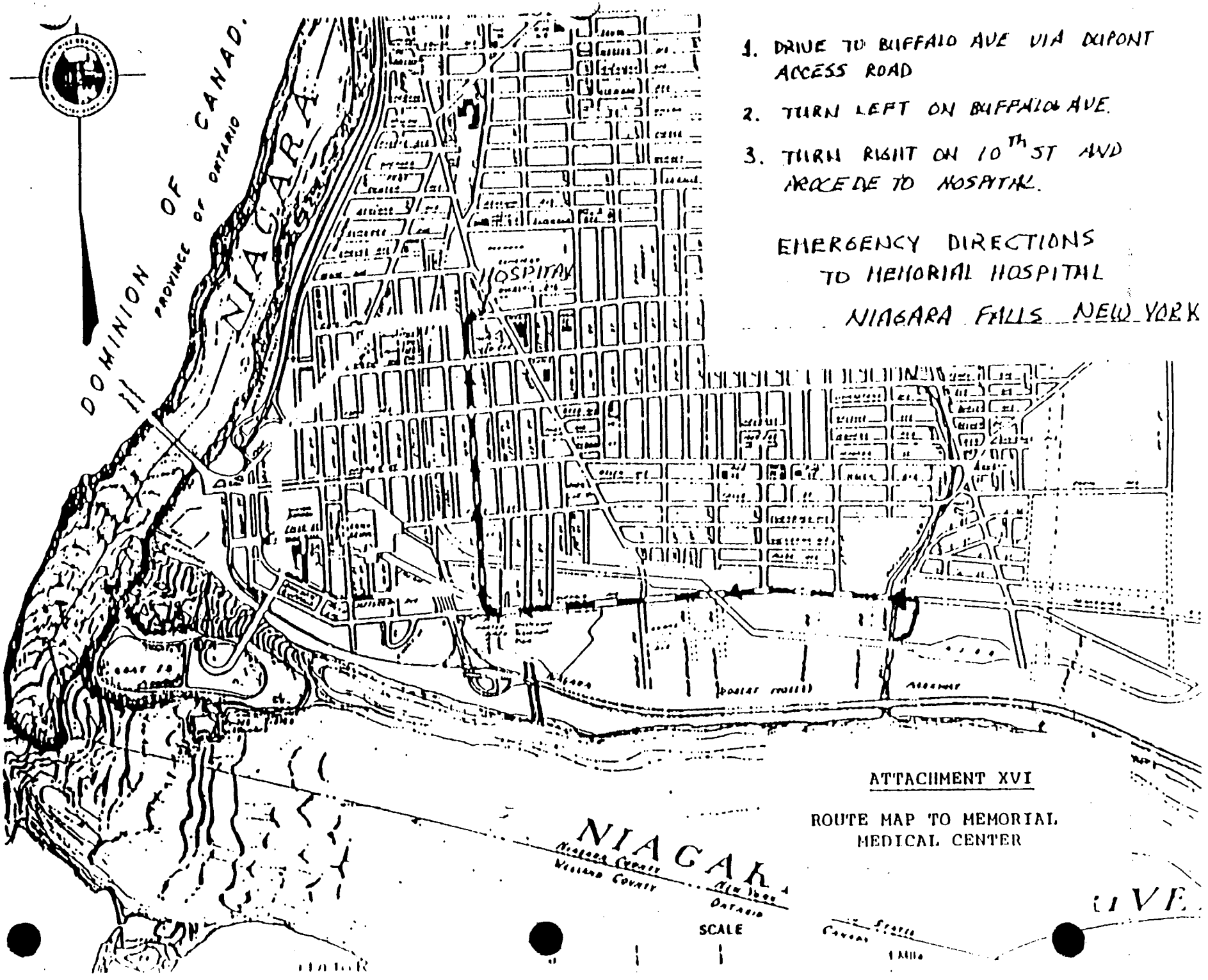
5.1.1 Safety showers and eyewash facilities in operating areas should be tested each working day.

5.1.2 Safety showers and eyewash facilities in laboratories may be tested on a weekly basis.

ATTACHMENT IX

1. DRIVE TO BUFFALO AVE VIA DUPONT ACCESS ROAD
2. TURN LEFT ON BUFFALO AVE.
3. TURN RIGHT ON 10TH ST AND PROCEDE TO HOSPITAL.

EMERGENCY DIRECTIONS
TO MEMORIAL HOSPITAL
NIAGARA FALLS NEW YORK



ATTACHMENT XVI

ROUTE MAP TO MEMORIAL MEDICAL CENTER

Injuries Which Occur After Clinic Hours

The contractor employee who is injured on the worksite contacts the contractor's supervisor or designated employee to report the injury. The supervisor or designated employee contacts the DuPont contract section.

	Office #	Home #	Pager #
o A. Obunge	278-5789	773-6942	774-1771
o J. McClincy	278-5795	745-3846	774-1812
o E. Lilly	278-5398	754-2339	743D
o W. Beglau	278-5501	773-7134	

The following information is given:

- Name of Employee
- Name of Employer
- Type of Injury
- If medical attention required
- How employee is being transported

The employee is sent to Niagara Falls Memorial Medical Center, Emergency Department.

Directions to Niagara Falls Memorial Medical Center Emergency Department:

- Exiting the plant, make a left hand turn onto Buffalo Avenue
- Proceed down Buffalo Avenue to 10th Street
- Make a right hand turn onto 10th Street
- Turn right onto Pine Avenue
- Proceed to first driveway on the right (Emergency Department driveway entrance)
- Drive to covered area and take employee into the emergency area
- Return to your vehicle and move it from the Emergency Department entrance.

On-call Occupational Health Care Representative

Occupational Health Care will provide a representative on a pager after clinic hours.

- Weekdays — 4 p.m. until 7 a.m.
- Weekends — from Friday at 4 p.m. until 7 a.m. Monday
- Holidays — through holiday period to 7 a.m. the next working day

The Du Pont contract section representative will contact the hospital switchboard at 278-4000 and have the Occupational Health Care representative contacted. The following information shall be given:

- Name of employee
- Contractor name
- Type of injury

The Occupational Health Care Representative will then contact the hospital to receive the message and come into the emergency department.

When the Occupational Health Care representative arrives at the emergency department, the representative will work with the emergency department staff as a resource person and help to determine the employee's ability to work. The representative also may contact the Du Pont contract section representative for accident information and job requirements to determine the employee's ability to work.

Before the employee leaves the emergency department, the Occupational Health Care representative will contact the Du Pont section representative and discuss pertinent details of the case and the outcome. The representative will make sure all necessary paperwork is completed and ready for proper distribution.

In the event that further medical evaluation is required, the Occupational Health Care representative will refer the employee to the Occupational Health Care clinic the next working day at 8:30 a.m..

DU PONT CONTRACT EMPLOYEE
OCCUPATIONAL INJURY PROGRAM

Injuries Which Occur During Clinic Hours

The contract employee, who is injured on the worksite, contacts the contractor's supervisor or designated employee to report the injury. The supervisor or designated employee contacts the Du Pont contact person:

o A. Obunge	278-5789	home 773-6942
o J. McClincy	278-5795	home 745-3846
o E. Lilly	278-5398	home 754-2339
o W. Beglau	278-5501	home 773-7134

To report the injury and give the following information:

- Name of Employee
- Contractor Name
- Type of Injury
- How being transported
- If medical assistance is required

The contractor employee is then sent to Occupational Health Care clinic, located on the second (2) floor of the Niagara Falls Memorial Medical Center, 621 10th Street. Enter through main office.

Directions to Niagara Falls Memorial Medical Center - Occupational Health Care clinic are as follows:

- Exiting the Plant, make a left hand turn onto Buffalo Avenue.
- Proceed down Buffalo Avenue to 10th Street.
- Make a right hand turn onto 10th Street.
- Proceed down 10th Street to the Hospital.
- Park in front of the hospital on 10th Street.
- Proceed to the Main Admitting Office (the glass enclosed office located at the 10th Street entrance level of the hospital). Ask to be directed to Occupational Health Care.
- Upon exiting the elevator, proceed down the first hallway to your left to the Occupational Health Care Facilities.
- Check in with Occupational Health Care staff - nursing area on the right hand side of the hall.

The Du Pont contract section contacts Occupational Health Care clinic at (278-4621), to inform them that a contractor's employee is enroute to the clinic. The following information is given to Occupational Health Care Staff:

- Name of employee
- Contractor
- Type of injury
- How being transported
- If assistance is required

On arrival at the clinic, an injury evaluation report will be completed. The employee will be taken to an examination area and an injury evaluation and treatment will be done. Upon completion of treatment, a determination of ability to work will be made.

An injury evaluation report shall be completed. The report shall address injury, treatment, Occupational Health Care evaluation, ability to return to work, restrictions, and any recommendations or required follow-up. Prior to the employee leaving the Occupational Health Care clinic, telephone contact will be made with the Du Pont contract section discussing the above. The employee is given a copy of the report to be given to the employer.

- A copy of the evaluation is sent to Du Pont contract section, Attention: A. Obunge.

- Billing is sent to the employee's employer.

OCCUPATIONAL HEALTH CARE

E. I. DU PONT CONTRACTOR EMPLOYEE OCCUPATIONAL INJURY PROGRAM

OCCUPATIONAL HEALTH CARE

SPECIAL INSTRUCTIONS FOR THE SEEP REMEDIATION PROJECT

1. When calling Occupational Health or the hospital switchboard to inform them that an injured person is being sent there, and advise them that it is for the Seep Remediation Project. This will advise them that they are to page Bob Eagler immediately to get to the hospital. Bob Eagler will be wearing a pager until the end of the project, and he will be the coordinator for this job. Advising the hospital that we are sending someone from Seep Remediation to them will also let them get the decontamination facilities ready in the Emergency Room.

2. When calling for an ambulance, either Niagara or Frontier Ambulance, advise the dispatcher that it is for Seep Remediation. By doing this, they will send a Category 4 Paramedic ambulance to the site. This category of paramedic can do life saving procedures. Also, these paramedics will be instructed in Hazardous Materials Training. The ambulance will come to the construction gate and will be directed to where the injured employee is at.

3. If the person who is injured has been working in a contaminated area and has not been decontaminated before putting the person on the ambulance stretcher, he should be laid on a sheet of plastic, if possible. This will prevent the spread of the contamination to others and the ambulance.

4. The Emergency Room and Occupational Health will have copies of all of the MSDS sheets for this project.

SECTION V

DETAILED DESCRIPTION OF EMERGENCY ORGANIZATION (Cont'd)

2. NIAGARA FALLS FIRE DEPARTMENT (NFFD)

- Escort

  The Patrolman on duty will escort NFFD.

- Emergency Scene

  After arrival at the emergency scene and after discussion with the Emergency Director, the NFFD Chief may request any or all apparatus from their standby locations as deemed necessary.

  The NFFD personnel work only under the direction of their Chief who receives his instructions from the Emergency Director.

  The NFFD will follow instructions carefully, being particularly observant on the use of fire extinguishing materials such as water and carbon dioxide which are not compatible with certain of the process materials in various production areas. They will be informed immediately of known explosion hazards or toxic materials in the area.

  If the NFFD personnel are injured or their equipment damaged, they will report the circumstances and information to the Emergency Director in addition to their normal NFFD reporting procedures.

  The Emergency Director will notify the NFFD when the emergency is under control and their services are no longer needed. He will provide a guide to accompany them to the nearest gate exiting from plant property.

SECTION V

DETAILED DESCRIPTION OF EMERGENCY ORGANIZATIONS

1. FIELD COMMAND POST (RADIO UNIT EM-1)

- Function and Location

The Field Command Post is the place from which the Emergency Director supervises emergency control activities. It will generally be located on the upwind side of the affected area.

- Personnel Assignments

Emergency Director

The Emergency Director is designated as the affected area Unit Manager. In his absence the ranking member of the Aides Group listed below will assume this responsibility.

Emergency control responsibility on night shifts or weekends will rest with the Shift Supervisor on duty until the Emergency Director or the Aide arrives on the scene. At that time he will relinquish direct control responsibility but will continue to assist the Emergency Director.

Field Command Post Aides

To assist in controlling the emergency as instructed by the Emergency Director, the following are designated:

(1) Affected Area Senior Supervisor

(2) Affected Area Operations Supervisor(s)/ Area Manager(s)

(3) Affected Area Day Supervisor(s)

(4) Affected Area Shift Supervisor on Duty

(5) Supervisor Safety

SECTION V

DETAILED DESCRIPTION OF EMERGENCY ORGANIZATION (Cont'd)

1. FIELD COMMAND POST (RADIO UNIT EM-1) (Cont'd)

- Field Command Post Responsibilities

Specific Emergency Director responsibilities include:

(1) Direct activities of the area plant emergency organization:

(a) Insure the safety of all personnel.

(b) Minimize the extent of equipment damage.

(2) Communicate with Central Control Headquarters to assure:

(a) That all personnel accounting needs are met so that rescue efforts are initiated if required.

(b) Emergency Coordinator is kept fully informed of the situation and needs at the scene.

(3) Clear the area of all non-essential personnel.

(4) Direct activities of the Niagara Falls Fire Department during the emergency and notify them when their assistance is no longer needed.

(5) Perform other duties as required in the Area Plant Emergency Plan.

(6) Advise the Emergency Coordinator at Central Control Headquarters (Radio Unit EM-2) when the emergency is over.

SECTION V

1. Call in final head count to 5200. If phones are out of order, call the headcount power failure number (286-1921) on one of the designated power failure phones or use a radio with headcount information.

2. Radios are kept on shifts by Shift Supervisors, and are to be used in a plant emergency as the EM-1 radio. Extra radios are available in some Shift Offices, and can be used for area communications during plant emergency.

3. After plant head count is completed, Central Control will notify Emergency Director to initiate search procedures for any missing personnel.

4. a. 40 Gate will notify Fire Department.
   b. Tell 40 Gate to close any roads you know are affected.
   c. Tell 40 Gate to notify any neighboring plants you know are affected.
   d. Arrange to have injured transported to Medical. If injured cannot be moved, call 5133 for medical help between 7 a.m. and 5 p.m., Monday through Friday. Have 40 Gate call for ambulance during any other times.
   e. Call 5305 (Boiler House) for emergency utility service.
   f. Call 5367 (Electrical Substation) for emergency electrical service.
   g. Call 5488 (Mechanical Shift) for assistance from 7 a.m. to 11 p.m. Any other hours refer to Mechanical off-hour call list.

5. a. Source and magnitude of any fume release is needed for the person manning the Dispersion Model.
   b. 40 Gate guard should activate yellow phone system for communication.
   c. Notify EM-2 (Central Control Headquarters) of types of injuries involved so they can arrange for proper medical follow-up. Let them know if you have already summoned medical help.
   d. What activity is underway to address emergency situation? What is status and expected timing to complete?

6. Use a runner if needed to give clear direction to the Niagara Falls Fire Department as to how to enter the affected area.

SECTION V

AFFECTED AREA - EMERGENCY CONTROL

DEFINITION

Area in which emergency originates and any other area affected by gas, fire, etc., from the emergency condition.

RESPONSE TO ALARM

Area personnel on plant initiate area head count procedure.

Uninvolved personnel (outside visitors, truck drivers, or plant employees) should leave the affected area immediately.

- Outside visitors, contractors and truck drivers must be directed to report to their host or responsible Plant Supervisor and await further instructions.

- Plant employees should report to their assigned assembly areas for head count and await instructions from their supervision.

The affected area is off limits until an all clear is sounded.

Personnel should not use telephone for personal reasons. Families and friends should have been previously told not to call the plant during a plant emergency.

EMERGENCY DIRECTION

Interim - Shift supervision directs the efforts of personnel until the Emergency Director arrives at the scene.

Emergency Director - Will normally be the Affected Area Unit Manager or in his absence, the Senior Supervisor. Upon arrival he is responsible for directing and controlling the situation.

COMMUNICATIONS

The Emergency Director (Unit Manager) is responsible for communications with Central Control Headquarters. This may be by telephone, radio or by messenger.

SEEP REMEDIATION
EMERGENCY PLAN

- In the event of a plant emergency originating in the Seep Remediation Project area, all personnel shall respond, as previously instructed at their orientation, in accordance with the Niagara Site Plant Emergency Plan.

- For the duration of this project, the Emergency Scene section of the Plant Emergency Plan is under the responsibility of Niagara Engineering. Personnel assignments for the Emergency Scene area as follows:

		Office #	Home #	Pager #
Emergency Director	L. A. Jewell	278-5347	688-1194	
Senior Supervisor	L. W. Beglau	278-5501	773-7134	
Day Supervisor	J. F. McClincy	278-5794	745-3846	774-1812
Supervisor on Duty	P. Palczynski	278-5485	695-3616	774-1811
Safety	A. O. Obunge	278-5789	773-6942	774-1771
	W. E. Gunter	278-5461	773-1068	541D

- Section V, The Emergency Scene, of the Plant Emergency Manual is attached for reference to show duties of the assigned personnel.

SECTION V

THE EMERGENCY SCENE

(EM-1)

Checklist

_____ 1. Initiate head count.

_____ 2. Obtain radio EM-1.

_____ 3. Verify all personnel accounted for in area.

_____ 4. Assess needs

- _____ Do you need fire department?
- _____ Do you need outside-roads closed? (Buffalo Avenue, Robert Moses Parkway)
- _____ Do you need to notify neighboring plants? (Olin, Carborundum, Occidental, EMD)
- _____ Do you need medical help?
  - doctor or nurse, specify if they are to report to the scene or not
  - ambulance
- _____ Do you need utilities shut off?
- _____ Do you need mechanical help?

_____ 5. Report status to Central Control Headquarters (EM-2).

- _____ Exact location of emergency
- _____ Type of emergency (fire, explosion, fume release)
- _____ If fume release:
  - _____ What is material?
  - _____ What is source?
  - _____ Small, medium, or large leak; "one shot" or continuous, estimate of quantity.
  - _____ Wind direction, adjacent areas affected.
- _____ Any injuries?
- _____ Action in progresss.
- _____ Other help needed.

_____ 6. Communicate to 40 Gate to direct fire department to scene.

TABLE B-1
(Concluded)

mg/m^3 = milligrams of contaminant per cubic meter of air
ppm = parts of contaminant per million parts of air
NE = Not Established
NA = Not Applicable
C = Ceiling Limit, shall not be exceeded at any time during the work day
S = Short Term Exposure Limit (STEL) usually 15 minutes, four times in one day
S/5/2 = STEL for 5 minutes, twice in one day
• = These TLV's have not yet been adopted. ACGIH has placed them under notice of intended changes.

Carcinogenic Category

IARC	IRIS	
1	As	Human Carcinogen
2A	B1	Probable Human Carcinogen (limited human data)
2B	B2	Probable Human Carcinogen (sufficient evidence in animals, inadequate evidence in humans)
3	C	Possible Human Carcinogen
4	D	Not Classifiable
	E	Evidence of Non-Carcinogen

TABLE B-1
(Continued)

Compound	CAS #	OSHA PEL	ACGIH TLV	IDLH	VAPOR PRESS. in mm @ 68°F	SPEC. GRAVITY @ 68°F	SKIN HAZARD	ODOR THRESHOLD (PPM)	CARC CAT.	HNu % RESPONSE (BENZENE)		OVA % (METHANE) RESPONSE	IP (eV)
										10.2 eV	11.7 eV		
Lindane (gamma-BHC, gamma-hexachlorocyclohexane)	58899	0.5 mg/m³	0.5 mg/m³	1000 mg/m³	0.00001	1.85	Yes	slight musty odor	NE	NE	NE	NE	NA
Mercury (inorganic)	7439976	0.1 mg/m³ C	0.1 mg/m³	28 mg/m³	0.0012	13.6	Yes	odorless	IRIS D	NE	NE	NE	NA
Methanol	67561	200 ppm	200 ppm	25,000 ppm	100 mm @ 21.2C	0.8 @ 0C	Yes	alcoholic barely detect at 2000 ppm	NE	NE	NE	12	
Methylene Chloride	75092	500 ppm 1000 ppm C 2000 ppm S/S/2	50 ppm	5000 ppm	350	1.33	No	sweet, pleasant 160 - 307 ppm	IRIS B2	NE	9.4	90	11.32
Phenol	108952	5 ppm	5 ppm	250 ppm	0.4	1.06	Yes	sweet aromatic 0.06 - 0.8 ppm	IRIS D	NE	NE	54	8.50
1,1,2,2-Tetrachloroethane	79345	1 ppm	1 ppm	150 ppm	9 @ 86F	1.59 @77F	Yes	0.237 - 7.9 ppm	IRIS C	NE	6	100	11.1 0
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016				~0		Yes		IARC B2	NE	NE	NE	
Tetrachloroethylene (Perchloroethylene)	127184	25 ppm	50 ppm 200 ppm	500 ppm	14	1.62	No	mildly sweet desensitizes olefactory 4.68 - 50 ppm	IARC 2B	NE	NE	70	9.32
Tetrahydrothiophene	110010	NE	NE	NE		0.9987 @ 20C	Yes	stench 1 ppb	NE	NE	NE	NE	7

TABLE B-1
(Continued)

Compound	CAS #	OSHA PEL	ACGIH TLV	IDLH	VAPOR PRESS. in mm @ 68°F	SPEC. GRAVITY @ 68°F	SKIN HAZARD	ODOR THRESHOLD (PPM)	CARC CAT.	HNu % RESPONSE (BENZENE)		OVA % (METHANE) RESPONSE	IP (eV)
										10.2 eV	11.7 eV		
1,2,3-Trichlorobenzene	87616	NE	NE	NE	0.07 @ 25C	1.69		NE	NE	NE	NE	100	
1,2,4-Trichlorobenzene	120821	NE	1 ppm 5 ppm C	NE	0.29 @ 25C	1.45 @ 20C	Yes	aromatic 3 ppm	IRIS D	NE	NE	100	
Trichloroethylene	79016	50 ppm 200 ppm C	50 ppm 200 ppm C	1000 ppm	58	1.46	No	sweet chloroform 21.4 - 82 ppm	3 IARC	8.9	NE	70	9.45
Toluene	108883	100 ppm 150 ppm C	50 ppm* 100 ppm 150 ppm C	2000 ppm	20 @ 65F	0.87	Yes	sweet pungent 0.16 - 37 ppm	D IRIS	10	10	110	8.82
Vinyl Chloride (Chloroethylene)	75014	1 ppm 5 ppm C	5 ppm	NE	400 @ 28C	0.9106 @ 20C	No	sweet high threshold	Suspect Carcinogen ACGIH	5	NE	35	9.99

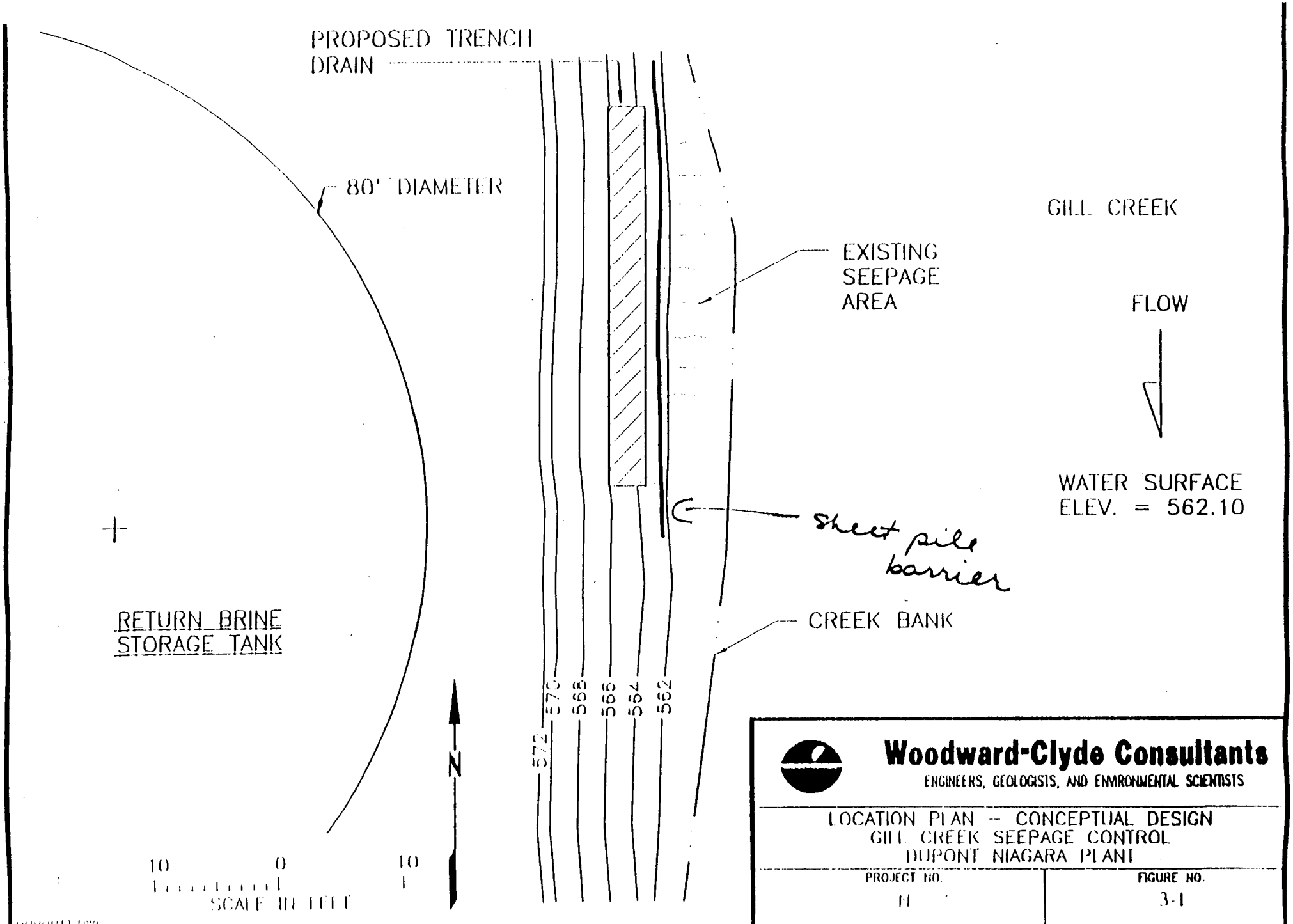
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
IRIS = Integrated Risk Information System
IARC = International Agency for Research on Cancer
PEL = Permissible Exposure Limit, unless noted is the TWA, Time Weighted Average (usually for 8 hours a day, 5 days a week), mandated by law
TLV = Threshold Limit Value, unless noted is the TWA, Time Weighted Average (usually for 8 hours a day, 5 days a week), recommended
IDLH = Immediately Dangerous to Life or Health
Skin Hazard = Contaminant is able to be absorbed through intact skin

TABLE B-1
EXPOSURE LIMITS

Compound	CAS #	OSHA PEL	ACGIH TLV	IDLH	VAPOR PRESS. in mm @ 68°F	SPEC. GRAVITY @ 68°F	SKIN HAZARD	ODOR THRESHOLD (PPM)	CARC CAT.	HNu % RESPONSE (BENZENE)		OVA % (METHANE) RESPONSE	IP (eV)
										10.2 eV	11.7 eV		
Acetone	67641	750 ppm 1000 ppm S	750 ppm 1000 ppm S	2000 ppm	180	0.79	No	mint like 40.1 - 650 ppm	IRIS D	6.3	5.7	60	9.69
Aroclor 1248	12672296	NE	NE	NE	0.0049 @ 25C	1.4 @ 15.5C		~odorless	IRIS B2	NA	NA	NA	NA
Aroclor 1254 (Polychlorinated Biphenyls, 54%)	11097691	0.5 mg/m³	0.5 mg/m³	5 mg/m³	0.000006	1.38 @ 77F	Yes	~odorless	IRIS B2	NA	NA	NA	NA
Benzene	71432	0.1 ppm* 1 ppm 5 ppm S	10 ppm	3000 ppm	75	0.88	Yes	aromatic 5 - 119 ppm	IRIS A	10	12.2	150	9.24
Alpha-BHC (alpha-hexachlorocyclohexane)	319846	NE	NE	NE	0.02 mm @ 20C	1.87 @ 20C		0.088 ppm	IRIS B2	NE	NE	NE	
Beta-BHC (trans-alpha-benzene hexachloride)	319857	5 mg/m³	NE	NE	NE	NE	NE		IRIS C	NA	NA	NA	NA
bis (2-ethyl hexyl) Phthalate	117817	5 mg/m³	5 mg/m³	NE	NE	NE	NE	odorless	NE	NA	NA	NA	NA
Carbon Tetrachloride	56235	2 ppm	5 ppm	300 ppm	91	1.59	Yes	sweet, aromatic 21.4 ppm	IRIS B2	NE	9	10	11.47
Chlorobenzene (monochlorobenzene)	108907	75 ppm	10 ppm	2400 ppm	12	1.11	No		IRIS D	NE	NE	200	0.07
Chloroform	67663	2 ppm	10 ppm	1000 ppm	160	1.48	No	pleasant 130 - 1000 ppm	IRIS B2	NE	6	65	11.42

TABLE B-1
(Continued)

Compound		CAS #	OSHA PEL	ACGIH TLV	IDLH	VAPOR PRESS. in mm @ 68°F	SPEC. GRAVITY @ 68°F	SKIN HAZARD	ODOR THRESHOLD (PPM)	CARC CAT.	HNu % RESPONSE (BENZENE)		OVA % (METHANE) RESPONSE	IP (eV)
											10.2 eV	11.7 eV		
2-Chlorophenol		95578	NE	NE	NE	2.2	1.26	Yes	unpleasant, penetrating 0.00018 mg/l	NE	NE	NE	NE	
Cyanide	KCN	168055	5 mg/m³	5 mg/m³	5 mg/m³	0	1.55	No	faint, bitter, almond	IRIS D	NE	NE	NE	NA
	NaCN	168955					1.60				NE	NE	NE	
1,2 Dichlorobenze		95501	50 ppm	25 ppm 50 ppm C	1000 ppm	1	1.3	No	aromatic 50 ppm	IRIS D	NE	NE	50	9.06
1,3 Dichlorobenze		541731	NE	NE	NE	2.3 @ 25C	1.2884			IRIS D	NE	NE	NE	9.12
1,4-Dichlorobenze		106467	75 ppm 110 ppm S	75 ppm	1000 ppm	10 @ 54.8C	1.25	No	aromatic (strong at 30 - 60 ppm)	IARC 2B	NE	NE	113	8.98
1,2-Dichloroethylene		540590	200 ppm	200 ppm	4000 ppm	180-264	1.27 @ 77F	No	Chloroform like	NE	NE	NE	50	
Hexachlorobenzene		118741	NE	0.025 mg/m³•	NE	0.000001 @ 20C	1.569 @ 23.6C	Yes		IRIS B2	NE	NE	NE	7
Hexachlorobutadiene		87683	0.02 ppm	0.02 ppm		0.15 @ 20C	1.5542 @ 20C	Yes	faint turpentine 12 mg/m³	IRIS C	NE	NE	71	
Hexachloroethane		67721	1 ppm	1 ppm	300 ppm	0.2	2.09	Yes	camphor-like 0.01 mg/l (in water)	IRIS C	NE	NE	NE	11.22



Woodward-Clyde Consultants
ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

LOCATION PLAN – CONCEPTUAL DESIGN
GILL CREEK SEEPAGE CONTROL
DUPONT NIAGARA PLANT

PROJECT NO.	FIGURE NO.
N	3-1

TABLE A-3

GILL CREEK SURFACE WATER QUALITY

Parameter	Concentration Range ug/l
Acetone	2JB-19
1,2-Dichloroethene	5U-61
Chloroform	1J-15
Trichloroethene	5U-240E
Tetrachloroethene	5U-92
1,1,2,2-Tetrachloroethane	5U-190

J = estimated value
B = compound present in blank

Source: Gill Creek Final Design Concepts Report (WCC 1992)
References:
1. 1990 Data: WCC gill Creek Water Sampling 1990 (n=11 unfiltered and 9 filtered)
2. 1929/1980 Data: DuPont Gill Creek Water Sampling 1979/1980 (2 sampling events, 4 sample locations for PCBs, 8 sampling events, 4 sample locations for turbidity and TSS)
3. 188 Data: Gill Creek Sediment Study (WCC 1989)
4. Proposal to the City of Niagara Falls for Routing Gill Creek into the Buffalo Avenue Diversion Sewer during sediment removal from Gill Creek (DuPont and Olin, 1992)

Average and range calculated from all available data at or above reporting limits if the chemical was detected in any sample.
Average assumed to be undetected at the lower detection limit value, if it was not detected in any of the samples.

TABLE 2-2

GROUNDWATER LEVEL MEASUREMENTS AT PW-35
DU PONT NIAGARA PLANT

Date	PW-35 Groundwater Elevation
11/04/91	554.95
11/11/91	554.95
11/18/91	554.95
11/25/91	554.80
12/01/91	554.95
12/09/91	554.92
12/16/91	554.94
12/23/91	554.95
12/30/91	554.95
01/06/92	554.90
03/30/92	554.91
04/28/92	554.95
05/18/92	554.94
06/19/92	554.95
07/10/92	563.07
08/17/92	563.35
09/17/92	561.37
10/12/92	563.02
11/16/92	565.01

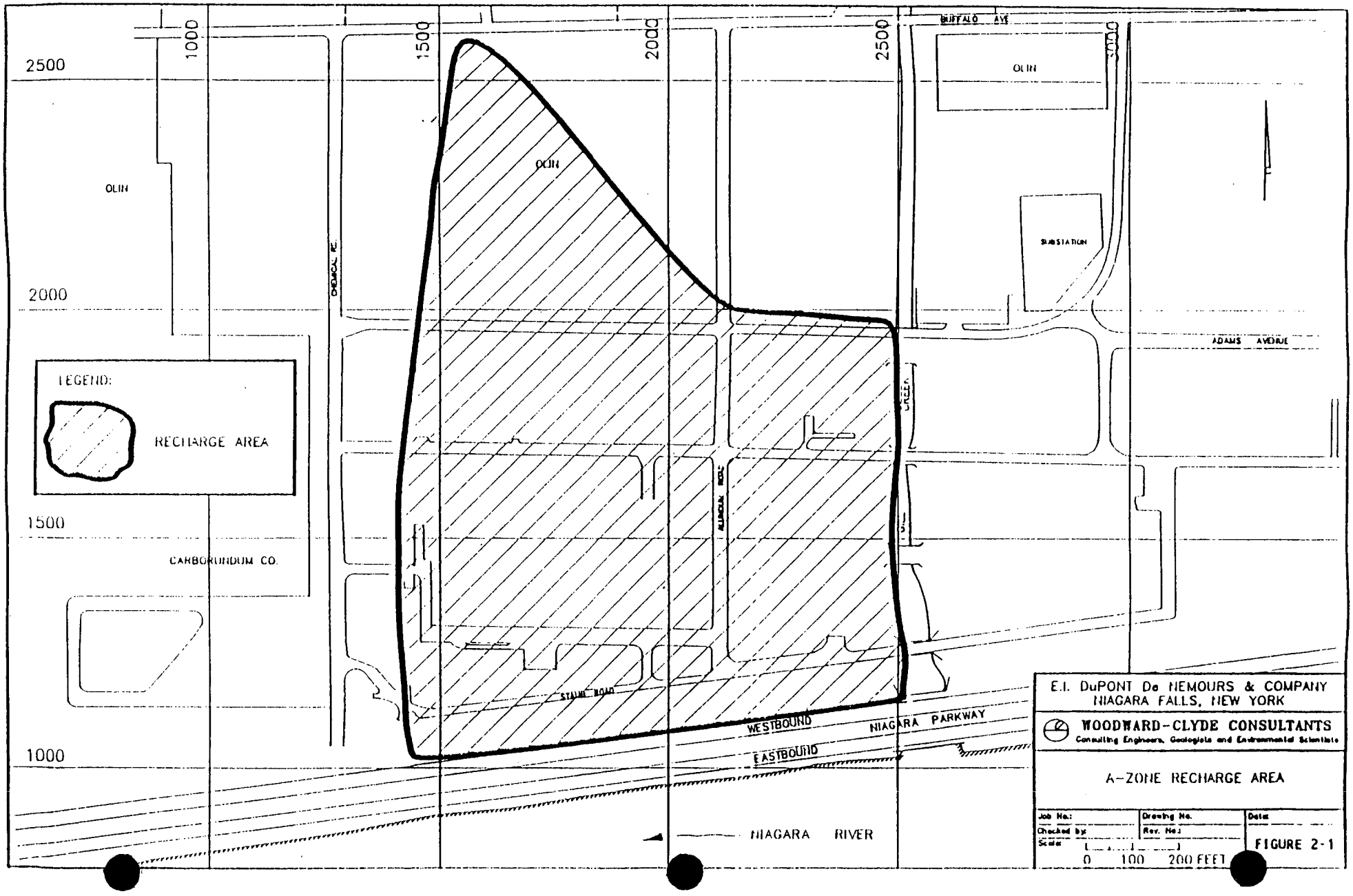

2500
2000
1500
1000
1000
1500
2000
2500
3000
OLIN
OLIN
OLIN
CHEMICAL RD.
BUFFALO AVE.
SUBSTATION
ADAMS AVENUE
ALBION ROAD
STAUB ROAD
CARBORUNDUM CO.
LEGEND:
RECHARGE AREA
WESTBOUND
NIAGARA PARKWAY
EASTBOUND
NIAGARA RIVER
E.I. DuPONT De NEMOURS & COMPANY
NIAGARA FALLS, NEW YORK
WOODWARD-CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists
A-ZONE RECHARGE AREA
Job No.:
Drawing No.
Date:
Checked by:
Rev. No.:
Scale
0 100 200 FEET
FIGURE 2-1

TABLE 2-1

RESULTS OF CHEMICAL ANALYSES OF SEEPAGE TO GILL CREEK DU PONT NIAGARA PLANT

	Concentration in ug/l			
	Seep 6	Seep 4	Seep 2	Average[1]
Volatiles				
chloroform	1100	400	210	570
1,1-dichloroethene	4.8J[2]	ND	ND	4.8J
cis-1,2-dichloroethene	1200	2200	2000	1800
trans-1,2-dichloroethene	9.6J	13J	9.3J	10.6J
methylene chloride	14J	ND	ND	14J
1,1,2,2-tetrachloroethane	81	98J	79J	86J
tetrachloroethene	1300	1500	1800	1533
1,1,1-trichloroethane	13J	48J	32J	31
trichloroethene	2000	3700	2500	2733
vinyl chloride	120	99J	75J	98J
Total	**5842**	**8058**	**6705**	**6868**
Semivolatiles				
hexachlorobutadiene	9.4	8.5	4.8	7.6
hexachloroethane	9.9	8.1	3.7	7.2
Pesticides/PCBs				
alpha-BHC	0.30	0.14	0.06	0.17
beta-BHC	0.46	0.34	0.26	0.35
gamma-BHC	0.069	0.049	0.025	0.048
delta-BHC	0.030	0.029	ND	0.029
aroclor 1248	0.63	ND	ND	0.63

TABLE 2-1 (continued)

RESULTS OF CHEMICAL ANALYSES OF SEEPAGE TO GILL CREEK
DU PONT NIAGARA PLANT

	Concentration in ug/l			
	Seep 6	Seep 4	Seep 2	Average[1]
Metals				
aluminum	727	1090	296	704
chromium	6.0	13.0	7.0	8.7
copper	16.0	78.0	39.0	44.0
iron	3670	7390	2320	4460
mercury	0.20	0.60	0.20	0.33
silicon	2550	5300	3550	3800
zinc	14	74	55	48
cadmium	ND	0.40	ND	0.40
lead	ND	10	ND	10

(1) Excluding non-detects (ND)
(2) Estimated concentration

KEY PROJECTS

1989 - Sealand Restoration, Lisbon, NY
1988 - New Lyme Landfill Site, Ashtabula, Ohio
1988 - Lang Property Site, Pemberton, New Jersey
1988 - Metaltec/Aerosystems Site, Franklin, New Jersey
1988 - Love Canal Site, Niagara Falls, New York
1988 - Union Carbide Corporation, Ponce, Puerto Rico
1987 - Maxus Energy, Painesville, Ohio
1987 - IBM, Poughkeepsie, New York
1987 - New York State DEC (Love Canal), Niagara Falls, New York
1987 - Universal Manufacturing, Bridgeport, Connecticut
1987 - FMC Corporation, Middleport, New York
1986 - Confidential Client, Crawfordsville, Indiana
1986 - Allied Corporation, Ironton, Ohio
1986 - Confidential Client, Staten Island, New York
1986 - Regional Municipality of Ottawa-Carlton, Ottawa, Ontario
1986 - U.S. Army Corps of Engineers, Council Bluffs, Iowa
1986 - New York State DEC (Love Canal), Niagara Falls, New York

CERTIFICATIONS & HONORS

- BOARD CERTIFIED INDUSTRIAL HYGIENIST
  AMERICAN BOARD OF INDUSTRIAL HYGIENE

- NATIONAL INSTITUTES OF HEALTH POSTDOCTORAL FELLOW
  UNIVERSITY OF MASSACHUSETTS

- NATIONAL SCIENCE FOUNDATION FELLOW
  UNIVERSITY OF NOTRE DAME

- DIPLOMATE: AMERICAN ACADEMY OF INDUSTRIAL HYGIENE

- CERTIFICATE OF APPRECIATION
  U.S. DEPARTMENT OF LABOR

GARY ROSE - SAFETY OFFICER

GENERAL

Mr. Rose is an Assistant Superintendent for Sevenson Environmental Services, Inc. As an Assistant Superintendent, Mr. Rose's responsibilities are to implement the construction schedule working in conjunction with the project manager; supervise and oversee specific field construction activities and determine equipment needs to complete tasks.

EXPERIENCE SUMMARY

Mr. Rose has gained significant experience in construction project management and health and safety protocols while working on a variety of remedial action projects involving: drum excavation, characterization and disposal; facilities decontamination and dismantlement; contaminated soil removal; and sludge solidification. During 1990 and 1991, he was actively involved in the Mercury Cell Facility Decommissioning and Dismantlement project.

CREDENTIALS

B.S. - Special Studies (1988), Fredonia State College, Fredonia, New York

EMPLOYMENT HISTORY

1987-Present	SEVENSON ENVIRONMENTAL SERVICES, INC. Niagara Falls, New York
1986	MODERN WASTE DISPOSAL COMPANY Model City, New York

KEY PROJECTS

1991:	Confidential Client, Niagara Falls, New York
1990:	Confidential Client, Massena, New York
1990:	Confidential Client, Niagara Falls, New York
1989:	Sealand Restoration Site, Lisbon, New York
1989:	Confidential Client, Avon Lake, Ohio
1988:	Metaltec/Aerospace Site, Franklin, New Jersey

DUPONT CHEMICAL COMPANY - OLIN CHEMICAL CORPORATION
NIAGARA FALLS PLANTS
GILL CREEK REMEDIATION PROJECT

OCCUPATIONAL HEALTH COORDINATOR
SITE SAFETY CONSTRUCTION SUPERVISOR

INDIVIDUAL RESUME'

MR. ALVIN FRITH, B.S., CIH - INDUSTRIAL HYGIENE SPECIALIST
OCCUPATIONAL HEALTH GROUP COORDINATOR

Mr. Frith has a Bachelor of Science Degree in Industrial Hygiene from Purdue University and is the Coordinator of DuPont's Niagara Falls plant Occupational Health Group. He is also a "CERTIFIED INDUSTRIAL HYGIENIST" by the American Board of Industrial Hygiene and a diplomate of the American Academy of Industrial Hygiene. He has been employed by Du Pont for over 25 years. The first 13 years of his career was spent working in our quality assurance/quality control (QA/QC) laboratory. For the past 12 years he has been involved in the practice, development and management of industrial hygiene programs at Niagara and continues this work at 12 other Du Pont sites located around the country. He has developed and implemented working documents that achieved the protection of employees along with assurance of compliance with applicable legal requirements. Experience also includes presentations and training on occupational health, OSHA regulations, reproductive hazards in the workplace, asbestos management, respiratory protection, radon, lead, electric and magnetic fields, and laboratory safety, etc. Mr. Frith is also a member of the local chapter and national American Industrial Hygiene Association and a member of the Chlorine Institute's Safety, Health and Environmental Committee.

MR. ABIYE O. OBUNGE - SITE SAFETY SPECIALIST (CONSTRUCTION)

Mr. Obunge has a Bachelor of Science Degree in safety engineering and an associate degree in electronic engineering. He has had extensive training on various safety related subjects which include construction safety and OSHA, 40 hour hazardous waste site worker training program 1910.120, electrical safety training for supervisors, excavation competency, industrial safety, and risk management and analysis. Mr. Obunge has been the site safety specialist for the Niagara construction group for three years and his primary responsibility is contractor safety. He is involved in construction continuous improvement audit processes at other Du Pont sites. His present duties include coordinating the interpretation of local legislation and Du Pont policies pertinent to safety, health and the environment. He is also responsible for contractors site safety orientations, and implements the site contractor drug and substance abuse program.

Prior to working at Du Pont, he spent five years working at Sima Construction/Reima Industries in London and NIgeria where his duties included managing and coordinating various programs and operations.

PAUL J. HITCHO, Ph.D., C.I.H.

GENERAL

Dr. Hitcho is Director of Occupational Health and Safety for Sevenson Environmental Services, Inc. He develops and implements site safety plans, provides consultative services on occupational health matters, coordinates and supervises a comprehensive employee medical surveillance program, and supervises a staff of site safety officers.

EXPERIENCE SUMMARY

Dr. Hitcho's career in the field of occupational health and safety has been very active and diverse. He has conducted extensive research as a National Institute of Health Postdoctoral Fellow, taught on the university level, conducted numerous health assessments as a regional field industrial hygienist prior to entering management. While the industrial hygiene department head for the United Steelworkers of America, Dr. Hitcho served as the liaison between the union and the coal carbonization (coking) and related chemical industries. He is recognized as a world expert in this field by the International Agency for the Research on Cancer (IARC). The IARC monographs developed while he was an active participant are used by OSHA in their hazardous communications standard 1910.1200 as a cited reference to determine whether a substance is a carcinogen. Also, Dr. Hitcho interfaced with pesticide and herbicide manufacturers to conduct occupational health studies and develop hazard analyses for some of the processes in this industry.

CREDENTIALS

Ph.D., Biology, Notre Dame University, Notre Dame, Indiana (1971)
A.B. Biology, St. Vincent College, Latrobe, Pennsylvania (1966)

EMPLOYMENT HISTORY

1986-Present	SEVENSON ENVIRONMENTAL SERVICES, INC. Niagara Falls, New York
1979-1986	UNITED STEELWORKERS OF AMERICA, Pittsburgh, Pennsylvania
1974-1979	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) Pittsburgh, Pennsylvania
1971-1974	NATIONAL INSTITUTES OF HEALTH POSTDOCTURAL RESEARCH FELLOW University of Massachusetts Amherst, Massachusetts

2. Products

a. Labor and Equipment

Contractor shall provide all labor and special equipment required. Equipment shall include, but not limited to, the following:

- Chemicals without organic solvents
- High pressure spraying equipment
- Steam cleaning equipment
- Industrial cleaning equipment
- Sand blasting equipment
- Brushes, scrapers and other tools

Execution

1. As stated herein, provide all equipment and labor required. A detailed procedure shall be prepared and submitted to purchaser for review and approval prior to any decontamination operations.

2. All personnel shall be adequately trained and wear suitable personal protective equipment in accordance with all OSHA requirements.

Rev. 2
6/22/93
JFM/nhg

XII. SITE CONTROL MEASURES

Site control procedures shall be described. These will include a site map with work zones and access points delineated. Site security (physical and procedural) will also be described.

A minimum of three work zones will routinely be used to reduce the accidental spread of hazardous substances from contaminated areas. Criteria for the establishment of an exclusion zone, a contamination reduction zone and a support zone will be established. Guidance presented in DHHS (NIOSH) publication No. 85-115, Section 9, will be used.

The guidance provided in DHHS (NIOSH) Publication 85-115 shall be used as the basis for devising a communications system that includes a method of internal communications between field teams and the base of field operations and that includes external communications between on-site personnel and off-site personnel. The combination on this site of heavy equipment and personnel in Level B is potentially very dangerous. Clear communications, including well defined hand signals and nonverbal warning systems, will be critical to safe operations on this site.

Remediation Decontamination

1. Personal Protective Equipment and Sampling Equipment Decontamination

   A personal decontamination zone and a small equipment decontamination zone will be established prior to commencement of work. No contaminated equipment will be carried off-site. Used personal protective equipment will be placed in plastic bags and disposed of at the end of each day. No disposable item will be reused. Ultimate disposal of these materials are the responsibility of the clients. All non-disposable items will be thoroughly washed with Alconox and water and steam rinsed. Used water must be collected for proper disposal by the clients. Equipment decontamination will be performed at a level of protection equal or greater than that used during sediment sampling. Air monitoring instrumentation will be wiped clean with baby wipes.

   The specific steps for personal decontamination are as follows:

   - Deposit equipment (tools, sampling devices, clipboards, etc.) that need to be decontaminated on plastic drop cloths.
   - Discard outer latex boots.
   - Wash steel-toe boots and gloves with long handled brushes (in a tub or other available water holding device) using an Alconox solution and water.

- Rinse boots and gloves in a separate tub or container. Use long handled brushes and plain water.
- Rinse boots and gloves in another tub or container using plain water or a sprayer.
- Decontaminate small pieces of equipment using Alconox and water.
- Discard outer gloves and Saranex coveralls.
- Remove respirator and place on table to be decontaminated later.
- Remover inner gloves and place in disposal drum or container.
- Wash hands and face.

2. Large Equipment Decontamination

Brushing will be the primary method, but if inadequate, steam or water cleaning may follow. A decontamination zone for large pieces of equipment (ponar dredge, hand push core) will be setup at the plant. As with the personal decontamination zone, all liquids generated during cleanup will be contained for disposal by the client. Large equipment decontamination will be performed in a level of personal protection equal to that used during sampling.

Further equipment decontamination may proceed as described below:
- Alconox and potable water wash.
- Distilled water rinse.
- Final distilled water rinse.

Post-Remediation Decontamination

1. General

a. Description

After completion of the project, contractor shall decontaminate all equipment and appurtenances provided and/or operated by contractor.

b. Quality
Contractor shall perform appropriate tests to demonstrate and document that all applicable components have been adequately decontaminated.

c. Submittals
Contractor shall provide detailed descriptions of the decontamination procedures he intends to use. This shall include estimates of the time required and quantity of wastes that will be produced.

Illumination of Work Areas

Work areas shall be illuminated per table C-1 (attached).

Contamination Prevention

Guidance provided in DHHS (NIOSH) Publication No. 85-115, Section 10, page 10-1, will be implemented as a minimum.

Heavy Material Handling

Procedures for implementing 29 CFR 1926.250(a) and (b) will be included. Procedures for periodically briefing proper lifting techniques designed to reduce back injury will be devised and implemented.

Housekeeping

Procedures for implementing requirements contained in 29 CFR 1926.25 shall be included in the HSP.

Geophysics and Clearing

Procedures for verifying the absence of buried utility lines and plumbing at sites of intrusive activities shall be implemented.

Use of Tools

All hand tools shall be in good repair and used only for the purpose for which designed. Power tools shall be inspected, tested, and determined to be in safe operating condition prior to use. Continued periodic inspections shall be made to assure safe operating condition and proper maintenance.

XI. STANDARD OPERATING PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

Prohibitions During Field Activities

Specific prohibitions not addressed elsewhere in the site-specific health and safety plan shall be listed here. The following items will be listed within this section if they would not otherwise be addressed in the plan.

1. No running or horseplay.
2. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material in prohibited in the exclusion zone and the contamination reduction zone.
3. Smoking, carrying lighters and/or matches is prohibited in the exclusion zone and the contamination reduction zone.
4. No jewelry may be worn by personnel engaged in field work, except for watches, which will be disposed of if they become contaminated.
5. Medicine and alcohol can potentiate the effects from exposure to toxic chemicals. Prescribed drugs are not be taken by personnel during operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages will not be allowed during breaks.
6. No person will enter an exclusion zone alone.
7. Safety devices on equipment will be left intact and used as designed.
8. No contact lenses shall be worn on site.

Dust Control

The contractor shall prepare a dust control plan to prevent dispersion of visible dusts from contaminated sediment during all remediation activities. While particulate emissions from remediation activities are not expected, ambient particulate monitoring will be conducted during active remediation construction periods through the use of a Portable Particulate Monitor.

On active remediation construction days when the prevailing wind direction at the beginning of the work day is not toward the river, downwind particulate samples will be collected using device(s) described above. Prevailing wind will be determined using a wind sock on site. If a high volume sampler is used, a 12-hour integrated sample will be collected. If the results of downwind ambient total nuisance particulates (dust) monitoring for this project exceeds concentration of 150 ug/m^3 (microgram/cubic meter), dust suppression control measures will be conducted. New York State Department of Environmental Conservation procedure TAGM 4031 will be used (see attachments).

Control measures which may be used for soil piles include wetting down the excavation area and/or covering the soil piles with vapor barriers. Soils removed from excavations may be kept moist to further assure particulate control. Measures for control of dusting from roadways, when required, may include limiting vehicle speeds, wetting and/or sweeping of plant roadways.

Heavy Equipment Operation

1. A competent person will be designated to inspect all equipment and machinery daily to insure it is in safe operating condition. As a minimum, tests shall be made to determine that the brakes and operating systems are in proper working condition. Records of inspections will be maintained at the site by the contractor and shall become part of the official project file.
2. Procedures shall be established to ensure that machinery found to be defective is removed from service until the unsafe condition has been corrected. The usage of accident prevention signs and tags, as described in 29 CFR 1926.200 will be incorporated into the procedures to be established.
3. All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded when exposed to contact by persons or otherwise creates a hazard. Guarding shall meet the requirements of ANSI B15.1, "Safety Standards for Mechanical Power Transmission Apparatus".
4. All hot surfaces of equipment shall be guarded or insulated to prevent injury or fire.
5. Fuel tanks shall be located in a manner which will not allow spills or overflow to run onto the engine, exhaust or electrical lines.
6. Platforms, footwalks, steps, handholds, guardrails, and toeboards shall be provided on machinery to promote safe footing. Accumulations of snow, ice, oils, grease, or any substance likely to increase the likelihood of a slip will be removed before such surfaces are used.
7. All mobile equipment are to carry their own fire extinguishers on board at all times.

Fall Prevention/Protection

Procedures to identify and eliminate or clearly mark tripping hazards and slippery surfaces will be established.

Visitors

A means will be devised and implemented to insure all visitors sign-in on a visitors log. A method will also be devised and implemented to insure visitors to hazardous field activities are medically qualified and have the health and safety training prerequisites required to visit hazardous waste operations.

PROCEDURE FOR SEEP REMEDIATION ACTIVITIES
OBTAINING REQUIRED EMISSION DATA AND INFORMATION

This procedure is to be followed by Sevenson contractors WHENEVER there is a 5 ppm PID (Photo Ionization Detector) or OVA (Organic Vapor Analyzer) reading at the Exclusion Zone (EZ) boundary **in any area.**

Sevenson monitor(s) and laboratory personnel are responsible for monitoring, sampling, accumulating and analyzing emission data and information from activities associated with the Seep Remediation Project. The PID must be calibrated using benezene. The OVA must be calibrated using methane.

Monitors handling the PID's must have a STEADY response for a reading--fluctuations should be ignored. It is critical that monitors are trained in taking readings. Refer to the Seep Remediation Project Safety and Halth Plant Section IX: EXPOSURE MONITORING/AIR SAMPLING PROGRAM for a complete description of monitoring requirements.

The activities of the following checklist must be filled out by the Sevenson employee, must be kept in a log book, and maintained in a cental location. For consistency, the same checklist has been provided to environmental resources who may have to respond should the Duty person be paged.

WITHIN 1-1/2 HOURS OF TIME that PID/OVA reading of 5 or greater ppm were taken, the data and information must be given to the plant environmental Duty Person. Contact the Niagara Plant Security Building 29 (x5444) to contact the duty person. **THIS IS CRITICAL.**

Exclusion Zone Air Emission PID/OVA readings of 5ppm or greater Checksheet

Name of person recording information:_____

1. Record the date and time at which an OVA/PID reading was 5 ppm or greater_____.
   a. Was it a PID or OVA reading? _____
   b. What was the reading (in ppm)?_____

2. Call the Main Security Building 29 (x5444) to get wind speed and direction:

   a. time:_____a.m. p.m.
   b. windspeed:_____mph
   c. wind direction:_____

3. Tedlar bag samples must be collected.

   a. Time of collection: a.m. p.m.
   b. Collection method: --------
   c.Sample collection location:_____

4. Until an on-site GC is set up for use, air samples must be analyzed by Waste Streams Laboratory in Buffalo. An 8-hour turn around time for analytical results is required. During busines hours, contact the lab AT 876-5290. During weekends or off-hours, contact the Waste Stream designated contact Dan Vollmer at 833-5139 or Dave Ennis at 692 6599.

   a. Record date and time Waste Stream was contacted:_____
   b. Record time that sample was given to lab_____

   Results must be immediately reported to the site certified industrial hygenist (Alvin Frith) and Marit Crowe.

5. Location of emission (sediment staging pad? Area 3)_____

6. Additional PID/OVA readings must be collected to determine the emission extent and duration. Record the location of PID/OVA reading and the levels:

Location	PID/OVA reading	time

4. Monitor or helper in remediation area with emission must contact the Project Team Leader or Field Team Leader and notify them of the situation and area affected.
5. Restrict access by site personnel/traffic not having the proper personal protective equipment in any affected area exceeding a PID/OVA reading of 1 ppm.
6. Continue attempts to identify and quantify specific chemical constituents in emission.
7. The Field Team Leader or Project Team Leader will contact B29 Security Center, who will make the following contacts:
   - Niagara Falls Fire Department (Community Emergency Response)
   - Environmental duty person
   - Conrail yard
   - Olin and other surrounding businesses
   - Niagara Falls Police
   - Memorial Medical Center and plant doctor (if necessary)
   - Niagara County Health Department and the DEC (if unable to contact the Environmental duty person)
   - Other site safety, security and Occupational Health personnel and other plant personnel, if necessary.
8. If the Robert Moses Parkway will be affected, guards will also contact the following for coordination of traffic diversion and evacuation:
   - New York State Police
   - New York Power Authority (285-2711)
   - Department of Transportation
   - Niagara County Office of Emergency Services
   - Niagara Falls Police Department
9. The Environmental duty person will notify the Niagara County Health Department, the DEC and other appropriate agencies.
10. Do not resume remediation activities in the area until a work continuation plan is approved to minimize future recurrences. Approval will come through the Environmental Group.

NOTE: Response Level III message for guard and others: There is a fugitive organic vapor emission from the Gill Creek sediment removal project at the DuPont site. Emergency measures are being activated.

NOTE: FOR THOSE NOT COMING ON PLANT TO THE SCENE, GUARDS WILL GIVE THE ADDITIONAL INFORMATION: Keep clear of the area downwind of the DuPont site until notified that the area is cleared. Give wind direction.

MONITORING METHOD	COMPOUND	LEVEL C	LEVEL B	STOP WORK
PID or OVA	Volatile Organics	1 ppm-50 ppm	50 ppm-500 ppm	500 ppm
Integrated	Vinyl Chloride	Not allowed	0.5 ppm-500 ppm	500 ppm
Integrated	Hexachloro-butadiene	Not allowed	0.01 ppm-500 ppm	500 ppm
Integrated	Benzene	Not allowed	0.5 ppm-500 ppm	500 ppm
Integrated	Chlorinated Biphenlys	0.25 ppm-15 ppm	15 ppm-500 ppm	500 ppm
Integrated	1,1,2,2-Tetrachloro ethane	0.5 ppm-25 ppm	25 ppm 500 ppm	500 ppm
Hg Vapor Detector Tubes	Mercury	.05-.5 mg/m^3	>.50 mg/m^3	

Air Monitoring - Response Levels

Continuous PID/OVA readings will be taken at the EZ downwind perimeter, as depicted on drawaing LOCMAP8, during each actibe remediation construction day. These readings will determine whether to initiate contingency actions if above the levels prescribed in the contingency plan shown below. Thereafter, chemical specific results from a portable GC will determine follow up actions. The readings will be taken to protect the public and site personnel.

X. CONTINGENCY PLAN FOR REMEDIATION AIR EMISSIONS

The following contingency plan, which applies to all remediation work, was developed based on the PEL's, TLV's, etc. of volatile chemicals found in the Seep sediments and also on considerations for protecting the health of remediation workers, plant personnel and the community.

The three work zones defined in the Safety and Health Plan for the remediation project are the Exclusion Zone (EZ), Hot Line Zone (HL) and the Contamination Reduction Zone (CR). Another perimeter requiring consideration for the contingency plan is the Security Zone (plant or site property line).

Response levels are levels above background. The appropriate readings will be taken continuously - while in the contingency operation - 50 foot increments downwind from the defined boundaries, at the site property line and at the edge of the R. M. Parkway (Area 1). Background data will be established upwind at the CR and site property boundaries before sediment removal activities begin and at the start of each work shift.

Response Level	I	II	III
Location	EZ Boundary	CR Boundary	Site Property Line
Action Level (Above Ground)	5 ppm (PID/OVA)	5 ppm (PID/OVA)	5 ppm (PID/OVA)

In the affected remediation area, work will continue during Response Level I, stop during Response Level II (except for suppression of vapors) and communication to site and non-site personnel (including agencies) will begin if Response Level III is reached. The contingency activities for each response level include, but are not limited to, the following actions:

Response Level I
Triggered by a PID/OVA reading exceeding 5 ppm for 15 minutes at the Exclusion Zone boundary.

1. Contact another monitor(s) to help monitor the affected area, CR boundary and beyond if needed. Continuously monitor downwind of the EZ boundary until source of emission is determined and reduced.
2. Monitor(s) must immediately sample at the EZ boundary to analyze the vapor emissions and determine the quantitative amounts of each specific chemical causing the reading.

3. Monitor must stop all remediation work in the affected area and workers must start suppressing emissions if the PID/OVA reading exceeds 5 ppm at the CR boundary and go to Response Level II.
4. Continue remediation activities if the PID/OVA reading is less than 5 ppm at the CR boundary. If excavated material is the source of emissions, cover it with a vapor barrier such as plastic sheet, foam, etc. to reduce emissions. Areas of the trench not being excavated will also be covered with a vapor barrier if they are the source of emissions.
5. Restrict access by site personnel/traffic not having the proper personal protective equipment in any affected area exceeding a PID/OVA reading of 1 ppm.

Response Level II
Triggered by a 5 ppm PID/OVA reading at the Contamination Reduction (CR) Zone boundary.

1. Continuously monitor the CR boundary and downwind site property line with the PID/OVA until source of emission is determined and reduced.
2. Contact another area monitor(s) to help monitor the affected area, CR boundary and site property line and beyond if necessary.
3. If the PID/OVA reading exceeds 5 ppm at the site property line, stop remediation activities and begin suppressing emissions in the creek bed and the staging area by covering with a vapor barrier, foam or the prescribed method of suppressing emissions.
4. Restrict access by site personnel/traffic not having the proper personal protective equipment in any affected area exceeding a PID/OVA reading of 1 ppm.

Response Level III
Triggered by a PID/OVA reading exceeding 5 ppm at the site boundary or exceeding 5 ppm during a traffic backup or jam on the Robert Moses Parkway in Area 1.

1. Determine and stop cleanup activities causing emissions in the affected area. Start suppressing emissions in the until the emissions stop leaving the site.
2. Contact another monitor(s) to help monitor the affected area and beyond. A plant emergency may exist depending on wind direction.
3. Continuously monitor site property line downwind and elsewhere to determine the extent of emissions. Determine distance to where 5 ppm PID/OVA readings are no longer exceeded.

REPORTABLE QUANTITIES RELEASE CALCULATIONS

CONTAMINANT	MOLECULAR WEIGHT	REGULATORY RQ	THRESHOLD PPM*	GC/MS PPM**	QUANTITY EMITTED (LBS.)***	MG/CU. M
ALPHA-BHC	290.83	10	2.9	5	17	59.47
BETA-BHC	290.83	1	0.3	5	17	59.47
DELTA-BHC (LINDANE)	290.83	1	0.3	5	17	59.47
GAMMA-BHC	290.83	1	0.3	5	17	59.47
PCB-1248		1	0.0	5	0	0.00
CHLOROBENZENE V	112.56	100	75.3	5	7	23.02
1,2,4-TRICHLOROBENZENE S	181.45	100	46.7	5	11	37.11
HEXACHLOROBENZENE S	284.78	10	3.0	5	17	58.24
PENTACHLOROBENZENE S	250.34	10	3.4	5	15	51.19
1,2-DICHLOROBENZENE/O- S	147.01	100	57.7	5	9	30.06
1,3-DICHLOROBENZENE/M- S	147.01	100	57.7	5	9	30.06
1,4-DICHLOROBENZENE/P- S	147.01	100	57.7	5	9	30.06
BENZENE V	78.10	10	10.9	5	5	15.97
HEXACHLOROBUTADIENE S	260.76	1	0.3	5	15	53.33
TRICHLOROETHENE V	131.40	100	64.5	5	8	26.87
1,1,1-TRICHLOROETHANE V	133.41	1000	635.5	5	8	27.28
TETRACHLOROETHENE V	165.38	100	51.3	5	10	33.82
1,1-DICHLOROETHANE V	98.96	1000	856.7	5	6	20.24
1,1,2,2-TETRACHLOROETHANE V	167.85	100	50.5	5	10	34.33
TRANS-1,2-DICHLOROETHENE V	96.95	1000	874.4	5	6	19.83
1,1-DICHLOROETHENE V	96.95	100	87.4	5	6	19.83
HEXACHLOROETHANE S	236.74	100	35.8	5	14	48.41
VINYL CHLORIDE V	62.50	1	1.4	5	4	12.78
TOLUENE V	92.14	1000	920.1	5	5	18.84
CHLOROFORM V	119.39	10	7.1	5	7	24.42
2-CHLOROPHENOL S	128.56	100	65.9	5	8	26.29
CARBON TETRACHLORIDE V	153.84	10	5.5	5	9	31.46
METHYLENE CHLORIDE V	84.93	1000	998.2	5	5	17.37
BIS(2-ETHYLHEXYL) ESTER S	390.56	100	21.7	5	23	79.87
FLUORANTHENE S	202.26	100	41.9	5	12	41.36
MERCURY	200.59	1	0.4	5	12	41.02
ARSENIC	74.92	1	1.1	5	4	15.32
LEAD	207.20	1	0.4	5	12	42.37

* THRESHOLD CONCENTRATION. VALUES GREATER THAN THIS CONCENTRATION AT THE ASSUMED EXAMPLE CONDITIONS WOULD RESULT IN RQ EXCEEDANCE.

** INPUT THE ACTUAL CONTRACT LABORATORY RESULTS INTO THIS COLUMN. 0.3 INTERIM VALUE PLACED IN COLUMN.

*** RELEASE QUANITITY IN POUNDS CALCULATED BASED ON CONTRACT LAB RESULTS. COMPARE WITH REGULATORY RQ.

REPORTABLE QUANTITIES RELEASE CALCULATIONS

CONTAMINANT	MOLECULAR WEIGHT	REGULATORY RQ	THRESHOLD PPM*	GC/MS PPM**	QUANTITY EMITTED (LBS.)***	MG/CU. M
ALPHA-BHC	290.83	10	2.9	10	34	118.95
BETA-BHC	290.83	1	0.3	10	34	118.95
DELTA-BHC (LINDANE)	290.83	1	0.3	10	34	118.95
GAMMA-BHC	290.83	1	0.3	10	34	118.95
PCB-1248		1	0.0	10	0	0.00
CHLOROBENZENE V	112.56	100	75.3	10	13	46.04
1,2,4-TRICHLOROBENZENE S	181.45	100	46.7	10	21	74.21
HEXACHLOROBENZENE S	284.78	10	3.0	10	34	116.48
PENTACHLOROBENZENE S	250.34	10	3.4	10	30	102.39
1,2-DICHLOROBENZENE/O- S	147.01	100	57.7	10	17	60.13
1,3-DICHLOROBENZENE/M- S	147.01	100	57.7	10	17	60.13
1,4-DICHLOROBENZENE/P- S	147.01	100	57.7	10	17	60.13
BENZENE V	78.10	10	10.9	10	9	31.94
HEXACHLOROBUTADIENE S	260.76	1	0.3	10	31	106.65
TRICHLOROETHENE V	131.40	100	64.5	10	15	53.74
1,1,1-TRICHLOROETHANE V	133.41	1000	635.5	10	16	54.56
TETRACHLOROETHENE V	165.38	100	51.3	10	20	67.64
1,1-DICHLOROETHANE V	98.96	1000	856.7	10	12	40.47
1,1,2,2-TETRACHLOROETHANE V	167.85	100	50.5	10	20	68.65
TRANS-1,2-DICHLOROETHENE V	96.95	1000	874.4	10	11	39.65
1,1-DICHLOROETHENE V	96.95	100	87.4	10	11	39.65
HEXACHLOROETHANE S	236.74	100	35.8	10	28	96.83
VINYL CHLORIDE V	62.50	1	1.4	10	7	25.56
TOLUENE V	92.14	1000	920.1	10	11	37.69
CHLOROFORM V	119.39	10	7.1	10	14	48.83
2-CHLOROPHENOL S	128.56	100	65.9	10	15	52.58
CARBON TETRACHLORIDE V	153.84	10	5.5	10	18	62.92
METHYLENE CHLORIDE V	84.93	1000	998.2	10	10	34.74
BIS(2-ETHYLHEXYL) ESTER S	390.56	100	21.7	10	46	159.74
FLUORANTHENE S	202.26	100	41.9	10	24	82.72
MERCURY	200.59	1	0.4	10	24	82.04
ARSENIC	74.92	1	1.1	10	9	30.64
LEAD	207.20	1	0.4	10	24	84.74

* THRESHOLD CONCENTRATION. VALUES GREATER THAN THIS CONCENTRATION AT THE ASSUMED EXAMPLE CONDITIONS WOULD RESULT IN RQ EXCEEDANCE.

** INPUT THE ACTUAL CONTRACT LABORATORY RESULTS INTO THIS COLUMN. 0.3 INTERIM VALUE PLACED IN COLUMN.

*** RELEASE QUANITITY IN POUNDS CALCULATED BASED ON CONTRACT LAB RESULTS. COMPARE WITH REGULATORY RQ.

REPORTABLE QUANTITTIES RELEASE CALCULATIONS

CONTAMINANT	MOLECULAR WEIGHT	REGULATORY RQ	THRESHOLD PPM*	GC/MS PPM**	QUANTITY EMITTED (LBS.)***	MG/CU. M
ALPHA-BHC	290.83	10	2.9	0.3	1	3.57
BETA-BHC	290.83	1	0.3	0.3	1	3.57
DELTA-BHC (LINDANE)	290.83	1	0.3	0.3	1	3.57
GAMMA-BHC	290.83	1	0.3	0.3	1	3.57
PCB-1248		1	0.0	0.3	0	0.00
CHLOROBENZENE V	112.56	100	75.3	0.3	0	1.38
1,2,4-TRICHLOROBENZENE S	181.45	100	46.7	0.3	1	2.23
HEXACHLOROBENZENE S	284.78	10	3.0	0.3	1	3.49
PENTACHLOROBENZENE S	250.34	10	3.4	0.3	1	3.07
1,2-DICHLOROBENZENE/O- S	147.01	100	57.7	0.3	1	1.80
1,3-DICHLOROBENZENE/M- S	147.01	100	57.7	0.3	1	1.80
1,4-DICHLOROBENZENE/P- S	147.01	100	57.7	0.3	1	1.80
BENZENE V	78.10	10	10.9	0.3	0	0.96
HEXACHLOROBUTADIENE S	260.76	1	0.3	0.3	1	3.20
TRICHLOROETHENE V	131.40	100	64.5	0.3	0	1.61
1,1,1-TRICHLOROETHANE V	133.41	1000	635.5	0.3	0	1.64
TETRACHLOROETHENE V	165.38	100	51.3	0.3	1	2.03
1,1-DICHLOROETHANE V	98.96	1000	856.7	0.3	0	1.21
1,1,2,2-TETRACHLOROETHANE V	167.85	100	50.5	0.3	1	2.06
TRANS-1,2-DICHLOROETHENE V	96.95	1000	874.4	0.3	0	1.19
1,1-DICHLOROETHENE V	96.95	100	87.4	0.3	0	1.19
HEXACHLOROETHANE S	236.74	100	35.8	0.3	1	2.90
VINYL CHLORIDE V	62.50	1	1.4	0.3	0	0.77
TOLUENE V	92.14	1000	920.1	0.3	0	1.13
CHLOROFORM V	119.39	10	7.1	0.3	0	1.46
2-CHLOROPHENOL S	128.56	100	65.9	0.3	0	1.58
CARBON TETRACHLORIDE V	153.84	10	5.5	0.3	1	1.89
METHYLENE CHLORIDE V	84.93	1000	998.2	0.3	0	1.04
BIS(2-ETHYLHEXYL) ESTER S	390.56	100	21.7	0.3	1	4.79
FLUORANTHENE S	202.26	100	41.9	0.3	1	2.48
MERCURY	200.59	1	0.4	0.3	1	2.46
ARSENIC	74.92	1	1.1	0.3	0	0.92
LEAD	207.20	1	0.4	0.3	1	2.54

* THRESHOLD CONCENTRATION. VALUES GREATER THAN THIS CONCENTRATION AT THE ASSUMED EXAMPLE CONDITIONS WOULD RESULT IN RQ EXCEEDANCE.

** INPUT THE ACTUAL CONTRACT LABORATORY RESULTS INTO THIS COLUMN. 0.3 INTERIM VALUE PLACED IN COLUMN.

*** RELEASE QUANITITY IN POUNDS CALCULATED BASED ON CONTRACT LAB RESULTS. COMPARE WITH REGULATORY RQ.

REPORTABLE QUANTITIES RE. SE CALCULATIONS

CONTAMINANT	MOLECULAR WEIGHT	REGULATORY RQ	THRESHOLD PPM*	GC/MS PPM**	QUANTITY EMITTED (LBS.)***	MG/CU. M
ALPHA-BHC	290.83	10	2.9	1	3	11.89
BETA-BHC	290.83	1	0.3	1	3	11.89
DELTA-BHC (LINDANE)	290.83	1	0.3	1	3	11.89
GAMMA-BHC	290.83	1	0.3	1	3	11.89
PCB-1248		1	0.0	1	0	0.00
CHLOROBENZENE V	112.56	100	75.3	1	1	4.60
1,2,4-TRICHLOROBENZENE S	181.45	100	46.7	1	2	7.42
HEXACHLOROBENZENE S	284.78	10	3.0	1	3	11.65
PENTACHLOROBENZENE S	250.34	10	3.4	1	3	10.24
1,2-DICHLOROBENZENE/O- S	147.01	100	57.7	1	2	6.01
1,3-DICHLOROBENZENE/M- S	147.01	100	57.7	1	2	6.01
1,4-DICHLOROBENZENE/P- S	147.01	100	57.7	1	2	6.01
BENZENE V	78.10	10	10.9	1	1	3.19
HEXACHLOROBUTADIENE S	260.76	1	0.3	1	3	10.67
TRICHLOROETHENE V	131.40	100	64.5	1	2	5.37
1,1,1-TRICHLOROETHANE V	133.41	1000	635.5	1	2	5.46
TETRACHLOROETHENE V	165.38	100	51.3	1	2	6.76
1,1-DICHLOROETHANE V	98.96	1000	856.7	1	1	4.05
1,1,2,2-TETRACHLOROETHANE V	167.85	100	50.5	1	2	6.87
TRANS-1,2-DICHLOROETHENE V	96.95	1000	874.4	1	1	3.97
1,1-DICHLOROETHENE V	96.95	100	87.4	1	1	3.97
HEXACHLOROETHANE S	236.74	100	35.8	1	3	9.68
VINYL CHLORIDE V	62.50	1	1.4	1	1	2.56
TOLUENE V	92.14	1000	920.1	1	1	3.77
CHLOROFORM V	119.39	10	7.1	1	1	4.88
2-CHLOROPHENOL S	128.56	100	65.9	1	2	5.26
CARBON TETRACHLORIDE V	153.84	10	5.5	1	2	6.29
METHYLENE CHLORIDE V	84.93	1000	998.2	1	1	3.47
BIS(2-ETHYLHEXYL) ESTER S	390.56	100	21.7	1	5	15.97
FLUORANTHENE S	202.26	100	41.9	1	2	8.27
MERCURY	200.59	1	0.4	1	2	8.20
ARSENIC	74.92	1	1.1	1	1	3.06
LEAD	207.20	1	0.4	1	2	8.47

* THRESHOLD CONCENTRATION. VALUES GREATER THAN THIS CONCENTRATION AT THE ASSUMED EXAMPLE CONDITIONS WOULD RESULT IN RQ EXCEEDANCE.

** INPUT THE ACTUAL CONTRACT LABORATORY RESULTS INTO THIS COLUMN. 0.3 INTERIM VALUE PLACED IN COLUMN.

*** RELEASE QUANITITY IN POUNDS CALCULATED BASED ON CONTRACT LAB RESULTS. COMPARE WITH REGULATORY RQ.

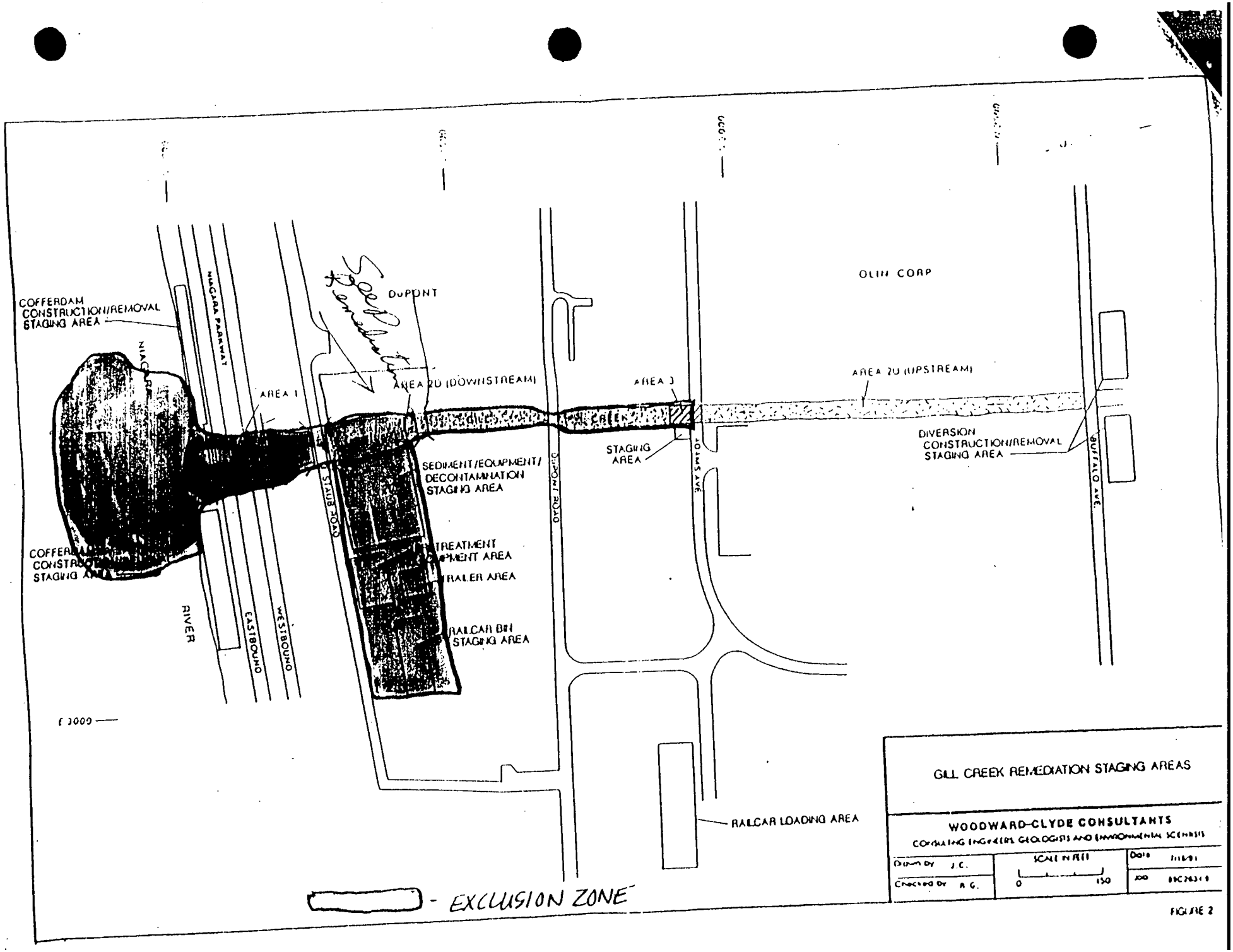

COFFERDAM CONSTRUCTION/REMOVAL STAGING AREA
NIAGARA PARKWAY
DuPONT
AREA 1
AREA 2U (DOWNSTREAM)
AREA 3
OLIN CORP
AREA 2U (UPSTREAM)
SEDIMENT/EQUIPMENT/ DECONTAMINATION STAGING AREA
STAGING AREA
DIVERSION CONSTRUCTION/REMOVAL STAGING AREA
TREATMENT EQUIPMENT AREA
TRAILER AREA
RAILCAR BIN STAGING AREA
RIVER
EASTBOUND
WESTBOUND
RAILCAR LOADING AREA
- EXCLUSION ZONE
GILL CREEK REMEDIATION STAGING AREAS
WOODWARD-CLYDE CONSULTANTS
SCALE IN FEET
0
150
FIGURE 2

TABLE I: EXAMPLE CALCULATIONS

REPORTABLE QUANTITIES RELEASE CALCULATIONS

CONDITIONS:

HEIGHT (FT.)	10	METERS	3.048
WIDTH (FT.)	35	METERS	10.668
AREA		SQ. METERS	32.52
WIND SPEED (MPH)	10	METERS/MIN.	268.22
DURATION (MIN.)	15	MINUTES	15
CONSTANT			24.45
CONVERSION		MG./LB.	453600
COMBINED			0.011796

FORMULA:

EMISSION = (ppm x MOL. WT. x AREA x SPEED x DURATION)/(CONSTANT x CONVERSION)

NOTE: THE ABOVE CONDITIONS WERE USED TO DETERMINE THE CALCULATED PPM. ADJUSTMENTS MUST BE MADE FOR OTHER CONDITIONS.

2. Field conditions for an actual release:

Area	=	15' high x 50' wide (750 sq. ft.)
Wind Speed	=	8 mph
Duration	=	120 minutes
Concentrations	=	0.03 ppm for Hexachlorobutadiene 3 ppm for trichloroethylene 6.5 ppm for benzene and 2 ppm for 1,1,2,2-Tetrachloroethane

3. Determine Individual Correction Factor

The spreadsheet calculated threshold concentrations of 0.3, 64.5, 10.9, and 50.5 ppm (called Base-case Example Results) respectively are required for these constituent to exceed their RQs at the example conditions (see Table I). For each of the conditions that may differ between the base case and the real actual emission (area, windspeed, duration), evaluate the individual correction factor, where

$$\text{Individual Correction Factor} = \frac{\text{Actual value}}{\text{Base Case value}}$$

The following individual correction factors would be evaluated for this example:

Area = 750/350 = 2.14
Wind Speed = 8/10 = 0.8
Duration = 120/15 = 8.0

4. Evaluate the incident-specific correction factor (CF)

The incident-specific correction factor (CF) is evaluated by multiplying all of the individual correction factors together. In this example, the incident-specific correction factor (CF) would be evaluated as follows:

$$CF = 2.14 \times 0.8 \times 8.0 = 13.7$$

5. Evaluated Adjusted Results for contaminant concentrations

FOR EACH COMPOUND DETECTED BY GC/MS, multiply the actual GC/MS analytical result by the incident-specific correction factor (CF). In this example, the adjusted results are:

13.7 x 0.03 = 0.4 ppm for hexachlorobutadiene *
13.7 x 3.0 = 41.1 ppm for trichloroethylene **
13.7 x 6.5 = 89.05 ppm for benzene *
13.7 x 2.0 = 27.4 ppm for 1,1,2,2-tetrachloroethane **

6. Compare adjusted concentrations to base case threshold concentrations

Comparing the adjusted concentrations (ppm) in this example with the base-case threshold concentrations (concentrations that would result in an exceedance of a regulatory RQ), it is immediately apparent that some compounds would have exceeded their RQ.

This conclusion can be drawn when the adjusted concentration (ppm) is greater than the base-case threshold concentration (ppm).

7. Determine actual release quantities

To determine the actual quantity of each compound emitted for reporting purposes, divide the adjusted concentrations (ppm) by base-case threshold concentration (ppm) and multiple by the regulatory RQ.

$$\text{Actual Release Quantity (lbs)} = \frac{\text{Adjusted conc. (ppm)}}{\text{Base Case Threshold conc. (ppm)}} \times \text{RQ}$$

In this example:

- For hexachlorobutadiene (0.4/0.3) x 1.0 = 1.3 pounds *
- For trichloroethylene (41.1/64.5) x 100 = 63.7 pounds **
- For benzene (89.05/10.9) x 10 = 81.7 pounds *
- For 1,1,2,2-tetrachloroethane (27.4/50.5) x 100 = 54.3 pounds**

* RQ exceeded
** RQ NOT exceeded

ATTACHMENT C-5.2-2

Equipment Operator Qualification

(Please check appropriate equipment.)

Backhoe _____

Bulldozer _____

Dump Truck _____

Front-end Loader ✓

Grader _____

Hydraulic Excavator _____

Other _____

John R. Jones
(Operator's Name) employed by

V G Construction, Inc.
(Employer's Name) is authorized to

operate this equipment Komatsu WA 250
(Equipment Make/Model)

and for the specific equipment to be operated:

- has the physical and mental abilities required to operate the equipment.
- has read the specific equipment manufacturer's operating manual.
- has received and successfully completed specific written and/or oral training and instructions on the equipment to be operated.
- has demonstrated proficiency in the safe operation of the equipment to be operated.

Verified by William S. Holden
Employer Representative — Date 05/07/91

John R. Jones
Employee's Signature — Date 05/07/91