Corporate Environmental Programs
General Electric Company
100 Woodlawn Avenue, Pittsfield, MA 01201

Transmitted Via Federal Express

September 26, 2003

Mr. Bryan Olson
EPA Project Coordinator
U.S. Environmental Protection Agency
EPA New England
One Congress Street, Suite 1100
Boston, MA 02114-2023

Re: GE-Pittsfield/Housatonic River Site
Newell Street Area I (GECD440)
Final Removal Design/Removal Action Work Plan - Supplemental Information Package

Dear Mr. Olson:

In August 2003, the General Electric Company (GE) submitted the *Final RD/RA Work Plan for Newell Street Area I* (Final Work Plan) to the U.S. Environmental Protection Agency (EPA). EPA conditionally approved the Final Work Plan in a letter to GE dated September 15, 2003.

The Final Work Plan stated that, following GE's selection of a Remediation Contractor for the work at the Newell Street Area I Removal Action Area (RAA), GE would submit a Supplemental Information Package to EPA to provide certain Contractor-specific information and implementation details that were not available at the time that the Final Work Plan was submitted. This letter and its attachments provide such supplemental information. In addition, this letter responds to certain conditions specified by EPA in its conditional approval letter for the Final Work Plan.

A. Supplemental Information Package

As stated in Section 9 of the Final Work Plan, the Supplemental Information Package would provide the following:

- Identification of, and contact information for, the selected Remediation Contractor;
- Copies of the Remediation Contractor's pre-mobilization submittals (i.e., Operations Plan, Health and Safety Plan, and Contingency Plan);
- Identification of backfill sources and location(s); and
- Analytical data for samples collected from the backfill sources (unless the backfill sources have already been approved based on previously submitted analytical data).

GE has selected Maxymillian Technologies, Inc. (MTI) of Pittsfield, Massachusetts as its Remediation Contractor for this project. The Contractor's proposed sources for soil fill, gravel, and topsoil include Pittsfield Sand & Gravel Brown's Pit located in Dalton, Massachusetts (general fill), Valley Materials "Goodermotes" located in Stephentown, New York (gravel borrow), and Burgner's Farm in Dalton, Massachusetts (topsoil), respectively. Analytical data for these fill sources have been previously provided to EPA in GE's May 8, 2003 letter to the MDEP (with copy to EPA) and GE's July 31, 2003 *Future City Recreational Area – Supplemental Information Package.* Therefore, those data are not provided herein again. The remainder of the required supplemental information is included as attachments to this letter, including:

- Attachment A – MTI's Operations Plan
- Attachment B – MTI's Health and Safety Plan/Contingency Plan

B. Response to EPA Conditional Approval Items

In its September 15, 2003 conditional approval letter for the Final RD/RA Work Plan, EPA specified conditions related to certain project-specific activities. Each EPA condition requiring a response is presented below, followed by GE's response.

EPA Condition 2:

GE shall ensure that the proposed Newell Street I drainage outlets are constructed to prevent erosion of the restored ½ Mile Reach river banks.

GE Response:

GE has revised the riprap specifications for use in the construction of all new drainage outlets. Accordingly, the following revised materials are included as attachments:

- Technical Drawings 10 and 11 (Attachment C)
- *Materials and Performance – Section 02222 Fill Materials* (Attachment D)

EPA Condition 3:

GE proposes to potentially utilize on-site stockpiled soils as backfill material. GE shall review available soil pile data and conduct any additional sampling that is necessary to meet the requirements of the Soil Cover/Backfill Characterization Plan.

GE Response:

As part of the pre-mobilization meeting with the property owner for Parcels J9-23-19 through J9-23-21, GE will secure access for the performance of the proposed remedial actions and determine whether the stockpiled soils located on this property will be used as backfill materials. Should such materials be proposed for use as backfill, GE will review the available data for these soil piles and conduct any additional sampling necessary to meet the requirements of the Soil Cover/Backfill Characterization Plan.

EPA Condition 4:

GE proposes to use soil with a maximum particle size of 3 inches as backfill material. For the top six inches of backfill in areas above which an engineered barrier will be placed, GE shall ensure that soil with a maximum particle size of 1 inch is utilized. Alternatively, GE can add a non-woven cushion geotextile instead of using the soil with a smaller maximum particle size.

GE Response:

GE has revised the specifications for soil fill used as the top six inches of backfill in areas above which engineered barriers will be installed. Accordingly, the revised specification *Materials and Performance – Section 02222 Fill Materials,* is included in Attachment D.

EPA Condition 5:

GE has proposed to abandon several wells to help to facilitate the cleanup work. GE shall not abandon Well SZ-3R as it may be useful for future groundwater investigations.

GE Response:

GE has revised the appropriate technical drawing to reflect the requested change. The revised Technical Drawing 5 is included in Attachment C.

EPA Condition 7:

EPA is concerned with the potential for water buildup in the anchor trenches. GE shall place lower permeability soil in all anchor trenches and/or place a flap of geomembrane over those anchor trenches which have a geocomposite drainage net over the top of the trench.

GE Response:

GE has revised the appropriate technical drawing to reflect the requested change. The revised Technical Drawing 14 is included in Attachment C.

EPA Condition 8:

GE shall ensure that, where utilized instead of seed, sod shall account for the final two inches of restoration.

GE Response:

GE has conducted a survey of several suppliers of sod and determined that it will not be possible to utilize two inches of sod because standard sod thicknesses range between 1/2 and 1 inch in thickness. Therefore, GE has revised the appropriate technical drawing (Technical Drawing 14) accordingly. Regardless, the material and performance specification requires a full warranty by the Contractor on all placed sod for a period extending one year from the date of acceptance by GE.

Finally, based on a review of MTI's Operations Plan, GE has clarified the text in the materials and performance specification for earthwork to clarify that low ground pressure equipment shall be used to

place backfill materials over engineered barrier components. The revised specification *Materials and Performance – Section 02220 Earthwork,* is included in Attachment D.

GE trusts that the supplemental information provided with this letter and the above responses adequately address EPA's conditions for approval. Please feel free to contact me if you have any questions regarding this letter or the attached supplemental information.

Sincerely,

Richard W. Gates/GA

Richard W. Gates
Remediation Project Manager

CRA/meg
Attachments
V:\GE_Pittsfield_CD_Newell_St_Area_I/Correspondence\2003199.doc

cc: Tim Conway, EPA
Holly Inglis, EPA
Rose Howell, EPA*
Michael Nalipinski, EPA
K.C. Mitkevicius, USACE
Susan Steenstrup, MDEP (2 copies)
Alan Weinberg, MDEP*
Robert Bell, MDEP*
Thomas Angus, MDEP*
Nancy E. Harper, MA AG*
Dale Young, MA EOEA*
Dawn Jamros, Weston
Teresa Bowers, Gradient
Mayor Sara Hathaway, City of Pittsfield
Pittsfield Department of Health
Thomas Hickey, Director, PEDA*
Michael Carroll, GE*
Andrew Silfer, GE
Rod McLaren, GE
James Nuss, BBL
James Bieke, Shea & Gardner
Jeffrey Bernstein, Bernstein, Cushner & Kimmell
Property Owner – 187 Newell Street
Property Owner – 203 Newell Street
Property Owner – 217 Newell Street
Property Owner – 221, 229, 230 Newell Street
Property Owner – 247/249 Newell Street
Property Owner – 269 Newell Street
Property Owner – 273 Newell Street
Cristobal Bonifaz, Esq.
Public Information Repositories
GE Internal Repository

(* Cover Letter Only)

Attachment A

MTI's Operations Plan

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

OPERATIONS PLAN

GENERAL ELECTRIC COMPANY
PITTSFIELD MA
REMEDIAL ACTION; NEWELL STREET AREA 1
REMOVAL ACTION AREA [RAA]

Prepared for:

General Electric Co.
100 Woodlawn Avenue
Pittsfield MA 01201

and

Blasland, Bouck & Lee, Inc.
6723 Towpath Road
Syracuse NY 13214

Prepared by:

Maxymillian Technologies, Inc.
1801 East Street
Pittsfield MA

September 2003

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1.0 EROSION AND SEDIMENTATION CONTROL MEASURES

Maxymillian Technologies, Inc (MT) proposes to utilize silt fence and/or hay bales for the prevention of erosion in removal areas. The same control measures will be utilized for the prevention of excess sedimentation in site drainage pathways. Erosion and Sedimentation control measures will be in place prior to start of remedial activities.

Proposed placement of erosion and sedimentation control measures will be as depicted on Fence Removal/Restoration and Erosion Controls Plan Dated July 2003, prepared by Blasland, Bouck & Lee, Inc., also as needed and/or directed by General Electric Co. (GE) or GE's representative during remediation.

Daily inspection of the erosion and sedimentation control system will be performed by MT's on-site project manager or designated personnel. The control system will be maintained in proper working condition throughout the remedial activities.

Erosion and sedimentation control measures will remain in place until vegetation is restored to the remedial areas, and removal authorization is provided by GE.

2.0 TRAFFIC CONTROL MEASURES

Prior to the start of any work along public roadways, MT will obtain all necessary road and bridge crossing permits. MT will provide all required traffic warnings and controls. These controls will include, but are not limited to, warning signs and the use of a flagperson(s) or police officer. In areas where the vehicular and/or pedestrian traffic is normally busy, MT will use a police officer to control traffic. MT will determine whether additional traffic controls are necessary depending on the volume of vehicular and pedestrian traffic encountered.

MT will install temporary construction fencing where site activities may disrupt normal pedestrian or vehicular traffic. Appropriate traffic warnings and controls will also be set up at all points of equipment access to the work site.

Traffic control will be provided for each day excavation or backfill operations are in progress.

3.0 PROPERTY PROTECTION PROCEDURES

The methodology of the MT excavation and restoration plan is to prevent work and/or disturbance of property not associated with remedial activities. If execution of the work

requires access from properties not associated with the remedial action, permission will be acquired from the property owners [by GE] and all surfaces will be restored to original condition. It is not anticipated that access from any property, which is not associated with the remedial action of the Work Sites, will be required.

Staging of equipment and materials will take place on the remedial action property in areas noted on contract drawings or otherwise approved by GE. No equipment or materials will be staged on adjacent properties during the remedial action. Any damage to properties (including structures, utilities, facilities, etc.) will be reported to GE and repaired as soon as possible.

4.0 LIST OF EQUIPMENT TO BE USED ON-SITE

MT will utilize track backhoes, rubber tire backhoes, trucks, and bulldozers for the performance of the work sites remedial activities.

A track backhoe will be used for excavation of impacted soils. Machines used for excavation of soils will be cleaned to remove accumulations of soils on exterior surfaces prior to exiting the work site.

A rubber tired backhoe may be used during remedial activities where more practical than a track excavator.

MT supplied trucks will be used for excavation activities on Phases I - IV to reduce residential neighborhood impact. MT anticipates direct loading of trucks for all of the soils excavated from the sites. Materials excavated during Phases I-IV are to be direct-loaded into trucks for transport to OPCA.

Stockpiles of soils will be minimized but may be required. Refer to Section 6.0 for further information on soil staging. All trucks and drivers are registered and licensed to haul hazardous waste. GE will supply required paperwork for the transport trucks. MT will fill out the proper paperwork and ensure loads are properly covered and placarded prior to the trucks leaving site. A daily transportation summary sheet which includes work site, date, load number, truck ID, time of departure from site, time of arrival at temporary stockpile, copy of signed hazardous waste manifest or bill of lading and type of material will be completed each day.

A low ground pressure bulldozer will be used for spreading and compacting backfill and topsoil over completed excavation areas. MT will ensure that the minimum cover thickness is maintained during backfill activities. Backfill will be placed in lifts and compacted with rollers or equivalent equipment to prevent future settlement of the remedial areas.

MT supplied trucks will be used to support backfill and topsoil operations. Trucks will transport backfill/topsoil from GE approved soil locations as needed to support backfill operations.

5.0 EQUIPMENT DECONTAMINATION PROCEDURES

Machines used for excavation of soils will be cleaned to remove accumulations of soils on exterior surfaces at the remedial properties prior to exiting the work site. The parts of the machine that contact impacted soils may be brushed clean (dry decon) on site and wrapped in polyethylene to be used in similar type soils on the next work site. The parts of the machines that had contact with impacted soils and will not be used on the next site will be decontaminated prior to leaving the site, before handling non-TSCA materials, and prior to handling clean backfill materials. Prior to leaving the site, cleaned items will also be wipe sampled.

Transport vehicles that have been in contact with contaminated materials will be washed with high-pressure, low-volume water spray before exiting the contaminated area. Wash water from the decontamination process will be collected and transported to the GE Facility for disposal by GE.

6.0 EXCAVATION APPROACH

Excavations of impacted soils will be completed to the horizontal and vertical limits specified on Contract Drawings. On-site survey will demonstrate that excavation has progressed to specified limits. Free liquid in soils during excavation is not expected from soils in Phases I-IV. Any soils removed with free liquid will be stockpiled to drain in a lined removal area prior to loading into trucks. Dust control will be performed throughout remedial activities using water and/or other means necessary. Noise controls will also be in place throughout the project including, but not limited to, ensuring that all equipment on site is equipped with noise muffling devices.

Two classifications of impacted soils are to be excavated during the remedial activities of the four Phases. The soils are classified as TSCA and non-TSCA. TSCA soils are characterized by soil sampling/analytical results indicating concentrations of PCB at levels of 50 ppm or greater. Non-TSCA soils are characterized by soil sampling/-analytical results indicating concentrations of PCB at levels less than 50 ppm. Soils of each type will be kept separate during excavating, stockpiling and loading.

MT plans to direct-load the soils as they are excavated, but will use a lined temporary staging area if necessary. The temporary staging area will be located in an area that will

not interfere with work activities and will not be located in an area not subject to future remedial action. The volume of material held in the temporary staging area will not exceed 100 CY. The staging area will be covered at the end of each workday. Erosion controls will be installed around the perimeter of the staging area.

Phase I

Upon completion of erosion controls, monitoring well decommissioning and site preparation excavation of the site will commence. Phase I soils will be excavated from East to West. Soils will be directly loaded and hauled on Ontario Street exit to Newell Street down the primary excavation haul road to OPCA. MT estimates the excavation to last approximately one week. Fencing, liner installation, backfill and restoration will last approximately one week.

Phase II

Upon completion of erosion controls, monitoring well decommissioning and site preparation excavation of the site will commence. Phase II soils will be transported through both NSAI parking lot and the Italian American Club parking lot to Newell Street. Soils will be directly loaded and transported to OPCA on the primary transportation route. MT expects the site preparation and excavation to last approximately three weeks. Fencing and liner work approximately one week, Bocce court restoration approximately two weeks and backfill and site restoration lasting approximately three weeks. Some items of each phase will be done concurrently.

Phase III

Upon completion of erosion controls, monitoring well decommissioning and site preparation excavation of the site will commence. Phase III soils will be excavated from North to South and soils will be transported to Newell Street along the best transportation route around Parcel J9-23-20. Soils will be directly loaded and transported to OPCA on the primary transportation route. Construction debris and scrap metal pile would be sized approximately prior to hauling to OPCA. Non-TSCA soils will be handled and transported separately from TSCA soils. Appropriate measures will be taken to keep non-TSCA operations separate from TSCA operations. MT expects the excavation to last approximately two weeks. Liner and fencing operations taking approximately one week and site restorations approximately two weeks.

Phase IV

Upon completion of erosion controls, monitoring well decommissioning and site preparation excavation of the site will commence. Phase IV soils will be excavated from North to South and transported through J9-23-22 lot to Newell Street.

In areas where the depth of excavation is required to go below the footing elevation, MT will use the following method. A 1:1 wedge of existing soil will be left from the top of the footing to the proposed excavation limit. For example, if the excavation limit is 2' below the footing top MT will leave a wedge of soil that will start at the top of the footing and extend 2' horizontally to the excavation limit.
This wedge of soil will be left in place to support the exposed section of footing. MT will excavate in increments of length to be determined by soil type once defined in the field. Survey and backfill will progress immediately behind soil removal.

MT expects the site preparation and excavation to last three weeks. The liner and fencing operations lasting approximately one week and the backfill and site restoration approximately two weeks.

7.0 MATERIAL HANDLING PLAN

TSCA and non-TSCA materials excavated from the Work Sites will be excavated, stockpiled and loaded separately to prevent comingling of waste streams.

Soils that are excavated saturated and can not be directly loaded due to generation of water leaving the trucks will be temporarily stockpiled in order drain excess water. Saturated soils will be placed on similarly classified soils when decanting. Decant water will be collected if the decant water adversely affects the underlying soils in the stockpile area. MT does not anticipate excavation of saturated soils within Phases I-IV. If saturated soils are encountered, water collected from Phases I-IV will be transported to GE for treatment prior to discharge.

Temporary access roads may be required on each site in order to get the transport trucks to the excavator. The temporary access roads will be created by placing fabric over existing ground to support the truck tires, and prevent tracking of material onto the road surface. Placing a layer of gravel over existing ground may be required to support trucks. When an excavated bucket of material is swung over areas not slated for removal, polyethylene sheeting will be placed over the ground to prevent spillage of materials. The access roads and loading areas will move with the excavation and the fabric will be kept clean and free of soil to prevent tracking.

Open areas of impacted soils will be covered with polyethylene sheeting when not actively being excavated. Any impacted soils excavated that have not been loaded out at the completion of an excavation day will be covered with polyethylene sheeting.

TSCA and non-TSCA soils will be excavated and loaded onto trucks separately and sent off-site. TSCA loads will be loaded in a lined truck bed and manifested. Non-TSCA loads will be loaded in lined trucks and will require a bill of lading. GE will supply manifests and bills of lading. MT will fill out the proper paperwork and ensure loads are properly covered and placarded prior to the trucks leaving site. A daily transportation summary sheet which includes work site, date, load number, truck ID, time of departure from site, time of arrival at temporary stockpile, copy of signed hazardous waste manifest or bill of lading and type of material will be completed each day.

A liner will be placed over the areas shown on the contract plans. Clean backfill will then be brought on site from GE approved sources. A loader may be used to transport backfill to the excavated areas. The remaining Engineered Barriers and top course will be installed per the plans and specifications.

8.0 REMEDIAL ACTION SCHEDULE

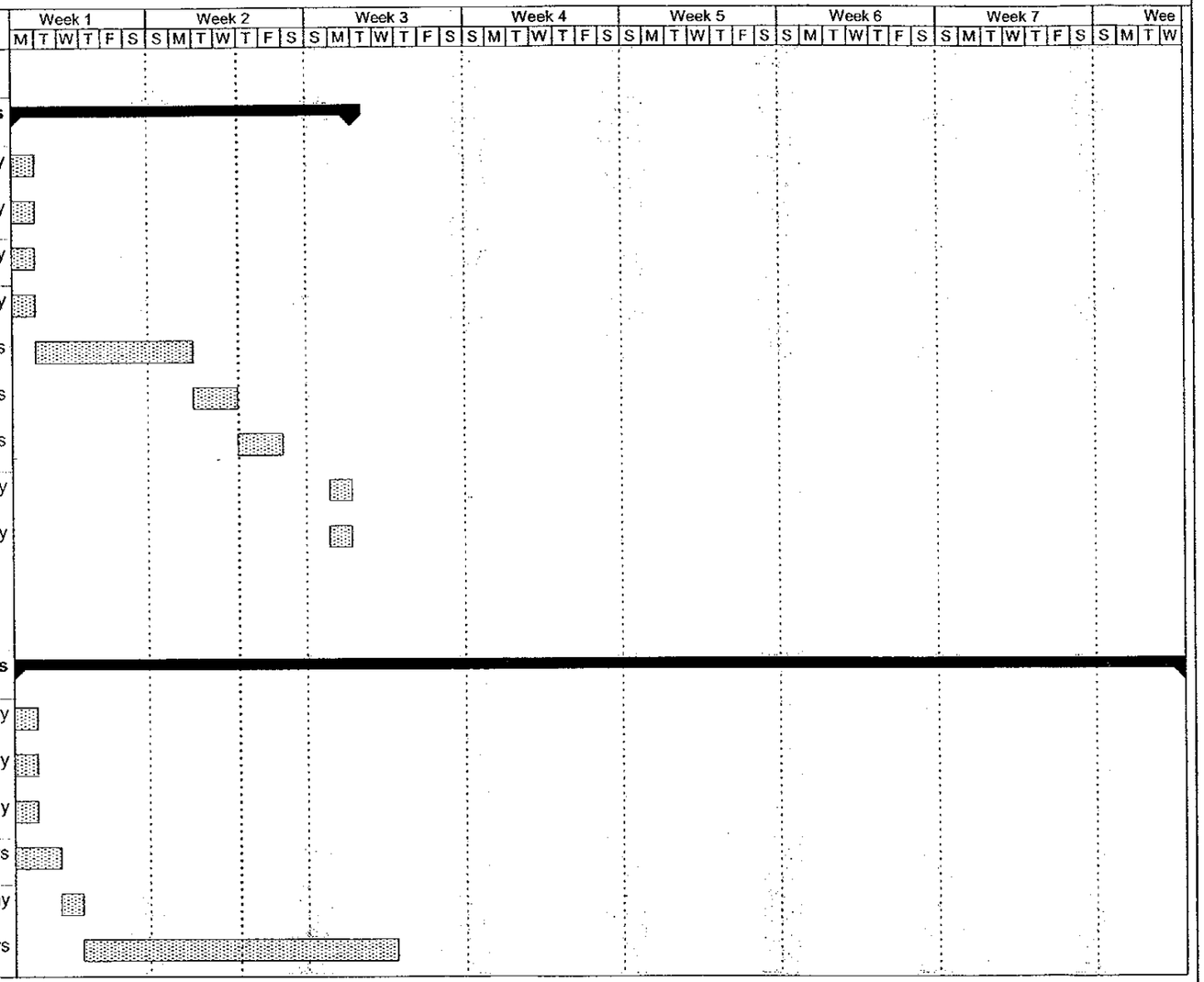
Attached is the proposed schedule for the Remedial Action Activities for each of the Phases. Note some items of each phase will be done concurrently.

General Electric Company
Newell Street Remedial Action Area 1
Pittsfield, MA

Project Remedial Schedule

MAXYMILLIAN Technologies

ID	Task Name	Duration
1	**Phase I - Parcel J9-23-13**	
2	**Project Schedule - Substantial Completion**	**11 days**
3	Mobilization	1 day
4	Install Erosion Control	1 day
5	Remove Trees and Brush	1 day
6	Decommission Monitoring Wells (2)	1 day
7	Excavate TSCA soils (1250 CY)	5 days
8	Install Engineered Barrier	2 days
9	Backfill over Liner	2 days
10	Install Sod, Grass Seed, Mulch	1 day
11	Demobilization	1 day
12		
13	**Phase II - Parcels J9-23-16, J9-23-17**	
14	**Project Schedule Substantial Completion**	**38 days**
15	Mobilization	1 day
16	Install Erosion Control	1 day
17	Remove Trees and Brush	1 day
18	Decommission Monitoring Wells (4)	2 days
19	Install Temporary Access Road	1 day
20	Excavate TSCA soils (4695 CY)	10 days

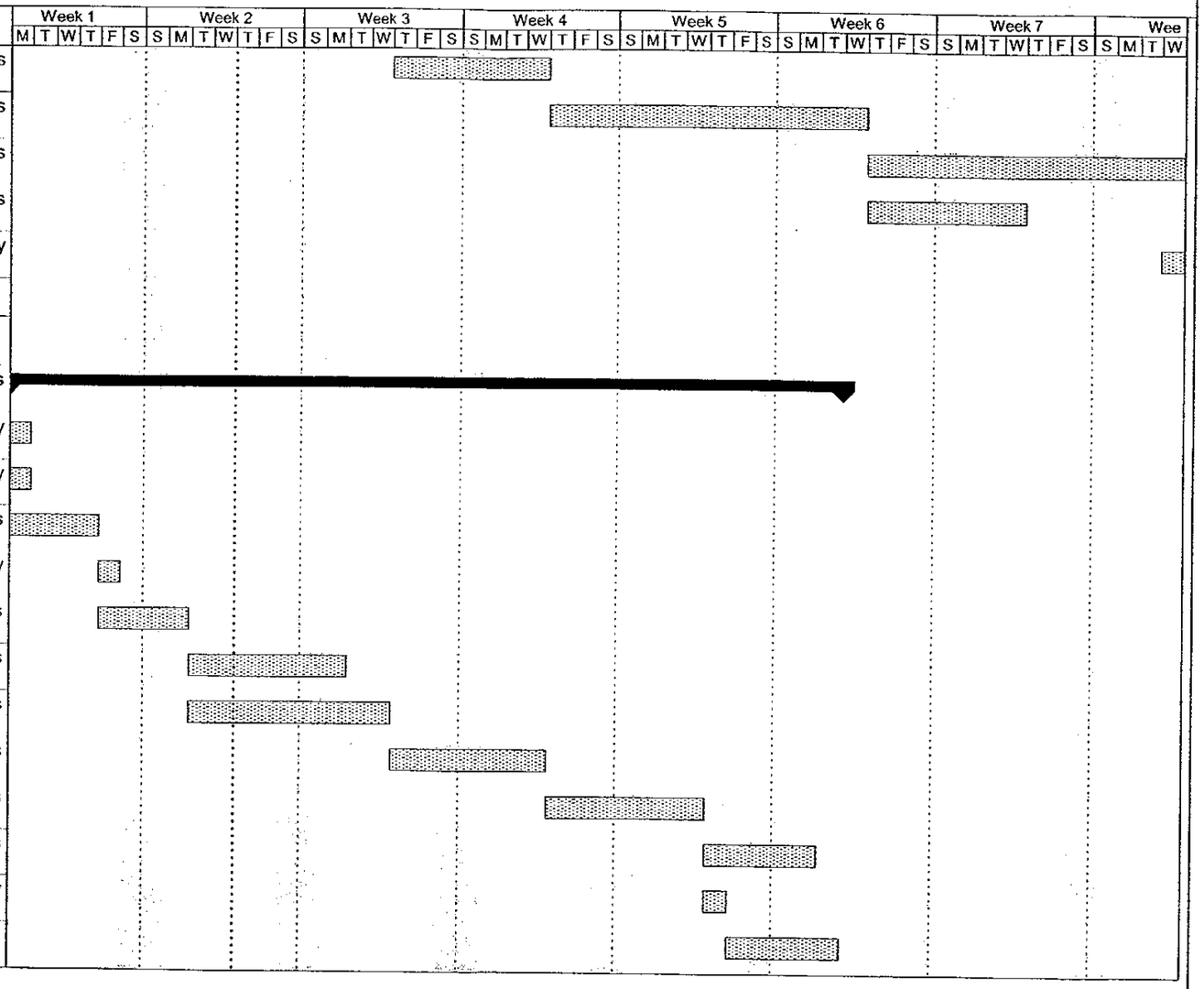


General Electric Company
Newell Street Remedial Action Area 1
Pittsfield, MA

Project Remedial Schedule

MAXYMILLIAN Technologies

ID	Task Name	Duration
21	Install Engineered Barrier	5 days
22	Backfill over Liner	10 days
23	Replace Bocce Courts	10 days
24	Install Sod, Grass Seed, Mulch	5 days
25	Demobilization	1 day
26		
27	**Phase III - Parcels J9-23-18 through J9-23-21 and adjacent portions or Parcel J9-23-12**	
28	**Project Schedule Substantial Completion**	27 days
29	Mobilization	1 day
30	Install Erosion Control	1 day
31	Remove Trees and Brush	4 days
32	Excavate TSCA soils from within 229 Newell Street Footprint (99 CY)	1 day
33	Excavate non-TSCA soils (620 CY)	2 days
34	Remove Construction Debris and Scrap Metal	5 days
35	Excavate TSCA soils (2736 CY)	7 days
36	Install Engineered Barrier	5 days
37	Backfill over Barrier	5 days
38	Bituminous Concrete Pavement	3 days
39	Construct Soil Berm along Property Line	1 day
40	Install Sod, Grass Seed, Mulch	3 days

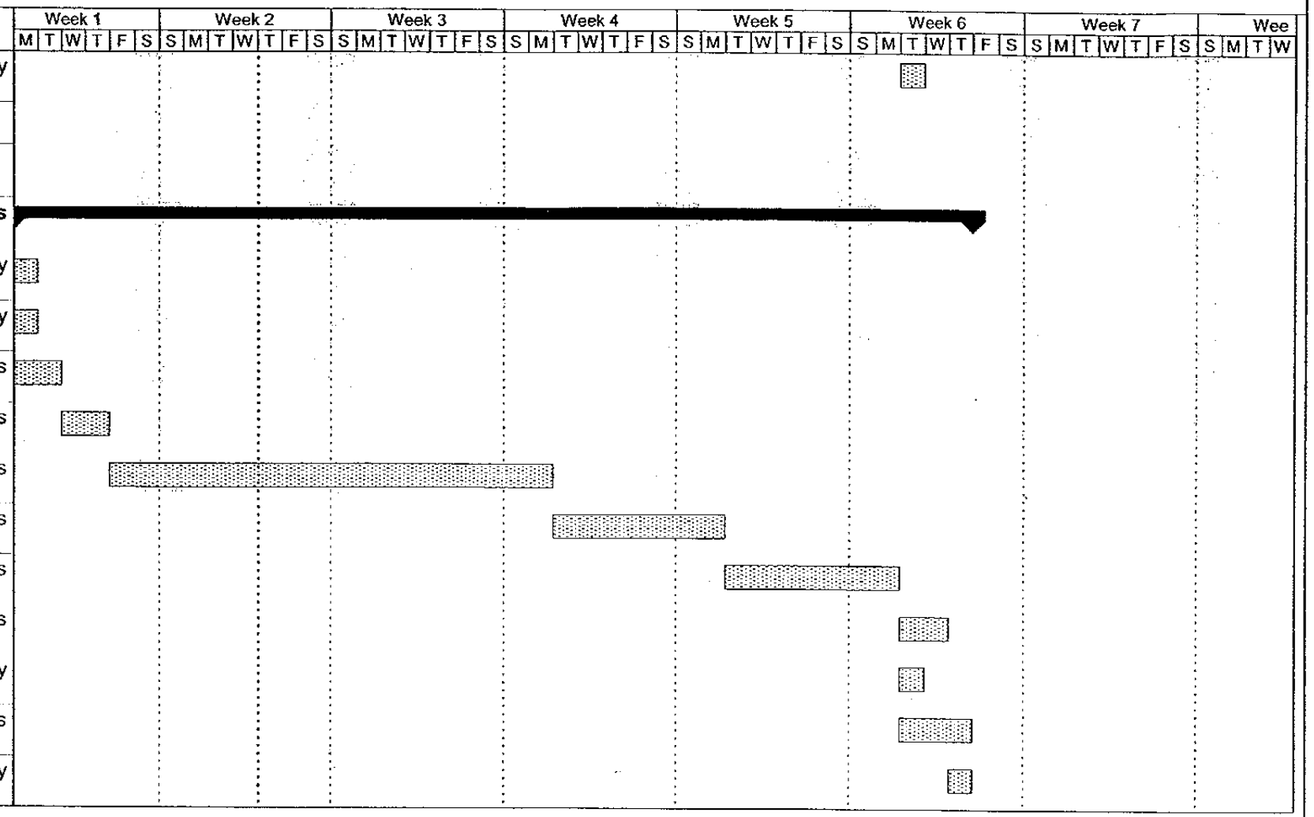


General Electric Company
Newell Street Remedial Action Area 1
Pittsfield, MA

Project Remedial Schedule

MAXYMILLIAN Technologies

ID	Task Name	Duration
41	Demobilization	1 day
42		
43	**Phase IV - Parcels J9-23-22 through J9-23-24 and adjacent portions of Parcel J9-23-12**	
44	**Project Schedule - Substantial Completion**	**29 days**
45	Mobilization	1 day
46	Install Erosion Control	1 day
47	Remove Trees and Brush	2 days
48	Abandon Existing Sewer and Water Service	2 days
49	Excavate TSCA soils (5410 CY)	12 days
50	Install Engineered Barrier	5 days
51	Backfill over Barrier	5 days
52	Install Catch Basin & Drain Pipe	2 days
53	Install Riprap Outfall Apron	1 day
54	Install Grass Seed and Mulch	3 days
55	Demobilization	1 day



Attachment B

MTI's Health and Safety Plan/ Contingency Plan

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

HEALTH, SAFETY & CONTINGENCY PLAN

General Electric
Newell Street Area I

Pittsfield, Massachusetts

August 2003

Prepared by:
Maxymillian Technologies, Inc.
1801 East Street
Pittsfield, Massachusetts 01201

HEALTH, SAFETY AND CONTINGENCY PLAN

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Safety Statement

I have been informed of the MT Health and Safety Plan for activities at the GE Newell Street Area I Site. My signature indicates that I have been notified of the on-site location of the above stated plans, have been provided the opportunity to review the contents of each plan and have been provided with on-site training. I will comply with the requirements and protocols outlined in these plans when working at or visiting the site.

Employee Name [print]	*Employee Signature*	*Date*

Safety Statement

I have been informed of the MT Health and Safety Plan for activities at the GE Newell Street Area I Site. My signature indicates that I have been notified of the on-site location of the above stated plans, have been provided the opportunity to review the contents of each plan and have been provided with on-site training. I will comply with the requirements and protocols outlined in these plans when working at or visiting the site.

Employee Name [print]	*Employee Signature*	*Date*

Safety Statement

I have been informed of the MT Health and Safety Plan for activities at the GE Newell Street Area I Site. My signature indicates that I have been notified of the on-site location of the above stated plans, have been provided the opportunity to review the contents of each plan and have been provided with on-site training. I will comply with the requirements and protocols outlined in these plans when working at or visiting the site.

Employee Name [print]	*Employee Signature*	*Date*

List of Acronyms and Abbreviations

ACGIH	American Conference of Government Industrial Hygienists
bsg	Below Surface Grade
CBC	Complete Blood Count
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CNS	Central Nervous System
CVS	Cardiovascular System
dBA	Decibels
FR	Federal Register
GE	General Electric Company
HSO	Health and Safety Officer
HSP	Health and Safety Plan
IDLH	Immediately Dangerous to Life or Health
LEL	Lower Explosive Limit
LFL	Lower Flammable Limit
MiniRAM®	air monitoring instrument for measuring dust
MADEP	Massachusetts Department of Environmental Protection
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
MT	Maxymillian Technologies
NEC	National Electric Code
NFPA	National Fire Protection Agency
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
ppm	parts per million
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
SCADA	Supervisory Control and Data Acquisition System
SCBA	Self Contained Breathing Apparatus
SOP	Standard Operating Procedures
SPCC	Spill Prevention Control and Countermeasures
STEL	Short Term Exposure Limits
TEF	Toxicity Equivalency Factor
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act
TWA	Time Weighted Average
UFL	Upper Flammable Limit

1.0 OVERVIEW

The discussions in this Health and Safety Plan (HSP) are specific to operations of Maxymillian Technologies, Inc. (MT) for work at the General Electric Company (GE) Newell Street Area I Site.

This Health and Safety Plan declares procedures and strategies to ensure human and environmental safety during any and all operations associated with these activities. This HSP also states safety policy and procedures for ensuring the safety and health of Maxymillian Technologies personnel, the general population around the site, and the environment from possible PCB exposure or other health risks or hazards during work and restoration of the job site.

This Health and Safety Plan is intended to cover Maxymillian Technologies' work on the GE Newell Street Area I Site. The plan is intended to be in effect for MT's total time on-site. All operating personnel will review this plan and will also be briefed by their immediate supervisor on required MT safety practices pertaining to their job before starting work at the site. These safety requirements apply to contracting personnel and visitors as well as employees.

Copies of the Health and Safety Plan will be maintained in the administration trailer at the site and at MT's main office. A copy of the approved plan will be provided to GE. Updates and amendments will be made as needed and submitted for approval. Once approved, copies of updates will be provided to all previous recipients of this document.

The list of emergency telephone numbers will be posted near the phones at the site. The home office will also have a copy of this emergency telephone list readily available for use in an emergency.

Throughout the Health and Safety Plan, the masculine gender is used for simplicity, however, the policies, practices, and procedures described in this plan apply equally to all employees.

Prior to commencement of operations, personnel involved with contaminated material removal, will be trained per Occupational Safety and Health Administration (OSHA) standards in safe operation of personal protective equipment and onsite equipment. Upon completion of 40-hour OSHA training, each of these employees will be requested to sign a sheet certifying completion and comprehension of the training. Copies of this training certification form will be kept at the remediation site and at the home office.

The Health and Safety Plan addresses remediation activities related to the safety and health of site personnel, the general public, and the environment. This plan will focus on:

- Site characteristics
- Maxymillian Technologies' activities
- Safety administration
- General safety issues
- Emergency procedures
- Personnel training
- Medical surveillance
- Safe work practices
- Personal protective equipment
- Site inspection procedures
- Site safety, emergency, and First Aid equipment
- Monitoring equipment
- Decontamination procedures
- Medical and site record keeping requirements
- Proposed site personnel and their responsibilities
- Safety and health concerns for the general population and the environment
- Procedures for preventing and controlling spills
- Contingency procedures

These safety and health considerations are designed to satisfy the requirements of 29 CFR 1910 and 1926 and 40 CFR 761 and will be followed through completion of the project.

Considerations for ensuring safety of site personnel, population that reside near the site, and the environment include:

- Comprehensive training of all site personnel.
- Use of pollution control devices and secondary containment systems for components, with regularly scheduled inspections.
- Provisions for preventing, controlling, and containing spills of hazardous liquids or petroleum products.

1.1 Safety Summary

The purpose and intent of the Health and Safety Plan is to ensure operations for the site are conducted in a safe manner. This site presents a number of safety concerns for site personnel, the general public living near the project, and the environment itself. Site hazards and risks are identified in 5.0 Hazard and Risk Analysis.

Health and safety of site personnel is of primary concern to MT. The Occupational Safety and Health Administration (OSHA) has identified general construction safety training requirements, 29 CFR § 1926 Subpart C, and Hazardous Waste Operations and Emergency

Response requirements, 29 CFR § 1910.120 in order to ensure the health and safety of personnel. Adhering to OSHA requirements, MT will:

- Establish and implement a comprehensive training program
- Define a Buddy System approach for all work above Level D protection. The Buddy System will be strictly enforced. No personnel will be allowed to work in this level of protection unless he is under continual surveillance.
- Provide personal protective equipment
- Provide and require medical surveillance
- Target and promote safe work practices
- Detail personal decontamination procedures
- Identify personal hygiene requirements
- Require adherence to general housekeeping rules
- Provide and maintain emergency First Aid equipment

A number of activities associated with remediation projects pose possible health and safety concerns to site personnel. These concerns could include exposure to previous site contaminants (PCB) and activities associated with excavation. In order to prevent potential exposure to contaminants, as well as exposure to hot substances and surfaces, site personnel will wear the personal protective equipment required to protect them in their specific work areas. Details on protective gear are discussed in Section 8.0 Personal Protection and Safety Equipment.

During excavation the potential inhalation of airborne particulate contaminated with PCB is a concern. To prevent fugitive dust generation associated with excavation, dust suppression equipment will be utilized when excavation appears to generate airborne particulate and/or based on air monitoring.

To prevent the potential for dermal contact with PCB-containing material all site personnel will be required to wear appropriate personal protective equipment/clothing as detailed in Section 8.0 Personal Protection and Safety Equipment.

Ingestion of materials is not considered a significant route of exposure. Safe work practices, discussed in Section 3.1.1 Safe Work Practices and Section 3.4 Site Specific Training, will be followed by all personnel and will effectively eliminate this route of exposure.

MT's activities at the site are designed to remediate the area, and should not exacerbate or spread the contamination. MT will adequately protect the environment including the soil and subsoil, surface water, groundwater, and air. Silt fences or other necessary erosion control measures will be installed as necessary.

1.2 Summarized Activities

MT activities at the GE Site will include, and are not limited to, the following:

- mobilization
- implementation of project environmental controls
- excavation of contaminated material
- excavation for utilities and building foundations
- equipment decontamination
- stockpiling clean backfill on site
- backfill, re-grade, and site restoration

1.3 Site Information and History

The GE Newell Street Area I Sites are located in Pittsfield, Massachusetts. The sites are recreational and commercial properties located on Newell Street. Parts of the area have been confirmed to be contaminated with PCBs.

2.0 PERSONNEL

The safety programs outlined in this document will be accomplished through project management. As new situations unfold this safety program will be reviewed to assure the quality of the program. Safety audits by our off-site Corporate Health and Safety Manger will be performed on a quarterly basis. Recommendations will be made for items to be acted on. Follow-up inspection will be made to ensure all items have been acted on. Personnel associated with operations on this site will include a Health and Safety Officer (HSO)/Site Supervisor, Materials Handling Operators, and various subcontractors.

Specific personnel assigned to the site will be fully trained in the operations and safety considerations associated with this project. MT employs a number of qualified personnel who are capable of fulfilling the responsibilities of each position. Responsibilities of each position are discussed below.

2.1 Health and Safety Officer/ Site Supervisor

Dave Smith, the designated Health and Safety Officer (HSO)/ Site Supervisor (SS) will establish and oversee general and environmental safety issues for all aspects of the fieldwork. This includes providing training protocols, implementing programs, and documenting programs. He will ensure that all health and safety monitoring is performed in accordance with 29 CFR §1910.120 and that health and safety documents are maintained on-site as required. The HSO will ensure compliance with all safety requirements of OSHA and MT.

The HSO/SS, will be responsible for conducting safety inspections and meetings. The HSOs will also conduct weekly Toolbox Meetings (safety meetings) and ensure that all health and safety documents are maintained on-site as required. If safety inspections reveal the need for more frequent safety meetings to ensure comprehension and compliance with safety requirements, the HSO will have the authority to conduct more frequent meetings. All MT personnel will be required to attend safety meetings conducted by the HSO or their appointed delegate.

The HSO/SS will also be responsible for managing all on-site activities during implementation of the project and assuring that these activities comply with applicable permits, local and state regulatory agencies. In addition, his responsibilities will include the supervision of all project field work including site preparations, operations and the supervision of all operators. He will maintain close contact with the GE Site Representative.

Additional HSO/SS responsibilities include:

- Reviewing health and safety aspects of any non-routine work in any restricted area
- Ensuring that all site activities are conducted in accordance with safe operating procedures
- Ensuring compliance with all safety requirements of OSHA, EPA, state, and local authorities
- Training
- Implementing safety protocols and requirements
- Implementing dust control if necessary
- Identifying and assessing hazards to on-site personnel and the surrounding community
- Identifying any emergency response procedures necessary
- Determining Personal Protective Equipment use and monitoring inventories (upgrading levels of PPE as necessary)
- Inspecting and auditing work areas for health and safety issues
- Maintaining health and safety documentation (inspections, any injuries, potential hazards, etc.)
- Briefing visitors to the site on health and safety issues
- Reviewing lockout/tagout procedures as necessary
- Contacting and coordinating with local emergency responders
- Notifying appropriate GE Representative of emergencies and on-site incidents
- Implementing evacuation procedures as necessary
- Instituting emergency shutdown procedures in the event of severe weather
- Identifying character, source, amount and extent of any MT material release

2.2 Materials Handling Operators

Materials operators will be responsible for the preparation and transportation of contaminated soil in designated contaminated areas. In addition, they will be responsible for transferring processed soils. All materials handling activities will be conducted such that contaminated

materials are not transported over clean areas and clean material does not come into contact with contaminated equipment.

All operators will be trained and experienced in the safe operation of construction equipment and will hold valid operating licenses for the piece(s) of equipment they are assigned to operate. They will also be required to participate in site training to ensure compliance with safe practices for working with hazardous materials.

2.3 Subcontractors

Some non-MT personnel may be present during the field activities. All personnel, including subcontractors, will participate in site safety training, as conducted by the Site Supervisor/ Health and Safety Officer and also will partake in GE Safety Training.

3.0 TRAINING

It is the responsibility of the MT Health and Safety Officer to ensure that training is provided to all MT personnel involved with the project. Training will be according to employee's tasks and the proper safety procedures as set forth in 29 CFR § 1910 and § 1926. Refer to Attachment 1 for an outline of HAZWOPER 40-Hour Curriculum.

The scope of training will ensure that site personnel develop safe work habits and are aware of the hazards involved with materials handling activities and hazardous compounds at the site. Personnel will be trained in the appropriate hazardous waste management procedures relative to their positions and in responding effectively to emergencies.

Records of training will be maintained at MT's home office. Upon satisfactory completion of training, the trainee will be required to sign a certification sheet, indicating the date when training was provided, the name of the trainer, and the nature/extent of the training. As required by state law, refresher training will be provided once every year.

Training for site personnel on site will include, at a minimum:

- Standard OSHA Forty (40) Hours off-site, for removal activities (see Attachment 1)
- Eight hour annual OSHA refresher course
- Site compounds and handling
- Overview of site operations
- Personal Protective and safety equipment required
- Decontamination procedures
- General Construction Safety
- Implementation of Site Emergency Response Plan/Contingency Plan
- Communication and/or alarm systems
- Safety Meetings
  - general construction safety and safe work practices

3.1 General Construction Training

In keeping with the requirements set forth in 29 CFR § 1926 Subpart C, MT will provide standard construction safety training to all site personnel. At a minimum, this training will include:

- Recognizing and avoiding unsafe conditions
- Controlling and eliminating hazards and exposure risks
- Methods for safely handling potentially hazardous materials
- Procedures for maintaining personal hygiene and protection
- Techniques for avoiding injury
- Lockout/Tagout procedures
- Fire protection and prevention
- Locations of emergency equipment
- Housekeeping regulations
- Safe work practices
- GE Safety Training of all on-site personnel

3.1.1 Safe Work Practices

Preliminary training includes identification of safe work practices that all site personnel will follow. Examples of safe work practices that will be followed at the site are:

- Smoking, eating, and drinking are allowed only outside the work and decontamination areas
- Employees have the right to refuse to perform an assignment if they feel it is unsafe

The following actions are prohibited:

- Alcoholic beverages and non-medicinal drugs
- Sleeping on the job
- Running
- Use of radios, televisions, tape players, or other forms of entertainment
- Possession of a firearm

Operating personnel are provided with information on chemical properties and health effects of all chemicals or wastes at the site. Material Safety Data Sheets (MSDSs) for chemical substances found or used at the site are included in Appendix B of this Plan.

3.2 Materials Handling Equipment and Excavation Training

In addition to the training requirements of 29 CFR § 1926.21, training will cover safety requirements associated with the operation of earth-moving equipment and activities related to excavation. These requirements are covered under 29 CFR § 1926 Subpart O and Subpart P. Earth-moving equipment operators will be responsible for operating their assigned pieces of equipment according to the requirements outlined in 29 CFR § 1926 Subpart O. Any pieces of equipment not satisfying the requirements of this Section will not be used and the Supervisors will be apprised of the unsatisfactory condition of the piece of equipment as soon as possible. The equipment will be tagged to identify its safety failing until the equipment can be decontaminated, if necessary, and demobilized from the site.

In addition to the training requirements outlined in 29 CFR § 1926, all MT employees involved with contaminated removal work at the site will have completed the standard 40-hour OSHA HAZWOPER training required under 29 CFR § 1910.120. This training will be kept current with yearly 8-hour refresher courses, as required. Certificates for completion of HAZWOPER training are maintained at the home office. Certifications for site personnel will be provided as personnel is assigned to the site.

3.3 Hazard Communication Standard

As required by 29 CFR § 1910.1200 and 29 CFR § 1926.59, a company Hazard Communication Standard will be available at the site. Related training will be provided by the Health and Safety Officer. Please refer to Appendix C, Maxymillian Technologies Hazard Communication Program, for additional information.

3.4 Site Specific Training

Preliminary training will be provided to all site personnel. This preliminary training is intended to provide general information about the safe handling of hazardous materials. The Site Supervisor will be familiar with all aspects of facility operation and, with the Health and Safety Officer, will be jointly responsible for providing general training for on-site operations.

Upon arrival at the site "hands-on" training specific to each employee's role will be provided by the Site Supervisor. Training will focus on the specific duties of the position and the methods for meeting safety and operating requirements.

Each employee assigned to a supervisory role will be trained in the safe and thorough operation of his duties as well as those of the personnel who report directly to him. It is expected that, in the event an employee should sustain an injury while at work, his injuries would be reported immediately to the employee's immediate supervisor, who would, in turn, be able to fulfill his subordinate's duties.

Site Specific Training will include the following:

- Regulatory agencies involved at the site
- Contaminants present at the site
- Public concerns
- General site safety
  - Health and Safety Plan and Health and Safety Officer
  - Emergency Response Plan

3.5 Updated Training

The Health and Safety Officer will conduct periodic scheduled inspections that will include monitoring activities of site personnel to ensure compliance with safety requirements. If updated training is required (for example, after minor modification of a process or to improve safety), the Site Supervisor / Health and Safety Officer will conduct a hands-on training session.

3.6 Toolbox Safety Meetings

Weekly follow-up training will be provided in the form of weekly toolbox safety meetings conducted by the Health and Safety Officer. Toolbox safety meetings will discuss safety concerns at the site including potential problems and methods for avoiding such problems and recommendations for improving safety. Attendance at toolbox safety meetings is mandatory for all site personnel.

The Health and Safety Officer will maintain written records on the dates when toolbox safety meetings are held, the topics discussed at the meeting, and a list of attendees. Refer to Form A-4 in Appendix A, Checklists/Inspection Forms, for a sample of this report.

4.0 GENERAL SAFETY

The following general safety procedures will be followed by all site personnel and visitors. Anyone on-site violating these procedures will be warned by the HSO and may be escorted from the site for failing to comply. Warnings will be documented.

4.1 General Safety Items

- A copy of this plan will be available at the job work site.
- Employees will wash their hands and face and remove outer protective garments before eating, drinking, smoking or taking medication.
- Containers will be moved only with the proper equipment and will be secured to prevent dropping or loss of control during transport.
- Emergency equipment will be located in readily accessible uncontaminated locations.

- All personnel entering the site will be thoroughly briefed on the hazards, equipment requirements, safety practices, emergency procedures, and communication methods.
- Unfamiliar operations will be discussed with affected employees prior to beginning work.
- Fire extinguishers will be mounted on all equipment as required.
- Personnel entering the job site will wear appropriate Personal Protective Equipment as required.
- All site personnel will work together to establish and maintain site control.
- Eating, drinking, and smoking will only be permitted in designated areas outside the Exclusion and Decontamination Zones.
- Wearing contaminated protective apparel outside the Decontamination Zone will be prohibited.
- Before beginning any non-routine operation in any restricted area, personnel will consult with the HSO about health and safety requirements.
- A Buddy System will be implemented for all work above Level D.
- Physician-approved First Aid kits shall be kept on-site during work. In addition, one kit shall be placed in the support office.
- First Aid equipment shall be approved, and will be able to provide stabilization for patients requiring off-site treatment and general First Aid.
- A heat and cold stress program will be developed and implemented. The program will address monitoring procedures, prevention, work scheduling, contingency, and other aspect related to both heat and cold stress.
- Protocols will be implemented for loading and unloading material on-site. These protocols will include DOT requirements covering such items as grounding, placarding, driver qualifications, and the use of wheel locks.
- All excavation work will be performed by qualified personnel and in accordance with 29 CFR § 1926.652.
- All electrical installation will comply with the National Electrical Code (NEC). Protective equipment will be provided for electrical system construction. Additionally, design safety standards will be incorporated in electrical systems in accordance with OSHA 29 CFR § 1910.

4.2 General Housekeeping

General housekeeping requirements are based upon OSHA regulations for general construction site safety. Housekeeping will be maintained daily. The requirements listed below will be included in the site training program, and will be followed by all site personnel:

- All stairways, gangways, passageways, and access ways will be kept clear of debris and obstructions.
- All non-excavated loose or light materials will be contained or safely secured so as to prevent their becoming airborne.
- Tools, construction materials, hoses, extension cords, or debris will be located so as not to cause tripping.
- Tools, construction materials, and any equipment subject to displacement or falling will be secured to prevent such mishap.

- Nails protruding from plywood or planks will be bent flush with the wood or placed in containers for removal.
- All scraps and debris will be cleared from work and storage areas on a daily basis.
- All areas of the site will be kept free of combustible or flammable materials unless these materials are properly stored.
- Grass and weeds will be controlled in areas where combustible or flammable materials are stored.
- The Site Supervisors will coordinate daily cleanup of the site to ensure compliance with these general housekeeping requirements.
- Machinery and equipment will be arranged and store to permit safe efficient work activities and tools and accessories will be safely stored out of traffic areas.
- Waste rags will be stored in metal containers.
- Flammable liquids will be stored in safety cans.

4.3 Fire Prevention

The following fire prevention rules will be followed work at the site:

- Fires and open flames will not be left unattended.
- Smoking will be prohibited in all areas except those clearly designated and labeled as such by the Health and Safety Officer as smoking areas.
- All tanks, containers, and pumping equipment associated with the storage or handling of combustible or flammable liquids will be UL-listed.
- All lighting used in areas where flammable or combustible liquids are stored or used will be UL-listed.
- Delivery and storage of combustible or flammable liquids will be in keeping with Department of Transportation regulations.

4.3.1 Spacing

Adequate spacing between temporary buildings, trailers, and portable tanks containing flammable or combustible liquids will minimize the spread of fires and allow access to fire control apparatus. Non-fire-resistant temporary structures will comply with the recommendations of the NFPA and state and local regulations. Prompt removal of debris from work areas is intended to minimize the spread of fires. Clearance around lights and heating units will be maintained to prevent ignition of combustible materials.

4.4 Preventing Ignition of Ignitable Materials

The possible contaminants at the site are not readily ignitable. No additional hazardous materials will be brought to site. Storage of any other materials brought to the site will be in approved storage containers.

"NO SMOKING" signs will be prominently displayed in the appropriate areas, and all authorized visitors will be instructed to refrain from smoking in areas designated as non-smoking areas.

Open flames will not be permitted in areas where fuel is stored or used. Any electrical equipment employed in these areas will be carefully inspected on a regular basis so as to prevent the generation of sparks that might ignite this material.

4.5 Handling of Reactive, Incompatible, or Ignitable Wastes

The wastes deposited at the site are neither incompatible, ignitable, nor reactive. No additional materials will be introduced to site, therefore, there are no procedures applicable to the handling of reactive, incompatible, or ignitable wastes at the site.

4.6 Electrical Safety

The following rules regarding electrical safety will be applied during the site:

- All electrical wiring and equipment will be UL-listed and used for its specific application.
- All electrical installations will comply with the National Electrical Code (NEC) regulations.
- All electrical work will be performed by qualified personnel who are familiar with the hazards of the site and the electrical code requirements.
- Live wires will be guarded to protect all persons and objects from accidental contact.
- All electrical equipment to be worked on will be de-energized before work is begun. Personnel and equipment will be properly grounded before commencing any work around or with electrical equipment. Switches or circuit breakers will be in the "locked off" position during maintenance work on associated lines and circuit breakers will be padlocked and tagged by person placing padlock. This procedure will follow "Lockout/Tagout" guidelines as described by OSHA 29 CFR § 1910.147.
- Personnel working on energized lines will be equipped with rubber gloves and other protective equipment or tools that meet the provisions of the American National Standards Institute (ANSI), when appropriate.
- All electrical circuits will be overload-protected.
- Electric cords must be single and continuous lengths; no patches, splices (unless molded or vulcanized and made by a qualified electrician), or frayed cables will be permitted for use at the site.
- All electric cords and cables will be adequately insulated.
- Cables will not be fastened to surfaces with metal fasteners (i.e. staples, wires, etc.).
- Fuses, switches, and automatic circuit breakers will be clearly marked to minimize accidental operation. These items will be located in a lockable fuse cabinet.
- Fuses and circuit breakers will be properly rated for their designated use.
- All electrical circuits, equipment, and tools will be properly grounded in accordance with the NEC.
- Grounding circuits and devices will be inspected regularly.

- Any bulbs attached to "festoon" lighting strings or cords will be protected by wire cages unless the bulbs are recessed. Broken bulbs and/or exposed light sockets are prohibited.
- All electrical connections will be made through a ground fault circuit interrupter.
- Every electrical connection and electrical wire will be treated as live. Workers will not handle electrical equipment or wires if their hands are wet or if they are standing on wet surfaces.
- Electrical cords will be pulled from an outlet by grasping the plug, not the cord.
- Electrical wires, cords, etc. will be located so that they cannot be tripped over or walked on. Where possible, extension cords will be located overhead, away from traffic areas.
- Electrical tools, extension cord connectors and other equipment and appliances will be kept 50 feet from fuel sources.

The following practices will decrease the risk of electric shock during excavation activities:

- Only qualified personnel will operate electrical equipment.
- Heavy equipment and energized tools will be inspected by the HSO and will meet all applicable local, state and federal standards.
- A crane boom will not be allowed within 20 feet of a power line.
- Excavation areas will be cleared through a local utility manager before starting work.
- All cords will have ground stems.
- Electrical power lines will be marked on applicable project maps and physically marked in the field if necessary.

Please refer to Appendix D, MT Control of Hazardous Energy (Lockout/Tagout) Program for details.

4.6.1 Hand/Power Tools

All personnel assigned to the site will have experience in the safe use of hand and power tools. Refer to the Hand/Power Tool Regulations found in 29 CFR § 1926 Subpart I and 29 CFR § 1910 Subpart P. Rules they will be instructed to follow regarding the safe use of hand and power tools are:

- All hand and power tools will be in good repair and will be used only for their designated purpose.
- Any tools that are defective in strength or operating capacity will be removed from service. Regular inspections will ensure safe operating conditions and proper maintenance of all tools used at the site.
- During performance of overhead work, all tools not being used will be secured.
- Hydraulic equipment will be used in compliance with manufacturers' safe operating pressures and conditions.
- Workers using hand or power tools will not wear loose clothing or dangling jewelry that might become tangled in the equipment.
- Circular saws will be equipped with guards that completely enclose the cutting edge of the blade. Damaged blades will be discarded immediately and properly.

- Under no circumstances will any power tools be left running and unattended.
- Portable electrical tools and equipment will be double-insulated.

4.6.2 Lockout/Tagout

MT's Lockout/Tagout Program establishes policies and provides guidelines to ensure standardized implementation of the OSHA Lockout/Tagout Standard.

This policy, described in detail in Appendix D, MT's Control of Hazardous Energy (Lockout/Tagout) Program, applies to all employees who perform work that involves the unexpected start-up of equipment, as defined in 29 CFR § 1910.147. Training will familiarize the employees with this policy so they may work safely and confidently while performing their assigned tasks. This program does not apply to routine service or maintenance, when guards or safety devices are not bypassed. When working at a facility with an established Lockout/Tagout program, that facility's program will take precedence. Training as outlined in the program will be on an annual basis and will be provided prior to any associated work.

4.7 Construction Equipment Safety

Maintenance Technicians assigned to the site will be experienced in the daily maintenance and minor repair of the construction equipment used at the site. The Site Supervisor will delegate the responsibility of conducting regular inspections of construction equipment to the Maintenance Technicians. It is expected that regular maintenance of construction equipment will minimize downtime resulting from major repairs. If repairs are required that cannot be conducted at the site, the equipment will be removed from the site and replaced with a comparable piece of equipment.

Maintenance Technicians charged with the responsibility of maintaining safe operations of construction equipment will follow these rules:

- All construction equipment delivered for use at the site will be in good operating condition and will have been recently inspected to ensure reliability.
- All construction equipment will be inspected during each shift that it is used. These inspections will occur before the equipment is used to determine that the brakes and operating systems are in good working condition.
- The maintenance technician will be familiar with the manufacturers' preventative maintenance procedures for each piece of equipment and will follow these procedures.
- Machinery or equipment determined by the maintenance technician or Health and Safety Officer to be unsafe will be so tagged. Unsafe equipment will not be used at the site, and will be removed from the site as soon as possible after such determination is made.
- Only authorized personnel will operate construction equipment at the site. Equipment operators will be properly trained and will have valid licenses.
- At no time will construction equipment be left running and unattended.
- When not operating, all construction equipment will be braked.

- When not in use, all ancillary devices on construction equipment (e.g. buckets on front-end loaders) will be placed in the secured position.
- Areas in which construction equipment will be operated or maintained will be properly lighted.
- Construction equipment will be shut down prior to and during re-fueling operations.
- Trailers and towing devices used for transport of construction equipment will be adequately rated and properly employed for the task.
- The locations of construction equipment not in operation will be readily identified by the use of attached reflectors.
- Equipment with windshields will be equipped with automatic windshield wipers in good operating conditions.
- Lift trucks will be used only within their rated capacities.
- Self-propelled construction equipment will be equipped with operating reverse signal alarms. The alarm will be audible under prevailing conditions at construction site, and will operate automatically upon commencement of backward motion.

4.8 Guard Devices

The Health and Safety Officer will periodically check the condition of equipment safety guards and devices. The following devices will be present on equipment to be used at the site:

- Self-propelled equipment will be equipped with a reverse signal alarm, sufficiently audible during equipment operation.
- Sprockets, gears, pulleys, belts, flywheels, chains, shafts, or other moving parts will be guarded.
- Hot surfaces will be guarded/insulated and labeled accordingly.
- Equipment to be operated/supervised by personnel will be provided with the appropriate guardrails, toe boards, hand grabs, walkways, steps, and platforms.
- No guards or safety devices will be removed during the operation of the equipment. Maintenance will be performed when equipment is inoperative.

4.9 Site Control

To prevent unauthorized personnel from entering the site and/or entering contaminated area or known safety and health hazards, site control measures will be established at the site. Site control will also minimize the potential contamination of workers and protect the surrounding environment and public from site hazards. Several site controls will be implemented at site including:

-
- Using the Buddy System when necessary
- Establishing and strictly enforcing decontamination procedures
- Setting up site communications
- Establishing site security measures
- Enforcing safe work practices

4.9.1 Work Zones

Work zones will be directed by MT's Health and Safety Officer will be set up to minimize the movement of contamination from the contaminated areas of the site to the uncontaminated or treated areas of the site. A site map will be kept onsite depicting the current work zones and decontamination areas.

5.0 HAZARD AND RISK ANALYSIS

All personnel will be familiar with all potential hazards and will adhere to the appropriate safety precautions used to minimize personnel exposure to hazards.

5.1 Physical

Potential physical hazards at the site may result from activities associated with materials handling operations, and operation of heavy equipment. Potential physical hazards may include:

- materials handling
- energized electrical equipment
- cutting, torching, and associated equipment (e.g., compressed gases and systems)
- noise
- falling or tripping
- traffic
- heavy equipment and machinery
- openings/trapping hazards
- access/egress
- housekeeping
- exposure to environmental elements

Exposure to physical hazards will be reduced through the use of engineering controls and general safe work practices. Controls for protection of site personnel may include signs, barricades, verbal warnings, personal protective equipment, and working equipment safety alarms/devices. Routine safety meetings will also alert personnel to changing site conditions and the implemented safety control.

5.1.1 Heat Stress and Cold Exposure

Use of steel-toed, steel shank work boots, safety glasses or goggles, and hard hats (if overhead hazard exists) may be required at the discretion of the HSO when in the work and decontamination areas. Personnel should be cognizant that if additional PPE such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired.

In addition, the PPE required for some activities (coveralls and respirators) places a physical strain on the wearer. Fluids will be provided at regular intervals during the work periods in order to maintain adequate body fluid levels for the field personnel. Refer to Section 6.2 for more detail on monitoring Heat and Cold Stress.

5.2 Chemical

The chemical hazard evaluation is based on the history of the site and the field investigations at the site. The chemical hazard evaluation identifies materials that potentially may be present and ensures that site activities, personnel protection, and emergency response are consistent with the specific contaminants expected to be encountered.

Based on the possible contaminates at the site, the primary routes of exposure are through dermal contact and airborne dust that may be generated during site activities or by air movement. The possible contaminants of concern are PCBs. Appropriate mitigative actions should be implemented prior to upgrading from initial personal protection levels.

5.2.1 Control of Exposure to Chemical Hazards

Ingestion of constituents of concern will be controlled on the site by prohibiting eating and smoking in the work zones and by requiring all field personnel to decontaminate themselves upon leaving the work zone.

Any body parts which come in contact with contaminated materials will be washed with soap and rinsed immediately. All field personnel will report any skin or eye contact symptoms to the HSO. The person will be treated by a physician, if necessary, and steps will be taken to eliminate similar exposures.

Potential hazards will be reduced by protecting against exposures to hazardous materials via utilization of appropriate personal protective equipment (PPE). PPE to protect the body against contact with known or anticipated chemical hazards can be divided into three levels of protection categories (Level D, Modified D, C, B and A) according to the degree of protection afforded. The anticipated levels of personal protective equipment to be used while performing the activities at this site are discussed in Section 8.0, Personal Protection and Safety Equipment.

5.2.2 MSDS Location

In accordance with the OSHA Hazard Communication Standard (29 CFR § 1910.1200), Material Safety Data Sheets (MSDS) or comparable chemical hazard information for regulated chemical materials used during the conduct of site operations will be available from the Site Supervisor and w ill be kept in Appendix B of this plan. MSDS training will

be conducted in accordance with 29 CFR § 1910.1200 during the on-site Informational Training.

5.3 Site Specific Hazards

5.3.1 Excavation

If required, 29 CFR § 1926, Subpart P will be followed for excavation activities. The Health and Safety Officer (HSO) will be consulted prior to entering excavations. The HSO will limit entry into excavation areas except when absolutely necessary. All excavation work will be performed from stable ground.

Soil and excavation piles will be located at least 2 feet from the edge of the excavation. A distance of 15 feet will be maintained between equipment and any overhead power lines. If the lines have appreciable sag, or if windy conditions exist, this distance will be 20 feet. See Appendix F, MT's Trenching and Shoring Program for further info.

5.3.2 Heavy Equipment and Machinery

All wheeled heavy equipment will have backup alarms, capable of being heard over background noise and over hearing protection. Vehicle operators will adhere to federal, state, and local regulations pertaining to the operation of equipment. Only the intended number of passengers will ride in/on equipment, and they will be seated properly. Equipment will be operated consistent with manufacturer's instructions. All heavy equipment will have a multipurpose, dry fire extinguisher.

5.3.3 Noise

Hearing protection (foam inserts) will be worn as required by 29 CFR § 1910.95 when noise is at or above a time weighted average of 85 dBA. The wearing of hearing protection will be enforced by the site HSO. For high noise operations, ear muffs will be worn in addition to foam inserts. The HSO will monitor noise levels at the start up of operations and will make a determination if hearing protection will be required in specific areas. All personnel will receive baseline and annual audiograms as well as training on the causes and prevention of hearing loss. Noise levels will be evaluated with ANSI Type 2 or 1 sound level meter and/or noise dosimeter or equivalent.

5.3.4 Lifting

Workers will wear gloves for lifting and will request assistance for heavy or bulky items. Workers will have a firm grip before lifting the material. Material will be transported or stored in a stable manner to avoid falling, rolling, or slipping. Lifting will be conducted with the legs, not the back. Long objects will be carried carefully and to avoid pinch points. Whenever possible, heavy loads will be handled by mechanical equipment.

5.3.5 Traffic

Traffic control will be maintained at all times on the site. Traffic flow will be monitored and trucks and heavy equipment will be required to adhere to a maximum speed limit of 5 miles per hour under posted speed limits for all roadways. Pedestrians will have the right of way on-site, and personnel will be careful when working around heavy equipment or walking near roads.

Drivers and operators will adhere to speed limits, signs, and road markings. Special care will be used when transporting contaminated materials. If heavy equipment is used in the Exclusion Zone then must exit into the Support Zone, it will go through via a decontamination station.

5.3.6 Compressed Gases and Systems

Compressed gases will be properly used according to the supplier's instructions and the Compressed Gas Associate guidelines. Cylinders will be handled carefully. Compressor hose segments will be secured using chains and/or locking pins. A pressurized hose will be connected to the compressor through a pressure-sensing device that will discharge the pressure if the hose pressure system fails. Safety glasses and gloves will be worn when handling/hooking up compressed gas cylinders or systems.

As per 29 CFR § 1910.253, inspection of compressed gas cylinders, the HSO shall determine that compressed gas cylinders in use are in a safe condition to the extent that this can be determined by visual inspection. Visual and other inspections will be conducted as prescribed in the Hazardous Materials Regulations of the Department of Transportation (49 CFR Parts 171-179 and 14 CFR Part 103). Where those regulations are not applicable, visual and other inspections shall be conducted in accordance with Compressed Gas Association Pamphlets C-6-1968 and C-8-1962.

5.3.7 Equipment Decontamination Hazards

Currently identified potential health and safety risks associated with the decontamination of equipment include, but are nor limited to the following:

- Steam burns / heat stress
- Fires from steam generator fuels
- Slips and falls on slippery surfaces

6.0 MONITORING

6.1 Dust Monitoring

Dust monitoring will be performed by MT's Health and Safety Officer. He will perform a periodic visual inspection of the site to confirm dust levels are low. If dust can be seen, preventative measures will be taken. The HSO shall implement dust control measures such as wetting the excavation areas and stock piles. The HSO will also take precaution to reduce dust by covering soil piles with tarps as deemed necessary.

Table 6-1

Air Quality Action Levels and Responses

Air Quality Measurement[1]	Action [2]
• No dust visible in breathing zone	Level D Protection or Modified Level D Protection (at the discretion of HSO)
• Dust visible in breathing zone • GE notification to MT of perimeter dust levels above 120 $\mu g/m^3$	Implement dust suppression measures
• Excessive dust in breathing zone • GE notification to MT of perimeter dust levels above 120 $\mu g/m^3$ continuous for one hour.	Suspend work in immediate area and notify the Site Supervisor / Health and Safety Officer. Take mitigative measures as necessary to suppress emissions as appropriate.

[1] All Air Quality Measurements should be made in the breathing zone of personnel who, in the opinion of the HSO, are most exposed to airborne contaminants.

[2] All Actions shall be determined and directed by MT's site HSO.

6.2 Personnel Monitoring

6.2.1 Heat Stress

Heat stress can be caused by a number of factors including workload, weather conditions, personal protective equipment, and physical condition of the individual. If ambient temperatures exceed 100°F, a heat stress monitor, similar to QuestTemp, will be used to more closely track heat stress. Heat stress includes several types of heat related illnesses, each with specific symptoms, listed below:

- Heat rash caused by continuous exposure to heat and humid air. Decreases the body's ability to tolerate heat.
- Heat cramps, caused by excessive perspiring without proper and adequate electrolyte replacement. Symptoms include:
  - pain in the hands, feet, and abdomen
  - muscle spasms
- Heat exhaustion, caused from inadequate blood circulation due to cardiovascular dehydration. Symptoms include:
  - pale, cool skin
  - excessive perspiring
  - fainting
  - nausea
  - dizziness
- Heat stroke, most serious form of heat stress, body temperature regulation fails and body temperature rises rapidly. Immediate action must be taken to cool the body. Medical attention is required. Symptoms include:
  - red, hot, dry skin
  - lack of perspiration
  - nausea
  - dizziness
  - rapid pulse
  - coma

Immediate recognition of heat stress is extremely important because heat-related injuries rapidly increase in their severity without attention. To prevent heat stress, proper training and planning is required including:

- Personnel must be able to recognize signs and symptoms of heat stress and administer immediate attention.
- Work/rest schedules established according to weather conditions, workload, and level of personal protective equipment. Workers will not do other tasks during rest period and will remove impermeable garments during rest periods.
- Maintain adequate body fluid levels, encouraging drinking ample quantities of water, and electrolytes. To prevent dehydration, personnel should be encouraged to drink generous amounts of water even if not thirsty.
- Ensure adequate shelter is available to protect personnel against heat, cold, rain, and snow.
- Allow personnel to become accustomed to site conditions, personal protective equipment, and workload. Rotate teams of personnel in hot weather.
- Utilize cooling devices to assist body cool down (i.e. showers, cooling jackets, etc.).
- Encourage personnel to maintain their physical fitness.

6.2.2 Cold Stress

Personnel working in sub-freezing temperatures are susceptible to cold stress. Areas of the body most susceptible are the fingers, toes, and ears. Cold stress is categorized into three levels, increasing in severity:

- Frost nip - skin is suddenly white/pale
- Superficial frostbite - skin color is white or grayish-yellow, skin surface is firm to the touch but skin beneath is resilient
- Deep frostbite - skin is cold, solid, and pale, blisters appear in 12 to 36 hours

Hypothermia, cooling of the body's core temperature, can also result from exposure to freezing temperatures. Symptoms are usually exhibited in five stages:

- Shivering
- Sleepiness, apathy, and rapid cooling of body temperature to less than 95°F
- Unconsciousness, slow pulse and respiratory rate, glassy stare
- Freezing of the extremities
- Death

To avoid cold stress, personnel must wear the appropriate protective clothing determined by ambient and weather conditions. For ambient temperatures of less than 0°F, continuous exposure of unprotected skin can result in cold stress. Wet clothing, either from perspiration or immersion in water, must be changed immediately.

The Buddy System will be employed during all on-site operations and especially in temperature conditions below 10°F.

6.3 Medical Surveillance

All site personnel will participate in a medical surveillance program, as per OSHA regulations 29 CFR § 1910.120. The objectives of this program are to ensure site personnel are medically fit to perform their job and to provide adequate medical monitoring during their involvement with the site. This will permit detection of any site-related health problems.

A detailed medical and work history is taken covering previous exposures, illnesses, and injuries with emphasis on symptoms related to the handling of hazardous substances and health hazards with emphasis on the ability to wear any required PPE under conditions that may be expected on-site.

Certification that all supervisory and onsite personnel - working in contaminated areas have received appropriate medical examinations shall be provided as personnel is assigned to the site.

6.3.1 Illnesses of Site Personnel

Exposure site contaminants will be minimized by the use of appropriate personal protective equipment by site personnel. Any personnel exhibiting symptoms associated with exposure to contaminants will immediately report them to the Site Supervisor. The occurrence of any of these symptoms by site personnel will be recorded. Upon investigation of the site and personal protective gear being employed, the Health and Safety Officer will assess the need for additional protective measures.

7.0 INSPECTIONS

Maxymillian Technologies' Health and Safety Officer will coordinate inspections of the site. Inspections will be conducted according to the schedule outlined in the following sections.

- General Facility: Personnel will be observed to ensure compliance with health and safety requirements, in particular the use of personal protective equipment. The availability of usable safety and emergency equipment will be verified.
- Excavation/General Construction Area: The excavation area will be checked to identify potential health and safety hazards.

7.1 Safety Inspections

Periodic site safety inspections will be performed by the Health and Safety Officer during the site. The purpose of these safety inspections is to ensure personnel are performing their duties in the safest manner possible and provide continuing analysis and modification to the safety program. Issues arising from safety inspections will be conveyed to Supervisors who will implement corrective actions.

Inspections of the general facility will focus on the consistent compliance with safety requirements and availability of safety and emergency gear. The format to be followed in general facility inspections can be found in Appendix A.

Personal protective gear will be maintained in the personal decontamination area, with additional emergency supplies kept in the administrative trailer. First Aid supplies are kept in the personal decontamination area, with additional stations located at strategic positions within the facility.

7.2 Record Keeping

The HSO or designated person responsible for conducting inspections will maintain records outlining the results of inspections. Inspection records will be maintained on-site. Please refer to Appendix A, Checklists/Inspection Forms, for examples of inspection forms.

8.0 PERSONAL PROTECTION AND SAFETY EQUIPMENT

8.1 Personal Protective Equipment

There is expected to be contaminated materials at the site that will present potential health hazards from exposure by dermal contact, inhalation, and/or ingestion. In areas where this material is presumed to be, personal protective equipment will be used. MT will provide all personal protective equipment (i.e. Tyvek® suits, chemical resistant gloves, respirators, face masks/goggles, ear protection, etc.) for MT personnel, if directed by MT's Health and Safety Officer. No employee-owned safety equipment will be allowed to be used at the site. For operations in the work zone, the level of PPE is based upon visual air dust concentrations, the job function, potential for skin contact or inhalation and will be directed by MT's Health and Safety Officer.

The following requirements will be followed in accordance with OSHA Regulations:

- facial hair will not interfere with the proper fit of respirators;
- contact lenses will not be worn; and,
- eyeglasses that interfere with the proper fit of full-face respirators will not be worn.

Personal safety equipment is inspected weekly by the Health and Safety Officer during excavation and construction operations. Filters on Air Purifying Respirators will be changed as appropriate. The following outlines Levels D, modified D and C of personal protective equipment:

Level D

Level D personal equipment shall be selected when there are no inhalation or dermal hazards and work precludes splashes, immersion, or potential for unexpected inhalation of any chemicals. Level D consists of:

- Gloves*, leather
- Boots, steel toed rubber boots for work around heavy equipment and chemical-resistant foot protection in the Exclusion Zone
- Safety glasses or chemical-splash goggles*
- Hard hat (face shield*)
- Escape mask*

* may be required based on the task to be performed.

Modified Level D

Modified Level D personal protective equipment shall be selected, at the discretion of the HSO, when no airborne particulate is present and there are no inhalation risks. Modified D with strict dust control measures is expected to be used on this project. This equipment shall consist of :

- Gloves*, leather
- Boots, steel toed rubber boots for work around heavy equipment and chemical-resistant foot protection in the Exclusion Zone
- Safety glasses or chemical-splash goggles*
- Hard hat (face shield*)
- Escape mask*
- Latex surgical gloves
- Tyvek® coveralls

* may be required based on the task to be performed.

Level C

Level C personal protective equipment shall be selected, at the discretion of the Health and Safety Officer, when contaminated airborne particulate are present and the criteria for air purifying respirators are met. Level C is not expected to be used on this project but if needed, this equipment shall consist of:

- Half-face, air-purifying, canister-equipped respirator (MSHA/NIOSH approved)
- Tyvek® coveralls
- Gloves (outer), Nitrile chemical-resistant
- Gloves (inner), Nitrile chemical-resistant*
- Boots, steel toed rubber boots for work around heavy equipment and chemical-resistant foot protection in the Exclusion Zone
- Hard Hat (face shield*)
- Escape mask*
- 2-way radio communications (intrinsically safe)
- Explosimeter/O_2 meter
- Photoionization detector or OVA system

* may be required based on the task to be performed.

Task specific levels of protection will be determined by the HSO based on air monitoring results, soil analyses, task specific activities, and other site conditions. General activity levels of protection are identified below but may be modified at the discretion of the HSO.

Personnel working in "clean" areas at the site (e.g. administrative trailer, cleanly filled areas, etc.) will wear standard construction site clothing.

The proper removal and disposal of contaminated personal protective equipment is essential to prevent exposure. Procedures for disposing of and decontaminating personal protective equipment are provided Section 9.0, Decontamination.

8.1.1 Respirator Protection

Respirator protection is not expected to be utilized at the site. If necessary, the type of cartridges to be used will be determined by the Health and Safety Officer. Please refer to Appendix E, Maxymillian Technologies Respirator Protection Program, for detailed information of respirator information. The prohibition of contact lenses is outlined in this program. Corrective eye wear that does not interfere with the seal of the respirator or eye wear designed for use with respirators will be allowed.

8.1.2 Hearing Protection

Per OSHA regulation 29 CFR § 1926.101, hearing protective devices will be provided and worn by personnel working in areas of high decibel noise. Periods of high decibel noise exposure are defined in 29 CFR § 1926.52, Table D-2, Permissible Noise Exposures.

8.2 Personnel Accidents and Injuries

In the event of a worker-related accident, it is MT's primary concern to provide immediate assistance without placing additional site personnel at risk. All accidents and injuries are required to be reported to the Health and Safety Officer and/or Site Supervisor.

All worker injuries will require First Aid procedures to be implemented. If the severity of the injury is beyond on-site First Aid procedures, the employee must be transported to an off-site medical facility. If the employee can be moved, he will be moved to the decontamination area where, if possible, decontamination procedures will be implemented and personal protective equipment removed. Transportation to a local emergency medical facility will be provided. The Project Manger will be required to notify hospital staff if they are to treat a contaminated worker.

If the injury involves chemical exposure, the following situations will require First Aid procedures as listed:

1. Eye exposure - thoroughly rinse at the eye wash station or portable eye wash unit using water and/or eyewash solution. Obtain medical attention immediately.
2. Dermal exposure - rinse affected area immediately using water. Obtain medical attention, if necessary.
3. Ingestion - refer to MSDS and administer emetic, if required. Obtain medical attention immediately.
4. Inhalation - move to fresh air. If breathing has stopped, perform CPR. Obtain medical attention immediately.

Temperature related injuries, including heat and cold stress, are discussed in Section 6.0, Monitoring.

8.3 Buddy System

The Buddy System will be employed by site personnel if workers are required to work in Level C protective gear. Under the Buddy System, each site worker is responsible for monitoring the well-being of another worker. Partners will maintain visual contact with each other. No one works alone when the Buddy System is implemented. At no time will fewer than two MT employees be present at the site if excavation/construction activities are under way.

Site personnel will be trained to observe each other for the following conditions that are symptomatic of toxic exposure:

- Changes in skin complexion (abnormal discoloration)
- Changes in coordination, behavior, or speech
- Excessive salivation
- Changes in papillary responsiveness

If a worker notices a co-worker exhibiting any of these symptoms, the observer will immediately notify his direct supervisor. In addition, any worker suffering from:

- Headaches or dizziness
- Blurred vision or eye irritation
- Stomach cramps
- Skin irritation
- Difficulty in breathing

will immediately notify his immediate supervisor. These conditions may indicate toxic exposure or heat exhaustion. When appropriate a work/rest schedule will be established to minimize the likelihood of a worker suffering from heat exhaustion. Details are included in Section 6.0, Monitoring.

8.4 Safety Equipment

The following safety equipment is provided for the protection of site personnel. The equipment will be properly identified at all times and all personnel will be made aware of the locations of these pieces of equipment. First Aid stations will be readily identifiable and adequately lighted. The Health and Safety Officer will be responsible for inspecting and maintaining the ready availability of these items.

First Aid kits will be supplied with:

- Bandage materials
- Antibacterial ointments
- Splints
- Non-aspirin pain reliever
- Emetic - Syrup of Ipecac
- Local and topical anesthetics
- Eyewash bottle and solution
- Sterile gloves
- Compresses
- Ammonia inhalant
- Scissors
- Tweezers
- First Aid cream
- Instant cold-packs
- Burn cream

8.5 Confined Space Entry

No confined spaces are expected to be present on this site. For protection in trenches, please see Appendix F, Maxymillian Technologies, Inc. Trenching and Shoring Program.

9.0 DECONTAMINATION

MT will use on-site personnel decontamination facilities, located immediately adjacent to the Exclusion Zone. No one will leave the containment reduction area until they have thoroughly decontaminated their protective equipment, removed the protective equipment and, if applicable, disposed of the protective equipment. The exception to this rule is the removal of an employee for emergency medical attention.

All wash water, solvents, detergents, etc. shall be contained and delivered to GE for disposal.

The personnel decontamination procedure (when applicable) will proceed as follows:

Step 1:	Equipment Drop
Step 2:	Boot* and Outer glove rinse and removal
Step 3:	Suit or coverall removal
Step 4:	Hard hat, eye protection and respirator removal
Step 5:	Inner glove removal
Step 6:	Wash of any potentially exposed skin

*If outer disposable boots are utilized, the outer layer shall be removed and disposed.
*If reusable boots are utilized a two station boot decon will be set up

Decontamination procedures to be followed by all on-site personnel will be determined for site specific conditions.

9.1 Reusable Personal Protective Gear

Gear that can be decontaminated and reused, such as respirator packs and facemasks, will be removed sequentially (the most contaminated equipment first). Decontaminated gear will then be set aside for storage in a clearly marked area of the personnel decontamination area. Decontamination of reusable equipment will be verified by visual inspection by the appointed HSO or a site employee charged with this responsibility.

Decontamination of reusable personal protective gear will be ongoing throughout the process, and will continue through closure. The MT Health and Safety Officer will periodically inspect the condition of reusable personal protective gear to verify its integrity. Upon completion of closure, all reusable gear will be decontaminated and all disposable gear will be transported off-site for safe disposal.

9.2 Single-Use Personal Protective Gear

Single-use personal protective gear, including disposable protective clothing (e.g. Tyvek® suits), is used for a single work shift and then stored for disposal. If the single-use personal protective gear becomes torn or damaged in the course of work within a single work shift, it will be removed and replaced with new single-use gear for the remainder of that work shift.

9.3 Equipment Decontamination

All earthmoving/transportation equipment in contact with any soil will be decontaminated at the edge of the Exclusion Zone prior to moving equipment into clean zones or the removal of the equipment from the site. MT will utilize a steam cleaning method to remove all contaminates from the equipment. After completion, a wipe test will be performed to confirm surfaces have less than 10 µg PCB's/ 100cm ^{2} remaining.

10.0 SPILL PREVENTION CONTROL & COUNTERMEASURES PLAN

10.1 Stored Substances

Some substances will be stored for use at the site. These materials will be kept in the containers provided by the supplier or manufacturer, and stored in the project storage trailer:

Material Safety Data Sheets (MSDSs) for these substances will be included in Appendix B, MSDSs, of this Plan.

10.2 Potential Spills

The primary potential spills that may occur during work at the site involve liquid fuel, lubricating oils, etc. If PCB contaminated soils are found and stored, they also will have a potential to spill.

10.2.1 Liquid Spills

Should a spill occur involving liquids at the at site (i.e. fuel, lubricating oils, etc.), the following procedures will be implemented:

- Contain the spill with berms formed with soil and/or dry absorbent
- Apply dry absorbent to the spill in a quantity sufficient to fully contain the spill
- Shovel absorbent into 55-gallon drum
- Spilled materials and associated wastes will be disposed of according to their regulatory classifications.
- Appropriate spill clean up verification will be performed to the satisfaction of the Regulatory Agency for all spills at the at site. The type of verification sampling is to be determined by the Project Manger and GE oversight Personnel.

11.0 EMERGENCY RESPONSE CONTACTS

Emergency situations can be categorized into three general classifications: fire and/or explosion, releases to the atmosphere and/or soil or surface waters, and severe weather conditions. First and foremost, the initial response to any emergency must be to protect human health and safety and then the environment. Secondary response to the emergency is identification, containment, treatment, and disposal assessment.

Specific emergency procedures to be followed in each situation are detailed in Section 12.0, Contingency Plan. In the event the situation is beyond the capabilities of site personnel, assistance will be contacted.

11.1 Emergency Numbers

- **Ambulance 911**
- Fire Department ..... 911 or (413) 448-9764
- Police Department ..... 911 or (413) 448-9700
- Area Hospital (Berkshire Medical Center) ..... 911 or (413) 447-2000

- Poison Control Center ..... (800) 336-6997
- USEPA National Response Center ..... (800) 438-2427

- MT's Project Manager/HSO, Dave Smith.....(413) 441-2890
- MT's Chief Engineer, Joseph Aberdale.....(413) 499-3050

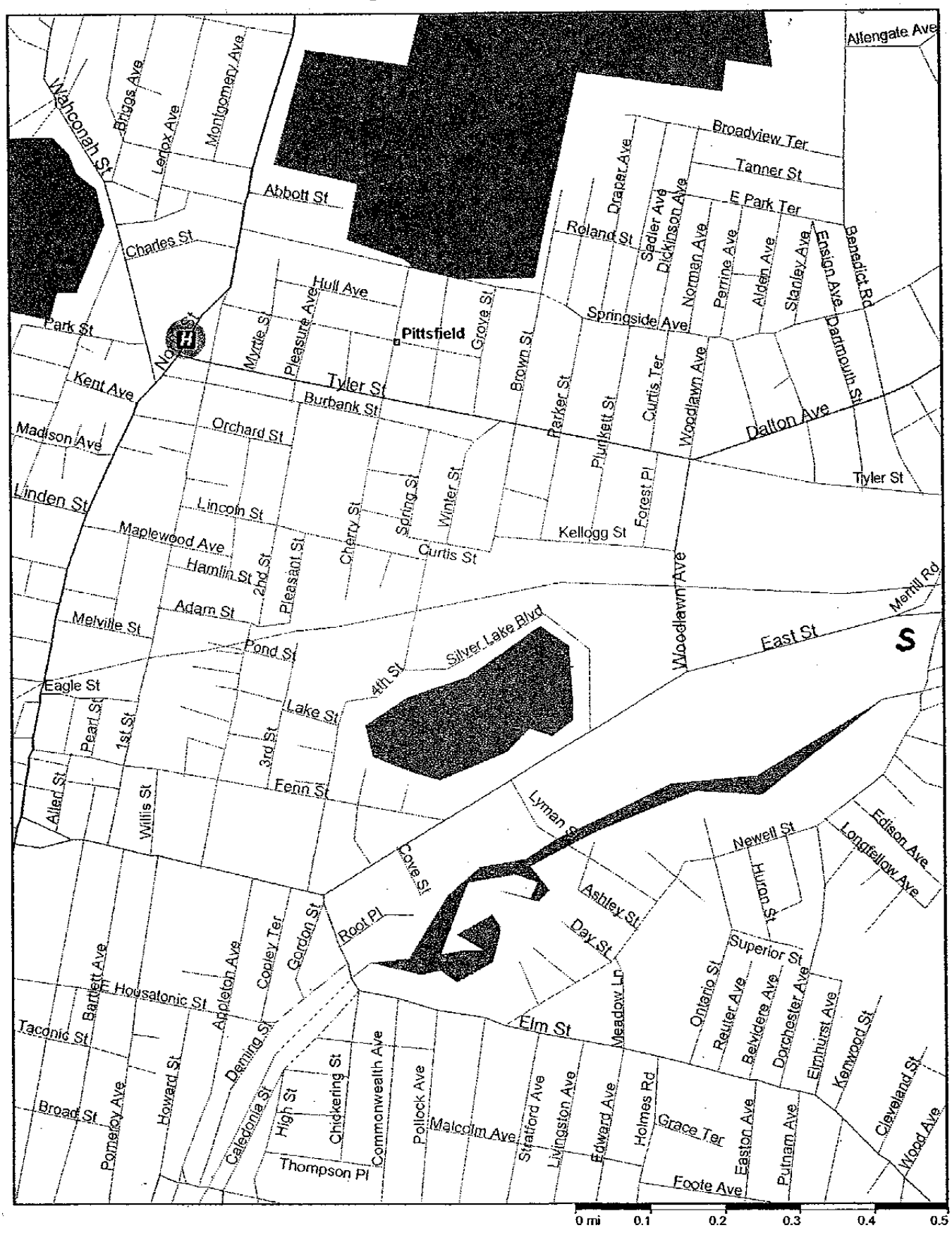
- GE's John Novotny.....(413) 494-3177
- GE Security.....(413) 448-4900

11.2 Hospital Directions

From East Street, Heading West:
Follow East Street to First Street, to just before rotary
Take Right onto First Street
Hospital, Berkshire Medical Center, will be down on the Left

Berkshire Medical Center
725 North Street
Pittsfield, MA

11.3 Map to Berkshire Medical Center



12.0 CONTINGENCY PLAN

Site personnel will conduct normal activities at the site as they were trained to do. In the event conditions at the site change, personnel might be required to modify their behavior to ensure continued safety. Change in status of operating conditions or activities at the site warrants implementation of the Contingency Plan. The Site Supervisor or senior site staff member has authority to implement the Contingency Plan. The Contingency Plan is intended to provide guidance for ensuring the safety of human health and the environment during non-normal operating conditions at the facility.

12.1 Conditions for Implementation

Some of the conditions under which the Contingency Plan would be implemented are:

- Identification of a localized and containable fire
- Occurrence of a spill or material release
- Severe weather conditions
- Physical or chemical injury to a worker

12.2 Assessing the Risk

First and foremost, the HSO's initial reaction to any emergency is to protect human health and safety and then the environment. Secondarily, he will assess the nature of the emergency, the steps required to contain and treat the emergency, and any requirements for disposal that may result from containing and treating the situation.

The HSO must assess possible hazards to human health or the environment that may result from any emergency situation. This assessment must take into consideration both direct and indirect effects of the incident (e.g., the effects of toxic, irritating, or asphyxiating gases that are generated).

12.3 Identifying the Hazards

The HSO will assess the possible hazards to human health or the environment that may result from the release, fire, explosion, or severe weather conditions. He will follow this procedure to make this assessment:

1. Identify the materials involved in the incident
2. Consult the MSDSs to determine the potential effects of exposure/release, and appropriate safety precautions
3. Identify the exposure and/or release pathways and the quantities of materials involved

Based on this assessment, the HSO will determine what risk is posed to personnel at the site and neighboring populations. If the incident cannot be controlled by operating personnel

without incurring undue risk, the HSO will implement the emergency procedures. These procedures include the HSO notifying the appropriate governmental agencies and departments that a situation resulting in evacuation has occurred. Should emergency assistance in treating injuries or carrying out the evacuation be required, the HSO will request assistance of the appropriate parties.

If the HSO deems that humans outside of the site are at risk, he will notify the appropriate agencies and departments of the need or potential need to institute off-site evacuation procedures.

12.4 Contingency Procedures for Fire/Explosion

When fire or explosion appear imminent or have occurred, all normal activity related to the site will cease. The HSO will be responsible for performing a risk assessment of the severity of the situation and deciding whether the emergency event is or is not readily controllable with existing portable fire extinguishers or site equipment and materials at hand. Under no conditions will fire fighting be performed if there are risks to the well-being of operating personnel. Local fire departments will be contacted in all situations in which fires and/or explosions have occurred.

12.4.1 Site Evacuation

The decision to evacuate the site must be made quickly by the HSO. This decision must be based on:

- The extent of the fire
- The location of the fire
- The identity of materials involved in the fire
- Proximity of other materials to the fire
- Prevailing weather conditions

If the fire is readily containable (that is, it is small, not fed by combustible materials, is in an isolated area, and is not being fanned by winds), evacuation will not likely be required. Operations outside of the normal realm of activity, such as contained fire fighting, automatically trigger implementation of the Contingency Plan.

If the fire involves a quantity of combustible materials and is being fanned by winds, evacuation of the site might be required. Under these conditions, procedures discussed in this Section would be implemented.

12.5 Contingency Procedures for Spills or Material Release

If a hazardous waste spill or material release or process upset resulting in probable vapor release is noted, the Supervisors will immediately assess the magnitude and potential seriousness of the spill or release by reviewing:

- MSDSs for the material spilled or released
- The source of the release or spillage of hazardous material
- An estimate of the quantity released and the release rate
- The direction in which the spill or air release is moving
- Exposed personnel and possible resulting injuries or illnesses
- Fire or explosion potential
- Estimates of area under influence of the release

If the accident is determined to lie within the on-site emergency response capabilities, the Supervisors will immediately activate the necessary remedial action. Occurrence of a spill automatically triggers activation of the Spill Prevention Control and Countermeasure Plan, discussed in detail in Section 10.0 of this Plan.

If contaminated soil is spilled during handling, the soil will be returned to the Exclusion Zone. If the spill involves liquids, the spill will be cleaned up with use of absorbent materials. If the HSO believes the incident might be beyond the capabilities of the operating crew, he will immediately notify the appropriate off-site response teams and GE Representative.

In the event of an emergency spill or release, all personnel not involved with emergency response activity will immediately evacuate the area around the release. The spill or release area will be roped or otherwise blocked off.

12.6 Severe Weather Conditions

When a tornado is sighted in the area, when a tornado warning has been issued, or when a lightning storm occurs, the information will immediately be relayed to the HSO. The HSO will immediately institute emergency shutdown procedures in the case of a tornado sighting, and all personnel will proceed indoors after completing appropriate shutdown procedures. In the case of a tornado warning or lightning storm, all operations will be stopped and all personnel will stand by for emergency procedures. When the storm has passed, the Supervisors will conduct an inspection of all equipment to ensure its readiness for operation. If the Supervisor's inspection indicates a fire, explosion or release has occurred as the result of a severe weather condition, the procedures for those events will be followed.

Immediately after an emergency, the Supervisors will arrange for treatment, storage, or disposal of recovered wastes, contaminated soil, surface water, or any other contaminated materials.

After an emergency event, all emergency equipment will be cleaned for reuse. Before operations are resumed, the HSO will conduct an inspection of all safety equipment to make certain all equipment is fit for reuse. If the inspection indicates the need for repairs or replacement of equipment, such actions will be taken before activities are resumed. The GE Representative will be notified that post-emergency equipment maintenance has been performed and operations can be resumed.

12.6.1 Lightning

Workers will take necessary precautions during lightning storms to protect themselves from lightning strikes. If possible, workers will stay indoors in a metal structure or car. Workers in a wood or brick structure will avoid touching faucets, electrical equipment, and telephones. If someone is hit by lightning immediate medical attention will be sought, and CPR will be initiated if breathing and/or circulation has stopped.

12.6.2 Thunderstorms and Tornadoes

Site personnel will be aware of weather conditions and alert for thunderstorms and tornadoes. Work will continue during severe thunderstorm or tornado watches. Work will cease during thunderstorms, severe thunderstorm warnings or tornado warnings. During a tornado, personnel on-site will:

- evacuate office trailers or vehicles
- if outdoors, lie flat in a nearby ditch
- stay away from power poles, electrical appliances, and metal objects
- not try to outrun a tornado

12.7 Major Injury to Workers

Major injuries sustained by workers will require professional medical attention at a hospital. The HSO will immediately follow procedures in the Contingency Plan and summon an ambulance and hospital to which the injured worker will be transported. The hospital and ambulance should be advised of:

- The nature of the injury
- Whether the injured worker will be decontaminated prior to transport
- When and where the injury was sustained
- The present condition of the injured worker (e.g. conscious, breathing)

Emergency decontamination procedures will be implemented, if possible. The injured person will, at a minimum, be wrapped in a blanket to prevent spreading of contamination to the transport vehicle. An employee will accompany the injured worker to the hospital and will bring copies of applicable MSDSs.

12.8 Emergency Equipment

Emergency equipment is provided for the protection of at site personnel. MT will notify all their personnel of the location and function of each piece of emergency equipment. The Supervisor is responsible for ensuring that all emergency equipment is functioning properly and is readily available for use.

Emergency equipment includes:

- Portable fire extinguishers
- Brooms and shovels for cleanup of small-quantity soil spills
- Front-end loader for cleanup of large-quantity soil spills
- Absorbent materials for cleanup of liquid spills
- Containers for storage and disposal of contaminated absorbent
- Generator for emergency power and lighting

Fire extinguishers will be stationed at the following locations:

- One on each piece of equipment
- One in storage trailer

All extinguishers will comply with National Fire Code standards for portable fire extinguishers.

Spill or containment equipment located on the site includes:

- Loose dry absorbent
- Shovels - wooden handle, steel type.
- Brooms - wooden handle, push type.
- Leakproof containers for storage and disposal of contaminated absorbent materials.

12.9 Record Keeping

Any incidents that result in implementation of any aspect of the Contingency Plan will be reported immediately to GE. GE notification will indicate the nature of the incident that triggered implementation of the Contingency Plan, the date and time at which the plan was implemented, and the results of the implementation.

13.0 EVACUATION PLAN

Evacuation procedures are implemented when human health is in danger. If the HSO determines that a site incident (i.e. fire, explosion, etc.) requires evacuation of all on-site personnel, he will follow evacuation procedures. In establishing safe evacuation routes, the HSO will use the following guidelines:

- Evacuation routes will be in the predominantly upwind direction of the Exclusion Zone.
- Evacuation routes will be through the Decontamination Zone in order to decontaminate, if time allows, and to account for site personnel.
- Alternate routes will be established in case the primary route is blocked by fire, spill, etc. Alternate routes will not cross or overlap the primary routes.
- Mobility constraints of personnel wearing protective clothing and equipment will be considered.
- All site personnel will be clearly aware of evacuation routes.

13.1 Record Keeping

Any incidents that require implementation of the Evacuation Plan will be immediately reported to GE. GE will be notified to the nature of the incident that triggered the evacuation, and the extent to which evacuation was conducted (e.g., only site personnel or project and surroundings). The date and time at which the evacuation was implemented and the duration for which the site was abandoned will also be incorporated into the report. At a minimum, the following will be included in the report:

- Chronological history and facts of the incident
- Titles and names of personnel
- Actions, decisions, and orders to whom, by whom, when, and results
- Types of samples and test results taken
- Possible exposure to site personnel

Attachment 1

Maxymillian Technologies, Inc.

Outline of HAZWOPER 40-Hour Training Curriculum

EMERGENCY RESPONSE TECHNOLOGIES
246 Pomeroy Avenue
Pittsfield, MA 01201

AGENDA

Hazardous Waste Site Worker
40 Hour Training Program

I. Introduction
- Regulatory Agencies
- Regulations
- Liability

II. Hazards
- Chemical exposure
- Fire & explosion
- Oxygen deficiency
- Ionizing radiation
- Biological hazards
- Safety hazards
- Electrical Hazards
- Heat Stress
- Cold exposures
- Noise

III. Planning & Organization
- Organizational structure
- Work plan
- Site safety plan
- Safety meetings & inspections

IV. Chemistry & Physics of Hazardous Materials
- Basic chemistry
- D.O.T. chemical classifications
- Material Safety Data Sheets
- D.O.T. Emergency Response Guidebook

V. Toxicology
- Dosage, routes of exposure, toxic effects, immediately dangerous to life or health (IDLH), values, permissible exposure limits (PEL), recommended exposure limits (REL), threshold limit values (TLV)

VI. Medical Program
- Pre-employment screening
  - Determination of fitness for duty
  - Baseline data for future exposures
- Periodic medical examinations
- Termination examinations
- Emergency treatment
- Non-emergency treatment
- Documentation of exposures
- Medical Records

VII. Site Control
- Site map
- Site work zones
  - Exclusion zone, (Hot)
  - Contamination reduction zone, (Warm)
  - Support zone, (Cold)
- Buddy system
- Site security
- Communications
- Safe work practices

VIII. Air Monitoring
- Monitoring equipment
  - Functions
  - Capabilities
  - Selection
  - Use
  - Limitations
  - Maintenance
- Site monitoring
  - IDLH & other dangerous conditions
  - General on-site monitoring
  - Periodic monitoring

IX. Personal Protective Equipment
- Respiratory protection
  - Air purifying respirators
  - Supplied air respirators
  - Self contained breathing apparatus
- Protective clothing & accessories
  - Selection
  - Permeation, degradation, & penetration
  - Heat stress
  - Levels of protection (A, B, C, D)

X. Handling Drums and Other Containers
- Inspection
- Planning
- Handling

XI. Decontamination
- Decontamination plan
- Prevention
- Types of contamination
- Decontamination methods
  - Physical removal
  - Chemical removal
- Decontamination facility design
- Decontamination equipment selection
- Disposal methods
- Emergency decontamination

XII. Site Emergencies
- Planning
- Personnel
  - On-site
  - Off-site
  - Federal Response Organizations
- Training
- Emergency recognition & prevention
- Communications
  - Internal
  - External
- Site mapping
- Safe distances & refuge
  - Safe distance
  - Public evacuation
  - Refuges (safety stations)
- Site security and control
- Evacuation routes & procedures
- Decontamination
- Equipment
- Medical treatment/First aid
- Emergency response procedures
  - Notification
  - Size up
  - Rescue response action
  - Follow up
- Documentation

XIII. First Aid & Cardiopulmonary Resuscitation (CPR)
- National Safety Council, Level 1 First Aid
- National Safety Council, Adult CPR

XIV. Confined Space Entry
- Permit required confined spaces
- Confined space entry
- Confined space rescue procedures

Attachment 2

Maxymillian Technologies, Inc.

OSHA First Report of Injury Form

OSHA's Form 301
Injury and Illness Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary,* these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by _____

Title _____

Phone (____) _____ - _____ **Date** ___/___/___

Information about the employee

1) Full name _____

2) Street _____

City _____ State _____ ZIP _____

3) Date of birth ___/___/___

4) Date hired ___/___/___ > (Office Use)

5) ☐ Male
☐ Female

Information about the physician or other health care professional

6) Name of physician or other health care professional _____

_____

7) If treatment was given away from the worksite, where was it given?

Facility _____

Street _____

City _____ State _____ ZIP _____

8) Was employee treated in an emergency room?
☐ Yes
☐ No

9) Was employee hospitalized overnight as an in-patient?
☐ Yes
☐ No

9a) Was there blood or body fluid?
☐ Yes (Anyone exposed to blood should file a
☐ No report with field coordinator immediately)

Information about the case

(Office Use)

10) Case number from the *Log* _____ *(Transfer the case number from the Log after you record the case.)*

11) Date of injury or illness ___/___/___

12) Time employee began work _____ AM / PM

13) Time of event _____ AM / PM ☐ Check if time cannot be determined

14) ***What was the employee doing just before the incident occurred?*** Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. *Examples:* "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

15) ***What happened?*** Tell us how the injury occurred. *Examples:* "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."

16) ***What was the injury or illness?*** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or sore." *Examples:* "strained back"; "chemical burn, hand"; "carpa tunnel syndrome."

17) ***What object or substance directly harmed the employee?*** *Examples:* "concrete floor"; "chlorine"; "radial arm saw." *If this question does not apply to the incident, leave it blank.*

18) ***If the employee died, when did death occur?*** Date of death ___/___/___

Appendix A

Maxymillian Technologies Inc.

Checklists and Inspection Forms

Safety and Emergency Equipment Checklist
Form A-1

Inspector:_____ **Date:**_____

Title:_____ **Time:**_____

Equipment	Types of Problems	Status	Remedial Actions
Fire extinguisher	seals, pressure, access	_____	_____
Alarms	horn damage	_____	_____
SCBA	air supply, damaged	_____	_____
Respirators	cartridges, damaged	_____	_____
Face shields, goggles, glasses	low stock, damaged	_____	_____
Hard hats	low stock, damaged	_____	_____
Boots	low stock, damaged	_____	_____
Gloves	low stock, damaged	_____	_____
Protective clothes	low stock, damaged	_____	_____
Eyewash stations	low liquid	_____	_____
First Aid kits	low stock	_____	_____
Emergency lights	battery or bulb failure	_____	_____

Safety Inspection Checklist
Form A-2

Item	Satisfactory	Not Satisfactory
Personal protective equipment		
Safety glasses/goggles/face shields	_____	_____
Gloves	_____	_____
Boots	_____	_____
Respirators	_____	_____
Protective clothing	_____	_____
Safety Equipment		
Eye protection	_____	_____
Hearing protection	_____	_____
Head protection	_____	_____
Foot protection	_____	_____
Skin protection	_____	_____
Respiratory protection	_____	_____
Electrical		
Lighting	_____	_____
Grounding	_____	_____
Insulation	_____	_____
Loose wires	_____	_____
Emergency lighting	_____	_____
Makeshift wiring	_____	_____
Approved equipment for hazardous classification	_____	_____
First Aid		
Eyewash station	_____	_____
First Aid kit	_____	_____
Adequately trained personnel	_____	_____

Item	Satisfactory	Not Satisfactory
Employee Instruction		
Protective equipment	_____	_____
Proper lifting procedures	_____	_____
Smoking area	_____	_____
Evacuation procedures	_____	_____
Decontamination	_____	_____
Horseplay	_____	_____
Rest area	_____	_____
Lunch area	_____	_____
Material Handling Equipment		
Cables, ropes, chains, etc.	_____	_____
Front-end loader	_____	_____
Crane	_____	_____
Crusher/Shredder	_____	_____
Screen	_____	_____
Machinery		
Protective guards or covers	_____	_____
Leak		
Rotation	_____	_____
Lubrication	_____	_____
Grounding	_____	_____
Other	_____	_____
Housekeeping		
Tripping hazards	_____	_____
Trash	_____	_____
Loose material	_____	_____
Storage of flammable materials	_____	_____
Leaks	_____	_____
Unobstructed access	_____	_____

Item	Satisfactory	Not Satisfactory
Material Storage		
Venting	_____	_____
Labeling	_____	_____
Material compatability	_____	_____
Container integrity	_____	_____
Open flames	_____	_____
Sparks	_____	_____
Lockout/Tagout Procedures	_____	_____
Health and Saftey Plan on Site	_____	_____

Employee Signature: _____ **Date:**_____

Supervisor Signature: _____ **Date:**_____

Inspector Signature: _____ **Date:**_____

Construction Equipment Inspection Sheet
Form A-3

Inspector:_____ **Date:**_____

Title:_____ **Time:**_____

Equipment	Types of Problems	Status	Observations/ Remedial Actions
Backhoe #__	cab glass missing	_____	_____
	no backup signal	_____	_____
	no parking brake	_____	_____
	brakes soft	_____	_____
	hydraulic problem	_____	_____
	no seat belt	_____	_____
Crane # ___	cab glass missing	_____	_____
	no backup signal	_____	_____
	no parking brake	_____	_____
	brakes soft	_____	_____
	hydraulic problem	_____	_____
	no seat belt	_____	_____
Bulldozer # ___	cab glass missing	_____	_____
	no backup signal	_____	_____
	no parking brake	_____	_____
	brakes soft	_____	_____
	hydraulic problem	_____	_____
	no seat belt	_____	_____
Front-End Loader # ___	cab glass missing	_____	_____
	no backup signal	_____	_____
	no parking brake	_____	_____
	brakes soft	_____	_____
	hydraulic problem	_____	_____
	heater broken	_____	_____
	defroster broken	_____	_____
	no seat belt	_____	_____

Toolbax Safety Meeting
Form A-4

Location:	**Job Number:**
Time:	**Conducted By:**
Meeting Date:	**Safety Topic:**

Personnel Attending

Name	Signature

Topics Covered/Comments:

Appendix B

Maxymillian Technologies, Inc.

Material Safety Data Sheets

The following is a list of MSDSs for materials, which may be on site or may be brought to the site. Additional MSDSs will be added as necessary.

List of MSDSs

Acetylene
Oxygen
Portland Cement
Propane
PCBs
Mobil Automotive Gasoline
Mobil Diesel Fuels
Mobil Delvac 1310
Mobil Delvac 1330
Mobil Delvac 1300 Super 15W-40
Mobil Hydraulic Oil AW 46
Mobilfluid 424
Mobilgrease XHP 222 Special
Mobilgrease Moly 52
Mobil Multipurpose ATF
Windshield Washer Antifreeze Premix; Monson Chemicals
Antifreeze and Summer Coolant (Permanent); Houghton Chemical Co.
Airline System Antifreeze; Power Service Products, Inc.
Thrust Quick Starting Fluid; Radiator Specialty Co.
Diesel Fuel Supplement; Power Service Products, Inc.
WD-40; WD-40 Company
Spray Marking Paint: orange, blue, white; Rust-Oleum Corp.

Praxair™ Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Acetylene, Dissolved (MSDS No. P-4559-G)	Trade Name:	Acetylene
Chemical Name:	Acetylene	Synonyms:	Acetylen, Ethine, Ethyne, Narcylene
Formula:	C_2H_2	Chemical Family:	Alkyne
Telephone:	Emergencies: 1-800-645-4633* CHEMTREC 1-800-424-9300* Routine: 1-800-PRAXAIR	Company Name:	Praxair, Inc. 39 Old Ridgebury Road Danbury CT 06810-5113

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).*

2. Composition / Information on Ingredients

This section covers materials of manufacture only. See sections 10 and 16 for information on by-products generated during use, especially use in welding and cutting.

INGREDIENT NAME	CAS NUMBER	PERCENTAGE	OSHA PEL	ACGIH TLV-TWA**
Acetylene	74-86-2	>99%*	None currently established	Simple asphyxiant

**The symbol ">" means "greater than."*

***Acetylene cylinders are filled with a porous material containing acetone (CAS 67-64-1) into which the acetylene is dissolved. ACGIH (1997) has established a TLV-TWA of 500 ppm for acetone and a STEL of 750 ppm.*

3. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Flammable gas under pressure.
Can form explosive mixtures with air.
Fusible plugs in top, bottom or valve melt at 208-220°F (98-104°C).
Do not discharge at pressures above 15 psig (103 KPa).
May cause dizziness and drowsiness.
Self-contained breathing apparatus may be required by rescue workers.
Odor: garlic-like.

THRESHOLD LIMIT VALUE: Simple asphyxiant (ACGIH, 1997). ACGIH recommends a TLV-TWA of 5 mg/m³ for welding fumes not otherwise classified (NOC) that may be generated during welding with this product. TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations. See section 16 for more information on welding hazards.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION–Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, nausea, vomiting, and unconsciousness. The vapor from a liquid release may also cause incoordination, and abdominal pain; effects may be delayed. Lack of oxygen can kill.

SKIN CONTACT–No harmful effect expected from vapor. Liquid (acetone) may cause frostbite.

SWALLOWING–An unlikely route of exposure, but frostbite of the lips and mouth may result from contact with the liquid (acetone). If swallowed, the liquid may cause nausea.

EYE CONTACT–Vapor containing acetone may irritate the eyes. Liquid may irritate and cause frostbite.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No harm expected.

OTHER EFFECTS OF OVEREXPOSURE: Acetylene is an asphyxiant. Lack of oxygen can kill.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: The toxicology and the physical and chemical properties of acetylene suggest that overexposure is unlikely to aggravate existing medical conditions.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None known.

CARCINOGENICITY: Acetylene is not listed by NTP, OSHA, or IARC.

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: For exposure to liquid, flush with water and warm frostbite area with warm water [not to exceed 105°F (41° C)]. In case of massive exposure, remove clothing while showering with warm water. Call a physician.

SWALLOWING: If liquid is swallowed, do not induce vomiting. Call a physician.

EYE CONTACT: In case of splash contamination, immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Urgently seek the advice of a physician, preferably an ophthalmologist.

NOTES TO PHYSICIAN: Aspirated acetone may cause severe lung damage. If a large quantity of material has been swallowed, stomach contents should be evacuated quickly in a manner which avoids aspiration. Otherwise, treatment should be directed at the control of symptoms and the clinical condition. No specific antidote is known.

Product: Acetylene Form No.: P-4559-G Date: October 1997

5. Fire Fighting Measures

FLASH POINT (test method)	0°F (−17.8°C) T.C.C.	AUTOIGNITION TEMPERATURE	581°F (305°C) @ 1 atm	
FLAMMABLE LIMITS IN AIR, % by volume	LOWER	2.3%	UPPER	100%

EXTINGUISHING MEDIA: See paragraphs below.

SPECIAL FIRE FIGHTING PROCEDURES: Refer to CGA pamphlet SB-4, Handling Acetylene Cylinders in Fire Situations.

DANGER! Flammable gas under pressure. Evacuate all personnel from danger area. Immediately cool cylinders with water spray from maximum distance taking care not to extinguish flames. Remove ignition sources if without risk. If flames are accidentally extinguished, explosive re-ignition may occur. Use self-contained breathing apparatus. Stop flow of gas if without risk while continuing cooling water spray. Remove all cylinders from area of fire if without risk. Allow fire to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable gas. Forms explosive mixtures with air and oxidizing agents. Heat of fire can build pressure in cylinder and cause it to rupture. All cylinders are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature. No part of a cylinder should be subjected to a temperature higher than 125°F°(52 C).

If venting or leaking acetylene catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive re-ignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with approved explosion meter.

HAZARDOUS COMBUSTION PRODUCTS: Carbon monoxide, carbon dioxide

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
DANGER! Flammable gas under pressure. Forms explosive mixtures with air. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off flow if without risk. Ventilate area or move leaking cylinder to well-ventilated area. Flammable gas may spread from leak. Before entering area, especially confined areas, check atmosphere with an appropriate device.

WASTE DISPOSAL METHOD: Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. Separate acetylene cylinders from oxygen and other oxidizers by at least 20 feet or use a barricade of non-combustible material. This barricade should be at least 5 feet high and have a fire resistance rating of at

least ½ hour. Storage in excess of 2,500 cu ft is prohibited in buildings with other occupancies. Firmly secure cylinders upright to keep them from falling or being knocked over. Acetylene cylinders designed to accept a valve protection cap must be provided with a cap. Screw cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. All piped acetylene systems and associated equipment must be grounded. Electrical equipment must be non-sparking or explosion-proof. Leak check with soapy water; never use a flame. Never use copper piping for acetylene service; use only steel or wrought iron. Open acetylene cylinder valves the minimum amount required for acceptable flow; this will allow you to close valves as quickly as possible in an emergency. Do not open acetylene cylinder valves more than 1½ turns. Never use acetylene at pressures exceeding 15 psig. Acetylene cylinders are heavier than other cylinders because they are packed with a porous material and acetone. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. For other precautions in using acetylene, see section 16.

When using acetylene in welding and cutting, read and understand the manufacturer's instructions and the precautionary labels on the products. See American National Standards Institute (ANSI) Z49.1 *Safety in Welding and Cutting* published by the American Welding Society, PO Box 351040, Miami FL 33135 and National Fire Protection Association (NFPA) 51, *Oxygen Fuel Gas Welding and Cutting*.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST–Use a local exhaust system, if necessary, to prevent oxygen deficiency and keep hazardous fumes and gases below applicable TLVs in the worker's breathing zone.

MECHANICAL (general)–General exhaust ventilation may be acceptable if it can maintain an adequate supply of air and keep hazardous fumes and gases below the applicable TLVs in the worker's breathing zone.

SPECIAL–None

OTHER–None

RESPIRATORY PROTECTION: Use air-purifying or air-supplied respirators, as appropriate, where local or general exhaust ventilation is inadequate. Adequate ventilation must keep worker exposure below applicable TLVs for fumes, gases and other by-products of welding with acetylene. See sections 3, 10, and 16 for details. An air-supplied respirator must be used in confined spaces. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

SKIN PROTECTION: Wear work gloves when handling cylinders; welding gloves for welding and cutting.

EYE PROTECTION: Wear goggles with filter lenses selected as per ANSI Z49.1. Provide protective screens and goggles, if necessary, to protect others. Select as per OSHA 29 CFR 1910.33. For welding, see section 16.

OTHER PROTECTIVE EQUIPMENT: As needed, wear hand, head, and body protection which help to prevent injury from radiation, and sparks. See ANSI Z49.1. At a minimum this includes welder's gloves and protective goggles, and may include arm protectors, aprons, hats, shoulder protection, as well as substantial clothing. For welding, see section 16. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT: 26.04	**EXPANSION RATIO:** Not applicable
SPECIFIC GRAVITY (air=1): At 70°F (21.1°C) and 1 atm: 0.906	**SOLUBILITY IN WATER:** vol/vol at 32°F (0°C) at 1 atm: 1.7
GAS DENSITY: At 32°F (0°C) and 1 atm: 0.07314 lb/ft^3 (1.1716 kg/m^3)	**VAPOR PRESSURE:** AT 70°F (21.1°C): 635 psig (4378 kPa)
PERCENT VOLATILES BY VOLUME: 100	**EVAPORATION RATE (Butyl Acetate=1):** Gas, not applicable
BOILING POINT (10 psig/68.9 kPa): -103.4°F (-75°C)	**pH:** Not applicable

MELTING POINT (10 psig/68.9 kPa): -116°F (-82.2°C)

APPEARANCE, ODOR, AND STATE: Colorless gas. Acetylene of 100% purity is odorless, but commercial acetylene has a distinctive garlic-like odor.

10. Stability and Reactivity

STABILITY:	Unstable	X*	Stable	

*Acetylene is stable as shipped. Avoid use at pressures above 15 psig.

INCOMPATIBILITY (materials to avoid): Copper, silver, mercury, or their alloys; oxidizing agents; acids; halogens; moisture.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition or burning may produce CO/CO_2H_2. The welding and cutting process may form reaction products such as carbon monoxide and carbon dioxide. Other decomposition products of normal operation originate from the volatilization, reaction or oxidation of the material being worked.

HAZARDOUS POLYMERIZATION:	May Occur		Will Not Occur	X

CONDITIONS TO AVOID: Elevated temperature and pressure and/or the presence of a catalyst.

11. Toxicological Information

Acetylene is a simple asphyxiant.

12. Ecological Information

No adverse ecological effects expected. Acetylene does not contain any Class I or Class II ozone-depleting chemicals. Acetylene is not listed as a marine pollutant by DOT.

Product: Acetylene Form No.: P-4559-G Date: October 1997

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier. For emergency disposal, secure cylinder in a well-ventilated area or outdoors, then slowly discharge gas to the atmosphere.

14. Transport Information

DOT/IMO SHIPPING NAME: Acetylene, dissolved	**HAZARD CLASS:** 2.1
IDENTIFICATION NUMBER: UN 1001	**PRODUCT RQ:** Not applicable
SHIPPING LABEL(s): FLAMMABLE GAS	**PLACARD (When required):** FLAMMABLE GAS

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (Environmental Protection Agency)

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: Superfund Amendment and Reauthorization Act:

- **SECTIONS 302/304:** Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):

  Threshold Planning Quantity (TPQ): None.
  Extremely Hazardous Substances (40 CFR 355): None.

- **SECTIONS 311/312:** Require submission of Material Safety Data Sheets (MSDSs) and chemical inventory reporting with identification of EPA hazard categories. The hazard categories for this products are as follows:

  IMMEDIATE: No PRESSURE: Yes
  DELAYED: No REACTIVITY: Yes
  FIRE: Yes

[illegible]
[illegible] CF[illegible] isk M[illegible]ent Pr[illegible] for Ch[illegible] Accide[illegible] elease [illegible]evention: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Acetylene is listed as a regulated substance in quantities of 10,000 pounds (4,553 kg) or greater.

TSCA: Toxic Substance Control Act: Acetylene is listed on the TSCA inventory.

OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION):

29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Acetylene is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable gas on site in one location, in quantities of 10,000 pounds (4,533 kg) or greater is covered under this regulation unless the gas is used as fuel.

STATE REGULATIONS:

CALIFORNIA: This product is not listed by California under the Safe Drinking Water Toxic Enforcement Act of 1986 (Proposition 65).

PENNSYLVANIA: This product is subject to the Pennsylvania Worker and Community Right-To-Know Act (35 P.S. Sections 7301-7320).

16. Other Information

ADDITIONAL SAFETY AND HEALTH HAZARDS: Using acetylene in welding and cutting my create additional hazards:

FUMES AND GASES can be dangerous to your health and may cause serious lung disease.

- **Keep your head out of fumes. Do not breathe fumes and gases. Use enough ventilation, local exhaust, or both to keep fumes and gases from your breathing zone and the general area. Short term overexposure to fumes may result in dizziness, nausea, dryness or irritation of nose, throat, and eyes or other similar discomfort.**

Fumes and gases cannot be classified simply. The amount and type depend on the metal being worked and the process, procedure, equipment, and supplies used. Possible dangerous materials may be found in fluxes, electrodes, and other materials. Get a Material Safety Data Sheet (MSDS) for every material you use.

Contaminants in the air may add to the hazard of fumes and gases. One such contaminant, chlorinated hydrocarbon vapors from cleaning and degreasing activities, poses a special risk.

- **Do not use electric arcs in the presence of chlorinated hydrocarbon vapors-highly toxic phosgene may be produced.**

Metal coatings such as paint, plating, or galvanizing may generate harmful fumes when heated. Residues from cleaning materials may also be harmful.

[illegible] the qu[illegible]nd co[illegible] mes a[illegible], you [illegible] air s[illegible]

By analyzing these samples, you can find out what respiratory protection you need. One recommended sampling method is to take air from inside the worker's helmet or from the worker's breathing zone. See ANSI/AWSF1.1, available from the American Welding Society, 550 N. W. Le Jeune Rd., Miami, FL 33126.

For other safe practices information and a more detailed description of the health hazards of welding and their consequences, see your welding products supplier.

NOTES TO PHYSICIAN:

Acute: Gases, fumes, and dusts may cause irritation to the eyes, lungs, nose , and throat. Some toxic gases associated with welding and related processes may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty breathing, frequent coughing, or chest pains.

Chronic: Protracted inhalation of air contaminants may lead to their accumulation in the lungs, a condition that may be seen as dense areas on chest x-rays. The severity of change is proportional to the length of exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on x-rays may be caused by non-work-related factors such as smoking, etc.

PROTECTIVE CLOTHING AND EQUIPMENT FOR WELDING OPERATIONS:

PROTECTIVE GLOVES: Wear welding gloves.

EYE PROTECTION: Wear a helmet or use a face shield with a filter lens. Select lens per ANSI Z49.1. Provide protective screens and flash goggles if needed to protect others; select per OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Wear hand, head, and body protection. (See ANSI Z49.1). Worn as needed, these help prevent injury from radiation, sparks, and electrical shock. Minimum protection includes welder's gloves and a face shield. For added protection consider arm protectors, aprons, hats, shoulder protection, and dark, substantial clothing.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: ***Arcs and sparks can ignite combustible materials.*** Prevent fires. Refer to NFPA 51B, "Cutting and Welding Processes." ***High pressure gas.*** Use piping and equipment adequately designed to withstand pressures to be encountered. Acetylene systems should be installed only by persons knowledgeable of the unique properties of acetylene and trained and experienced in such installation. ***Keep away from heat, sparks, and open flame.*** Use only spark-proof tools and explosion-proof equipment. ***In choosing tools and equipment, avoid materials incompatible with acetylene.*** Copper, silver and mercury; their salts, compounds, and high-concentration alloys can form explosive compounds with acetylene. Brass containing less than 65% copper and certain nickel alloys are generally acceptable for use in acetylene service, but may not be adequate if high corrosion or excess moisture is present. ***Prevent reverse flow.*** Use a check valve or other protective device in any line or piping from the cylinder. ***Gas can cause rapid suffocation*** due to oxygen deficiency. Store and use with adequate ventilation. Close valve after each use; keep closed even when empty. ***Do not strike an arc on the cylinder.*** The defect produced by an arc burn could lead to cylinder rupture. ***Never work on a pressurized system.*** If there is a leak, close the cylinder valve. Blow the system

down in a safe and environmentally sound manner in compliance with all federal, state and local laws; then repair the leak. *Never ground a compressed gas cylinder or allow it to become part of an electrical circuit.*

Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, "Safety in Welding and Cutting," published by the American Welding Society and OSHA Publication 2206 (29 CFR 1910), U.S. Government Printing Office, Washington, DC 20402 for more details. For further safety and health information, ask your welding products supplier for manufacturer's safety publications.

Be sure to read and understand all labels and instructions supplied with all containers of this product.

MIXTURES: When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist, or other trained person when you evaluate the end product.

Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:		HMIS RATINGS:	
HEALTH	=1	HEALTH	=1
FLAMMABILITY	=4	FLAMMABILITY	=4
REACTIVITY	=3	REACTIVITY	=3
SPECIAL	SA (CGA recommends this to designate simple asphyxiant).		

STANDARD VALVE CONNECTIONS FOR U.S . AND CANADA:

THREADED:	The CGA-510 connection is standard for cylinders of greater than 50 cu ft capacity. For additional limited standard connections, see CGA Pamphlet V-1 listed below.
PIN-INDEXED YOKE:	Not applicable
ULTRA-HIGH-INTEGRITY CONNECTION:	Not applicable

Use the proper CGA connections. **DO NOT USE ADAPTERS.** See pamphlet CGA V-1 listed below.

Ask your supplier about free Praxair safety literature as referenced on the label for this product; you may also obtain copies by calling 1-800-PRAXAIR. Further information about acetylene can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

G-1.1	*Commodity Specification for Acetylene*
G-1	*Acetylene*
P-1	*Safe Handling of Compressed Gases in Containers*
SB-4	*Handling Acetylene Cylinders in Fire Situations*
SB-8	*Use of Oxy-fuel Gas Welding and Cutting Apparatus*
V-1	*Compressed Gas Cylinder Valve Inlet and Outlet Connections*

Praxair asks users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents and contractors of the information on this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR; Address: Praxair, Inc., PO Box 44 Tonawanda, NY 14150-7891).

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113

Praxair™ Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Oxygen (MSDS No. P-4638-D)	**Trade Name:**	Oxygen
Chemical Name:	Oxygen	**Synonyms:**	Not applicable
Formula:	O_2	**Chemical Family:**	Not applicable
Telephone:	**Emergencies:** 1-800-645-4633* CHEMTREC 1-800-424-9300* Routine: 1-800-PRAXAIR	**Company Name:**	Praxair, Inc. 39 Old Ridgebury Road Danbury CT 06810-5113

*Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

2. Composition / Information on Ingredients

For custom mixtures of this product request a Material Safety Data Sheet for each component. See Section 16 for important information about mixtures.

INGREDIENT NAME	CAS NUMBER	PERCENTAGE	OSHA PEL	ACGIH TLV-TWA
Oxygen	7782-44-7	>99%*	None currently established	None currently established

"The symbol ">" means "greater than."

3. Hazards Identification

EMERGENCY OVERVIEW

WARNING! High-pressure, oxidizing gas. Vigorously accelerates combustion. Self-contained breathing apparatus may be required by rescue workers. Odor: None.

THRESHOLD LIMIT VALUE: None currently established—ACGIH 1997 recommends a TLV-TWA of 0.5 mg/m³ for welding fumes not otherwise classified (NOC) that may be generated during welding with this product. See section 16 for more information on welding hazards.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION–Breathing 80% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain and breathing difficulty. Breathing oxygen at higher pressure increases the likelihood of adverse effects within a shorter time period. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects resulting in dizziness, poor coordination, tingling sensation, visual and hearing disturbances, muscular twitching, unconsciousness and convulsions. Breathing oxygen under pressure may cause prolongation of adaptation to darkness and reduced peripheral vision.

SKIN CONTACT–No harm expected.

SWALLOWING–This product is a gas at normal temperature and pressure.

EYE CONTACT–No harm expected.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No harm expected.

OTHER EFFECTS OF OVEREXPOSURE: See section 11, Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: See section 11, Toxicological Information.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None known.

CARCINOGENICITY: Oxygen is not listed by NTP, OSHA, or IARC.

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. Keep victim warm and at rest. Call a physician. Advise the physician that the victim has been exposed to a high concentration of oxygen.SKIN CONTACT: No emergency care anticipated.

SWALLOWING: This product is a gas at normal temperature and pressure.

EYE CONTACT: No emergency care anticipated.

NOTES TO PHYSICIAN: Supportive treatment should include immediate sedation, anti-convulsive therapy if needed, and rest. See section 11, Toxicological Information.

5. Fire Fighting Measures

FLASH POINT (test method)	Not applicable		**AUTOIGNITION TEMPERATURE**	Not applicable	
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER**	Not applicable	**UPPER**	Not applicable	

EXTINGUISHING MEDIA: Vigorously accelerates combustion. Use media appropriate for surrounding fire. Water (e.g. safety shower) is the preferred extinguishing media for clothing fires.

SPECIAL FIRE FIGHTING PROCEDURES:
WARNING! High-pressure, oxidizing gas. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool, then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Oxidizing agent; vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion. Heat of fire can build pressure in cylinder and cause it to rupture. Oxygen cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) No part of a cylinder should be subjected to a temperature higher than

125F (52C). Smoking, flames, and electric sparks in the presence of enriched oxygen atmospheres are potential explosion hazards.

HAZARDOUS COMBUSTION PRODUCTS: None known.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
WARNING! High-pressure, oxidizing gas. Shut off flow if without risk. Ventilate area or move cylinder to well-ventilated area. Remove all flammable materials from vicinity. Oxygen must never be permitted to strike an oily surface, greasy clothes, or other combustible material.

WASTE DISPOSAL METHOD: Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation, away from oil, grease, and other hydrocarbons. Separate oxygen cylinders from flammables by at least 20 feet or use a barricade of noncombustible material. This barricade should be at least 5 feet high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. Never apply flame or localized heat directly to any part of the cylinder. High temperatures may damage the cylinder and could cause the pressure relief device to fail prematurely, venting the cylinder contents. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electrical circuit. For other precautions in using oxygen, see section 16.

Precautions when using oxygen in welding and cutting: Read and understand the manufacturer's instructions and the precautionary labels on the products. See American National Standards Institute (ANSI) Z49.1, *Safety in Welding and Cutting*, published by the American Welding Society, PO Box 351040, Miami, Florida 33135 and National Fire Protection Association (NFPA) 51, *Oxygen Fuel Gas Welding and Cutting*.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST–Use a local exhaust system, if necessary, to prevent increased oxygen concentration and, in welding, to keep hazardous fumes and gases below applicable TLVs in the worker's breathing zone.

MECHANICAL (general)–General exhaust ventilation may be acceptable if it can maintain a supply of air that is not too rich in oxygen and, during welding, can keep hazardous fumes and gases below the applicable TLVs in the worker's breathing zone.
SPECIAL–None
OTHER–None

RESPIRATORY PROTECTION: None required under normal use. However, air-supplied respirators are required while working in confined spaces with this product. For welding, use air-purifying or air-supplied respirators, as appropriate, where local or general exhaust ventilation is inadequate. Adequate ventilation must keep worker exposure below applicable TLVs for fumes, gases and other by-products of welding with oxygen. See sections 3, 10, and 16 for details. The respiratory protection used must conform with OSHA rules as specified in 29 CFR 1910.134.

SKIN PROTECTION: Wear work gloves when handling cylinders; welding gloves for welding. Gloves must be free of oil and grease.

EYE PROTECTION: Wear safety glasses when handling cylinders. For welding, wear goggles with filter lens selected as per ANSI Z49.1. Provide protective screens and goggles, if necessary, to protect others. Select as per OSHA 29 CFR 1910.33

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. As needed for welding, wear hand, head, and body protection to help prevent injury from radiation and sparks. (See ANSI Z49.1.) At a minimum this includes welder's gloves and protective goggles, and may include arm protectors, aprons, hats, shoulder protection, as well as substantial clothing. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT: 31.9988	**EXPANSION RATIO:** Not applicable
SPECIFIC GRAVITY (air=1): At 70°F (21.1°C) and 1 atm: 1.105	**SOLUBILITY IN WATER:** vol/vol at 32°F (0°C): 0.0491
GAS DENSITY: At 70°F (21.1°C) and 1 atm: 0.083279 lbs/ft³ (1.326 kg/m3)	**VAPOR PRESSURE:** AT 68°F (20°C): Not applicable
PERCENT VOLATILES BY VOLUME: 100	**EVAPORATION RATE (Butyl Acetate=1):** Gas, not applicable
BOILING POINT (1 atm): -297.33°F (182.96°C)	**pH:** Not applicable
FREEZING POINT (1 atm): -361.8°F (-218.78°C)	

APPEARANCE, ODOR, AND STATE: Colorless, odorless, tasteless gas at normal temperature and pressure.

10. Stability and Reactivity

STABILITY:	Unstable		Stable	X

7INCOMPATIBILITY (materials to avoid): Combustible materials, asphalt, flammable materials, especially oils and greases. Oxygen reacts with many materials. See NFPA 491M, *Manual of Hazardous Chemical Reactions* for details.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

HAZARDOUS POLYMERIZATION:	May Occur		Will Not Occur	X

CONDITIONS TO AVOID: None currently known.

11. Toxicological Information

At atmospheric concentration and pressure, oxygen poses no toxicity hazards. At high concentrations, newborn premature infants may suffer delayed retinal damage (retrolental fibroplasia) that can progress to retinal detachment and blindness. Retinal damage may also occur in adults exposed to 100% oxygen for extended periods (24 to 48 hours) or at greater than atmospheric pressure, particularly in individuals whose retinal circulation has been previously compromised. All individuals exposed for long periods to oxygen at high pressure and all who exhibit overt oxygen toxicity should have ophthalmologic examinations.

At two or more atmospheres, toxicity to the Central Nervous System (CNS) occurs. Symptoms include nausea, vomiting, dizziness or vertigo, muscle twitching, vision changes, and loss of consciousness and generalized seizures. At three atmospheres, CNS toxicity occurs in less than two hours; at six atmospheres, in only a few minutes.

Patients with chronic obstructive pulmonary disease retain carbon dioxide abnormally. If oxygen is administered, raising their blood oxygen concentration, their breathing becomes depressed and retained carbon dioxide rises to a dangerous level.

Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increases the susceptibility to toxicity from oxygen at high concentrations or pressures. Animal studies also indicate that vitamin E deficiency may increase susceptibility to oxygen toxicity.

Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the oxygen. Similarly, occlusion of the eustachian tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce vacuum-type headache.

12. Ecological Information

No adverse ecological effects expected. Oxygen does not contain any Class I or Class II ozone-depleting chemicals. Oxygen is not listed as a marine pollutant by DOT.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier. For emergency disposal, secure cylinder in a well-ventilated area or outdoors, then slowly discharge gas to the atmosphere.

14. Transport Information

DOT/IMO SHIPPING NAME: Oxygen, compressed	HAZARD CLASS: 2.2
IDENTIFICATION NUMBER: UN 1072	PRODUCT RQ: Not applicable

SHIPPING LABEL(s): OXYGEN. An oxygen label may be used for domestic shipment in the United States and Canada in place of the NONFLAMMABLE GAS and OXIDIZER labels (49 CFR Part 172).

PLACARD (When required): Nonflammable gas or oxygen

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.
Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (Environmental Protection Agency)

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: Superfund Amendment and Reauthorization Act:

- **SECTIONS 302/304:** Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):

  Threshold Planning Quantity (TPQ): None.
  Extremely Hazardous Substances (40 CFR 355): None.

- **SECTIONS 311/312:** Require submission of Material Safety Data Sheets (MSDSs) and chemical inventory reporting with identification of EPA hazard categories. The hazard categories for this products are as follows:

  IMMEDIATE: No
  DELAYED: No
  PRESSURE: Yes
  REACTIVITY: No
  FIRE: Yes

- **SECTION 313:** Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

  Oxygen does not require reporting under Section 313.

40 CFR 68: Risk Management Program for Chemical Accidental Release Prevention: Requires development and implementation of risk management programs at facilities that manufacture,

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ygen is not listed as a regulated substance.

TSCA: Toxic Substances Control Act: Oxygen is listed on the TSCA inventory.

OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION):

29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Oxygen is not listed in Appendix A as a highly hazardous chemical.

STATE REGULATIONS:

CALIFORNIA: This product is not listed by California under the Safe Drinking Water Toxic Enforcement Act of 1986 (Proposition 65).

PENNSYLVANIA: This product is subject to the Pennsylvania Worker and Community Right-To-Know Act (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

WARNING: Medical grades of Oxygen are subject to strict federal regulation, and are for use only under the control of a licensed physician or clinician, familiar with the product and its hazards.

ADDITIONAL SAFETY AND HEALTH HAZARDS: *High-pressure, oxydizing gas.* Clean all gauges, valves, regulators, piping, and equipment to be used in oxygen service in accordance with CGA pamphlet G-4.1. Keep cylinders and their valves free of oil and grease. Use piping and equipment adequately designed to withstand pressures to be encountered. Close cylinder valve after each use; keep closed even when empty. *Never use oxygen as a substitute for compressed air.* Never use an oxygen jet for cleaning purposes of any sort, especially for clothing. Oxygen increases the likelihood of an engulfing fire. *Prevent reverse flow.* Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. *Never work on a pressurized system.* If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state and local laws; then repair the leak. *Never ground a compressed gas cylinder or allow it to become part of an electrical circuit.*

Personnel who have been exposed to high concentrations of oxygen should stay in a well-ventilated or open area before going into a confined space or near an ignition source.

SPECIAL PRECAUTIONS: *Use in welding and cutting.* Read and understand the manufacturer's instructions and the precautionary label on the product. See American Standard Z49.1, Safety in Welding and Cutting, published by the American Welding Society, PO Box 351040, Miami, FL 33135, and OSHA Publication 2206 (29CFR 1910), US Government Printing Office, Washington, DC 20402, for more information.

Arcs and sparks can ignite combustible materials. Prevent fires. Refer to NFPA 51B, "Cutting and Welding Processes." *Do not strike an arc on the cylinder.* The defect produced by an arc burn could lead to cylinder rupture.

Praxair asks users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents and contractors of the information on this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

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Consult industrial ist, or ined p hen ye ate th odur our,
gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:		HMIS RATINGS:	
HEALTH	= 0	HEALTH	= 0
FLAMMABILITY	= 0	FLAMMABILITY	= 0
REACTIVITY	= 0	REACTIVITY	= 0
SPECIAL	= OX (Oxidizer)		

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	0-3000 psig	CGA-540
	3001-4000 psig	CGA-577
	4001-5500 psig	CGA-701
PIN-INDEXED YOKE:	0-3000 psig	CGA-870 (Medical Use)
ULTRA-HIGH-INTEGRITY CONNECTION:	0-3000 psig	CGA-714

Use the proper CGA connections. DO NOT USE ADAPTERS.

Ask your supplier about free Praxair safety literature as referenced on the label for this product; you may also obtain copies by calling 1-800-PRAXAIR. Further information about oxygen can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

- AV-1 *Safe Handling and Storage of Compressed Gases*
- AV-8 *Characteristics and Safe Handling of Cryogenic Liquid and Gaseous Oxygen*
- G-4.3 *Commodity Specification for Gaseous and Liquid Oxygen*
- G-4.1 *Cleaning Equipment for Oxygen Service*
- G-4.3 *Commodity Specification for Oxygen*
- P-1 *Safe Handling of Compressed Gases in Containers*
- P-2 *Characteristics and Safe Handling of Medical Gases*
- P-14 *Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres*
- SB-2 *Oxygen-Deficient Atmospheres*
- SB-8 *Use of Oxy-Fuel Gas Welding and Cutting Apparatus*
- V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
- — *Handbook of Compressed Gases, Third Edition*

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

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PRAXAIR

Praxair, Inc.
39 Old Ridgebury Road
Danbury CT 06810-5113

Section 1- IDENTIFICATION

Product name

Iron Clad Portland Cement - Type I, Type II, Type III and Block

MSDS Information

This MSDS was produced in February 2000 and replaces any prior versions.

Product code

CAS# 65997-15-1

Chemical family

Calcium compounds. Calcium silicate compounds and other calcium compounds containing iron and aluminum make up the majority of this product. Major compounds:

$3CaO \cdot SiO_2$ .....Tricalcium silicate

$2CaO \cdot SiO_2$ .....Dicalcium silicate

$3CaO \cdot Al_2O_3$ .....Tricalcium aluminate

$4CaO \cdot Al_2O_3 \cdot Fe_2O_3$ .....Tetracalcium aluminoferrite

$CaSO_4 \cdot 2H_2O$ .....Calcium sulfate dihydrate or Gypsum

Chemical name and synonyms

Portland cement. Portland cement is also known as hydraulic cement.

Formula

This product consists of finely ground portland cement clinker mixed with a small amount of calcium sulfate dihydrate (gypsum).

Manufacturer

Glens Falls Lehigh Cement Company
313 Lower Warren Street
Glens Falls, New York 12801

Telephone Number (518) 792-1137

Section 2- COMPONENTS

Hazardous Ingredients

Portland cement (CAS# 65997-15-1) - approximately 94-97% by weight
ACGIH TLV-TWA (1995-1996) = 10 mg total dust/m^3
OSHA PEL (8-hour TWA) =50 million particles/ft^3

Gypsum (CAS# 7778-18-9) - approximately 3-6% by weight
ACGIH TLV-TWA(1995-1996) = 10 mg total dust/m^3
OSHA PEL (8-hour TWA) = 10 mg total dust/m^3
OSHA PEL (8-hour TWA) =5 mg respirable dust/m^3

Quartz (CAS# 14808-60-7) - less than 0.1% by weight
ACGIH TLV-TWA (1995-1996) =0.10 mg respirable quartz dust/m^3
OSHA PEL (8-hour TWA) (10 mg of respirable dust/m^3)/(percent silica + 2)
NIOSH REL (8-hour TWA) =0.05 mg respirable quartz dust/m^3

Trace Elements

Portland cement is made from materials mined from the earth and is processed using energy provided by fuels. Trace amounts of naturally occurring, potentially harmful chemicals might be detected during chemical analysis. For example, portland cement may contain up to 0.75% insoluble residue, some of which may be free crystalline silica. Other trace constituents may include calcium oxide (also known as free lime or quick lime), free magnesium oxide, potassium and sodium sulfate compounds, chromium compounds, and nickel compounds.

Section 3- HAZARDS IDENTIFICATION

Emergency Overview

Portland cement is a light gray powder that poses little immediate hazard. A single short term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement.

Potential Health Effects

- **Relevant Routes of Exposure:**
  Eye contact, skin contact, inhalation, and ingestion.
- **Effects resulting from eye contact:**
  Exposure to airborne dust may cause immediate or delayed irritation or inflammation.

  Eye contact by larger amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns and blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.
- **Effects resulting from skin contact:**
  Discomfort or pain cannot be relied upon to alert a person to a hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing skin contact, particularly contact with wet cement. Exposed persons may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

  Exposure to dry portland cement may cause drying of the skin with consequent mild irritation or more significant effects attributable to aggravation of other conditions. Dry portland cement contacting wet skin or exposure to moist or wet portland cement may cause more severe skin effects including thickening, cracking or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

  Some individuals may exhibit an allergic response upon exposure to portland cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may first experience this effect after years of contact with portland cement products.

Some individuals may exhibit an allergic response upon exposure to masonry cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may first experience this effect after years of contact with masonry cement products.

- **Effects resulting from Inhalation:**
  Masonry cement may contain trace amounts of free crystalline silica. Prolonged exposure to respirable free crystalline silica may aggravate other lung conditions. It also may cause delayed lung injury including silicosis, a disabling and potentially fatal lung disease, and/or other diseases. (Also see "Carcinogenic potential" below.)

  Exposure to masonry cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

- **Effects resulting from Ingestion:**
  Although small quantities of dust are not known to be harmful, ill effects are possible if larger quantities are consumed. Masonry cement should not be eaten.

- **Carcinogenic potential:**
  Masonry cement is not listed as a carcinogen by NTP, OSHA, or IARC. It may, however, contain trace amounts of substances listed as carcinogens by these organizations.

  Crystalline silica, a potential trace level contaminant in masonry cement, is now classified by IARC as a known human carcinogen (Group 1). NTP has characterized respirable silica as "reasonably anticipated to be [a] carcinogen".

- **Medical conditions which may be aggravated by inhalation or dermal exposure:**
  - Pre-existing upper respiratory and lung diseases.
  - Unusual (hyper) sensitivity to hexavalent chromium (chromium+^{6}) salts.

Section 4 - FIRST AID

Eyes

Immediately flush eyes thoroughly with water. Continue flushing eye for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin

Wash skin with cool water and pH-neutral soap or a mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposure to dry cement.

Inhalation of Airborne Dust

Remove to fresh air. Seek medical help if coughing and other symptoms do not subside. ("Inhalation" of gross amounts of masonry cement requires immediate medical attention.)

Ingestion

Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

Section 5- FIRE & EXPLOSION DATA

Flash point .....None

Lower Explosive Limit .....None

Upper Explosive Limit .....None

Auto ignition temperature .....Not combustible

Extinguishing media.....Not combustible

Special fire fighting procedures .....None. (Although masonry cement poses no fire-related hazards, a self-contained breathing apparatus is recommended to limit exposure to combustion products when fighting any fire.)

Hazardous combustion products .....None

Unusual fire and explosion hazards.....None

Section 6- ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal. Do not attempt to wash masonry cement down drains.

Dispose of waste material according to local, state and federal regulations.

Section 7- HANDLING AND STORAGE

Keep masonry cement dry until used. Normal temperatures and pressures do not affect the material.

Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixtures or fluids.

Section 8- EXPOSURE CONTROLS/PERSONAL PROTECTION

Skin protection

Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened (wet) masonry cement products. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened masonry cement products might occur, wear impervious clothing and gloves to eliminate skin contact.

Do not rely on barrier creams; barrier creams should not be used in place of gloves.

Periodically wash areas contacted by dry masonry cement or by wet cement or fluids with a pH neutral soap. Wash again at the end of the work. If irritation occurs, immediately wash the affected area and seek treatment. If clothing becomes saturated with wet mortar, it should be removed and replaced with clean dry clothing.

Respiratory protection

Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits.

Use NIOSH/MSHA-approved (under 30 CFR 11) or NIOSH-approved (under 42 CFR 84) respirators in poorly ventilated areas, if an applicable exposure limit is exceeded, or when dust causes discomfort or irritation. (Advisory: Respirators and filters purchased after July 10, 1998, *must* be certified under 42 CFR 84.)

Ventilation

Use local exhaust or general dilution ventilation to control exposure within applicable limits.

Eye protection

When engaged in activities where cement dust or wet cement or mortar could contact the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with masonry cement or fresh cement products.

Section 9- PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Light to dark gray powder
Odor	No distinct odor
Physical state	Solid (powder)
pH (in water) (ASTM D 1293-95)	12 to 13
Solubility in water	Slightly soluble (0.1 to 1.0 %)
Vapor pressure	Not applicable
Vapor density	Not applicable
Boiling point	Not applicable (i.e., $>1000^{o}C$)
Melting point	Not applicable
Specific gravity (H20 = 1.0)	≅ 2.90
Evaporation rate	Not applicable

Section 10- STABILITY AND REACTIVITY

Stability

Stable.

Conditions to avoid

Unintentional contact with water.

Incompatibility

Wet masonry cement is alkaline. As such it is incompatible with acids, ammonium salts and aluminum metal.

Hazardous decomposition

Will not spontaneously occur. Adding water results in hydration and produces (caustic) calcium hydroxide.

Hazardous polymerization

Will not occur.

Section 11- TOXICOLOGICAL INFORMATION

For a description of available, more detailed toxicological information, contact the supplier or manufacturer.

Section 12- ECOLOGICAL INFORMATION

Ecotoxicity

No recognized unusual toxicity to plants or animals

Relevant physical and chemical properties

(See Sections *9* and *10*.)

Section 13- DISPOSAL

Dispose of waste material according to local, state and federal regulations. (Since masonry cement is stable, uncontaminated material may be saved for future use.)

Dispose of bags in an approved landfill or incinerator.

Section 14- TRANSPORTATION DATA

Hazardous materials description/proper shipping name

Masonry cement is not hazardous under U.S. Department of Transportation (DOT) regulations.

Hazard class

Not applicable.

Identification number

Not applicable.

Required label text

Not applicable.

Hazardous substances/reportable quantities (RQ)

Not applicable.

Section 15- OTHER REGULATORY INFORMATION

Status under USDOL-OSHA Hazard Communication Rule, 29 CFR 1910.1200

Masonry cement is considered a "hazardous chemical" under this regulation, and should be part of any hazard communication program.

Status under CERCLA/Superfund, 40 CFR 117 and 302

Not listed.

Hazard Category under SARA (Title III), Sections 311 and 312

Masonry cement qualifies as a "hazardous substance" with delayed health effects.

Status under SARA (Title III), Section 313

Not subject to reporting requirements under Section 313.

Status under TSCA (as of May 1997)

Some substances in masonry cement are on the TSCA inventory list.

Status under the Federal Hazardous Substances Act

Masonry cement is a "hazardous substance" subject to statutes promulgated under the subject act.

Status under WHMIS

Masonry cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products Regulations (Class E - Corrosive Material) and is therefore subject to the labeling and MSDS requirements of the Workplace Hazardous Materials Information System (WHMIS).

Section 16- OTHER INFORMATION

Prepared by

This MSDS was prepared from information provided by the Portland Cement Association.

Approval date or Revision date

Revised February 4, 2000

Date of previous MSDS

May 10, 1999

Other important information

Masonry cement should only be used by knowledgeable persons. A key to using the product safely requires the user to recognize that masonry cement chemically reacts with water, and that some of the intermediate products of this reaction (that is, those present while a masonry cement product is "setting") pose a far more severe hazard than does masonry cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of masonry cement as it is commonly used, the sheet cannot anticipate and provide all of the information that might be needed in every situation. Inexperienced product users should obtain proper training before using this product.

In particular, the data furnished in this sheet do not address hazards that may be posed by other materials mixed with masonry cement to produce masonry cement products. Users should review other relevant material safety data sheets before working with this masonry cement or working on masonry cement products, for example, masonry cement mortar.

SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY GLENS FALLS LEHIGH CEMENT COMPANY, INC., except that the product shall conform to contracted specifications. The information

provided herein was believed by Glens Falls Lehigh Cement Company, Inc. to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information to comply with all laws and procedures applicable to the safe handling and use of product and to determine the suitability of the product for its intended use. Buyer's exclusive remedy shall be for damages and no claim of any kind, whether as to product delivered or for non-delivery of product, and whether based on contract, breach of warranty, negligence, or otherwise shall be greater in amount than the purchase price of the quantity of product in respect of which damages are claimed. In no event shall Seller be liable for incidental or consequential damages, whether Buyer's claim is based on contract, breach of warranty, negligence or otherwise.

6. FIRST AID MEASURES

ALATION	REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF BREATHING STOPPED. CALL DOCTOR
NGESTION	NOT EXPECTED TO BE AN INGESTION PROBLEM.
	IF THE LIQUID SPLASHES IN EYES FLUSH IMMEDIATELY WITH FRESH WATER FOR AT LEAST 15 MINUTES. CALL A DOCTOR.
N	SOAK THE AFFECTED AREA IN LUKEWARM WATER. SEE DOCTOR FOR FROSTBITE OR BURNS.
ENERAL ADVICE	

7. PREVENTIVE AND CORRECTIVE MEASURES

RSONAL PROTECTIVE EQUIPMENT

PROTECT FROM SKIN CONTACT

LOVES (SPECIFY)	RESPIRATORY (SPECIFY)	EYE (SPECIFY)
IMPERVIOUS PROTECTIVE GLOVES	CARTRIDGE RESPIRATOR-OR-AIR SUPPLIED	CHEMICAL SAFETY GLASSES
FOOTWARE (SPECIFY)	CLOTHING (SPECIFY)	OTHER (SPECIFY)
	IMPERVIOUS PROTECTIVE CLOTHING	

NGINEERING CONTROLS (SPECIFY, E.G. VENTILATION, ENCLOSED PROCESS)

AK AND SPILL PROCEDURE	EVACUATE AREA - ELIMINATE ALL SOURCES OF IGNITION - WEAR PROTECTIVE CLOTHING FOR CLEANUP.
ASTE DISPOSAL	NOT AVAILABLE
NDLING PROCEDURES AND EQUIPMENT	HANDLE AND OPEN CONTAINERS WITH CARE.
ORAGE REQUIREMENTS	STORE IN COOL WELL VENTILATED AREA. KEEP AWAY FROM STRONG OXIDIZING MATERIAL AND SOURCES OF IGNITION.
PECIAL SHIPPING INFORMATION	STORE AND LOAD AT NORMAL TEMPERATURE (UP TO 38 C) AND AT ATMOSPHERIC PRESSURE

8. REACTIVITY DATA

HEMICAL STABILITY
S [X] NO [ ] IF NO, UNDER WHICH CONDITIONS?

INCOMPATABILITY WITH OTHER SUBSTANCES
ES [X] NO [ ] IF SO, WHICH ONES? MAY REACT WITH STRONG OXIDIZING MATERIALS

ACTIVITY, AND UNDER WHAT CONDITIONS

AZARDOUS DECOMPOSITION PRODUCTS	NORMAL COMBUSTION FORMS CARBON DIOXIDE AND WATER VAPOUR. INCOMPLETE COMBUSTION CAN PRODUCE CARBON MONOXIDE.

9. PREPARATION

REPARED BY: IRVING OIL LIMITED, SAINT JOHN, N.B. (506) 632-2000 DATE: FEB. 18, 1994

Material Safety Data Sheet Collection
Genium Publishing Corp.
1171 RiverFront Center
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(518) 842-4111

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Aroclor 1242
ARO4990

Section 1 - Chemical Product and Company Identification

Material Name: Aroclor 1242 **CAS Number:** 53469-21-9
Chemical Formula: $C_{12}H_7Cl_3$ (approx)
Structural Chemical Formula: $C_6H_4ClC_6H_3Cl_2$ (approx)
Synonyms: AROCHLOR 1242; AROCLOR 1242; CHLORIERTE BIPHENYLE,CHLORGEHALT 42%; CHLORODIPHENYL (42% CHLORINE); CHLORODIPHENYL (42% CL); CLORODIFENILI,CLORO 42%; DIPHENYLE CHLORE,42% DE CHLORE; GECHLOREERDEDIFENYL; PCB; PCB-1242; PCB 1242; POLYCHLORINATED BIPHENYL; POLYCHLORINATED BIPHENYL 1242
General Use: Used as dielectric fluids in transformers and capacitors. Prior to 1972, were used as hydraulic and other industrial fluids (e.g., in vacuum pumps, as lubricants and cutting oils), in paints, inks and fire retardants.
Also used in heat transfer systems; gas-transmission turbines; carbonless reproducing paper; adhesives; as plasticizer in epoxy paints; fluorescent light ballasts; wax extenders; coolants; dedusting agents; pesticide extenders; surface treatment and coatings; sealants; caulking material.
This is one of a group of once widely used industrial chemicals whose high stability contributed both to their commercial usefulness and long term deleterious environmental health effects. Consequently their use has been phased out. Manufacture in the U.S.A. was discontinued in 1977 and they were banned as imports in 1979.
Conditions for use are restricted.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Aroclor 1242	53469-21-9	>98

OSHA PEL
TWA: 1 mg/m^3; skin.

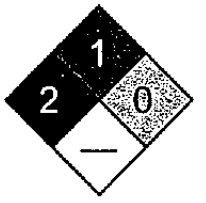
NIOSH REL
TWA: 0.001 mg/m^3.

DFG (Germany) MAK
TWA: 0.1 ppm, 1.1 mg/m^3; skin, substances with systemic effects, onset of effect greater than 2 hours, half-life greater than shift length, strongly cumulative.

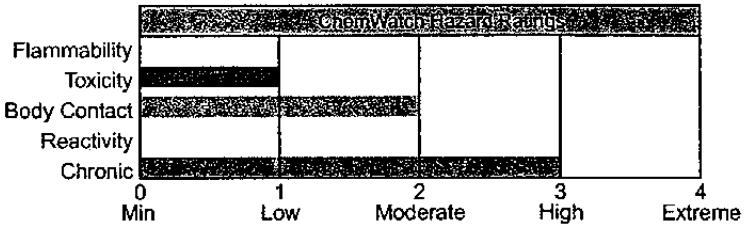
ACGIH TLV
TWA: 1 mg/m^3; skin.

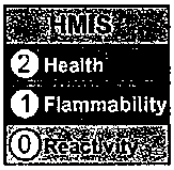
IDLH Level
5 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Oily liquid, white crystalline solid, or hard resin. Severely irritating. Suspect cancer hazard. Chronic: chloracne, GI disturbances, neurological symptoms, liver enlargement, menstrual changes, bronchitis. Possible reproductive and teratogenic effects.

Potential Health Effects

Target Organs: skin, liver, eyes, mucous membranes, respiratory system
Primary Entry Routes: inhalation, skin contact, ingestion
Acute Effects
Inhalation: Not normally a hazard due to nonvolatile nature of product. Inhalation of vapor is more likely at higher than normal temperatures. The vapor/mist is discomforting and may be extremely toxic if inhaled.
Eye: The vapor/liquid is moderately discomforting and may be harmful to the eyes.
Skin: The liquid is harmful to the skin, it is rapidly absorbed and is capable of causing skin reactions.

Exposure to material may result in a dermatitis, described as chloracne, a persistent acneiform characterized by comedones (white-, and black- heads), keratin cysts, and inflammed papules with hyperpigmentation and an anatomical distribution frequently involving the skin under the eyes and behind the ears. It occurs after acute or chronic exposure to a variety of chlorinated aromatic compounds by skin contact, ingestion or inhalation and may appear within days or months following the first exposure. Other dermatological alterations including hypertrichosis (the growth of excess hair), an increased incidence of actinic or solar elastosis (the degeneration of elastic tissue within muscles or loss of dermal elasticity produced by the effects of sunlight), and Peyrone's disease (a rare progressive scarring of the penile membrane).

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed in large quantity.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Digestion may lead to nausea, vomiting, abdominal pain, anorexia, jaundice and liver damage, coma and death.

Headache, dizziness, lethargy, depression, nervousness, loss of libido, muscle, joint pains may be found.

Symptoms appear after a latent period of 5 to 6 months.

PCB's may appear in the breast milk of exposed mothers and in newborn infants.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2A, Probably carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: These compounds may penetrate into the human body by cutaneous, respiratory or digestive exposure. People occupationally exposed to PCB's have relatively high PCB residue levels in blood plasma. Symptoms include chloracne dermatitis and degreasing the skin, pigmentation of skin and nails, excessive eye discharge, swelling of eyelids, transient visual disturbances, distinctive hair follicles, edema of the face and hands.

In common with other polyhalogenated aromatic hydrocarbons, the chlorinated biphenyls exhibit dioxin-like behavior. Polyhalogenated aromatic hydrocarbons (PHAHs) comprise two major groups.

The first group represented by the halogenated derivatives of dibenzodioxins (the chlorinated form is PCDD), dibenzofurans (PCDF) and biphenyls (PCB) exert their toxic effect (as hepatoxicants, reproductive toxicants, immunotoxicants and procarcinogens) by interaction with a cytostolic protein known as the Ah receptor. In guinea pigs the Ah receptor is active in a mechanism which "pumps" PHAH into the cell whilst in humans the reverse appears to true. This, in part, may account for species differences often cited in the literature. This receptor exhibits an affinity for the planar members of this group and carries these to the cellular nucleus where they bind, reversibly, to specific genomes on DNA.

This results in the regulation of the production of certain proteins which elicit the toxic response. The potency of the effect is dependent on the strength of the original interaction with the Ah receptor and is influenced by the degree of substitution by the halogen and the position of such substitutions on the parent compound.

The most potent molecule is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) while the coplanar PCBs (including mono-ortho coplanars) possess approximately 1% of this potency. Nevertheless, all are said to exhibit "dioxin-like" behavior and in environmental and health assessments it has been the practice to assign each a TCDD-equivalence value.

The most subtle and important biological effects of the PHAHs are the effects on endocrine hormones and vitamin homeostasis. TCDD mimics the effect of thyroxin (a key metamorphosis signal during maturation) and may disrupt patterns of embryonic development at critical stages. Individuals from exposed wildlife populations have been observed to have altered sexual development, sexual dysfunction as adults and immune system suppression.

Immunotoxic effects of the PHAHs (including the brominated congener, PBB) have been the subject of several studies. No clear pattern emerges in human studies however with T-cell numbers and function (a blood marker for immunological response) increasing in some and decreasing in others.

Three incidences have occurred which have introduced abnormally high levels of dioxin or dioxin-like congeners to humans. The explosion at a trichlorophenol-manufacturing plant in Seveso, Italy distributed TCDD across a large area of the country-side, whilst rice-oil contaminated with heat-transfer PCBs (and dioxin-like contaminants) has been consumed by two groups, on separate occasions (one in Yusho, Japan and another in Yu-cheng, Taiwan). The only symptom which can unequivocally be related to all these exposures is the development of chloracne, a disfiguring skin condition, following each incident. Contaminated oil poisonings also produced eye-discharge, swelling of eyelids and visual disturbances. The Babies born up to 3 years after maternal exposure (so-called "Yusho-babies") were characteristically brown skinned, colored gums and nails and (frequently) produced eye-discharges. Delays in intellectual development have been noted. It has been estimated that Yu-cheng patients consumed an average level of 0.06 mg/kg body weight/day total PCB and 0.0002 mg/kg/day of PCDF before the onset of symptoms after 3 months. Preliminary data from the Yusho cohort suggests a six-fold excess of liver cancer mortality in males and a three-fold excess in women.

Recent findings from Seveso indicate that the biological effects of low level exposure (BELLEs), experienced by a cohort located at a great distance from the plant, may be hormetic, i.e. may be protective AGAINST the development of cancer.

The PHAHs do not appear to be genotoxic - they do not alter the integrity of DNA. This contrasts with the effects of the many polycyclic aromatic hydrocarbons (PAHs) (or more properly, their reactive metabolites).

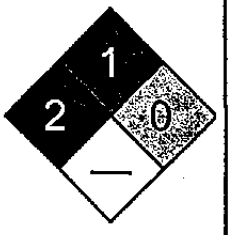
Exposures as low as 0.001 ug/kg body weight/day produce carcinoma.
Several studies implicate PCBs in the development of liver cancer in workers as well as multi-site cancers in animals.
The second major group of PHAH consists of the non-planar PCB congeners which possess two or more ortho-substituted halogens. These have been shown to produce neurotoxic effects which are thought to reduce the concentration of the brain neurotransmitter, dopamine, by inhibiting certain enzyme-mediated processes.
The specific effect elicited by both classes of PHAH seems to depend on the as much on the developmental status of the organism at the time of the exposure as on the level of exposure over a lifetime.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.
Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.
Ingestion: DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Treat symptomatically. If large amounts are ingested, gastric lavage is suggested. In the case of splashes in the eyes, a petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs. If electrical equipment arcs over, PCB dielectric fluids may decompose to produce hydrogen chloride (HCl), a respiratory irritant.
Preplacement and annual medical examinations of workers, with emphasis on liver function, skin condition, reproductive history, are recommended.

Section 5 - Fire-Fighting Measures

Flash Point: 176 to 180 °C Cleveland Open Cup
Extinguishing Media: Foam. Alcohol stable foam.
Dry chemical powder.
General Fire Hazards/Hazardous Combustion Products: POLLUTANT -contain spillage.
Noncombustible liquid.
Decomposes on heating and produces acrid black soot and toxic fumes of aldehydes, hydrogen chloride (HCl), chlorides and extremely toxic polychlorinated dibenzofuran (PCDF), polychlorinated dibenzodioxin (PCDD).
Fire Incompatibility: Reacts vigorously with chlorine (Cl2).



Fire Diamond

Fire-Fighting Instructions: POLLUTANT -contain spillage. Noncombustible.
Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Cool fire-exposed containers with water spray from a protected location.
Avoid spraying water onto liquid pools.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. POLLUTANT -contain spillage.
Environmental hazard - contain spillage.
Avoid breathing vapors and contact with skin and eyes.
Wear protective clothing, impervious gloves and safety glasses.
Contain spill with sand, earth or vermiculite.
Wipe up and absorb small quantities with vermiculite or other absorbent material.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: POLLUTANT -contain spillage. Clear area of personnel.
Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
Stop leak if safe to do so.
Contain spill with sand, earth or vermiculite.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect residues and seal in labeled drums for disposal.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If equipment is grossly contaminated, decontaminate and destroy.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Avoid all personal contact, including inhalation.
Wear protective clothing and gloves when handling containers.
Avoid physical damage to containers.
Handle gently.
Use in a well-ventilated area.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.
Use only in completely enclosed system.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Wash hands with soap and water after handling.
Work clothes should be laundered separately: NOT at home.
Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Metal can.
Metal drum.
Steel drum with plastic liner.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Provide adequate ventilation in warehouse or closed storage areas.
If inhalation risk of overexposure exists, wear NIOSH-approved organic-vapor respirator.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.
Personal Protective Clothing/Equipment
Eyes: Safety glasses with side shields; chemical goggles.
Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Impervious gloves; Viton gloves.
Polyethylene gloves.
PVC gloves.
Protective footwear.
Respiratory Protection:
Exposure Range >1 to <5 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range 5 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: odor threshold unknown
Other: Impervious protective clothing. Overalls.
Impervious apron.
Eyewash unit.
Ensure there is ready access to a safety shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, almost colorless, mobile oily liquid. Slightly soluble in glycerol and glycols. Soluble in organic solvents and lipids. Viscosity ranges from 82 - 92 Saybolt unit sec. at 38 °C. PCB's are resistant to chemical and biological degradation and because of their solubility in fats and oils they tend to be concentrated in living organisms. The highly chlorinated PCB's are retained in animals' bodies longer and seem to delay the excretion of lower chlorinated PCB's. They have become widely dispersed in the world-wide environment and in the food-chain since their introduction in 1929. They are now recognized internationally to be a major environmental pollutant, their persistence causing serious ecological damage via water pollution. Consequently loss of PCBs to the environment is to be absolutely avoided.

Physical State: Liquid
Vapor Pressure (kPa): Negligible
Formula Weight: 270 (average)
Specific Gravity (H_2O=1, at 4 °C): 1.30 - 1.39 at 25 °C
Water Solubility: 703 ppb
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 325 °C (617 °F) to 366 °C (691 °F)
Freezing/Melting Point Range: -18.89 °C (-2.002 °F)
Volatile Component (% Vol): Negligible
Decomposition Temperature (°C): 370-550

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur. Very inert, chemically.
Storage Incompatibilities: Avoid storage with oxidizers. Segregate from chlorine.

Section 11 - Toxicological Information

No relevant toxicological data found at time of research.

See NIOSH, *RTECS* TQ1356000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Current evidence suggests that the major source of release to the environment may be an environmental cycling process of material previously introduced into the environment; this cycling process involves volatilization from ground surfaces (water, soil) into the atmosphere with subsequent removal from the atmosphere via wet/dry deposition and then revolatilization. It is a mixture of different congeners of chlorobiphenyl and the relative importance of the environmental fate mechanisms generally depends on the degree of chlorination. In general, the persistence of the PCB congeners increases with an increase in the degree of chlorination. Screening studies have shown that it is biodegraded slowly. Although biodegradation may occur slowly in the environment, no other degradation mechanisms have been shown to be important in natural water and soil systems; therefore, biodegradation may be the ultimate degradation process in water and soil. The PCB composition of the biodegraded Aroclor is different from the original Aroclor. If released to soil, the PCB congeners will become tightly adsorbed to the soil particles. Although the volatilization rate may be low from soil surfaces, the total loss by volatilization over time may be significant because of persistence and stability. Enrichment of the low Cl PCBs occurs in the vapor phase relative to the original The residue will be enriched in the PCBs containing high Cl content. If released to water, adsorption to sediment and suspended matter will be an important fate process. Although adsorption can immobilize it for relatively long periods of time, eventual resolution into the water column has been shown to occur. The PCB composition in water will be enriched in the lower chlorinated PCBs because of their greater water solubility, and the least water soluble PCBs (highest Cl content) will remain adsorbed. In the absence of adsorption, it volatilizes relatively rapidly from water. However, strong PCB adsorption to sediment significantly competes with volatilization which may have a half-life of 2-7 years in typical bodies of water. Although the resulting volatilization rate may be low, the total loss by volatilization over time may be significant because of persistence and stability. It has been shown to bioconcentrate significantly in aquatic organisms. If released to the atmosphere, the PCB congeners will exist primarily in the vapor-phase with enrichment of the most volatile PCBs although a relatively small percentage will partition to the particulate phase. The dominant atmospheric transformation process for these congeners is probably the vapor-phase reaction with hydroxyl radicals which has estimated half-lives ranging from 27.8 days to 4.75 months. Physical removal from the atmosphere, which is important environmentally due to chemical stability, is accomplished by wet and dry deposition.

Ecotoxicity: LC_{50} Lepomis macrochirus (Bluegill) 54 ug/l/15 day /Conditions of bioassay not specified; LC_{50} Phasianus colchicus (Ring-necked pheasant) oral 2,078 mg/kg diet (5 days on treated diet plus 3 days untreated); LC_{50} Gammarus pseudolimnaeus (Scud) 10 ug/l/96 hr /Conditions of bioassay not specified; LC_{50} Ischnura verticalis (Damselfly) 400 ug/l/96 hr /Conditions of bioassay not specified; LD_{50} Mustela vison (Mink) ip 1.0 mg/kg; LD_{50} Colinus virginianus (Northern bobwhite) oral 2,098 mg/kg diet; LC_{50} Oronectes nais (Crayfish) 30 ug/l/7 day /Conditions of bioassay not specified
Henry's Law Constant: 5×10^{-5}
BCF: fathead minnow 2.74×10^{5}

Octanol/Water Partition Coefficient: log K_{ow} = 4.11
Soil Sorption Partition Coefficient: K_{oc} = 2240 to 1.5 x10^5

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Due to their environmental persistence and potential health hazards, PCBs cannot be disposed of in landfills or dumped at sea. The only environmentally acceptable method for the disposal of PCBs is by high temperature incineration.
All wastes and residues containing PCB's (e.g., wiping cloths, absorbent material, used disposable protective gloves, contaminated clothing, etc.) should be collected, placed in proper containers, labelled and disposed of in accordance with applicable regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: POLYCHLORINATED BIPHENYLS
Additional Shipping Information: PCB'S
Hazard Class: 9
ID No.: 2315
Packing Group: II
Label: Miscellaneous Dangerous Goods[9]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per CWA Section 307(a) 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed as Compound
SARA EHS 40 CFR 355: Not listed
TSCA: Not listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Mobil

REVISED: 05/01/88

MOBIL OIL CORPORATION MATERIAL SAFETY DATA BULLETIN

I. PRODUCT IDENTIFICATION

AUTOMOTIVE GASOLINES

SUPPLIER: MOBIL OIL CORP.
CHEMICAL NAMES AND SYNONYMS: HYDROCARBONS AND ADDITIVES
USE OR DESCRIPTION: MOTOR FUEL
HEALTH EMERGENCY TELEPHONE: 212-883-4411
TRANSPORT EMERGENCY TELEPHONE: 800-424-9300 (CHEMTREC)
PRODUCT TECHNICAL INFORMATION: 800-662-4525

II. TYPICAL CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE: CLEAR TO YELLOW/ORANGE LIQUID
ODOR: HYDROCARBON
RELATIVE DENSITY: 15/4 C
0.7 - 0.76
VISCOSITY: AT 100 F, SUS 30; AT 40 C, CST 1.0
BOILING RANGE: 75-430 F
FLASH POINT: F(C) (METHOD) -40(-40) (ASTM D-56)
SOLUBILITY IN WATER: NEGLIGIBLE
VAPOR PRESSURE: 400.0 MM HG 20C (REID VAPOR PRESSURE: 9-15 PSIA)
FOR ADDITIONAL INFORMATION PLEASE CONTACT YOUR LOCAL MARKETING OFFICE

III. INGREDIENTS

HAZARDOUS INGREDIENTS:	WT PCT (APPROX)	EXPOSURE LIMITS MG/M3	PPM	SOURCES (AND NOTES)
GASOLINE	100	900	300	A
BENZENE (COMPONENT OF GASOLINE) (CAS NUMBER 71-43-2)	2		1	O -PEL
			5	O -STEL
			10	A
FOR MOBIL REGULAR GASOLINE ONLY:				
LEAD ALKYL COMPOUNDS	0.003S	0.1		A -(SKIN)
		0.075		O -(SKIN)

KEY TO SOURCES: A=ACGIH-TLV, A*=SUGGESTED-TLV, M=MOBIL, O=OSHA
NOTE: SEE SECTION XI FOR ADDITIONAL INFORMATION CONCERNING BENZENE.

IV. HEALTH HAZARD SUMMARY

-- INCLUDES AGGRAVATED MEDICAL CONDITIONS, IF ESTABLISHED --

THRESHOLD LIMIT VALUE: 300 PPM FOR GASOLINE
EFFECTS OF OVEREXPOSURE: MODERATE SKIN IRRITATION. SLIGHT EYE IRRITATION. RESPIRATORY IRRITATION, DIZZINESS, NAUSEA, LOSS OF CONSCIOUSNESS. PROLONGED EXPOSURE TO HIGH CONCENTRATIONS HAS CAUSED KIDNEY DAMAGE AND KIDNEY CANCER IN RATS AND LIVER CANCER IN MICE. SEE SECTION XI FOR ADDITIONAL DATA.

V. EMERGENCY AND FIRST AID PROCEDURES

--- FOR PRIMARY ROUTES OF ENTRY ---

EYE CONTACT: FLUSH WITH WATER.
SKIN CONTACT: WASH CONTACT AREAS WITH SOAP AND WATER. LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.
INHALATION: REMOVE FROM FURTHER EXPOSURE. IF UNCONSCIOUSNESS OCCURS, SEEK IMMEDIATE MEDICAL ASSISTANCE AND CALL A PHYSICIAN. IF BREATHING HAS STOPPED, USE MOUTH TO MOUTH RESUSCITATION.
INGESTION: DO NOT INDUCE VOMITING. ADMINISTER VEGETABLE OIL. GET MEDICAL ASSISTANCE. (NOTE TO PHYSICIAN: MATERIAL IF ASPIRATED INTO THE LUNGS MAY CAUSE CHEMICAL PNEUMONITIS. TREAT APPROPRIATELY.)

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AUTOMOTIVE GASOLINES

********** VI. FIRE AND EXPLOSION DATA **********

FLASH POINT: F(C) (METHOD)
-40(-40) (ASTM D-56)

FLAMMABLE LIMITS: LEL: 1.1 UEL: 7.6

NFPA CODES:
HEALTH 1
FLAMMABILITY 3
REACTIVITY 0

EXTINGUISHING MEDIA:
CO2, FOAM, DRY CHEMICAL OR WATER FOG

SPECIAL FIRE FIGHTING PROCEDURES:
FOR FIRES IN ENCLOSED AREAS, FIREFIGHTERS MUST USE SELF-CONTAINED BREATHING APPARATUS. COOL STORAGE DRUMS WITH WATER SPRAY. EVACUATE AREA. PREVENT RUNOFF FROM FIRE CONTROL OR DILUTION FROM ENTERING STREAMS OR DRINKING WATER SUPPLY.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
EXTREMELY FLAMMABLE LIQUID. VAPOR ACCUMULATION COULD FLASH AND/OR EXPLODE IF IN CONTACT WITH OPEN FLAME.

********** VII. REACTIVITY DATA **********

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, SPARKS, FLAME, AND BUILD UP OF STATIC ELECTRICITY.

INCOMPATIBLE MATERIALS: HALOGENS, STRONG ACIDS, ALKALINES AND OXIDIZERS.

HAZARDOUS DECOMPOSITION PRODUCTS: CARBON MONOXIDE FROM INCOMPLETE COMBUSTION.

********** VIII. SPILL OR LEAK PROCEDURES **********

ENVIRONMENTAL IMPACT: REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES. IN CASE OF ACCIDENT OR ROAD SPILL NOTIFY CHEMTREC (800-424-9300). U.S. COAST GUARD REGULATIONS REQUIRE IMMEDIATE REPORTING OF SPILLS THAT COULD REACH ANY WATERWAY INCLUDING INTERMITTENT DRY CREEKS. THE COAST GUARD TOLL FREE NUMBER IS (800-424-8802).

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: ELIMINATE ALL IGNITION SOURCES. REMOVE LEAKING CONTAINERS TO SAFE AREA. ADSORB ON FIRE RETARDANT TREATED SAWDUST, DIATOMACEOUS EARTH, ETC. SHOVEL UP AND DISPOSE OF AT AN APPROPRIATE WASTE DISPOSAL FACILITY IN ACCORDANCE WITH CURRENT APPLICABLE LAWS AND REGULATIONS, AND PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL. RUNOFF MAY CREATE FIRE OR EXPLOSION HAZARD IN SEWER SYSTEM.

WASTE MANAGEMENT: PRODUCT IS SUITABLE FOR BURNING FOR FUEL VALUE IN COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.

********** IX. SPECIAL PROTECTION INFORMATION **********

EYE PROTECTION: IF EYE CONTACT IS LIKELY, SAFETY GLASSES WITH SIDE SHIELDS OR CHEMICAL TYPE GOGGLES SHOULD BE WORN.

SKIN PROTECTION: IF SKIN CONTACT IS LIKELY, IMPERVIOUS GLOVES SHOULD BE WORN. GOOD PERSONAL HYGIENE PRACTICES SHOULD ALWAYS BE FOLLOWED.

RESPIRATORY PROTECTION: APPROVED RESPIRATORY EQUIPMENT MUST BE USED WHEN VAPOR OR MIST CONCENTRATIONS ARE UNKNOWN OR EXCEED THE TLV.

VENTILATION: VENTILATION REQUIRED AND EQUIPMENT MUST BE EXPLOSION PROOF. USE AWAY FROM ALL IGNITION SOURCES. USE IN WELL VENTILATED AREA WITH LOCAL EXHAUST VENTILATION.

OTHER: AVOID SKIN CONTACT AND BREATHING MISTS/VAPORS.

********** X. SPECIAL PRECAUTIONS **********

HANDLING: AVOID CONTACT WITH SKIN. AVOID INHALATION OF VAPORS OR MISTS. USE IN WELL VENTILATED AREA AWAY FROM ALL IGNITION SOURCES.

STORAGE: AVOID SPARKING CONDITIONS; GROUND AND BOND ALL TRANSFER AND STORAGE EQUIPMENT. DRUMS MUST BE GROUNDED AND BONDED AND EQUIPPED WITH SELF-CLOSING VALVES, PRESSURE VACUUM BUNGS AND FLAME ARRESTERS. STORE AWAY FROM ALL IGNITION SOURCES IN A COOL AREA EQUIPPED WITH AN AUTOMATIC SPRINKLING SYSTEM. OUTSIDE OR DETACHED STORAGE PREFERRED.

STORED MATERIALS MUST BE LABELED AS: EXTREMELY FLAMMABLE. VAPOR HARMFUL. SEE SECTION XI FOR ADDITIONAL LABELING INFORMATION.

********** XI. TOXICOLOGICAL DATA **********

ACUTE

ORAL TOXICITY: (RATS) LD50 GREATER THAN 5 G/KG. CONSIDERED TO BE NO MORE THAN SLIGHTLY TOXIC BASED ON SINGLE DOSE LEVEL TESTING AT 5 G/KG.

DERMAL TOXICITY: (RABBITS) LD50 GREATER THAN 2 G/KG. CONSIDERED TO BE NO MORE THAN SLIGHTLY TOXIC BASED ON SINGLE DOSE LEVEL TESTING AT 2 G/KG.

INHALATION TOXICITY: (RATS) MODERATELY TOXIC (ESTIMATED) BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

EYE IRRITATION: (RABBITS) MAY CAUSE SLIGHT IRRITATION, BASED ON TESTING OF SIMILAR PRODUCTS AND/OR COMPONENTS.

SKIN IRRITATION: (RABBITS) MODERATELY IRRITATING TO RABBITS. MAY CAUSE IRRITATION ON PROLONGED OR REPEATED CONTACT.

CHRONIC OR SPECIALIZED (SUMMARY)

RECENT STUDIES WITH LABORATORY ANIMALS HAVE SHOWN THAT GASOLINE VAPORS ADMINISTERED IN HIGH CONCENTRATIONS OVER A PROLONGED PERIOD OF TIME (TWO YEAR LIFE TIME STUDIES) CAUSED KIDNEY DAMAGE AND KIDNEY CANCER IN MALE RATS AND LIVER CANCER IN FEMALE MICE. THESE EFFECTS WERE NOT SEEN IN FEMALE RATS OR MALE MICE.

GENERALLY, HUMAN EXPOSURES TO GASOLINE VAPORS ARE CONSIDERABLY LESS THAN THOSE USED IN THE ANIMAL TOXICITY STUDIES. AS FAR AS SCIENTISTS KNOW, LOW LEVEL OR INFREQUENT EXPOSURE TO GASOLINE VAPORS IS UNLIKELY TO BE ASSOCIATED WITH CANCER OR OTHER SERIOUS DISEASES IN HUMANS.

REGULAR LEADED GASOLINE CONTAINS LEAD COMPOUNDS. LEAD CAN BE A CUMULATIVE POISON.

OTHER DATA

GASOLINE CONSISTS OF A COMPLEX BLEND OF PETROLEUM/PROCESSING DERIVED PARAFFINIC, OLEFINIC, NAPHTHENIC AND AROMATIC HYDROCARBONS WHICH MAY CONTAIN UP TO 5 PERCENT BENZENE, WITH 1-2 PERCENT BEING TYPICAL IN THE U. S.; AND LOW LEVELS OF MULTIFUNCTIONAL ADDITIVES. REPEATED EXPOSURE TO LOW LEVELS OF BENZENE (<100 PPM) HAS BEEN REPORTED TO RESULT IN BLOOD ABNORMALITIES IN BOTH ANIMALS AND HUMANS, INCLUDING ANEMIA AND, IN RARE CASES, LEUKEMIA. THESE EFFECTS WERE NOT OBSERVED IN LABORATORY ANIMALS FOLLOWING REPEATED EXPOSURE TO VAPORS FROM UNLEADED GASOLINE CONTAINING 2 PERCENT BENZENE.

THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) FINALIZED AN UPDATED REGULATION ON BENZENE ON SEPTEMBER 11, 1987. THIS STANDARD EXEMPTS THE STORAGE, TRANSPORTATION, DISTRIBUTION, DISPENSING, SALE OR USE OF GASOLINE, MOTOR FUELS, OR OTHER FUELS CONTAINING BENZENE, SUBSEQUENT TO THE FINAL DISCHARGE FROM BULK WHOLESALE STORAGE FACILITIES. CERTAIN INDOOR MOTOR FUEL DISPENSING OPERATIONS ARE COVERED REGARDLESS OF THE EXEMPTION. THE STANDARD ESTABLISHES REQUIREMENTS COVERING POTENTIAL EMPLOYEE EXPOSURES, CONTAINER LABELING, MEDICAL PROGRAMS, AND EMPLOYEE TRAINING. REFER TO CHAPTER 29 OF THE CODE OF FEDERAL REGULATIONS (CFR) PART 1910.1028 FOR SPECIFIC GUIDANCE. THE OSHA MANDATED LABEL OF -DANGER. CONTAINS BENZENE

Mobil

AUTOMOTIVE GASOLINES

********** XII. REGULATORY INFORMATION **********

TSCA INVENTORY STATUS: ALL COMPONENTS REGISTERED.

D.O.T. SHIPPING NAME: GASOLINE D.O.T. HAZARD CLASS: FLAMMABLE LIQUID
DOT ID NUMBER: UN 1203

US OSHA HAZARD COMMUNICATION STANDARD: PRODUCT ASSESSED IN ACCORDANCE WITH OSHA CFR 1910.1200 AND DETERMINED TO BE HAZARDOUS.

RCRA INFORMATION: THE DISPOSAL OF THE UNUSED PRODUCT MAY BE SUBJECT TO RCRA REGULATIONS PER 40 CFR PART 261 FOR THE REASONS INCLUDING, BUT NOT LIMITED TO THOSE LISTED BELOW. DISPOSAL OF THE USED PRODUCT MAY BE REGULATED.

TETRAETHYL LEAD: 0.0035 PCT (LEADED GASOLINE)
FLASH: -40(-40) F(C)

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) TITLE III:

EXTREMELY HAZARDOUS SUBSTANCES FOR EMERGENCY RESPONSE AND PLANNING

COMPONENT	CAS NUMBER	PERCENT	TPQ(LBS)	RQ(LBS)
TETRAETHYL LEAD (LEADED GASOLINE ONLY)	78-00-2	0.0035	100	10

PRODUCT QUANTITY (GALS) WHICH RESULTS IN AN RQ OF AN EHS: 45000

TOXIC CHEMICALS FOR EMISSION REPORTING

COMPONENT	CAS NUMBER	PERCENT (TYPICAL)
TOLUENE	108-88-3	10
XYLENE	1330-20-7	9
1,2,4-TRIMETHYLBENZENE	95-63-6	3
BENZENE	71-43-2	2
ETHYLBENZENE	100-41-4	2
METHYL TERT-BUTYL ETHER	1634-04-4	15 (MAXIMUM)

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AUTOMOTIVE GASOLINES

********** APPENDIX **********

PRECAUTIONARY LABEL TEXT:
GASOLINE

FOR USE AS MOTOR FUEL ONLY.
DANGER.

EXTREMELY FLAMMABLE. HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL.

LONG-TERM EXPOSURE TO VAPORS HAS CAUSED CANCER IN LABORATORY ANIMALS.

KEEP AWAY FROM HEAT, SPARKS AND FLAME. AVOID PROLONGED BREATHING OF VAPOR. KEEP CONTAINER CLOSED. USE ONLY WITH ADEQUATE VENTILATION. NOT TO BE USED AS A SKIN CLEANSING AGENT. NEVER SIPHON BY MOUTH. KEEP AWAY FROM EYES AND SKIN. FAILURE TO USE CAUTION MAY CAUSE SERIOUS INJURY OR ILLNESS.

FIRST AID: IF SWALLOWED, DO NOT INDUCE VOMITING. CALL A PHYSICIAN IMMEDIATELY.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO-MOUTH AND CALL A PHYSICIAN.

ATTENTION
EMPTY CONTAINERS MAY CONTAIN PRODUCT RESIDUE, INCLUDING FLAMMABLE OR EXPLOSIVE VAPORS. DO NOT CUT, PUNCTURE OR WELD ON OR NEAR CONTAINER. ALL LABEL WARNINGS AND PRECAUTIONS MUST BE OBSERVED UNTIL CONTAINER HAS BEEN THOROUGHLY CLEANED OR DESTROYED.

REFER TO PRODUCT MATERIAL SAFETY DATA BULLETIN FOR FURTHER SAFETY AND HEALTH INFORMATION.

MOBIL OIL CORPORATION, NEW YORK, N.Y.

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PREPARED BY: MOBIL OIL CORPORATION
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY, PRINCETON, NJ
REVISED:
05/01/88

FOR FURTHER INFORMATION CONTACT:
MOBIL OIL CORPORATION
LUBE PRODUCT MANAGEMENT ATTN: MSDS ANALYST
3225 GALLOWS ROAD, FAIRFAX, VA 22037 (703) 849-3265

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Mobil

REVISED: 01/13/89

MOBIL OIL CORPORATION MATERIAL SAFETY DATA BULLETIN

I. PRODUCT IDENTIFICATION

—DIESEL FUELS

SUPPLIER: MOBIL OIL CORP.
CHEMICAL NAMES AND SYNONYMS:
HYDROCARBONS AND ADDITIVES
USE OR DESCRIPTION: FUEL OIL

HEALTH EMERGENCY TELEPHONE: 212-883-4411
TRANSPORT EMERGENCY TELEPHONE: 800-424-9300 (CHEMTREC)
PRODUCT TECHNICAL INFORMATION: 800-662-4525

II. TYPICAL CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE:
CLEAR TO AMBER LIQUID

ODOR:
HYDROCARBON

RELATIVE DENSITY: 15/4 C
0.82 - 0.87

VISCOSITY: AT 100 F, SUS
31.0 - 40.0

AT 40 C, CST
1.3 - 4.1

BOILING RANGE: NO.1 300-550 F
NO.2 350-700 F

FLASH POINT: F(C) (ASTM D-93)
NO.1: 100(40) NO.2: 125(52)

SOLUBILITY IN WATER:
NEGLIGIBLE

VAPOR PRESSURE:
0.5 MM HG 20C

(FOR ADDITIONAL INFORMATION PLEASE CONTACT YOUR LOCAL MARKETING OFFICE)

III. INGREDIENTS

HAZARDOUS INGREDIENTS:	WT PCT (APPROX)	EXPOSURE LIMIT MG/M3	EXPOSURE LIMIT PPM	SOURCES (AND NOTES)
DIESEL OIL (CAS NO. 68334-30-5)	100	575	100	A*

KEY TO SOURCES: A=ACGIH-TLV, A*=SUGGESTED-TLV, M=MOBIL, O=OSHA
NOTE: LIMITS SHOWN ARE FOR GUIDANCE ONLY. FOLLOW APPLICABLE REGULATIONS.

IV. HEALTH HAZARD SUMMARY

-- INCLUDES AGGRAVATED MEDICAL CONDITIONS, IF ESTABLISHED --

THRESHOLD LIMIT VALUE: NO TLV ESTABLISHED. SUGGESTED TWA EXPOSURE LIMIT OF 100 PPM.

EFFECTS OF OVEREXPOSURE: SLIGHT SKIN IRRITATION. RESPIRATORY IRRITATION, DIZZINESS, NAUSEA, LOSS OF CONSCIOUSNESS. THIS PRODUCT MAY CONTAIN TRACE QUANTITIES OF POLYCYCLIC AROMATIC HYDROCARBONS (PCAH). UNDER CONDITIONS OF POOR PERSONAL HYGIENE AND PROLONGED, REPEATED CONTACT, SOME PCAH HAVE BEEN SUSPECTED AS A CAUSE OF SKIN CANCER IN HUMANS.

V. EMERGENCY AND FIRST AID PROCEDURES

--- FOR PRIMARY ROUTES OF ENTRY ---

EYE CONTACT: FLUSH WITH WATER.

SKIN CONTACT: WASH CONTACT AREAS WITH SOAP AND WATER.

INHALATION: REMOVE FROM FURTHER EXPOSURE. IF UNCONSCIOUSNESS OCCURS, SEEK IMMEDIATE MEDICAL ASSISTANCE AND CALL A PHYSICIAN. IF BREATHING HAS STOPPED, USE MOUTH TO MOUTH RESUSCITATION.

INGESTION: DO NOT INDUCE VOMITING. ADMINISTER VEGETABLE OIL. GET MEDICAL ASSISTANCE. (NOTE TO PHYSICIAN: MATERIAL IF ASPIRATED INTO THE LUNGS MAY CAUSE CHEMICAL PNEUMONITIS. TREAT APPROPRIATELY.)

VI. FIRE AND EXPLOSION DATA

FLASH POINT: F(C) (ASTM D-93)
NO.1: 100(40) NO.2: 125(52)

FLAMMABLE LIMITS: LEL: NE UEL: NE

EXTINGUISHING MEDIA:
CO2, FOAM, DRY CHEMICAL OR WATER FOG

SPECIAL FIRE FIGHTING PROCEDURES:

NFPA CODES:
HEALTH 0
FLAMMABILITY 2
REACTIVITY 0

Mobil

DIESEL FUELS

VII. REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR
CONDITIONS TO AVOID: HEAT, SPARKS, FLAME, AND BUILD UP OF STATIC ELECTRICITY.
INCOMPATIBLE MATERIALS: HALOGENS, STRONG ACIDS, ALKALINES AND OXIDIZERS.
HAZARDOUS DECOMPOSITION PRODUCTS: CARBON MONOXIDE FROM INCOMPLETE COMBUSTION.

VIII. SPILL OR LEAK PROCEDURES

ENVIRONMENTAL IMPACT: REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES. IN CASE OF ACCIDENT OR ROAD SPILL NOTIFY CHEMTREC (800-424-9300). U.S. COAST GUARD REGULATIONS REQUIRE IMMEDIATE REPORTING OF SPILLS THAT COULD REACH ANY WATERWAY INCLUDING INTERMITTENT DRY CREEKS. THE COAST GUARD TOLL FREE NUMBER IS (800-424-8802).
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: ADSORB ON FIRE RETARDANT TREATED SAWDUST, DIATOMACEOUS EARTH, ETC. SHOVEL UP AND DISPOSE AT AN APPROPRIATE WASTE DISPOSAL FACILITY IN ACCORDANCE WITH CURRENT LAWS AND REGULATIONS, AND PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.
WASTE MANAGEMENT: PRODUCT IS SUITABLE FOR BURNING FOR FUEL VALUE IN COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.

IX. SPECIAL PROTECTION INFORMATION

EYE PROTECTION: NO SPECIAL EQUIPMENT REQUIRED
SKIN PROTECTION: IF SKIN CONTACT IS LIKELY, IMPERVIOUS GLOVES SHOULD BE WORN. GOOD PERSONAL HYGIENE PRACTICES SHOULD ALWAYS BE FOLLOWED.
RESPIRATORY PROTECTION: NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.
VENTILATION: VENTILATION DESIRABLE AND EQUIPMENT MUST BE EXPLOSION PROOF. USE IN WELL VENTILATED AREA.

X. SPECIAL PRECAUTIONS

STORED MATERIAL MUST BE LABELED AS: COMBUSTIBLE
STORAGE: STORE IN A COOL AREA.

XI. TOXICOLOGICAL DATA

ACUTE

ORAL TOXICITY: SLIGHTLY TOXIC (ESTIMATED) - BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.
DERMAL TOXICITY: (RABBITS) NONTOXIC (ESTIMATED) - BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.
INHALATION TOXICITY: (RATS) SLIGHTLY TOXIC (ESTIMATED) - BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.
EYE IRRITATION: (RABBITS) EXPECTED TO BE NON-IRRITATING - BASED ON TESTING OF SIMILAR PRODUCTS AND/OR COMPONENTS.
SKIN IRRITATION: (RABBITS) MAY CAUSE SLIGHT IRRITATION ON PROLONGED OR REPEATED CONTACT - BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

CHRONIC OR SPECIALIZED (SUMMARY)

THIS PRODUCT MAY CONTAIN TRACE QUANTITIES OF POLYCYCLIC AROMATIC HYDROCARBONS, SOME OF WHICH HAVE BEEN SHOWN TO CAUSE SKIN CANCER IN LABORATORY ANIMALS AFTER PROLONGED, REPEATED SKIN CONTACT.

Mobil

DIESEL FUELS

********** XII. REGULATORY INFORMATION **********

TSCA INVENTORY STATUS: ALL COMPONENTS REGISTERED.

D.O.T. SHIPPING NAME: FUEL OIL D.O.T. HAZARD CLASS: COMBUSTIBLE LIQUID
ID NUMBER: NA 1993

US OSHA HAZARD COMMUNICATION STANDARD: PRODUCT ASSESSED IN ACCORDANCE WITH OSHA CFR 1910.1200 AND DETERMINED TO BE HAZARDOUS.

RCRA INFORMATION: THE DISPOSAL OF THE UNUSED PRODUCT MAY BE SUBJECT TO RCRA REGULATIONS PER 40 CFR PART 261 FOR THE REASONS INCLUDING, BUT NOT LIMITED TO THOSE LISTED BELOW. DISPOSAL OF THE USED PRODUCT MAY BE REGULATED.
FLASH: LESS THAN 140 F

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) TITLE III:
EXTREMELY HAZARDOUS SUBSTANCES FOR EMERGENCY RESPONSE AND PLANNING
THIS PRODUCT CONTAINS NO EXTREMELY HAZARDOUS SUBSTANCES.
TOXIC CHEMICALS FOR EMISSION REPORTING
THIS PRODUCT CONTAINS NO TOXIC CHEMICALS AT CONCENTRATIONS ABOVE THE ESTABLISHED DE MINIMIS LEVELS.

********** APPENDIX **********

PRECAUTIONARY LABEL TEXT:

PETROLEUM DISTILLATE

DANGER.
HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. COMBUSTIBLE.

KEEP AWAY FROM HEAT AND FLAME. AVOID PROLONGED BREATHING OF VAPOR. KEEP CONTAINER CLOSED. USE ONLY WITH ADEQUATE VENTILATION. AVOID PROLONGED OR REPEATED SKIN CONTACT.

FIRST AID: IF SWALLOWED, DO NOT INDUCE VOMITING. CALL A PHYSICIAN IMMEDIATELY.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO-MOUTH AND CALL A PHYSICIAN.

ATTENTION
EMPTY CONTAINERS MAY CONTAIN PRODUCT RESIDUE, INCLUDING FLAMMABLE OR EXPLOSIVE VAPORS. DO NOT CUT, PUNCTURE OR WELD ON OR NEAR CONTAINER. ALL LABEL WARNINGS AND PRECAUTIONS MUST BE OBSERVED UNTIL CONTAINER HAS BEEN THOROUGHLY CLEANED OR DESTROYED.

REFER TO PRODUCT MATERIAL SAFETY DATA BULLETIN FOR FURTHER SAFETY AND HEALTH INFORMATION.

MOBIL OIL CORPORATION, NEW YORK, N.Y.

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Mobil

DIESEL FUELS

********** XII. REGULATORY INFORMATION **********

PREPARED BY: MOBIL OIL CORPORATION
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY, PRINCETON, NJ
REVISED: 01/13/89

FOR FURTHER INFORMATION CONTACT:
MOBIL OIL CORPORATION
LUBE PRODUCT MANAGEMENT ATTN: MSDS ANALYST
3225 GALLOWS ROAD, FAIRFAX, VA 22037 (703) 849-3265

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Copy to SACA
11/20/02

440701-00 MOBIL DELVAC 1310 / 5810
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL DELVAC 1310 5310
SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect):	609-737-4411	
Product and MSDS Information:	800-662-4525	856-224-4644
CHEMTREC:	800-424-9300	202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SEVERE TREAT MIN. OILS & ADDITIVES
INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:
This product is not formulated to contain ingredients which have exposure limits established by U.S. agencies. It is not hazardous to health as defined by the European Union Dangerous Substances/Preparations Directives. See Section 15 for a regulatory analysis of the ingredients.
See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined not to be hazardous.
EFFECTS OF OVEREXPOSURE: No significant effects expected.
EMERGENCY RESPONSE DATA: Dark Amber Liquid. DOT ERG No. - NA

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water.
INHALATION: Not expected to be a problem.
INGESTION: Not expected to be a problem.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from

fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None. Flash Point C(F): > 199(390) (ASTM D-92). Flammable limits - LEL: NA, UEL: NA.
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.
ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Do not store in open or unlabelled containers. Store away from strong oxidizing agents or combustible material.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: No special requirements under ordinary conditions of use and with adequate ventilation.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: Normal industrial eye protection practices should be employed.
SKIN PROTECTION: No special equipment required. However, good personal hygiene practices should always be followed.
EXPOSURE LIMITS: This product does not contain any components which have recognized exposure limits. However, a exposure limit of 5.00 mg/m3 is suggested for oil mist.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid

COLOR: Dark Amber
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): > 199(390) (ASTM D-92)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.881
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 44.0
VISCOSITY AT 100 C, cSt: 7.2
POUR POINT C(F): < -35(-31)
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NA
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
---SUBCHRONIC TOXICOLOGY (SUMMARY)---
Severely solvent refined and severely hydrotreated mineral base oils have been tested at Mobil Environmental and Health Sciences Laboratory by dermal application to rats 5 days/week for 90 days at doses significantly higher than those expected during normal industrial exposure. Extensive evaluations including microscopic examination of internal organs and clinical chemistry of body

fluids, showed no adverse effects.

---CHRONIC TOXICOLOGY (SUMMARY)---

The base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as the Mobil Modified Ames Test and IP-346.

---OTHER TOXICOLOGY DATA---

Used gasoline engine oils have shown evidence of skin carcinogenic activity in laboratory tests when no effort was made to wash the oil off between applications. Used oil from diesel engines did not produce this effect.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: Not established.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value or disposal by supervised incineration. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.
RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.

15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, MITI, DSL, AND KECI.
EU Labeling: EU labeling not required.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains no chemicals reportable under

SARA (313) toxic release program.
The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
ZINC (ELEMENTAL ANALYSIS) (0.14%)	7440-66-6	22
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2: 1) (ZDDP) (0.24%)	68649-42-3	22

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: COMMERCIAL ENGINE OIL
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

Please call the Customer Response Center on 800-662-4525 for formulation disclosure.

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For Internal Use Only: MHC: 1* 1* 0* 1* 1*, MPPEC: A, TRN: 440701-00, GLIS: 400249, CMCS97: 970440, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 30MAY2000

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Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropiate warnings and safe handling procedures should be providedto handlers and users. Use or re-transmission of the information contained herein in any other format than the format as presented is strictly prohibited. Mobil neither represents nor warrants that the format, content or product formulas contained in this document comply with the laws of any other country except the United States of America.

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440727-00 MOBIL DELVAC 1330 (5330)
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

5330

PRODUCT NAME: MOBIL DELVAC 1330
SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect):	609-737-4411	
Product and MSDS Information:	800-662-4525	856-224-4644
CHEMTREC:	800-424-9300	202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SEVERE TREAT MIN. OILS & ADDITIVES
INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:
This product is not formulated to contain ingredients which have exposure limits established by U.S. agencies. It is not hazardous to health as defined by the European Union Dangerous Substances/Preparations Directives. See Section 15 for a regulatory analysis of the ingredients.
See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined not to be hazardous.
EFFECTS OF OVEREXPOSURE: No significant effects expected.
EMERGENCY RESPONSE DATA: Dark Amber Liquid. DOT ERG No. - NA

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water.
INHALATION: Not expected to be a problem.
INGESTION: Not expected to be a problem.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from

fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None. Flash Point C(F): > 199(390) (ASTM D-92). Flammable limits - LEL: NA, UEL: NA.
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.
ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Do not store in open or unlabelled containers. Store away from strong oxidizing agents or combustible material.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: No special requirements under ordinary conditions of use and with adequate ventilation.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: Normal industrial eye protection practices should be employed.
SKIN PROTECTION: No special equipment required. However, good personal hygiene practices should always be followed.
EXPOSURE LIMITS: This product does not contain any components which have recognized exposure limits. However, a exposure limit of 5.00 mg/m3 is suggested for oil mist.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid

COLOR: Dark Amber
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): > 199(390) (ASTM D-92)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.89
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 90.0
VISCOSITY AT 100 C, cSt: 11.6
POUR POINT C(F): -18(0)
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NA
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
---SUBCHRONIC TOXICOLOGY (SUMMARY)---
Severely solvent refined and severely hydrotreated mineral base oils have been tested at Mobil Environmental and Health Sciences Laboratory by dermal application to rats 5 days/week for 90 days at doses significantly higher than those expected during normal industrial exposure. Extensive evaluations including microscopic examination of internal organs and clinical chemistry of body

fluids, showed no adverse effects.

---CHRONIC TOXICOLOGY (SUMMARY)---

The base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as the Mobil Modified Ames Test and IP-346.

---OTHER TOXICOLOGY DATA---

Used gasoline engine oils have shown evidence of skin carcinogenic activity in laboratory tests when no effort was made to wash the oil off between applications. Used oil from diesel engines did not produce this effect.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: Not established.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value or disposal by supervised incineration. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.
RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.

15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, MITI, and DSL.
EU Labeling: EU labeling not required.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains no chemicals reportable under

SARA (313) toxic release program.
The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
ZINC (ELEMENTAL ANALYSIS) (0.14%)	7440-66-6	22
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2: 1) (ZDDP) (0.24%)	68649-42-3	22

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: COMMERCIAL ENGINE OIL
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

Please call the Customer Response Center on 800-662-4525 for formulation disclosure.

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For Internal Use Only: MHC: 1* 1* 0* 1* 1*, MPPEC: A, TRN: 440727-00, GLIS: 400253, CMCS97: 970501, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 31MAY2000

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Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropiate warnings and safe handling procedures should be providedto handlers and users. Use or re-transmission of the information contained herein in any other format than the format as presented is strictly prohibited. Mobil neither represents nor warrants that the format, content or product formulas contained in this document comply with the laws of any other country except the United States of America.

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440693-00 MOBIL DELVAC 1300 SUPER 15W-40
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL DELVAC 1300 SUPER 15W-40
SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect):	609-737-4411	
Product and MSDS Information:	800-662-4525	856-224-4644
CHEMTREC:	800-424-9300	202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SEVERE TREAT MIN. OILS & ADDITIVES
INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:
This product is not formulated to contain ingredients which have exposure limits established by U.S. agencies. It is not hazardous to health as defined by the European Union Dangerous Substances/Preparations Directives. See Section 15 for a regulatory analysis of the ingredients.
See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined not to be hazardous.
EFFECTS OF OVEREXPOSURE: No significant effects expected.
EMERGENCY RESPONSE DATA: Brown Liquid. DOT ERG No. - NA

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water.
INHALATION: Not expected to be a problem.
INGESTION: Not expected to be a problem. However, if greater than 1/2 liter(pint) ingested, immediately give 1 to 2 glasses of water and call a physician, hospital emergency room or poison control center for assistance. Do not induce vomiting or give anything by mouth to an unconscious person.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None. Flash Point C(F): > 216(421) (ASTM D-92). Flammable limits - LEL: NA, UEL: NA.
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.

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6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.
ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.
PERSONAL PRECAUTIONS: See Section 8

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7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Do not store in open or unlabelled containers. Store away from strong oxidizing agents or combustible material.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: No special requirements under ordinary conditions of use and with adequate ventilation.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: Normal industrial eye protection practices should be employed.
SKIN PROTECTION: No special equipment required. However, good personal hygiene practices should always be followed.
EXPOSURE LIMITS: This product does not contain any components which have recognized exposure limits. However, a exposure limit of 5.00 mg/m3 is suggested for oil mist.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Brown
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): > 216(421) (ASTM D-92)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.887
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 120.7
VISCOSITY AT 100 C, cSt: 15.5
POUR POINT C(F): < -24(-11)
FREEZING POINT C(F): NE
VOC: < 3.00 (Wt. %); 0.220 lbs/gal
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
---SUBCHRONIC TOXICOLOGY (SUMMARY)---
Severely solvent refined and severely hydrotreated mineral base oils have been tested at Mobil Environmental and Health Sciences

Laboratory by dermal application to rats 5 days/week for 90 days at doses significantly higher than those expected during normal industrial exposure. Extensive evaluations including microscopic examination of internal organs and clinical chemistry of body fluids, showed no adverse effects.

---CHRONIC TOXICOLOGY (SUMMARY)---

The base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as the Mobil Modified Ames Test and IP-346.

---OTHER TOXICOLOGY DATA---

Used gasoline engine oils have shown evidence of skin carcinogenic activity in laboratory tests when no effort was made to wash the oil off between applications. Used oil from diesel engines did not produce this effect.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: Not established.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value or disposal by supervised incineration. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.

15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, and MITI. Contains a component(s) which is not listed on the DSL but is in compliance with the New Substance

Notification requirements. May require special arrangements for import into Canada. Contains a component for which the supplier has exclusive importation rights in Australia; special arrangements may be required.
EU Labeling: EU labeling not required.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains the following SARA (313) Toxic Release Chemicals:

CHEMICAL NAME	CAS NUMBER	CONC.
ZINC DITHIOPHOSPHATE	68649-42-3	1.69%

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
NAPHTHALENE (COMPONENT ANALYSIS) (<0.02%)	91-20-3	22
STYRENE MONOMER (COMPONENT ANALYSIS) (0.02%)	100-42-5	22
PHENOL (COMPONENT ANALYSIS) (<0.02%)	108-95-2	22
XYLENES (COMPONENT ANALYSIS) (<0.02%)	1330-20-7	22
ZINC (ELEMENTAL ANALYSIS) (0.14%)	7440-66-6	22
ZINC DITHIOPHOSPHATE	68649-42-3	18, 21, 24

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

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16. OTHER INFORMATION

USE: COMMERCIAL ENGINE OIL
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

Please call the Customer Response Center on 800-662-4525 for formulation disclosure.
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For Internal Use Only: MHC: 1* 1* 0* 1* 1*, MPPEC: A, TRN: 440693-00, CMCS97: 970529, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 15NOV1999
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Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropiate warnings and safe handling procedures should be providedto handlers and users. Use or re-transmission of the information contained herein in any other format

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530550-00 MOBILGREASE XHP 222 SPECIAL
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBILGREASE XHP 222 SPECIAL
SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect):	609-737-4411	
Product and MSDS Information:	800-662-4525	856-224-4644
CHEMTREC:	800-424-9300	202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SEVERE TREAT MIN. OILS & ADDITIVES
INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:
This product is not formulated to contain ingredients which have exposure limits established by U.S. agencies. It is not hazardous to health as defined by the European Union Dangerous Substances/Preparations Directives. See Section 15 for a regulatory analysis of the ingredients.
See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined not to be hazardous.
EFFECTS OF OVEREXPOSURE: No significant effects expected.
EMERGENCY RESPONSE DATA: Gray Grease. DOT ERG No. - NA

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. High pressure accidental injection through the skin requires immediate medical attention for possible incision, irrigation and/or debridement.
INHALATION: Not expected to be a problem.
INGESTION: Not expected to be a problem. However, if greater than 1/2 liter (pint) ingested, seek medical attention.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Note: Pressurized mists may form a flammable mixture. Flash Point C(F): 198(388) (ASTM D-92).
Flammable limits - LEL: NA, UEL: NA.
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.
ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: High pressure injection under the skin may occur due to the rupture of pressurized lines. Always seek medical attention.
STORAGE: Do not store in open or unlabelled containers. Store away from strong oxidizing agents or combustible material.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: No special requirements under ordinary conditions of use and with adequate ventilation.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: Normal industrial eye protection practices should be employed.
SKIN PROTECTION: No special equipment required. However, good personal hygiene practices should always be followed.
EXPOSURE LIMITS: This product does not contain any components which have recognized exposure limits. However, a exposure limit of 5.00 mg/m3 is suggested for oil mist.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Amber
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): 198(388) (ASTM D-92)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: > 2.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.875
SOLUBILITY IN WATER; Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 46.0
VISCOSITY AT 100 C, cSt: 6.7
POUR POINT C(F): < -18(0)
FREEZING POINT C(F): NE
VOC: < 5.00 (Wt. %); 0.358 lbs/gal
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Not applicable ---Harmful concentrations of mists and/or vapors are unlikely to be encountered through any customary or reasonably foreseeable handling, use, or misuse of this product.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: The acute toxicological results summarized above are based on testing of representative Mobil products.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---
Representative Mobil formulations have been tested at the Mobil Environmental and Health Sciences Laboratory by dermal applications to rats 5 days/week for 90 days at doses significantly higher than those expected during normal industrial exposure. Extensive evaluations, including microscopic examination of internal organs and clinical chemistry of body fluids, showed no adverse effects.

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---
Dermal exposure of pregnant rats to representative formulations did not cause adverse effects in either the mothers or their offspring.

---CHRONIC TOXICOLOGY (SUMMARY)---
The base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as the Mobil Modified Ames Test and IP-346.

---SENSITIZATION (SUMMARY)---
Representative Mobil formulations have not caused skin sensitization in guinea pigs.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: This product is expected to be inherently biodegradable. There is no evidence to suggest bioaccumulation will occur. It is not expected to be toxic to aquatic organisms.
Accidental spillage may lead to penetration in the soil and groundwater. However, there is no evidence that this would cause adverse ecological effects.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value or disposal by supervised incineration. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.
RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.

IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.

15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, MITI, DSL, AND KECI.
EU Labeling: EU labeling not required.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains no chemicals reportable under SARA (313) toxic release program.
The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
2-ETHYLHEXANOL	104-76-7	15
ZINC (ELEMENTAL ANALYSIS) (<0.06%)	7440-66-6	22
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2: 1) (ZDDP) (0.42%)	68649-42-3	22

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: HYDRAULIC OIL
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

Please call the Customer Response Center on 800-662-4525 for formulation disclosure.

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For Internal Use Only: MHC: 1* 1* NA 1* 1*, MPPEC: A, TRN: 583021-00, CMCS97: 971019, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 22FEB2000

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Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropiate warnings and safe handling procedures should be providedto handlers and users. Use or re-transmission of the information contained herein in any other format than the format as presented is strictly prohibited. Mobil neither represents nor warrants that the format, content or product formulas contained in this document comply with the laws of any other country

except the United States of America.

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522334-00 MOBILFLUID 424
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBILFLUID 424
SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect):	609-737-4411	
Product and MSDS Information:	800-662-4525	856-224-4644
CHEMTREC:	800-424-9300	202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SEVERE TREAT MIN. OILS & ADDITIVES
INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:
This product is not formulated to contain ingredients which have exposure limits established by U.S. agencies. It is not hazardous to health as defined by the European Union Dangerous Substances/Preparations Directives. See Section 15 for a regulatory analysis of the ingredients.
See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined not to be hazardous.
EFFECTS OF OVEREXPOSURE: No significant effects expected.
EMERGENCY RESPONSE DATA: Dark Amber Liquid. Note: Pressurized mists may form a flammable mixture. DOT ERG No. - NA

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. High pressure accidental injection through the skin requires immediate medical attention for possible incision, irrigation and/or debridement.
INHALATION: Not expected to be a problem.
INGESTION: Not expected to be a problem. However, if greater than 1/2 liter(pint) ingested, immediately give 1 to 2 glasses of water and call a physician, hospital emergency room or poison control center for assistance. Do not induce vomiting or give anything by mouth to an unconscious person.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Note: Pressurized mists may form a flammable mixture. Flash Point C(F): > 198(389) (ASTM D-92).
Flammable limits - LEL: NA, UEL: NA.
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.
ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: High pressure injection under the skin may occur due to the rupture of pressurized lines. Always seek medical attention.
STORAGE: Do not store in open or unlabelled containers. Store away from strong oxidizing agents or combustible material.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: No special requirements under ordinary conditions of use and with adequate ventilation.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: Normal industrial eye protection practices should be employed.
SKIN PROTECTION: No special equipment required. However, good personal hygiene practices should always be followed.
EXPOSURE LIMITS: This product does not contain any components which have recognized exposure limits. However, a exposure limit of 5.00 mg/m3 is suggested for oil mist.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Dark Amber
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): > 198(389) (ASTM D-92)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: > 2.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.882
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 55.0
VISCOSITY AT 100 C, cSt: 9.5
POUR POINT C(F): < -36(-33)
FREEZING POINT C(F): NE
VOC: < 5.00 (Wt. %); 0.358 lbs/gal
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Not applicable ---Harmful concentrations of mists and/or vapors are unlikely to be encountered through any customary or reasonably foreseeable handling, use, or misuse of this product.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based

on testing of similar products and/or the components.

---CHRONIC TOXICOLOGY (SUMMARY)---

The base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as the Mobil Modified Ames Test and IP-346.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: Not established.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value or disposal by supervised incineration. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.

15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, MITI, and DSL.
EU Labeling: EU labeling not required.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains the following SARA (313) Toxic Release Chemicals:

CHEMICAL NAME	CAS NUMBER	CONC.
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS	68649-42-3	1.68%

(2:1) (ZDDP)
The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
2-ETHYLHEXANOL	104-76-7	11, 15
TOLUENE (0.11%)	108-88-3	22, 24
ZINC (ELEMENTAL ANALYSIS) (<0.20%)	7440-66-6	22
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP) (1.68%)	68649-42-3	18, 20, 21, 22, 24, 25

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: HYDRAULIC OIL
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

Please call the Customer Response Center on 800-662-4525 for formulation disclosure.

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For Internal Use Only: MHC: 1* 1* NA 1* 1*, MPPEC: A, TRN: 522334-00, GLIS: 400110, CMCS97: 971955, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 27MAR2000

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Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropiate warnings and safe handling procedures should be providedto handlers and users. Use or re-transmission of the information contained herein in any other format than the format as presented is strictly prohibited. Mobil neither represents nor warrants that the format, content or product formulas contained in this document comply with the laws of any other country except the United States of America.

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583021-00 MOBIL HYDRAULIC OIL AW 46
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL HYDRAULIC OIL AW 46
SUPPLIER: MOBIL OIL CORP.
NORTH AMERICA MARKETING AND REFINING
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Emergency (call collect):	609-737-4411	
Product and MSDS Information:	800-662-4525	856-224-4644
CHEMTREC:	800-424-9300	202-483-7616

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SEVERE TREAT MIN. OILS & ADDITIVES
INGREDIENTS CONSIDERED HAZARDOUS TO HEALTH:
This product is not formulated to contain ingredients which have exposure limits established by U.S. agencies. It is not hazardous to health as defined by the European Union Dangerous Substances/Preparations Directives. See Section 15 for a regulatory analysis of the ingredients.
See Section 15 for European Label Information.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined not to be hazardous.
EFFECTS OF OVEREXPOSURE: No significant effects expected.
EMERGENCY RESPONSE DATA: Amber Liquid. Note: Pressurized mists may form a flammable mixture. DOT ERG No. - NA

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. High pressure accidental injection through the skin requires immediate medical attention for possible incision, irrigation and/or debridement.
INHALATION: Not expected to be a problem.
INGESTION: Not expected to be a problem. However, if greater than 1/2 liter (pint) ingested, seek medical attention.

5. FIRE-FIGHTING MEASURES

SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None. Flash Point C(F): > 204(400) (ASTM D-93). Flammable limits - LEL: NA, UEL: NA.
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Shovel up and dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulations, and product characteristics at time of disposal.
ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: High pressure injection under the skin may occur due to the rupture of pressurized lines. Always seek medical attention.
STORAGE: Do not store in open or unlabelled containers. Store away from strong oxidizing agents or combustible material.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: No special requirements under ordinary conditions of use and with adequate ventilation.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: Generally eye contact is unlikely with this type material. If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.
SKIN PROTECTION: If prolonged or repeated skin contact is likely, oil impervious gloves should be worn. Good personal hygiene practices should always be followed.
EXPOSURE LIMITS: This product does not contain any components which have recognized exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet

for specific details.
APPEARANCE: Grease
COLOR: Gray
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
DROP POINT C(F): > 260(500)
FLASH POINT C(F): > 204(400) (ASTM D-93)
FLAMMABILITY: NE
AUTO FLAMMABILITY: NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: NE
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.91
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 220.0
VISCOSITY AT 100 C, cSt: > 16.0
POUR POINT C(F): NA
FREEZING POINT C(F): NE
VOC: < 1.00 (Wt. %); 0.083 lbs/gal
NOTE: MOST PHYSICAL PROPERTIES FOR OIL COMPONENT.
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide. Metal oxides. Elemental oxides.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Not applicable ---Harmful concentrations of mists and/or vapors are unlikely to be encountered through any customary or reasonably foreseeable handling, use, or misuse of this product.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
---SUBCHRONIC TOXICOLOGY (SUMMARY)---
Severely solvent refined and severely hydrotreated mineral base oils have been tested at Mobil Environmental and Health Sciences

Laboratory by dermal application to rats 5 days/week for 90 days at doses significantly higher than those expected during normal industrial exposure. Extensive evaluations including microscopic examination of internal organs and clinical chemistry of body fluids, showed no adverse effects.

---CHRONIC TOXICOLOGY (SUMMARY)---

The base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as the Mobil Modified Ames Test and IP-346.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: This product is expected to be inherently biodegradable. There is no evidence to suggest bioaccumulation will occur. It may be harmful to aquatic organisms.
Accidental spillage may lead to penetration in the soil and groundwater. However, there is no evidence that this would cause adverse ecological effects.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value or disposal by supervised incineration. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.
RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.

15. REGULATORY INFORMATION

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS and AICS.

EU Labeling: EU labeling not required.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains the following SARA (313) Toxic Release Chemicals:

CHEMICAL NAME	CAS NUMBER	CONC.
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP)	68649-42-3	1.52%

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
LITHIUM HYDROXIDE MONOHYDRATE (0.05%)	1310-66-3	22
TRICRESYL PHOSPHATE (>0.01%)	1330-78-5	22
ZINC (ELEMENTAL ANALYSIS) (0.18%)	7440-66-6	22
LITHIUM-SOAP THICKENER (6.14%)	7620-77-1	22
ZINC DINONYLNAPHTHALENE SULFONATE (0.40%)	28016-00-4	22
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP) (1.52%)	68649-42-3	18, 20, 21, 22, 24, 25
FATTY ACIDS, C16-22, LITHIUM SALTS (0.76%)	68783-36-8	22

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: AUTOMOTIVE GREASE
NOTE: MOBIL PRODUCTS ARE NOT FORMULATED TO CONTAIN PCBS.

Please call the Customer Response Center on 800-662-4525 for formulation disclosure.

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For Internal Use Only: MHC: 1* 1* NA 1* 1*, MPPEC: A, TRN: 530550-00, CMCS97: 97G870, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 26JUL2000

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Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropiate warnings and safe handling procedures should be providedto handlers and users. Use or re-transmission of the information contained herein in any other format

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530170-00 MOBILGREASE MOLY 52
MATERIAL SAFETY DATA BULLETIN

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1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBILGREASE MOLY 52
SUPPLIER: EXXONMOBIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037
24 - Hour Health and Safety Emergency (call collect): 609-737-4411
24 - Hour Transportation Emergency:
CHEMTREC: 800-424-9300 202-483-7616
LUBES AND FUELS: 281-834-3296
Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 613-228-1467
MSDS Internet Website: http://emmsds.ihssolutions.com/

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2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: PET. HYDROCARBONS AND ADDITIVES
GLOBALLY REPORTABLE MSDS INGREDIENTS:

Substance Name	Approx. Wt%
MOLYBDENUM DISULFIDE (1317-33-5)	5-15
ZINC DIALKYL DITHIOPHOSPHATE (68649-42-3)	1-5
HYDROXYALKYL LONG-CHAIN ALKENYL IMIDAZOLINE (27136-73-8)	<1

OTHER INGREDIENTS:

Substance Name	Approx. Wt%
ALKYLATED DIPHENYL AMINES (68411-46-1)	1-5

See Section 8 for exposure limits (if applicable).

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3. HAZARDS IDENTIFICATION

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).
EMERGENCY OVERVIEW: Gray to Black Grease. DOT ERG No. : NA
POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation.
POTENTIAL ENVIRONMENTAL EFFECTS: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area.
INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.
INHALATION: Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with mechanical device or use mouth-to-mouth resuscitation.
INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None.
COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.
Flash Point C(F): > 204(400) (ESTIMATED FOR OIL, ASTM D-92 (COC)).
Flammable Limits (approx.% vol.in air) - LEL: NE, UEL: NE
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary,

dispose of adsorbed residues as directed in Section 13.
WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.
ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: High pressure injection under the skin may occur due to the rupture of pressurized lines. Always seek medical attention. No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.
SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.
EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

		---TWA---		----STEL---		NOTE
Substance Name (CAS-No.)	Source	ppm	mg/m3	ppm	mg/m3	
MOLYBDENUM DISULFIDE (1317-33-5)						
as Mo Sol Cmpds	OSHA		5			
as Mo Insol Cmpds Tot Dust	OSHA		10			
as Mo Sol Cmpds	ACGIH		5			
as Mo Insol Cmpds	ACGIH		10			

NOTE: Limits shown for guidance only. Follow applicable regulations.
VENTILATION: Use adequate ventilation.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: Generally eye contact is unlikely with this type material. If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.
SKIN PROTECTION: If prolonged or repeated skin contact is likely, oil impervious gloves should be worn. Good personal hygiene

practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Grease
COLOR: Gray to Black
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): NE
DROP POINT C(F): > 246(475)
FLASH POINT C(F): > 204(400) (ESTIMATED FOR OIL, ASTM D-92 (COC))
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NA
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: NE
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.941
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 320.0
VISCOSITY AT 100 C, cSt: NE
POUR POINT C(F): NA
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
NOTE: MOST PHYSICAL PROPERTIES FOR OIL COMPONENT.
DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the

components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral oils and synthetic base oils, such as those in this product have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.

---CHRONIC TOXICOLOGY (SUMMARY)---

Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.

---SENSITIZATION (SUMMARY)---

Not expected to be sensitizing based on tests of this product, components, or similar products.

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12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS:
This environmental assessment was conducted using information on the individual components as no test data was available for this specific formulation.
ECOTOXICITY: This product is expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.
MOBILITY: Not established.
PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable, as the principal components have been shown to degrade at slow to moderate rates.
BIOACCUMULATIVE POTENTIAL: Not established.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this product is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

EU Labeling: Product is dangerous as defined by the European Union Dangerous Substances/Preparations Directives.

Symbol: Not applicable.

Risk Phrase(s): R52/53.
Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrase(s): Not applicable.

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS and AICS.

U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains the following SARA (313) Toxic Release Chemicals:

CHEMICAL NAME	CAS NUMBER	CONC.
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP)	68649-42-3	1.3%

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
LITHIUM HYDROXIDE (0.05%)	1310-65-2	22

MOLYBDENUM (IV) SULFIDE	1317-33-5	1, 10, 18, 20, 21, 23
TRICRESYL PHOSPHATE (>0.01%)	1330-78-5	22
ZINC (ELEMENTAL ANALYSIS) (0.15%)	7440-66-6	22
LITHIUM-SOAP THICKENER (6.14%)	7620-77-1	22
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP) (1.29%)	68649-42-3	18, 20, 21, 22, 24, 25
FATTY ACIDS, C16-22, LITHIUM SALTS (0.76%)	68783-36-8	22

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

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16. OTHER INFORMATION

USE: EXTREME PRESSURE GREASE
NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES ARE NOT FORMULATED TO CONTAIN PCBS.
Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:
INDUSTRIAL LABEL
Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. Always observe good hygiene measures. First Aid: Wash skin with soap and water. Flush eyes with water. If overcome by fumes or vapor, remove to fresh air. If ingested do not induce vomiting. If symptoms persist seek medical assistance. Read and understand the MSDS before using this product.
****
For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: A, TRN: 530170-00, CMCS97: 97E099, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 27FEB2003
****

****
Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropiate warnings and safe handling procedures should be providedto handlers and users. Use or re-transmission of the information contained herein in any other format than the format as presented is strictly prohibited. Mobil neither represents nor warrants that the format, content or product formulas

contained in this document comply with the laws of any other country except the United States of America.

****

525238-00 MOBIL MULTIPURPOSE ATF
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL MULTIPURPOSE ATF
SUPPLIER: EXXONMOBIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037
24 - Hour Health and Safety Emergency (call collect): 609-737-4411
24 - Hour Transportation Emergency (Primary) CHEMTREC: 800-424-9300
(Secondary) 281-834-3296
Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 613-228-1467
MSDS Internet Website: http://emmsds.ihssolutions.com/

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SEVERE TREAT MIN. OILS & ADDITIVES
GLOBALLY REPORTABLE MSDS INGREDIENTS:
None.
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).
EMERGENCY OVERVIEW: Red Liquid. DOT ERG No. : NA
POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation.
For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area. (See Section 16 - Injection Injury)
INHALATION: Not expected to be a problem. However, if respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or mouth-to-mouth resuscitation.

INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None.
COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.
Flash Point C(F): > 177(350) (ASTM D-92).
Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.
WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.
ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing

agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.
SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.
EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:
When mists/aerosols can occur, the following are recommended: 5 mg/m3 (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m3 (as oil mist) - ACGIH Short Term Exposure Limit (STEL), 5 mg/m3 (as oil mist) - OSHA Permissible Exposure Limit (PEL)
VENTILATION: If mists are generated, use adequate ventilation, local exhaust or enclosures to control below exposure limits.
RESPIRATORY PROTECTION: If mists are generated, and/or when ventilation is not adequate, wear approved respirator.
EYE PROTECTION: If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.
SKIN PROTECTION: Not normally required. When splashing or liquid contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Red
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): > 177(350) (ASTM D-92)
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NA
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: > 2.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.869
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 38.0

VISCOSITY AT 100 C, cSt: 7.5
POUR POINT C(F): < -45(-49)
FREEZING POINT C(F): NE
VOC: < 8.00 (Wt. %); 0.574 lbs/gal
DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral and synthetic oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---
No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---
No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.

---CHRONIC TOXICOLOGY (SUMMARY)---

Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.

---SENSITIZATION (SUMMARY)---

Not expected to be sensitizing based on tests of this product, components, or similar products.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS:

In the absence of specific environmental data for this product, this assessment is based on information for representative products.

ECOTOXICITY: Available ectoxicity data (LL50 >1000 mg/L) indicates that adverse effects to aquatic organisms are not expected from this product.

MOBILITY: When released into the environment, adsorption to sediment and soil will be the predominant behavior.

PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable.

BIOACCUMULATIVE POTENTIAL: Bioaccumulation is unlikely due to the very low water solubility of this product, therefore bioavailability to aquatic organisms is minimal.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.
STATIC ACCUMULATOR (50 picosiemens or less): YES

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this product is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.
EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling not required.
Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS and AICS.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains no chemicals subject to the supplier notification requirements of SARA (313) toxic release program.
The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
NAPHTHALENE (COMPONENT ANALYSIS)	91-20-3	16
TOLUENE (COMPONENT ANALYSIS) (0.09%)	108-88-3	22
DIPHENYLAMINE	122-39-4	1

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: AUTOMATIC TRANSMISSION FLUID
NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES ARE NOT FORMULATED TO CONTAIN PCBS.
Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:
INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.
INDUSTRIAL LABEL
Under normal conditions of intended use, this product does not pose a

risk to health. Excessive exposure may result in eye, skin or respiratory irritation. Always observe good hygiene measures. First Aid: Wash skin with soap and water. Flush eyes with water. If overcome by fumes or vapor, remove to fresh air. If ingested do not induce vomiting. If symptoms persist seek medical assistance. Read and understand the MSDS before using this product.
Precautionary Label Text:
This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer.

****

For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: A, TRN: 525238-00, CMCS97: 971582, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 16MAY2002

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Legally required information is given in accordance with applicable Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. Nothing is intended as a recommendation for uses which infringe valid patents or as extending any license under valid patents. Appropiate warnings and safe handling procedures should be providedto handlers and users. Use or re-transmission of the information contained herein in any other format than the format as presented is strictly prohibited. Mobil neither represents nor warrants that the format, content or product formulas contained in this document comply with the laws of any other country except the United States of America.

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Material Safety Data Sheet

last revised 3-11-88

I. General Information

Chemical Name & Synonyms
Methanol

Trade Name & Synonyms
Windshield Washer Antifreeze Premix

Chemical Family
Aliphatic Alcohol

Formula
--

Proper DOT Shipping Name
Methyl Alcohol

DOT Hazard Classification
Flammable Liquid

Manufacturer
Monson Chemicals, Inc/Uni-Gard Division

Manufacturer's Phone Number
(617)534-1425

Manufacturer's Address
154 Pioneer Drive, Leominster, MA 01453

Chemtrec Phone Number
1-800-424-9300

II. Ingredients

Principal Hazardous Components	Percent	Threshold Limit Value (units)
Methanol CAS# 67-56-1	35-40	Oral 12.88 gm/kg
Surfactant Polyol CAS#9003-11-6	< 1	
Color CAS# 3486-30-4	< 1	

III. Physical Data

Boiling Point (°F)
148

Specific Gravity (H_2O = 1)
0.95 @ 60°F

Vapor Pressure (mm Hg.)
96

Percent Volatile By Volume (%)
99+

Vapor Density (Air = 1)
1.1

Evaporation Rate (_____ = 1)
(n-Butyl Acetate = 1)
2.0

Solubility in Water
Complete

pH
7

Appearance & Odor
Clear blue liquid; alcohol odor; odor is not a good indicator of exposure level.

IV. Fire & Explosion Hazard Data

Flash Point (Test Method)
TCC 94°F

Auto Ignition Temperature
867°F

Flammable Limits
15 to 62

LEL
6

UEL
36

Extinguishing Media
Dry chemicals, CO2, Alcohol foam or water.

Special Fire Fighting Procedures
A methanol fire may not be visible to the naked eye. Do not enter fire area w/o proper protection. Fight fire from safe distance/protected location. Heat may build ruptüre closed containers, spreading fire. Increasing risk of burns/injuries. Apply aqueous extinguishing media carefully to avoid frothing & limit exposure of nearby equipment. Notify authorities if liquid enters sever/public waters.

Unusual Fire & Explosion Hazards
None

CODE 1100

V. Health Hazard Data

A Permissible Exposure Limit
00 ppm, 8 hr. TWA

ACGIH Threshold Limit Value
800 ppm

rcinogen - NTP Program
–

Carcinogen - IARC Program
--

ioms of Exposure
ute: Anesthesia, Nausea, headache or dizziness.

ronic: Blindness or death.

cal Conditions Aggravated By Exposure
--

mary Route(s) of Entry
gestion, skin absorption, eye contact or inhalation.

gency First Aid Eyes: Wash with water. Skin: Wash with soap and water. Inhalation: Remove ctim to fresh air and give artificial respiration. Ingestion: Give one or two glasses of ater or milk, call physician, hospital or poison control center immediately for instructions induce vomiting. ALWAYS GET MEDICAL ATTENTION.

VI. Reactivity Data

bility		Unstable
	XX	Stable
ncompatability		
ardous		May Occur
erization	XX	Will Not Occur

Conditions To Avoid
Heat sparks and open flames

Materials To Avoid
Avoid strong oxidizing agents

Conditions To Avoid

ardous Decomposition Products
ne

VII. Environmental Protection Procedures

Response
h with copious quantities of water. Wear respiratory protection if necesary.

void contact with sparks or open flames.

e Disposal Method
sh with water or controlled burning. Do not flush into confined areas.

VIII. Special Protection Information

Protection Wear safety glasses or goggles to old eye contact

Skin Protection Wear rubber gloves & other protective clothing to minimize skin contact.

atory Protection (Specific Type)
pack or organic canister

Ventilation Recommended
Local exhaust desirable.

r Protection
e

IX. Special Precautions

nic Practices In Handling & Storage
Handle as a flammable liquid. Avoid breathing vapors. Avoid open flames and sparks.

tions for Repair & Maintenance Of Contaminated Equipment Isolate, vent & drain, wash & purge systems or ipment. before maintenance or repair. Remove all ignition sources. Check atmosphere for explosiveness and oxygen defficiencies. Use adequate personal protective equipment. Observe ecautions pertaining to confined space entry.

Precautions
e

MATERIAL SAFETY DATA SHEET

11/20/02

t (As Used on Label and List)	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.
MANT ✓ ANTIFREEZE AND SUMMER COOLANT	

turer's Name	Emergency Telephone Number
GATON CHEMICAL CORPORATION	800-424-9300 CHEMTREC
ess (Number, Street, City, State and ZIP Code)	Telephone Number for Information
bridge Street, P. O. Box 307	617-254-1010 HOUGHTON
on, MA 02134	Date Prepared
	1/31/89

on II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Ethylene Glycol CAS # 107-21-1 *		50 ppm		~ 90%
Polyalkylene Glycol CAS# 111-46-6		N/A		~ 5%
Additive Package (trade secret) and water		N/A		~ 5%

* This component is subject to the reporting requirements of section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR Part 372

on III - Physical/Chemical Characteristics

ing Point (degrees F)	320	Specific Gravity (H_2O = 1) @ 60/60° F @ 20/20°C	~ 1.12
r Pressure (mm Hg.) @ 20°C	< 0.1	Melting Point	N/A
or Density (AIR = 1)	~ 2.1	Evaporation Rate (Butyl Acetate = 1)	less than 1

olubility in Water

COMPLETE

erance and Odor

BLUE GREEN OR FLUORESCENT GREEN; MILD ODOR

ion IV - Fire and Explosion Hazard Data

n Point (Method Used)	Flammable Limits	LEL	UEL
50°F - TAG OPEN CUP; 225°F - CLOSED CUP		~ 3.0	~ 16 calc

inguishing Media

WATER, FOG, ALCOHOL FOAM, DRY CHEMICAL OR CO2 FOR SMALL FIRES.

ecial Fire Fighting Procedures

A SOLID STREAM OF WATER DIRECTED INTO HOT BURNING LIQUID CAN CAUSE FROTHING.

Unusual Fire and Explosion Hazards

NONE

Y - Reactivity Data

...ility	Unstable		Conditions to Avoid
	Stable	X	

...mpatibility (Materials to Avoid) - KEEP AWAY FROM STRONG OXIDIZING AGENTS.

...ous Decomposition or Byproducts - BURNING CAN PRODUCE CARBON DIOXIDE OR CARBON MONOXIDE.

...ous ...rization	May Occur		Conditions to Avoid
	Will not Occur	X	

...n VI - Health Hazard Data

...s) of Entry:	Inhalati... ?	Skin?	Ingestion?
	YES	YES - SLIGHT IRRITATION	YES

...th Hazards (Acute and Chronic) - IRRIT... NG TO EYES & SKIN. INHALATION IRRITATES NOSE & THROAT. HIGH VAPOR ...NTRATIONS CAUSE NAUSEA, VOMITING, HEA... CHES. SWALLOWING CAUSES ABDOMINAL DISCOMFORT OR PAIN, DIZZINESS, LUMBAR ..., OLIGURIA, UREMIA & CENTRAL NERVOUS S...TEM DEPRESSION. LARGE VOLUMES CAUSES KIDNEY DAMAGE AND CAN BE FATAL.

...nogencity:	NTP?	IARC Monographs?	OSHA Regulated?

... and Symptoms of Exposure - SLIGHT IR...ATION TO SKIN. SWALLOWING CAUSES DRUNKENNESS, RAPIDLY PASSING INTO COMA ...ING SERIOUS OR FATAL KIDNEY AND LIVER ...JURY.

...al Conditions
...ally Aggravated by Exposure PRE-EXIS...ING SKIN, EYE & RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO ...RODUCT.

...gency and First Aid Procedures - FLUSH SKIN OR EYE CONTACT WITH PLENTY OF WATER. IF INHALED, REMOVE TO FRESH AIR ...D GIVE ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED. CALL A PHYSICIAN. IF SWALLOWED GIVE LARGE AMOUNTS OF WATER ...ILK IF CONSCIOUS, THEN INDUCE VOMITING AND SEEK MEDICAL ATTENTION IMMEDIATELY.

...tion VII - Precautions for Safe Handling and Use
... to Be Taken in Case Material is Released or Spilled - SMALL SPILLS - FLUSH SPILLED MATERIAL WITH LARGE AMOUNTS ... WATER. MAJOR SPILLS - NOTIFY AUTHORITI... AND COLLECT FOR DISPOSAL (SEE WASTE DISPOSAL METHOD.)

...e Disposal Method - CONSULT WITH LOCAL SEWER, MUNICIPAL, STATE AND/OR FEDERAL AGENCIES TO DETERMINE APPROPRIATE ...URRENT DISPOSAL OPTIONS.

...autions to Be Taken in Handling and Storing - AVOID SKIN AND EYE CONTACT. HARMFUL OR FATAL IF SWALLOWED. AVOID ...ROLONGED BREATHING OF VAPORS. ACGIH TLV ... PPM, VAPOR.

...r Precautions - DO NOT STORE IN OPEN, ...LABELED OR MISLABELED CONTAINERS.

...tion VIII - Control Mea...res
...piratory Protection (Spe...fy Type) - ... ...UPPLIED MASK.

...ilation	Local Exh...	X	Special
	Mechanical (General)		Other

...tive Gloves ... RESISTANT ... ... Protection - COVERALL GOGGLES

...er Protective Clothing ... Equipment - ...R CHEMICAL RESIS... PANTS & JACKET.

...k/Hygienic Practices - ...ETY SHOWER ...EWASH. WASH WIT... ...AP & WATER BEFORE EATING, SMOKING, OR USING TOILE... ...CILITIES. L... ...ATED CLOTHI... ...EFORE REUSE.

MATERIAL SAFETY DATA SHEET
Required under USDL Safety and Health Regulations

POWER SERVICE PRODUCTS, INC.
P.O. BOX 1089
WEATHERFORD, TEXAS 76086
817-599-9486
JULY 18, 1989

SECTION I - PRODUCT IDENTIFICATION

CHEMICAL NAME..... Methyl Alcohol
CHEMICAL FAMILY..... Alcohols
TRADE NAME..... Power Service "AIRLINE SYSTEM ANTIFREEZE"
FORMULA..... CH3OH
DOT SHIPPING NAME..... FLAMMABLE LIQUID NOS
DOT HAZARD CLASSIFICATION.. FLAMMABLE LIQUID
UN NUMBER..... 1993
IMCO CLASS..... 3.2
CAS #..... 67-56-1

SECTION II - HAZARDOUS INGREDIENTS

INGREDIENT	% (BY WT)	TLV
METHYL ALCOHOL.....	99.9	200 ppm 8 hr day
ADDITIVES.....	>.1	N/A

TIER ONE RATING: PHYSICAL HAZARD - FIRE
HEALTH HAZARD - IMMEDIATE (ACUTE)

NFPA RATING: HEALTH -1
FLAM - 3
REACT - 0

SECTION III - PHYSICAL DATA

BOILING POINT (DEG F)..... 147 DEG F (64.5 DEG C)
VAPOR PRESSURE (mmHG)..... 96 @ 68 DEG F (22 DEG C)
VAPOR DENSITY (air=1)..... 1.11
SOLUBILITY IN WATER..... Totally miscible
SPECIFIC GRAVITY (H20=1)..... 0.792
PERCENT, VOLATILE BY VOLUME (%). 100
EVAPORATION RATE..Butyl acetate. 4.6
MOLECULAR WEIGHT..... 32.04
MELTING POINT..... -144 DEG F (-97.8 DEG C)
APPEARANCE..... Clear, water white, liquid
ODOR..... Alcohol Odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (method used)..... 54 Deg F (12.2 Deg C) (TCC)
FLAMMABLE LIMIT..... LEL 5.5 UEL 36.5

EXTINGUISHING MEDIA: Dry chemical, alcohol type foam, CO2. Water may be ineffective. Use water spray to cool fire exposed containers. Use alcohol resistant foam to extinguish large fires or to blanket spill to reduce vapors.

SPECIAL FIRE FIGHTING PROCEDURES: Class 1B flammable liquid. Avoid water streams which may splash and spread flaming liquid. Firefighters should use self-contained breathing equipment and protective clothing for fires in enclosed areas.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Reacts violently to oxidizers. Vapors are heavier than air but may travel in ventilation systems coming in contact with sparks or open flame. Keep away from heat and sources of ignition. Burns with a clear almost invisible flame, especially hard to see in strong sunlight.

EMPTY CONTAINERS CONTAIN FLAMMABLE VAPORS: "DO NOT USE TORCH CUTTING EQUIPMENT OR ANY OTHER FLAME ON EMPTY CONTAINERS".

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE..... 200 ppm for 8 hr work day
OSHA THRESHOLD LIMIT VALUE..... 200 ppm 260 mg/m3 "SKIN"
ACGIH THRESHOLD LIMIT VALUE..... 200 ppm 260 mg/m3 "SKIN"
CARCINOGEN-NTP PROGRAM..... NONE
CARCINOGEN-IARC PROGRAM..... NONE

SYMPTOMS of EXPOSURE: Inhalation of high vapor concentrations may have results ranging from dizziness and headaches to unconsciousness. Prolonged repeated liquid contact with skin can dry and defat the skin leading to irritation and dermatitis skin.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: May be fatal or cause blindness if swallowed. Cannot be made non-poisonous. Harmful if inhaled. May irritate eyes. Repeated contact may irritate skin. LD 50 (Rats)=12,900 mg/kg. LC 50 (Rats) > 145,000 ppm.

PRIMARY ROUTE(S) OF ENTRY: Ingestion and inhalation.

EMERGENCY AND FIRST AID PROCEDURES: Thoroughly wash area with soap and water. Remove contaminated clothing. FLUSH EYES with large amounts of water, get medical attention. If swallowed give two glasses of water, induce vomiting immediately. Have patient lie down and keep warm. Cover eyes to exclude light. Call a physician. Never give anything by mouth to an unconscious person. If inhaled, move to fresh air. If breathing is difficult administer oxygen. If breathing is stopped give artificial respiration.

SECTION VI - REACTIVITY DATA

STABILITY..... Stable___X____ Unstable _____

CONDITIONS AND MATERIALS TO AVOID: Excessive heat, sources of ignitions.

INCOMPATABILITY "MATERIALS TO AVOID": Reacts vigorously with strong oxidizers, chronic anhydride, lead perchlorate and perchloric acid.

HAZARDOUS DECOMPOSTION PRODUCTS: Occurs from heat and reaction with above materials. CARBON MONOXIDE AND CARBON DIOXIDE.

HAZARDOUS POLYMERIZATION: May Occur____ Will not Occur _X___
CONDITIONS TO AVOID: 1. Prolong or repeated breathing of vapors
2. Contact with eyes
3. Prolong or repeated contact with skin

SECTION VII - ENVIRONMENTAL PROTECTION PROCEDURES

SPILL RESPONSE: Dike large spills. Flush spill area with large amounts of water. DO NOT flush into sewers.

WATER DISPOSAL METHOD: Dispose of in accordance with Federal, State and Local regulations. If approved, use incineration, on-site bio-oxidation or subsurface injection, or disposal contractor.

EPA HAZARDOUS WASTE NUMBER: U154

AQUATIC TOXICITY RATING - TLm 96: over 1000 ppm

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specific type): In case of conditions where there is a potential for vapor concentrations near exposure limits, use self-contained breathing apparatus, face shield, rubber clothing as appropriate.

VENTILATION:
LOCAL EXHAUST..... Face Velocity 60 fpm
MECHANICAL (General). Explosion proof ventilation equipment
SPECIAL..... Use only with adequate ventilation
OTHER..... No smoking or open flame

SKIN PROTECTION: Chemical resistant gloves such as Neoprene.

EYE PROTECTION: Chemical splash goggles. Eye wash and safety showers should be provided in area of use.

OTHER PROTECTIVE EQUIPMENT: Store in closed containers in cool

SECTION VIII - SPECIAL PROTECTION INFORMATION

place. No smoking allowed in areas of use or storage. Use explosion proof electrical fixtures. Containers should be electrically grounded/bonded during material transfer to prevent static spark. Corrosive to lead and aluminum.

SECTION IX - SPECIAL PRECAUTIONS

HYGIENIC PRACTICES IN HANDLING AND STORAGE: Keep container tightly closed. Keep away from sparks and flames.

PRECAUTIONS FOR REPAIR & MAINTENANCE OF CONTAMINATED EQUIPMENT: Use personal protective equipment as needed.

OTHER PRECAUTIONS: Do not store or mix with strong oxidizers, chronic anhydride, lead perchlorate, or perchloric acid. Store in adequate ventilated areas.

CONTAINERS ARE STRICTLY "SINGLE TRIP CONTAINER" THEY ARE NOT TO BE USED FOR ANY REASON AFTER EMPTIED.

FORMAT BASED ON OSHA FORM 174

MATERIAL SAFETY DATA SHEET

Radiator Specialty Company

1400 W. INDEPENDENCE BLVD. • CHARLOTTE, N.C. 28208 • 704-377-6555

MATERIAL SAFETY DATA SHEET
May be used to comply with OSHA's Hazard Communication Standard 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration. (Non-Mandatory Form) Form Approved OMB No. 1218-0072

SECTION I GENERAL INFORMATION

PRODUCT NAME THRUST QUICK STARTING FLUID
PARTS NUMBER M38-15

NOTE: Blank spaces are not permitted. If any item is not applicable or no information is available, the space must be marked to indicate that.

SECTION II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

COMPONENT	WT.%	C.A.S. NO.	TLV (ACGIH ——— OSHA ~~XXXX~~)
Diethyl Ether	35-50	60-29-7	400ppm (Air)
Aliphatic Petroleum Distillate	50-65	142-82-5	400ppm
Carbon Dioxide (Propellant)	1-5	124-38-9	5000ppm (Air)

Comments: by National Toxicology Program (NTP)

Components not identified are non-hazardous according to 29 CFR 1910.1200

SECTION III PHYSICAL/CHEMICAL CHARACTERISTICS

Specific Gravity (H2O = 1) 0.67-0.70
Solubility In Water Approx. 2-3%
Flash Point (Method) - F° Less Than 20°F (TCC)
Melting Point - F° NDA
Vapor Pressure (mmHg) NDA
Evaporation Rate (Butyl Acetate = 1) NDA
Appearance and Odor Colorless volatile liquid.

pH 6-7
Solubility in Solvent Petroleum Ether
% Volatiles By Wt. Greater Than 95%
Boiling Point - F° NDA
Vapor Density (Air = 1) NDA

SECTION IV FIRE AND EXPLOSION HAZARD DATA

EXTINGUISHING MEDIA: Caution: EXTREMELY FLAMMABLE!!
Water Fog ____ Foam XXX CO2 XXX Dry Chemical XXX

SPECIAL FIRE FIGHTING PROCEDURES. Wear self-contained, positive pressure breathing apparatus and protective clothes. Water spray to cool containers. Shield to protect eyes from venting, rupturing, and bursting cans.

UNUSUAL FIRE AND EXPLOSION HAZARDS At elevated temperatures containers may vent, rupture or burst, even violently. CONTENTS UNDER PRESSURE!!!

SECTION V REACTIVITY DATA

Stable XXXX Unstable ____ Corrosive NO Hazardous Polymerization? Yes ____ NoXXXX

Incompatibilities Oxidizing agents, acids, alkalis, and high temperatures.

Hazardous Decomposition or Byproducts Fire: Normal products of combustion; carbon dioxide, carbon monoxide, and acrid smoke.

SECTION VI HEALTH HAZARD INFORMATION

Recommended TLV of Product 400ppm Aliphatic Petroleum Distillate*

EYE CONTACT Irritant.	SKIN CONTACT Irritant.
INHALATION May cause headache, dizziness, narcosis. Over-exposure: unconsciousness.	INGESTION HARMFUL OF FATAL IF SWALLOWED!
OTHER Caution: EXREMELY FLAMMABLE!!.	

SECTION VII EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT Flush with water for 15 minutes thoroughly while lifting eyelids. Get medical attention immediately.

SKIN CONTACT Wash with soap and water thoroughly. Remove contaminated clothing and launder before re-use

INHALATION Move to fresh air. If breathing is difficult, apply artificial respiration. Consult physician.

INGESTION DO NOT INDUCE VOMITING!! Get medical attention. Consult physician. DO NOT ADMINISTER EPINEPHRINE OR ADRENALIN!!!

SECTION VIII SPECIAL PROTECTION INFORMATION

	CONSUMER	BULK HANDLING (Prolonged Exposure)
RESPIRATORY PROTECTION	N/A	If TLV is exceeded, wear NIOSH approved respirator.
VENTILATION	Use with adequate ventilation.	General
EYE PROTECTION	Goggles	Splash-proof goggles or face shield.
PROTECTIVE CLOTHING	N/A	Solvent-resistant gloves and apron.

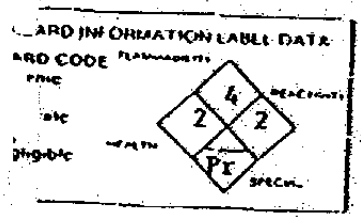
SECTION IX PRECAUTIONS FOR SAFE HANDLING AND USE

SPILL OR LEAK PROCEDURE Observing health hazards described above, ventilate area, remove ignition sources. Confine spill, wipe up with rags

WASTE DISPOSAL METHOD *Dispose of in accordance with all applicable government laws and regulations.*

STORAGE AND HANDLING PRECAUTIONS Store in cool place below 120°F away from ignition sources, oxidizing agents, acids and alkalis

OTHER PRECAUTIONS WEARING CONTACT LENSES IS INADVISABLE!!! DO NOT PUNCTURE OR INCINERATE CONTAINERS!!! KEEP AWAY FROM CHILDREN AND ANIMALS!!!



Supersedes September, 1985 OSHA Revised April, 1987

Title I. Liebman/Technical Director

While Radiator Specialty Company believes this data is accurate as of the revision date, we make no warranty with respect to the data and we expressly disclaim all liability for reliance thereon. The data is offered solely for your information, investigation, and verification.

Pr - Pressure

11/20/02

MATERIAL SAFETY DATA SHEET
Required under USDL Safety and Health Regulations

POWER SERVICE PRODUCTS, INC.
P.O.BOX 1089
WEATHERFORD, TEXAS 76086
817-599-9486
AUGUST 1,1988

SECTION I PRODUCT IDENTIFICATION

IEMICAL NAME:... Diesel Fuel Supplement
EMICAL FAMILY:.. Petroleum Hydrocarbon
ADE NAME:..... Power Service
ORMULA:..... Mixture of Petroleum Hydrocarbons
T Shipping name:For 16 oz,32 oz & Gallon Packaging=CONSUMER COMMODITY
I Shipping name:For 2 1/2 gallons & 55 gallons=FLAMMABLE LIQUID NOS
OT Hazard Classification: For 16 oz,32 oz & Gallon packaging=ORM-D
OT Hazard Classification: For 2 1/2 & 55 gallons=FLAMMABLE LIQUID
Number:..... For 16 oz, 32 oz & Gallon packaging=NONE
Number:..... For 2 1/2 gallons & 55 gallons= UN 1993

SECTION II - HAZARDOUS INGREDIENTS

INGREDIENT	% (BY WT)	TLV	PRODUCT ID CODE
YDROXY COMPOUNDS.....	55	100 ppm	C05
DROCARBONS.....	45	100 ppm	C01
GMENTS.....	<1	N/A	

omplex mixture of Petroleum Hydrocarbons,specific chemical information
s being withheld as a Trade Secret. Specific chemical information
ill be made available to health professionals in accordance with
9 CFR 1910.1200.

ER ONE RATING:PHYSICAL HAZARD FIRE, HEALTH HAZARD IMMEDIATE(ACUTE)

FPA RATING: HEALTH 2 FIRE 3 REACTIVITY 0

SECTION III - PHYSICAL

OILING POINT (DEG. F.):..... 303 deg. f.
APOR PRESSURE (mmHG):..... 30 @ 25 deg. C.
APOR DENSITY (AIR=1):..... 5.1
OLUBILITY IN WATER:..... 10%
PECIFIC GRAVITY (H20=1)..... .82 @ 20/20 deg. C.
ERCENT,VOLATILE BY VOLUME (%)... 100
APORATION RATE:..... .8
PPEARANCE:..... Reddish colored liquid.
DOR:..... Moderate Aromatic Hydrocarbon Odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

SH POINT (METHOD USED):..... 74 deg. F (TCC)
AMMABLE LIMITS
Lel:..... 1.4 %
JEL:..... 10 %

TINGUISHING MEDIA: Foam, dry chemical, CO_2, waterspray or fog

CIAL FIRE FIGHTING PROCEDURES: Use air-supplied rescue equipment
r enclosed areas. Cool exposed containers with water.

SUAL FIRE AND EXPLOSION HAZARDS:Do not store or mix with strong oxidants or
ombustible liquid.

NOT USE TORCH CUTTING EQUIPMENT OR ANY OTHER FLAME ON ANY EMPTY CONTAINERS*

SECTION V - HEALTH HAZARD DATA

RESHOLD LIMIT VALUE:..... 100 ppm for 8-hour workday.
iA Threshold Limit Value:... 100 ppm (694 mg/m3) 8-hour workday
CGIH Threshold Limit Value:.. 100 ppm (694 mg/m3) 8-hour workday
arcinogen-NTP Program:..... N/A
rcinogen-IARC Program:..... N/A

FFECTS OF OVEREXPOSURE: Avoid breathing vapor. Inhalation of high vapor
ncentrations may have results ranging from dizziness and headaches to
consciousness. Prolonged or repeated liquid contact will dry and defat the skin
leading to irritation and dermatitis.

ERGENCY AND FIRST AID PROCEDURES: If overcome by vapor, remove from exposure
mmediately; call a physician. If breathing is irregular or stopped, start
esuscitation, administer oxygen. If swallowed, do not induce vomiting; call a
ysician. Remove contaminated clothing and wash skin with soap and water. Flush
es with water until irritation subsides.

imary Route(s) of entry: Ingestion and inhalation.

VARIABLITY AMONG INDIVIDUALS:
Health studies have shown that many petroleum hydrocarbons and synthetic
ubricants pose potential human health risks which may vary from person to person.
s a precaution, exposure to liquids, vapors, mists or fumes should be minimized.

ATURE OF HAZARD AND TOXICITY INFORMATION:
Prolonged or repeated skin contact with this product tends to remove skin oils
possibly leading to irritation and dermatitis: however,based on human experiences
and available toxicological data, this product is judge to be neither a "corrosive"
or an "irritant".
Potential risk to humans can be minimized by observing good work practices and
personal hygiene procedures generally recommended for petroleum products. Product
as a low order of acute oral toxicity, but minute amounts aspirated into the lungs
during ingestion may cause severe pulmonary injury or death

SECTION VI- REACTIVITY DATA

'ABILITY:.... Stable
COMPATABILITY (Materials to avoid):.... None
..ZARDOUS DECOMPOSITION PRODUCTS:..... Will not occur
'AZARDOUS POLYMERIZATION:..... Will not occur

NDITIONS TO AVOID:
1. Prolong or repeated breathing of vapors
2. Contact with eyes
3. Prolong or repeated contact with skin

VII - ENVIRONMENTAL PROTECTION PROCEDURES

TEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Remove all ignition ources. Keep people away. Recover free liquid. Add absorbent to spill area. Avoid breathing vapors. Ventilate enclosed spaces. Open all windows and doors. Keep etroleum products out of - public sewers, streams, and waterways.

ASTE DISPOSAL METHOD: Dispose of waste by supervised incineration or in a chemical disposal area in compliance with local regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

ESPIRATORY PROTECTION (Specify type): Hydrocarbon vapor canister or supplied-air hose mask if needed.

ENTILATION
LOCAL EXHAUST:.....Face velocity > 60fpm
MECHANICAL (General):.... Explosion-proof ventilation equipment
SPECIAL:..... Use only with adequate* ventilation.
OTHER:..... No smoking or open lights.
Adequate means equivalent to outdoors ventilation

PROCTECTIVE GLOVES: Normally not needed. Use chemical resistant gloves if necessary.
EYE PROTECTION: Normally not needed.
OTHER PROCTECTIVE EQUIPMENT: Hydrocarbon-insoluble apron if needed.

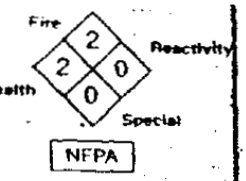
SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep containers closed. Keep away from heat, sparks and open flame.

CONTAINERS ARE STRICTLY "SINGLE TRIP CONTAINERS" THEY ARE NOT TO BE USED FOR ANY REASON AFTER EMPTIED.

OTHER PRECAUTIONS:
Avoid breathing vapors. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; wash before re-use. Wash skin with soap and water after contact.

WD-40®



MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Manufacturer:	WD-40 Company	Telephone:	
		Emergency Only:	1 (800) 424-9300 (CHEMTREC)
Address:	1061 Cudahy Place (92110)	Information:	(619) 275-1400
	P.O. Box 80607	Chemical Name:	Organic Mixture
	San Diego, California 92138-9021	Trade Name:	WD-40 Bulk Liquid

II. HAZARDOUS INGREDIENTS

Chemical Name	CAS Number	%	Exposure Limit ACGIH/OSHA
Aliphatic Petroleum Distillates	8052-41-3	70	100 ppm (PEL)
Petroleum Base Oil	64742-65-0	> 20	5 mg/M³ (TWA)
Non-hazardous Ingredients		< 10	

III. PHYSICAL DATA

Boiling Point:	300°F (minimum)	Evaporation Rate:	Not determined
Vapor Density (air = 1):	Greater than 1	Vapor Pressure:	Not determined
Solubility in Water:	Insoluble	Appearance:	Cloudy light amber
Specific Gravity (H_2O = 1):	.800 @ 70°F	Odor:	Characteristic odor
Percent Volatile (volume):	74%	VOC:	576 grams per liter

IV. FIRE AND EXPLOSION

Flash Point:	Tag Open Cup 110°F (minimum)
Flammable Limits:	(solvent portion) [Lel] 1.0% [Uel] 6.0%
Extinguishing Media:	CO_2, Dry Chemical, Foam
Special Fire Fighting Procedures:	None
Unusual Fire and Explosion Hazards:	None

V. HEALTH HAZARD / ROUTE(S) OF ENTRY

Threshold Limit Value

Aliphatic Petroleum Distillates (Stoddard solvent) lowest TLV (ACGIH 100 ppm.)

Symptoms of Overexposure

Inhalation (Breathing): May cause anesthesia, headache, dizziness, nausea and upper respiratory irritation.
Skin Contact: May cause drying of skin and or irritation.
Eye Contact: May cause irritation, tearing and redness.
Ingestion (Swallowed): May cause irritation, nausea, vomiting and diarrhea.

First Aid Emergency Procedures

Ingestion (Swallowed): Do not induce vomiting, seek medical attention.
Eye Contact: Immediately flush eyes with large amounts of water for 15 minutes.
Skin Contact: Wash with soap and water.
Inhalation (Breathing): Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

DANGER!

Aspiration Hazard: If swallowed can enter lungs and may cause chemical pneumonitis. Do not induce vomiting. Call Physician immediately.

Suspected Cancer Agent

Yes ___ No X The components in this mixture have been found to be noncarcinogenic by NTP, IARC and OSHA.

#1 of 00

Fastenal Company

INDUSTRIAL & CONSTRUCTION SUPPLIES
10a COMMERCIAL STREET
PITTSFIELD MASS. 01201
PHONE #413-445-4800
FAX #413-445-5328
Jay Gaudette –Branch Manager

Attn : Sara

Please find msds sheets for the paint we talked about.

Thanks Jay

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**** DRAFT COPY -- FOR EVALUATION USE ONLY ****

PRODUCT NAME : FLUORESCENT ORANGE SPRAY PAINT
IDENTIFICATION NUMBER: 1856 838
DATE PRINTED : 02/14/01

PRODUCT USE/CLASS : Industrial Choice Marking

SUPPLIER:
Rust-Oleum Corporation
11 Hawthorn Parkway
Vernon Hills, Illinois
60061 USA

(847) 367-7700 Rust-Oleum Corp.
8:00 AM-4:30 PM/24-hr Emer.Assist

MANUFACTURER:
Rust-Oleum Corporation
11 Hawthorn Parkway
Vernon Hills, Illinois
60061 USA

(847) 367-7700 Rust-Oleum Corp.
8:00 AM-4:30 PM/24-hr Emer.Assist

PREPARER: L.J.W., PHONE: 847-816-2445, PREPARE DATE: 07/25/00

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	LIQUIFIED PETROLEUM GAS	68476-85-7	25.0 %
02	TOLUENE	108-88-3	15.0 %
03	ALIPHATIC PETROLEUM DISTILLATES	64742-89-8	10.0 %
04	Hydrotreated Light Distillate	64742-47-8	10.0 %
05	Calcium Carbonate (Limestone)	1317-65-3	5.0 %
06	Stoddard Solvent	8052-41-3	5.0 %

EXPOSURE LIMITS

ITEM	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA PEL-CEILING	MEXICAN TLV-TWA	SKIN
01	1000 PPM	N.E.	1000 PPM	N.E.	N.E.	NO
02	50 PPM	N.E.	200 PPM	300 PPM	N.E.	YES
03	300 PPM	N.E.	300 PPM	N.E.	N.E.	NO
04	N.E.	N.E.	N.E.	N.E.	N.E.	NO
05	10mg/m3	N.E.	15mg/m3	N.E.	N.E.	NO
06	100ppm	N.E.	100ppm	N.E.	100 PPM	NO

(See Section 16 for abbreviation legend)

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: Harmful if inhaled. Harmful if swallowed. Extremely flammable liquid and vapor. Vapors may cause flash fire or explosion. Harmful if inhaled. May effect the brain or nervous system causing
dizziness, headache or nausea. Contents Under Pressure.

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Causes eye irritation.

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Substance may cause slight skin irritation. Prolonged or repeated contact may cause skin irritation.

EFFECTS OF OVEREXPOSURE - INHALATION: Harmful if inhaled. High gas, vapor, mist or dust concentrations may be harmful if inhaled. Avoid breathing vapors or mists. High vapor concentrations are irritating to the eyes, nose, throat and lungs.

EFFECTS OF OVEREXPOSURE - INGESTION: Substance may be harmful if swallowed. Aspiration hazard if swallowed; can enter lungs and cause damage.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion, and blurred vision) and/or damage. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Overexposure to toluene in laboratory animals has been associated with liver abnormalities, kidney, lung and spleen damage. Effects
in humans have included liver and cardiac abnormalities.

PRIMARY ROUTE(S) OF ENTRY: INHALATION EYE CONTACT SKIN ABSORPTION

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: Hold eyelids apart and flush with plenty of water for at lease 15 minutes. Get medical attention.

FIRST AID - SKIN CONTACT: Wash with soap and water. Get medical attention if irritation develops or persists.

FIRST AID - INHALATION: If you experience difficulty in breathing, leave the area to obtain fresh air. If continued difficulty is experienced, get medical assistance immediately.

FIRST AID - INGESTION: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. Get immediate medical attention.

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -99 F

LOWER EXPLOSIVE LIMIT: 1.0 %
UPPER EXPLOSIVE LIMIT: 9.5 %

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: DRY CHEMICAL FOAM

UNUSUAL FIRE AND EXPLOSION HAZARDS: FLASH POINT IS LESS THAN 20 DEG. F. - EXTREMELY FLAMMABLE LIQUID AND VAPOR! Water spray may be ineffective. Closed containers may explode when exposed to extreme heat due to buildup of steam. Closed containers may explode when exposed to extreme heat. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flash back. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Perforation of the pressurized container may cause bursting of the can. Closed containers may explode when exposed to extreme heat.

SPECIAL FIREFIGHTING PROCEDURES: Evacuate area and fight fire from a safe distance.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Evacuate the area, remove all sources of ignition and ventilate well. Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Remove all sources of ignition, ventilate area and remove with inert absorbent and non-sparking tools. Dispose of according to local, state (provincial) and federal regulations. Do not incinerate closed containers.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Wash thoroughly after handling. Wash hands before eating. Use only in a well-ventilated area. Follow all MSDS/label precautions even after container is emptied because it may retain product residues. Avoid breathing vapor or mist.

STORAGE: Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Do not store above 120 degrees F. Store large quantities in buildings designed and protected for storage of NFPA Class I flammable liquids. Contents under pressure. Do not expose to heat or store above 120 degrees F.

(Continued on Page 4)

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Prevent build-up of vapors by opening all doors and windows to achieve cross-ventilation.

RESPIRATORY PROTECTION: A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. A NIOSH/MSHA approved air purifying respirator with an organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

SKIN PROTECTION: Use impervious gloves to prevent skin contact and absorption of this material through the skin. Nitrile or Neoprene gloves may afford adequate skin protection.

EYE PROTECTION: Use safety eyewear designed to protect against splash of liquids.

OTHER PROTECTIVE EQUIPMENT: Refer to safety supervisor or industrial hygienist for further information regarding personal protective equipment and its application.

HYGIENIC PRACTICES: Wash thoroughly with soap and water before eating, drinking or smoking.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: -34 - 383 F	VAPOR DENSITY	: Is heavier than air
ODOR	: Solvent	ODOR THRESHOLD	: N.D.
APPEARANCE	: Liquid	EVAPORATION RATE	: Is faster than Ether
SOLUBILITY IN H2O	: Soluble		
FREEZE POINT	: N.D.	SPECIFIC GRAVITY	: 0.9564
VAPOR PRESSURE	: N.D.	pH @ 0.0 %	: N.D.
PHYSICAL STATE	: LIQUID	VISCOSITY	: N.D.

COEFFICIENT OF WATER/OIL DISTRIBUTION: N.D.

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Avoid temperatures above 120 degrees F. Avoid all possible sources of ignition.

(Continued on Page 5)

SECTION 10 - STABILITY AND REACTIVITY

INCOMPATIBILITY: Incompatible with strong oxidizing agents, strong acids and strong alkalies.

HAZARDOUS DECOMPOSITION PRODUCTS: By open flame, carbon monoxide and carbon dioxide. When heated to decomposition it emits acrid smoke and irritating fumes.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

COMPONENT TOXICOLOGICAL INFORMATION:

CHEMICAL NAME	LD50	LC50
LIQUIFIED PETROLEUM GAS	N.E.	N.E.
TOLUENE	RAT 5000MG/KG	MOUSE 5320PPM 8HR
ALIPHATIC PETROLEUM DISTILLATES	No Information	No Information
Hydrotreated Light Distillate	No Information	No Information
Calcium Carbonate (Limestone)	No Information	No Information
Stoddard Solvent	4900mg/kg(rat)	N.E.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: Product is a mixture of listed components. According to our raw material suppliers, all components are listed on the TSCA inventory as required or meet the polymer exemption as defined in Section 5.5.2 of the Toxic Substances Control Act.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of material in accordance to local, state and federal regulations and ordinances. Do not allow to enter storm drains or sewer systems.

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: AEROSOLS

DOT TECHNICAL NAME:

DOT HAZARD CLASS: 2.1 HAZARD SUBCLASS: 1

(Continued on Page 6)

SECTION 14 - TRANSPORTATION INFORMATION

DOT UN/NA NUMBER: UN1950 PACKING GROUP: RESP. GUIDE PAGE: 126

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

CERCLA - SARA HAZARD CATEGORY:
This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD CHRONIC HEALTH HAZARD FIRE HAZARD

SARA SECTION 313:
This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

CHEMICAL NAME	CAS NUMBER	WT/WT % IS LESS THAN
TOLUENE	108-88-3	15.0 %

U.S. STATE REGULATIONS: AS FOLLOWS -

NEW JERSEY RIGHT-TO-KNOW:
The following materials are non-hazardous, but are among the top five components in this product:

CHEMICAL NAME	CAS NUMBER
WATER DEIONIZED	7732-18-5
FLUORESCENT RESIN	39277-28-6

PENNSYLVANIA RIGHT-TO-KNOW:
The following non-hazardous ingredients are present in the product at greater than 3%:

CHEMICAL NAME	CAS NUMBER
WATER DEIONIZED	7732-18-5
FLUORESCENT RESIN	39277-28-6
Barium Sulfate	7727-43-7

(Continued on Page 7)

SECTION 15 - REGULATORY INFORMATION

CALIFORNIA PROPOSITION 65:
WARNING: The chemical(s) noted below and contained in this product, are known to the state of California to cause cancer, birth defects or other reproductive harm:

CHEMICAL NAME	CAS NUMBER
TOLUENE	108-88-3

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: B5 D2A D2B

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 2* FLAMMABILITY: 4 REACTIVITY: 0

PREVIOUS MSDS REVISION DATE: 07/12/00

LEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

: No Information.

The information contained on this MSDS has been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations.

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : WHITE MARKING SPRAY PAINT
IDENTIFICATION NUMBER: 1893 838
DATE PRINTED : 02/14/01

PRODUCT USE/CLASS : Industrial Choice Marking

SUPPLIER:
Rust-Oleum Corporation
11 Hawthorn Parkway
Vernon Hills, Illinois
60061 USA

(847) 367-7700 Rust-Oleum Corp.
8:00 AM-4:30 PM/24-hr Emer.Assist

MANUFACTURER:
Rust-Oleum Corporation
11 Hawthorn Parkway
Vernon Hills, Illinois
60061 USA

(847) 367-7700 Rust-Oleum Corp.
8:00 AM-4:30 PM/24-hr Emer.Assist

PREPARER: MTM, PHONE: 847-816-2445, PREPARE DATE: 02/13/01

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	LIQUIFIED PETROLEUM GAS	68476-85-7	30.0 %
02	XYLENE	1330-20-7	15.0 %
03	Calcium Carbonate (Limestone)	1317-65-3	10.0 %
04	Titanium Dioxide	13463-67-7	10.0 %
05	TOLUENE	108-88-3	10.0 %
06	ETHYLBENZENE	100-41-4	5.0 %
07	VM&P NAPHTHA	64742-89-8	5.0 %

EXPOSURE LIMITS

ITEM	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA PEL-CEILING	MEXICAN TLV-TWA	SKIN
01	1000 PPM	N.E.	1000 PPM	N.E.	N.E.	NO
02	100PPM	150PPM	100PPM	N.E.	100 PPM	YES
03	10mg/m3	N.E.	15mg/m3	N.E.	N.E.	NO
04	10 mg/m3	N.E.	15 mg/m3	N.E.	N.E.	NO
05	50 PPM	N.E.	200 PPM	300 PPM	N.E.	YES
06	100 PPM	125 PPM	100 PPM	N.E.	N.E.	YES
07	300 PPM	N.E.	300 ppm	N.E.	N.E.	NO

(See Section 16 for abbreviation legend)

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: Harmful if inhaled. Harmful if swallowed. Extremely flammable liquid and vapor. Vapors may cause flash fire or explosion. Harmful if inhaled. May effect the brain or nervous system causing
dizziness, headache or nausea. Contents Under Pressure.

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Causes eye irritation.

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Substance may cause slight skin irritation. Prolonged or repeated contact may cause skin irritation.

EFFECTS OF OVEREXPOSURE - INHALATION: Harmful if inhaled. High gas, vapor, mist or dust concentrations may be harmful if inhaled. Avoid breathing vapors or mists. High vapor concentrations are irritating to the eyes, nose, throat and lungs.

EFFECTS OF OVEREXPOSURE - INGESTION: Substance may be harmful if swallowed. Aspiration hazard if swallowed; can enter lungs and cause damage.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion, and blurred vision) and/or damage. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Overexposure to xylene in laboratory animals has been associated with liver abnormalities, kidney, lung, spleen, eye and blood damage as well as reproductive disorders. Effects in humans, due to chronic overexposure, have included liver, cardiac abnormalities and nervous system damage. Overexposure to toluene in laboratory animals has been associated with liver abnormalities, kidney, lung and spleen damage. Effects
in humans have included liver and cardiac abnormalities.

PRIMARY ROUTE(S) OF ENTRY: INHALATION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: Hold eyelids apart and flush with plenty of water for at lease 15 minutes. Get medical attention.

FIRST AID - SKIN CONTACT: Wash with soap and water. Get medical attention if irritation develops or persists.

FIRST AID - INHALATION: If you experience difficulty in breathing, leave the area to obtain fresh air. If continued difficulty is experienced, get medical assistance immediately.

FIRST AID - INGESTION: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. Get immediate medical attention.

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -99 F

LOWER EXPLOSIVE LIMIT: 0.9 %
UPPER EXPLOSIVE LIMIT: 9.5 %

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: DRY CHEMICAL FOAM

UNUSUAL FIRE AND EXPLOSION HAZARDS: FLASH POINT IS LESS THAN 20 DEG. F. - EXTREMELY FLAMMABLE LIQUID AND VAPOR! Water spray may be ineffective. Closed containers may explode when exposed to extreme heat due to buildup of steam. Closed containers may explode when exposed to extreme heat. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flash back. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Perforation of the pressurized container may cause bursting of the can. Closed containers may explode when exposed to extreme heat.

SPECIAL FIREFIGHTING PROCEDURES: Evacuate area and fight fire from a safe distance.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Evacuate the area, remove all sources of ignition and ventilate well. Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Remove all sources of ignition, ventilate area and remove with inert absorbent and non-sparking tools. Dispose of according to local, state (provincial) and federal regulations. Do not incinerate closed containers.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Wash thoroughly after handling. Wash hands before eating. Use only in a well-ventilated area. Follow all MSDS/label precautions even after container is emptied because it may retain product residues. Avoid breathing vapor or mist.

STORAGE: Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Do not store above 120 degrees F. Store large quantities in buildings designed and protected for storage of NFPA Class I flammable liquids. Contents under pressure. Do not expose to heat or store above 120 degrees F.

(Continued on Page 4)

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Prevent build-up of vapors by opening all doors and windows to achieve cross-ventilation.

RESPIRATORY PROTECTION: A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. A NIOSH/MSHA approved air purifying respirator with an organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

SKIN PROTECTION: Use impervious gloves to prevent skin contact and absorption of this material through the skin. Nitrile or Neoprene gloves may afford adequate skin protection.

EYE PROTECTION: Use safety eyewear designed to protect against splash of liquids.

OTHER PROTECTIVE EQUIPMENT: Refer to safety supervisor or industrial hygienist for further information regarding personal protective equipment and its application.

HYGIENIC PRACTICES: Wash thoroughly with soap and water before eating, drinking or smoking.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: -34 - 285 F	VAPOR DENSITY	: Is heavier than air
ODOR	: Solvent	ODOR THRESHOLD	: N.D.
APPEARANCE	: Liquid	EVAPORATION RATE	: Is faster than Ether
SOLUBILITY IN H2O	: Soluble		
FREEZE POINT	: N.D.	SPECIFIC GRAVITY	: 0.9564
VAPOR PRESSURE	: N.D.	pH @ 0.0 %	: N.D.
PHYSICAL STATE	: LIQUID	VISCOSITY	: N.D.

COEFFICIENT OF WATER/OIL DISTRIBUTION: N.D.

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Avoid temperatures above 120 degrees F. Avoid all possible sources of ignition.

(Continued on Page 5)

SECTION 10 - STABILITY AND REACTIVITY

INCOMPATIBILITY: Incompatible with strong oxidizing agents, strong acids and strong alkalies.

HAZARDOUS DECOMPOSITION PRODUCTS: By open flame, carbon monoxide and carbon dioxide. When heated to decomposition it emits acrid smoke and irritating fumes.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

COMPONENT TOXICOLOGICAL INFORMATION:

CHEMICAL NAME	LD50	LC50
LIQUIFIED PETROLEUM GAS	N.E.	N.E.
XYLENE	RAT 4300MG/KG	RAT 5000PPM 4HR
Calcium Carbonate (Limestone)	No Information	No Information
Titanium Dioxide	24000mg/kg Rats	6820mg/m3 Rats
TOLUENE	RAT 5000MG/KG	MOUSE 5320PPM 8HR
ETHYLBENZENE	RAT 3500MG/KG	N.A.
VM&P NAPHTHA	N.D.	N.D.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: Product is a mixture of listed components. According to our raw material suppliers, all components are listed on the TSCA inventory as required or meet the polymer exemption as defined in Section 5.5.2 of the Toxic Substances Control Act.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of material in accordance to local, state and federal regulations and ordinances. Do not allow to enter storm drains or sewer systems.

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: AEROSOLS

DOT TECHNICAL NAME:

(Continued on Page 6)

SECTION 14 - TRANSPORTATION INFORMATION

DOT HAZARD CLASS: 2.1 HAZARD SUBCLASS: 1

DOT UN/NA NUMBER: UN1950 PACKING GROUP: RESP. GUIDE PAGE: 126

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

CERCLA - SARA HAZARD CATEGORY:
This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD CHRONIC HEALTH HAZARD FIRE HAZARD

SARA SECTION 313:
This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

CHEMICAL NAME	CAS NUMBER	WT/WT % IS LESS THAN
XYLENE	1330-20-7	15.0 %
TOLUENE	108-88-3	10.0 %
ETHYLBENZENE	100-41-4	5.0 %

U.S. STATE REGULATIONS: AS FOLLOWS -

NEW JERSEY RIGHT-TO-KNOW:
The following materials are non-hazardous, but are among the top five components in this product:

CHEMICAL NAME	CAS NUMBER
WATER DEIONIZED	7732-18-5

PENNSYLVANIA RIGHT-TO-KNOW:
The following non-hazardous ingredients are present in the product at greater than 3%:

CHEMICAL NAME	CAS NUMBER
WATER DEIONIZED	7732-18-5
RESIN SOLUTION	NOT AVAILABLE

(Continued on Page 7)

SECTION 15 - REGULATORY INFORMATION

CALIFORNIA PROPOSITION 65:
WARNING: The chemical(s) noted below and contained in this product, are known to the state of California to cause cancer, birth defects or other reproductive harm:

CHEMICAL NAME	CAS NUMBER
TOLUENE	108-88-3

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: B5 D2A D2B

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 2* FLAMMABILITY: 4 REACTIVITY: 0

PREVIOUS MSDS REVISION DATE: 07/12/00

LEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

: No Information.

The information contained on this MSDS has been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations.

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : CAUTION BLUE
IDENTIFICATION NUMBER: 1825 830
DATE PRINTED : 02/14/01

PRODUCT USE/CLASS : WATER-BASED MARKING SPRAY

SUPPLIER:
Rust-Oleum Corporation
11 Hawthorn Parkway
Vernon Hills, Illinois
60061 USA

(847) 367-7700 Rust-Oleum Corp.
8:00 AM-4:30 PM/24-hr Emer.Assist

MANUFACTURER:
Rust-Oleum Corporation
11 Hawthorn Parkway
Vernon Hills, Illinois
60061 USA

(847) 367-7700 Rust-Oleum Corp.
8:00 AM-4:30 PM/24-hr Emer.Assist

PREPARER: MTM, PHONE: 847-816-2445, PREPARE DATE: 02/13/01

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	LIQUIFIED PETROLEUM GAS	68476-85-7	25.0 %
02	XYLENE	1330-20-7	20.0 %
03	TOLUENE	108-88-3	15.0 %
04	Calcium Carbonate (Limestone)	1317-65-3	15.0 %
05	ETHYLBENZENE	100-41-4	5.0 %
06	Titanium Dioxide	13463-67-7	5.0 %
07	VM&P NAPHTHA	64742-89-8	5.0 %

EXPOSURE LIMITS

ITEM	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA PEL-CEILING	MEXICAN TLV-TWA	SKIN
01	1000 PPM	N.E.	1000 PPM	N.E.	N.E.	NO
02	100PPM	150PPM	100PPM	N.E.	100 PPM	YES
03	50 PPM	N.E.	200 PPM	300 PPM	N.E.	YES
04	10mg/m3	N.E.	15mg/m3	N.E.	N.E.	NO
05	100 PPM	125 PPM	100 PPM	N.E.	N.E.	YES
06	10 mg/m3	N.E.	15 mg/m3	N.E.	N.E.	NO
07	300 PPM	N.E.	300 ppm	N.E.	N.E.	NO

(See Section 16 for abbreviation legend)

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: Harmful if inhaled. Harmful if swallowed. Extremely flammable liquid and vapor. Vapors may cause flash fire or explosion. Harmful if inhaled. May effect the brain or nervous system causing
dizziness, headache or nausea. Contents Under Pressure.

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Causes eye irritation.

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Substance may cause slight skin irritation. Prolonged or repeated contact may cause skin irritation.

EFFECTS OF OVEREXPOSURE - INHALATION: Harmful if inhaled. High gas, vapor, mist or dust concentrations may be harmful if inhaled. Avoid breathing vapors or mists. High vapor concentrations are irritating to the eyes, nose, throat and lungs.

EFFECTS OF OVEREXPOSURE - INGESTION: Substance may be harmful if swallowed. Aspiration hazard if swallowed; can enter lungs and cause damage.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: May cause central nervous system disorder (e,g.,narcosis involving a loss of coordination, weakness, fatigue, mental confusion, and blurred vision) and/or damage. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Overexposure to xylene in laboratory animals has been associated with liver abnormalities, kidney, lung, spleen, eye and blood damage as well as reproductive disorders. Effects in humans, due to chronic overexposure, have included liver, cardiac abnormalities and nervous system damage. Overexposure to toluene in laboratory animals has been associated with liver abnormalities, kidney, lung and spleen damage. Effects
in humans have included liver and cardiac abnormalities.

PRIMARY ROUTE(S) OF ENTRY: SKIN ABSORPTION INHALATION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: Hold eyelids apart and flush with plenty of water for at lease 15 minutes. Get medical attention.

FIRST AID - SKIN CONTACT: Wash with soap and water. Get medical attention if irritation develops or persists.

FIRST AID - INHALATION: If you experience difficulty in breathing, leave the area to obtain fresh air. If continued difficulty is experienced, get medical assistance immediately.

FIRST AID - INGESTION: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. Get immediate medical attention.

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -99 F
(TAGLIABUE CLOSED CUP)

LOWER EXPLOSIVE LIMIT: 0.9 %
UPPER EXPLOSIVE LIMIT: 9.5 %

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: DRY CHEMICAL FOAM

UNUSUAL FIRE AND EXPLOSION HAZARDS: FLASH POINT IS LESS THAN 20 DEG. F. - EXTREMELY FLAMMABLE LIQUID AND VAPOR! Water spray may be ineffective. Closed containers may explode when exposed to extreme heat due to buildup of steam. Closed containers may explode when exposed to extreme heat. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flash back. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Perforation of the pressurized container may cause bursting of the can. Closed containers may explode when exposed to extreme heat.

SPECIAL FIREFIGHTING PROCEDURES: Evacuate area and fight fire from a safe distance.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Evacuate the area, remove all sources of ignition and ventilate well. Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Remove all sources of ignition, ventilate area and remove with inert absorbent and non-sparking tools. Dispose of according to local, state (provincial) and federal regulations. Do not incinerate closed containers.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Wash thoroughly after handling. Wash hands before eating. Use only in a well-ventilated area. Follow all MSDS/label precautions even after container is emptied because it may retain product residues. Avoid breathing vapor or mist.

STORAGE: Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Do not store above 120 degrees F. Store large quantities in buildings designed and protected for storage of NFPA Class I flammable liquids. Contents under pressure. Do not expose to heat or store above 120 degrees F.

(Continued on Page 4)

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Prevent build-up of vapors by opening all doors and windows to achieve cross-ventilation.

RESPIRATORY PROTECTION: A respiratory protection program that meets OSHA 1910.134 and ANSI 288.2 requirements must be followed whenever workplace conditions warrant a respirator's use. A NIOSH/MSHA approved air purifying respirator with an organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

SKIN PROTECTION: Use impervious gloves to prevent skin contact and absorption of this material through the skin. Nitrile or Neoprene gloves may afford adequate skin protection.

EYE PROTECTION: Use safety eyewear designed to protect against splash of liquids.

OTHER PROTECTIVE EQUIPMENT: Refer to safety supervisor or industrial hygienist for further information regarding personal protective equipment and its application.

HYGIENIC PRACTICES: Wash thoroughly with soap and water before eating, drinking or smoking.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: -34 - 285 F	VAPOR DENSITY	: Is heavier than air
ODOR	: SOLVENT	ODOR THRESHOLD	: N.D.
APPEARANCE	: LIQUID	EVAPORATION RATE	: Is faster than Ether
SOLUBILITY IN H2O	: SOLUBLE		
FREEZE POINT	: N.D.	SPECIFIC GRAVITY	: 0.9000
VAPOR PRESSURE	: N.D.	pH @ 0.0 %	: N.D.
PHYSICAL STATE	: LIQUID	VISCOSITY	: N.D.

COEFFICIENT OF WATER/OIL DISTRIBUTION: N.D.

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Avoid temperatures above 120 degrees F. Avoid all possible sources of ignition.

(Continued on Page 5)

SECTION 10 - STABILITY AND REACTIVITY

INCOMPATIBILITY: Incompatible with strong oxidizing agents, strong acids and strong alkalies.

HAZARDOUS DECOMPOSITION PRODUCTS: By open flame, carbon monoxide and carbon dioxide. When heated to decomposition it emits acrid smoke and irritating fumes.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

COMPONENT TOXICOLOGICAL INFORMATION:

CHEMICAL NAME	LD50	LC50
LIQUIFIED PETROLEUM GAS	N.E.	N.E.
XYLENE	RAT 4300MG/KG	RAT 5000PPM 4HR
TOLUENE	RAT 5000MG/KG	MOUSE 5320PPM 8HR
Calcium Carbonate (Limestone)	No Information	No Information
ETHYLBENZENE	RAT 3500MG/KG	N.A.
Titanium Dioxide	24000mg/kg Rats	6820mg/m3 Rats
VM&P NAPHTHA	N.D.	N.D.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: Product is a mixture of listed components. According to our raw material suppliers, all components are listed on the TSCA inventory as required or meet the polymer exemption as defined in Section 5.5.2 of the Toxic Substances Control Act.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of material in accordance to local, state and federal regulations and ordinances. Do not allow to enter storm drains or sewer systems.

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: AEROSOL

DOT TECHNICAL NAME:

(Continued on Page 6)

SECTION 14 - TRANSPORTATION INFORMATION

DOT HAZARD CLASS: 2.1 HAZARD SUBCLASS: 1

DOT UN/NA NUMBER: UN1950 PACKING GROUP: RESP. GUIDE PAGE: 126

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

CERCLA - SARA HAZARD CATEGORY:
This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD CHRONIC HEALTH HAZARD FIRE HAZARD

SARA SECTION 313:
This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

CHEMICAL NAME	CAS NUMBER	WT/WT % IS LESS THAN
XYLENE	1330-20-7	20.0 %
TOLUENE	108-88-3	15.0 %
ETHYLBENZENE	100-41-4	5.0 %

U.S. STATE REGULATIONS: AS FOLLOWS -

NEW JERSEY RIGHT-TO-KNOW:
The following materials are non-hazardous, but are among the top five components in this product:

CHEMICAL NAME	CAS NUMBER
WATER DEIONIZED	7732-18-5

PENNSYLVANIA RIGHT-TO-KNOW:
The following non-hazardous ingredients are present in the product at greater than 3%:

CHEMICAL NAME	CAS NUMBER
WATER DEIONIZED	7732-18-5
RESIN SOLUTION	NOT AVAILABLE

(Continued on Page 7)

SECTION 15 - REGULATORY INFORMATION

CALIFORNIA PROPOSITION 65:
WARNING: The chemical(s) noted below and contained in this product, are known to the state of California to cause cancer, birth defects or other reproductive harm:

CHEMICAL NAME	CAS NUMBER
TOLUENE	108-88-3

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 2* FLAMMABILITY: 4 REACTIVITY: 0

PREVIOUS MSDS REVISION DATE: 08/04/00

LEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

: No Information.

The information contained on this MSDS has been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations.

MATERIAL SAFETY DATA SHEET

KNIGHT'S

Knight Marketing Corporation
251 N. Comrie Ave.
Johnstown, NY 12095

Emergency # 1-800-477-7299
CHEMTREC # 1-800-424-9300
(518)762-4591/FAX (518)762-2566

SECTION I - PRODUCT INFORMATION

Revised: October 17, 1996

PRODUCT NAME: **SUPER SPRAY KLEEN**

PRODUCT USE: Concentrated multi-purpose cleaner

HMIS RATING	HEALTH:	3	FLAMMABILITY:	0	REACTIVITY	0	PERSONAL PROTECTION: B
NFPA RATING	HEALTH:	2	FLAMMABILITY:	0	REACTIVITY	0	

SECTION II - HAZARDOUS INGREDIENT INFORMATION (29 CFR 1910.1200)

CHEMICAL NAME	CAS NUMBER	%	EXPOSURE LIMITS
Sodium Metasilicate	6834-92-0	1-5	Not Established

The states of Massachusetts, New Jersey and Pennsylvania may require regulatory information not contained herein. If the product is intended for use in any of the aforementioned states, the additional information will be provided by the manufacturer upon request.

SECTION III - PHYSICAL AND CHEMICAL DATA

PHYSICAL STATE:	Liquid	APPEARANCE:	Transparent, blue
ODOR:	Sassafras	pH:	13.0
EVAPORATION RATE (WATER=1):	>1	BOILING POINT:	~212°F
VAPOR DENSITY (air=1):	>1	VAPOR PRESSURE:	~18mm
SPECIFIC GRAVITY:	1.043	SOLUBILITY IN WATER:	Complete

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT AND METHOD:	None (TCC)
FLAMMABLE LIMITS:	Not applicable
EXTINGUISHING MEDIA:	Not applicable
SPECIAL FIRE FIGHTING PROCEDURES:	Not applicable
UNUSUAL FIRE AND EXPLOSION HAZARDS:	Not applicable

SECTION V - REACTIVITY HAZARD DATA

STABILITY:	Yes
INCOMPATIBILITY (Materials to Avoid):	Strong oxidizing agents
HAZARDOUS DECOMPOSITION PRODUCTS:	Not determined
HAZARDOUS POLYMERIZATION:	Will not occur

SECTION VI - CONTROL AND PROTECTIVE MEASURES

GLOVES:	The use of rubber gloves is recommended.
SAFETY GLASSES:	The use of safety glasses is recommended.
RESPIRATORY:	Not applicable
VENTILATION:	Adequate

SECTION VII - HEALTH HAZARD DATA

PRIMARY ROUTE OF ENTRY:	Skin and Eye
EFFECTS OF ACUTE EXPOSURE:	Skin - will cause burns; Eye - Will cause burns.
EFFECTS OF CHRONIC EXPOSURE:	None, based on ingredient safety data, supportive technical information and extensive product history (over 20 years).
MEDICAL CONDITIONS AGGRAVATED BY USE:	Persons with pre-existing skin disorders or sensitivity may be more susceptible to the effects of acute exposure.
OTHER HEALTH HAZARDS (Carcinogenic, Mutagenic, Teratogenic):	None, based on ingredient safety data, supportive technical information, and extensive product history (over 20 years). Not listed with NTP, OSHA or IARC as a carcinogen.

SECTION VIII - FIRST AID PROCEDURES

EYE:	Flush immediately with water for 15 minutes. Contact physician.
SKIN:	Flush with water for 15 minutes. Contact physician.
INHALATION:	Not applicable
INGESTION:	Drink plenty of water. Do NOT induce vomiting. Contact physician immediately.

SECTION IX - STORAGE, SPILL AND DISPOSAL INFORMATION

LEAK AND SPILL PROCEDURE:	Where possible, salvage product and use for cleaning or use absorbent material to soak up spill. Thoroughly rinse residue with water.
STORAGE REQUIREMENTS:	Avoid freezing or excessive heat. Keep container closed. Keep out of reach of children.
WASTE DISPOSAL:	Dispose of in accordance with local, state, and federal regulations.

SECTION X - SHIPPING REGULATIONS

DOT: 32 fl. oz. or less: Consumer Commodity ORM-D (Cannot be shipped by air).
Over 32 fl. oz.: Compounds, Cleaning Liquid(Contains Sodium Metasilicate), 8, NA1760, PG II

SECTION XI - OTHER REGULATORY INFORMATION

SARA TITLE III:	Ingredients in this product that may require reporting under Section 313 of SARA Title III: Glycol Ether (3-7%).
TSCA:	All of the ingredients in this product are on the Toxic Substance Control Act (TSCA) inventory.
USDA:	Super Spray Kleen is authorized by USDA for use in federally inspected meat and poultry plants.

SECTION XII - MSDS PREPARATION INFORMATION

SOURCES: Ingredient MSDS's, RTECS - NIOSH, The Merck Index, Clinical Toxicology of Commercial Products, The New York Public Health Fact Sheets, TLV's ACGIH

PREPARED BY: Terry L. Bolibaugh DATE: 10/17/96

REVIEWED BY: Gary M. Greco DATE: 10/17/96

Appendix C

Maxymillian Technologies, Inc.

Hazard Communication Program

Hazard Communication Standard

Table of Contents

1.0 OVERVIEW

The Hazard Communication Standard is intended to satisfy requirements of various federal and state agencies. In particular, the Occupational Safety and Health Administration (OSHA) 29 CFR part 1926 and state Right-To-Know laws require us to make this information available to you. This standard contains information about categories of potentially hazardous materials with which workers might come in contact on a jobsite. Be sure you understand how to find information about hazardous materials.

We will make a copy of this standard available to each jobsite supervisor. It is your right to review this standard. Master copies of this standard will be maintained at the home office. This standard and the Material Safety Data Sheets (MSDSs) that represent each category are intended for use at all company jobsites; each jobsite may also have specific MSDSs.

Determination of hazardous materials is made by the manufacturer or importer of the material, not by this company. If doubt exists about the accuracy of a hazard evaluation, a qualified person may make the determination, using the guidelines set forth by the Occupational Safety and Health Administration (OSHA) and the written procedures for the evaluation included in this standard, as per 48 Federal Register (FR) 53296-66 through 5335-36. The determinations of qualified persons regarding hazard evaluations shall not preclude state or federal hazardous materials lists.

1.1 Training

It is your right as an employee to be trained to recognize hazardous materials and to understand the importance of performing your job safely. You should be trained before you begin working at a jobsite in how to safely work with hazardous materials in general and those specific to the jobsite. This provision for being trained before beginning work applies especially to the performance of non-routine tasks. It is the joint responsibility of the Safety Engineer and the jobsite supervisor to ensure that such training is provided. You will be requested to sign a copy of a training verification form that indicates when, where, and by whom you were trained; copies of this form are maintained at the home office.

1.2 Definitions

The following abbreviations and terms are used throughout this standard:

Hazard Warning

- Any picture, symbol, or combination of pictures and/or symbols that convey the hazard(s) of the substance(s) in the container(s). These hazard warnings are provided by the manufacturer of the substance.

MSDS/MSDSs
- Material Safety Data Sheets; A printed form that provides information about health, fire, and safety risks associated with a particular substance of compound. These forms are provided by the manufacturer of the substance.

NFPA
- National Fire Protection Agency; a non-profit organization whose aim is to safeguard against fires. The NFPA is responsible for the nationally accepted NFPA 704 Fire Hazard Marking System.

OSHA
- Occupational Safety and Health Administration; the federal agency responsible for the establishment and enforcement of safety and health standards in industry.

UN Classification Numbers
- Those numbers located on some hazard warnings to identify the type and degree of a particular hazard.

UN ID Numbers
- The four-digit identification system used for shipping hazardous materials. For details on this identification system, refer to the Emergency Response Guide Book (Department of Transportation Publication Number 5800.4).

2.0 IDENTIFYING AND LABELING HAZARDOUS MATERIALS

IMPORTANT: DO NOT remove the label from any container. If a label is removed accidentally or is missing, be sure to notify the jobsite supervisor.

2.1 Responsibilities and Requirements

Jobsite supervisors are responsible for ensuring that all containers in which hazardous materials are stored or transported are labeled properly. If a label is accidentally removed, promptly transfer the information and affix a new label to the container. At a minimum, the label must be written in English and must identify the material and the appropriate hazard warning(s).

Original labels will list the chemical identity, appropriate hazard warnings and the name and address of the manufacturer. Referral will be made to the corresponding MSDS to assist in verifying label information. Original labels should not be defaced or removed.

If chemicals are transferred from a labeled container to a portable container that is intended only for immediate use, no labels are required on the portable container. However, no hazardous materials or chemicals should be permanently used or stored in unlabeled containers.

2.2 More than 1 gallon or 5 pounds

It is the responsibility of the manufacturer or distributor of a substance to label, tag, or mark each container that holds more than one (1) gallon or five (5) pounds of hazardous material. The label will contain, at a minimum:

- Identity of the material or substance
- Hazard warning(s) appropriate for the material(s) or substance(s)
- Name and address of the manufacturer (and/or other responsible party).

The label will be diamond-shaped, not less than four (4) inches per side, and include the symbol(s) appropriate for the substance.

2.3 More than 5 gallons or 30 pounds

Containers holding more than five (5) gallons or thirty (30) pounds of an NFPA-classified hazardous substance are required to carry an NFPA label, in addition to the basic label.

The exception to the labeling requirement involves solid metal: solid metal need only be identified by label or MSDS during or prior to initial shipment; subsequent loads need not be labeled.

2.4 Less than 1 gallon or 5 pounds

Containers holding less than one (1) gallon or five (5) pounds may provide signs, placards, or written operating procedures instead of labels, as long as the required information is conveyed.

3.0 MSDS - GENERAL INFORMATION

3.1 Suppliers

MSDSs are supplied by the distributor or manufacturer, either with the first or every delivery of the hazardous substance(s). If an MSDS for a substance is not on file, a responsible person appointed by the Safety Engineer will make written request of the distributor for the MSDS. That person will retain a copy of the written request for safety records.

3.2 File Maintenance

An MSDS for each substance with which an employee might come into contact is kept on file at the home office. Each jobsite supervisor is responsible for ensuring that his or her book contains an MSDS for each substance at the jobsite. The Safety Engineer will appoint a responsible person to ensure the proper and accurate maintenance of MSDS files.

3.3 Distribution Responsibility

Responsibility for MSDSs is shared by the person who accepts shipment, the person who delivers shipment, and the person who maintains MSDS files. If you accept or deliver a shipment that includes an MSDS, it is your responsibility to deliver the MSDS to the home office. A responsible person at the home office will file and distribute the MSDS.

3.4 Availability at Jobsites

The jobsite supervisor or an appointed employee will be responsible for making this standard available to all employees at that jobsite. In the event the individual who maintains the standard is unavailable, copies of this standard, as well as a complete set of MSDSs, can be found at the home office.

3.5 Contents

The specific content and format of MSDSs may vary. At a minimum, they must include the following information:

1. Product identification
   - material name
   - synonyms and trade names
   - chemical formula (unless proprietary)

1. Hazardous ingredients
   - percentage of hazardous substances

   - toxicological data

1. Physical data
   - vapor pressure
   - solubilities
   - specific gravity
   - vapor density

1. Fire and explosion data

- autoignition temperature
- flash point
- flammability limits in ark
- precautions

1. Reactivity data

2. Health hazard and first aid information

3. Special protection requirements and recommendations

4. Special precautions

5. Point of contact and manufacturer information

4.0 INFORMATION AND TRAINING

All employees who may come in contact with hazardous materials will be provided with general training in how to safely work with hazardous materials. Training also discusses employee rights about working with hazardous substances. OSHA and state Right-To-Know laws require us to maintain records of your training sessions.

4.1 Supervisory Responsibility

Job supervisors are responsible for ensuring that all members of their work crews are trained according to the provisions outlined below. Job supervisors should check with each new member of the crew or with the home office to ensure that the employee has been trained before the employee begins work at the jobsite.

4.2 General Training

You will be trained before your assignment to a jobsite. After this general training, you will receive updated and refresher training annually. Training will be documented by a sign-in sheet recording each employee's attendance, the date and the training topics covered. Training will cover:

1. Health and physical hazards of chemicals in the work area
2. Methods for detecting the presence or release of hazardous chemicals in the workplace
3. Interpreting MSDSs and labels
4. Protective measures
5. Understanding this standard
6. Operations at worksites with hazards chemicals
7. Right to request MSDSs
8. Right to refuse to work with a substance
9. Standard location and availability, including lists of chemicals and MSDSs

4.2.1 Non-Routine Tasks

Non-routine tasks at jobsites require special training. Be sure you are trained before you begin to perform any non-routine task. It is the responsibility of the jobsite supervisor to ensure that employees are trained to safely perform non-routine tasks before they begin performance of the non-routine task.

5.0 PROTECTIVE MEASURES

The use of splash goggles, gloves, protective clothing, boots and possibly respiratory protection may be required during certain site activities. If respiratory protection is used, it will be in full compliance with OSHA Regulations 29 CFR 1910.134 and 29 CFR 1926.103. All personnel protective equipment used will be in accordance with Subpart I of OSHA Regulations 29 CFR 1910 and Subpart E of OSHA Regulations 29 CFR 1926. Any emergencies involving hazardous chemicals of potentially contaminated samples must be reported to the jobsite supervisor or Safety Engineer.

6.0 MULTI-EMPLOYER WORKSITES

OSHA regulations and state Right-To-Know laws require us to coordinate information about hazardous materials used by our workers and those of subcontractors at a jobsite.

We recognize the importance of making this information available to all persons who may come in contact with hazardous materials, and we will make available to our contractors and subcontractors copies of this Hazard Communication Standard. Other contractors and subcontractors at a jobsite are required to provide for use of all employees at a jobsite their own hazard communication standard, or material safety data sheets for all hazardous substances used by their crews.

To this end, a responsible person appointed by the Safety Engineer will make a written request for MSDSs from each subcontractor or contractor whose employees will share our jobsite.

7.0 HEALTH/SAFETY EMERGENCY INFORMATION

Emergency procedures may be unique to each site, but all jobsites should include these standard practices in their emergency procedures:

- Emergency telephone numbers must be prominently displayed near a working telephone. These numbers include:
  - Fire
  - Ambulance
  - Police

Additional emergency phone numbers should be posted before any non-routine task involving hazardous materials begins.

- First aid kits and eye wash stations will be maintained in a convenient location on each site. These locations will be identified to all employees.

- Emergency evacuation procedures should be developed for each jobsite, as necessary. Such procedures should include evacuation routes and designated meeting spots for employee check-in. It is the responsibility of the jobsite supervisor to notify the appropriate authorities in the event any employee does not check in at the designated meeting spot.

Appendix D

MaxymillianTechnologies, Inc.

Control of Hazardous Energy (Lockout/Tagout) Program

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1.0 OVERVIEW

This program establishes policies and provides guidelines to ensure standardized implementation of the OSHA Lockout/Tagout Standard.

This policy applies to all employees who perform work that involves the unexpected start-up of equipment, as defined in 29 CFR 1910.147. Training will familiarize the employees with this policy so they may work safely and confidently while performing their assigned tasks. This program does not apply to routine service or maintenance, when guards or safety devices are not by passed. When working at a facility with an established Lockout/Tagout program, that facility's program will take precedence. Training as outlined herein will be on an annual basis and will be provided prior to any associated work. This program will be reviewed by the Safety Officer on an annual and as needed basis.

2.0 DEFINITIONS

Affected employee -- An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under Lockout or Tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized employee -- A person who locks or implements a Tagout system procedure on machines or equipment to perform the servicing or maintenance on that machine or equipment. An authorized employee and an affected employee may be the same person when the affected employees duties also include performing maintenance or service on machines or equipment that must be locked or tagged out.

Blanking of lines -- When possible, each end of a feed line into a confined space will be blocked and the line drained. Any drains that may be present in the confined space will be locked open so that any spill will drain from the area.

Capable of being locked out -- An energy isolating device will be considered capable of being locked out if it is designed with a hasp or other attachment or internal part to which or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized -- Connected to an energy source of containing residual or stored energy.

Energy isolating device -- A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following:

- a disconnect switch
- a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and in addition, no pole can be operated independently:
- a slide gate
- a manually operated electrical circuit breaker
- a slip blind
- a line valve
- a block
- any similar device used to block or isolate energy

The term does not include:

- a push button
- a selector switch
- or other control circuit type devices

Energy source -- Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Hot tap -- A procedure used in repair, maintenance and service activities that involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipelines without the interruption of service for air, gas, water, steam and petrochemical distribution systems.

Lockout -- The placement of a lockout device on an energy isolating device, in occurrence with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device -- A device that utilizes a positive mean such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

Normal production operations -- The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance -- Workplace activities such as construction, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustment or release of hazardous energy.

Setting up -- Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout -- The placement of a Tagout device on an energy isolating device, in accordance with an established procedure, to indicate the energy isolating device and the equipment being controlled may not be operated until the Tagout device is removed.

Tagout device -- A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the Tagout device is removed.

3.0 EMPLOYEES AND TRAINING

Employee training will address the following:

- each authorized employee shall receive training in the recognition or applicable hazardous energy sources, the type and magnitude of the energy and the methods and means necessary for energy isolation and control
- each authorized employee will be furnished with his/her own unique key and lock
- each affected employee shall be instructed in the purpose and use of the energy control procedure
- tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program; they are essentially working devices fixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock -- locks are to be used whenever possible.
- when a tag is attached to an energy isolating means, it is not to be removed with authorization of the person responsible for it, and it is never to be bypassed, ignored or otherwise defeated
- tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective
- tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use
- tags will be attached to the lock to identify The Company as the company locking out -- tags will conform to 1910.147 in regards to water and corrosion resistance
- all tags will be attached with nylon ties

3.1 Retraining Employees

Retraining of authorized and affected employees shall be performed annually or whenever there is a change in employee job assignments; whenever a new hazard is introduced due to a change in machines, equipment or process and; whenever a periodic inspection by the employer reveals inadequacies in The Company procedures or in the knowledge of the employees.

4.0 ISOLATION PROCEDURES

- isolation will be initiated by the authorized person or persons
- employees in the facility shall be notified prior to equipment isolation and after all isolation procedures have been removed
- machine shutdown - an authorized person shall turn off or shutdown the machine - a Company Supervisor shall observe and verify that shutdown is complete
- equipment isolation - all isolation devices shall be placed at this time - a Company Supervisor shall observe and verify

4.1 Lockout/Tagout

- devices shall be affixed to each energy isolating device by the authorized employee -- a Company Supervisor shall verify
- no employee may affix a personal Lockout/Tagout device for another employee
- locks shall be affixed in a manner that will hold the energy isolating device in a safe (off) position
- Tagout devices, where used, shall be affixed at the same location as would a lock if such fittings are provided, or shall be affixed in a manner that will clearly indicate that movement of the isolating device is prohibited
- stored energy - all potential stored or residual energy must be released, relieved or disconnected, if there is a potential of reclamation, verification of isolation shall continue throughout the project

4.2 Verification of Isolation

- prior to work, the authorized person(s) shall verify that the equipment has been disengaged and isolated
- The Supervisor will complete Attachment "A". Certification of Inspection and Record of Training

4.3 Release from Lockout/Tagout

- the work area shall be inspected to insure that nonessential items are not left in the work area and to ensure that the equipment is intact
- the work area shall be checked to ensure that all employees are clear
- before Lockout/Tagout devices are removed affected employees shall be notified
- removal of Lockout/Tagout devices shall be performed by the authorized employee
- a Company shall verify - **Exception:** when the employee is not available then the Supervisor shall remove the Lockout/Tagout devices provided that he:
- verifies that the employee is not at the facility
- makes all reasonable efforts to contact the employee and notify him/her that he will remove the devices
- before re-energization, all employees in the machine or equipment area shall be notified that the Lockout/Tagout devices have been removed.

4.4 Group Lockout/Tagout

Each authorized employee performing servicing or maintenance where the release of hazardous energy is possible, shall be protected by his/her personal Lockout/Tagout device and by the company procedure.

4.5 Shift or Personnel Changes

Changes between shifts shall be made in an orderly fashion. The initial authorization person shall remain in control until all of his crew have removed their locks and tags. He will then transfer them to the next shifts authorized person, who will start the entire Lockout/Tagout procedure for his/her crew. If an employee must leave a site and be replaced, he/she must remove his/her lock and turn them into his/her supervisor who shall orient the new employee. The new employee will then place his/her lock and tag on the equipment.

As it applies to confined space (tank entry):

- Electrical boxes, valves and mechanical devices will be tagged and locked out with chains and padlocks when these items pose a potential threat to an employee. Each person working in the work zone will have a unique padlock that he or she will open upon leaving the work zone. Those items that are locked out will remain so until the last person removes his or her padlock.

- Blanking of lines - When possible, each end of a feed line into a confined space will be blocked and the line drained. Any drains that may be present in the confined space will be locked open so that any spill will drain from the area.

- Misalignment of Lines - Feed lines may be misaligned in the event blanking is not possible. Again, any drains in the confined space must be locked in the open position.

- At lease annually, an authorized employee other than the one(s) utilizing the energy control procedure being inspected, is required to inspect and verify the effectiveness of The Company energy control procedures. These inspections shall at least provide for a demonstration of the procedures and may be implemented through random audits and planned visual observations. These inspections are intended to ensure that the energy control procedures are being properly implemented and to provide an essential check on the continued utilization of the procedures.

- When Lockout is used, The Employer's inspection shall include a review of the responsibilities of each authorized employee implementing the procedure with that employee. Group meetings between the authorized employee who is performing the inspection and all authorized employees who implement the procedure would constitute compliance with this requirement.

- When Tagout is used, The Employer shall conduct this review with each affected and authorized employee.

- Energy control procedures used less frequently than once a year need be inspected only when used.

- The periodic inspection must provide for and ensure effective correction of identified deficiencies.

- The Employer is required to certify that the prescribed periodic inspections have been performed. See Attachment "A"., Certification of Inspection and Record of Training.

Attachment 1

CERTIFICATION OF INSPECTION AND RECORD OF TRAINING

Date:_____ Inspection/Training performed by:_____

Supervisor: _____

Crew:_____

Type of work, include name of equipment:_____

Type of controls used:_____If no, why?_____

Were procedures followed?

_____

Were procedures reviewed with authorized and affected employees?

_____

What type of control was used?

_____

Comments:

_____

Supervisors comments:

_____

Supervisors signature:_____

Appendix E

Maxymillian Technologies, Inc.

Respiratory Protection Program

Respirator Program

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Figures

FOREWORD

No employee will be assigned duties requiring use of a respirator until medical clearance is obtained from a competent authority.

1.0 DEFINITIONS

I.D.L.H. Immediately Dangerous to Life or Health—Used for respirator selection. This represents a maximum concentration of airborne contaminant from which, in the event of respirator failure, one could escape within thirty (30) minutes without experiencing any escape impairing or irreversible health effects.

P.E.L. Permissible Exposure Levels—based on an 8 hour work day as prescribed by OSHA

S.C.B.A. Self Contained Breathing Apparatus

S.O.P. Standard Operating Procedure

T.L.V. Threshold Limit Valve—Airborne concentrations of substance and represent conditions under which it is believed that nearly all workers may be repeatedly exposed for an eight hour day, day after day without adverse effects. As recommended by The American Conference of Governmental Industrial Hygienists.

Whenever possible, atmospheric contamination will be prevented through the use of:

- Engineering Controls
- Administrative Controls
- Work Practices

Respirators need to be used for those environments that cannot be controlled through other means. Respirators referred to here are to be used for respiratory protection, any time a hazard(s) exceeds OSHA MANDATED P.E.L. or T.L.V, where applicable.

This Standard Operating Procedure will be available and utilized as part of the Company's required respirator program. This program shall meet or exceed the minimum requirements as set forth in 29 CFR 1910.124. This S.O.P. consists of the following components:

2.0 SELECTION

Respirators shall be selected by a qualified individual. All respirators shall be approved in the latest edition of *The NIOSH Certified Equipment List* or the specific hazard encountered.

Selection criteria[1] shall include but not be limited to the following factors:

- Oxygen Level
- Contaminant
- Warning Properties
- TLV
- Service Limit of Canister
- Protection Factor
- Successful Fit Test
- Respirator Assembly Approval

3.0 TRAINING

Anyone who uses or can be expected to use a respirator in the course of his/her employment shall be trained in its use.

Respirator training shall include but not be limited to the following:

- hazards, definition
- results of improper use
- engineering and administrative controls on the job
- reason for selection of particular type of respirator
- functions, capabilities and limitations of respirator selected
- donning, checking fit and operation
- proper wearing of respirator
- emergency situations, recognition and action
- decontamination.

[1]See Enclosure # 1

4.0 FIT TESTING

Fit testing shall be performed and recorded[2] for each person[3] to ensure proper selection of respirator (not all masks fit all people). Testing will be conducted initially upon assignments and annually thereafter, or when subject has:

- weight change—approximately 20 pounds;
- significant facial scarring;
- significant dental changes;
- re-constructive or cosmetic surgery;
- any other condition interfering with a proper seal.

> Fit testing will not be conducted if there is hair between the skin and face piece sealing surface. Beards or apparel will be altered or removed to allow a satisfactory fit.

All users or potential users of demand type respiratory protection devices should be fit tested to ensure a proper face piece to face seal. A selection of respirators should be tested with users allowed to choose the most comfortable from those that fit satisfactorily. Fit testing should be performed in accordance with the most appropriate method described by OSHA Respirator Standard, Appendix A, Part 1 (JHM/MT Respirator Program, Enclosure 3: OSHA Respirator Standards, Appendices A – D).

4.1 MAINTENANCE

4.1.1 General Requirements

The purpose of this program is to assure that all respirators are maintained at their original effectiveness. If they are modified in any way, the Protection Factors may be voided. At least one person will be assigned and trained to inspect, clean, repair, and store respirators. However, each individual will be responsible for their assigned respirator except where repairs are concerned. No components will be replaced or repairs made beyond those recommended by the manufacturer.

The program should be based on the number and types of respirators, working conditions, and hazards involved. In general, the program will include:

[2]See Enclosure # 2
[3]See Enclosure # 1

- inspection (including a leak check);
- cleaning and disinfecting;
- repair.

4.1.2 Inspection

Inspect respirator before and after each use. Inspect a respirator that is kept ready for emergency use monthly to assure it will perform satisfactorily.

The following checklist will be used when inspecting respirators:

- Face piece:
  - Cracks, tears, holes
  - Facemask distortion
  - Cracked or loose lenses/faceshield
- Headstrap
  - Breaks or tears
  - Broken buckles
- Valves
  - Residue or dirt
  - Cracks or tears in valve material
- Filters/Cartridges
  - Approval designation
  - Gaskets
  - Cracks or dents in housing

4.1.3 Cleaning and Disinfecting

Respirators assigned to individuals shall be cleaned regularly. Those used by more than one person shall be cleaned and disinfected after each use.

Clean and disinfect respirators in accordance with the most appropriate method described by OSHA Respirator Standard, Appendix B-2 (JHM/MT Respirator Program, Enclosure 3: OSHA Respirator Standards, Appendices A – D).

4.1.4 Repairs

Only a trained person with proper tools and replacement parts should work on respirators. No one should ever attempt to replace components or to make adjustments or repairs beyond the manufacturer's recommendations. It may be necessary to send high-pressure side components of SCBA's to an authorized facility for repairs.

Make repairs as follows:

- Disassemble and hand clean the pressure-demand and exhalation valve assembly (SCBA's only); exercise care to avoid damage to the rubber diaphragm.
- Replace all faulty or questionable parts or assemblies; use parts only specifically designed for the particular respirator.
- Reassemble the entire respirator and visually inspect the completed assembly.
- Insert new filters, cartridges, or canisters as required; make sure that gaskets or seals are in place and tightly sealed.

4.1.5 Storage

Follow manufacturers' storage instructions, which are always furnished with new respirators or affixed to the lit of the carrying case. In addition:

- After respirators have been inspected, cleaned and repaired, store them so as to protect against dust, excessive moisture, damaging chemicals, extreme temperatures and direct sunlight.
- Do not store respirators in clothes lockers, bench drawers, or tool boxes; place them in wall compartments at work stations or in a work area designated for emergency equipment. Store them in the original carton or carrying case.
- Draw clean respirators from storage for each use; each unit can be sealed in a plastic bag, placed in a separate box and tagged for immediate use.

5.0 EXPOSURE MONITORING/SURVEILLANCE

Air monitoring shall be used to identify and quantify levels of hazardous substance in order to determine the appropriate level of employee protection needed.

As a first step, air monitoring shall be conducted to identify any I.D.L.H. conditions and other dangerous situations, i.e., flammable atmospheres, oxygen deficient environment, or toxic levels of air borne contaminants.

Periodic monitoring shall be conducted when:

- work begins on a different portion of the site;
- contaminants other than those previously identified are being handled;
- a different type of operation is initiated;
- employees are working in areas of obvious liquid contamination, i.e., a spill or lagoon;
- prior to change in protective posture, i.e., upgrade/downgrade.

Whenever possible, real time monitoring will be utilized, i.e., photoionizer, explosimeter. It is recognized, however, that there will be occasions where laboratory tests must be made. On these occasions a qualified person and laboratory facilities shall be utilized.

5.1 Medical Program

Employees are not permitted to wear respirators until a physician or other licensed healthcare professional (PLHCP) has determined that they are medically able to do so. Any employee refusing the medical evaluation will not be allowed to work in an area requiring respirator use.

A licensed physician or other licensed healthcare professional at Berkshire Occupational Health will provide the medical evaluations. Medical evaluation procedures are as follows:

- The medical evaluation will be conducted using the questionnaire provided in Appendix C of the OSHA Respirator Standard (JHM/MT Respirator Program, Enclosure 3: OSHA Respirator Standards, Appendices A – D). The program administrator will provide a copy of this questionnaire to all employees requiring medical evaluations.
- Follow up medical exam will be granted to employees as required by the standard, and/or as deemed necessary by the physician.
- All employees will be granted the opportunity to speak with the physician/PLHCP about their medical evaluation if they so request.
- The physician will be provided with a copy of this respirator program, a copy of the Respiratory Protection Standard, the list of hazardous substances by work area, and for each employee requiring evaluation:
  - their work area or job title;
  - proposed respirator type and weight;
  - length of time required to wear respirator;
  - expected physical work load (light, moderate, heavy);
  - potential temperature and humidity extremes; and
  - any additional protective clothing required.
- Any employee required for medical reasons to wear a positive pressure air purifying respirator, or who requests one, will be provided with a powered air purifying respirator (PAPR).
- After an employee has received medical clearance to wear a respirator, additional medical evaluations will be provided under the following circumstances:
  - The employee reports signs and/or symptoms relating to their ability to use a respirator, such as shortness of breath, dizziness, chest pains, or wheezing.

- The examining physician or supervisor informs the program administrator that the employee needs to be reevaluated.
- Information from this program, including observations made during fit testing and program evaluation, indicates a need for reevaluation.
- A change occurs in workplace conditions that may result in an increased physiological burden on the employee.

The records for employees currently enrolled in a medical surveillance program are on file at company headquarters.

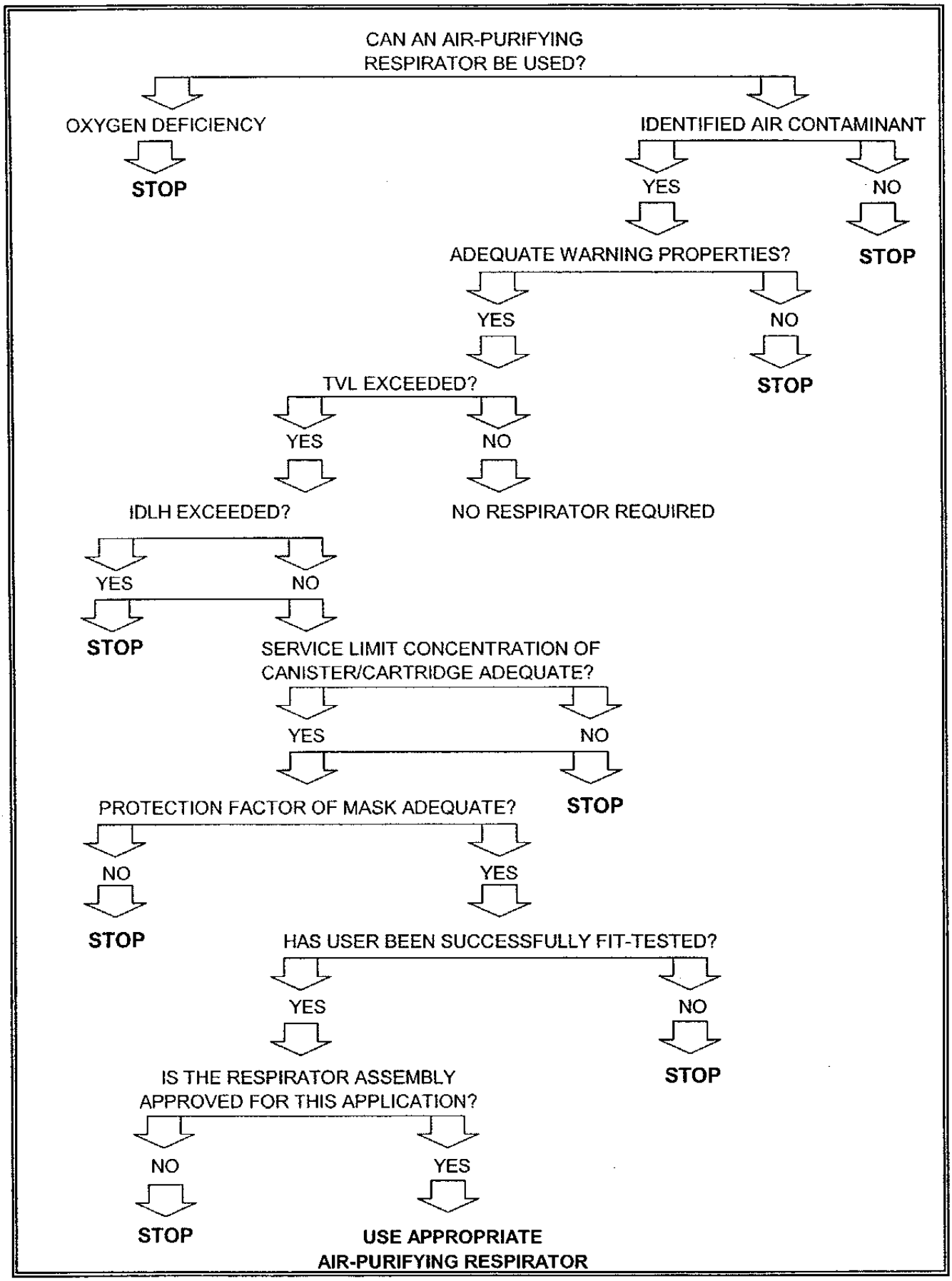
All examinations and questionnaires are to remain confidential between the employee and the physician.

5.2 General

Contact lenses are potentially dangerous on hazardous waste sites. Contaminants, where they could otherwise be removed quickly, may lodge between the lens and eye with serious results. For this reason contact lenses are strictly prohibited on contaminated sites.

Beards or other facial hair that may interfere with the seal of an air purifying respirator are prohibited.

Selection Considerations Flow Chart
Enclosure 1



MAXYMILLIAN TECHNOLOGIES, INC.
RESPIRATOR FIT TEST
ENCLOSURE 2

A. EMPLOYEE INFORMATION

Test Type: Qualitative; Irritant Smoke; Rainbow

Name of Employee: _____ **Date:** _____

Employee's Social Security Number: ____/____/____

License #: _____ **Company:** _____

B. RESPIRATOR INFORMATION

Respirator Type Selected: _____

Manufacturer: _____ **Model:** _____

Approval #: _____ **Size:** S _____ M _____ L_____

Name of Test Conductor: _____

C. TEST RESULTS

- ☐ Lateral Head Movement Pass
- ☐ Deep Breathing Pass
- ☐ Stationary Jogging Exercise Pass
- ☐ Rainbow Passage Reading Pass
- ☐ Employee Reaction to Agent after Test Pass
- ☐ Proper Performance of Positive and Negative Pressure Valve Checks and Fit

☐ Employee Passes ☐ Employee Fails

EXPIRATION DATE: ____/____/____

RESPIRATOR FIT TESTING PERFORMED IN ACCORDANCE WITH OSHA METHODS AND PROCEDURES

Enclosure 3

OSHA Respirator Standards, Appendices A – D

OSHA Respirator Standards, Appendix A

Fit Testing Procedures (Mandatory)

Appendix A to § 1910.134: Fit Testing Procedures (Mandatory)
Part I. OSHA-Accepted Fit Test Protocols

A. Fit Testing Procedures -- General Requirements

The employer shall conduct fit testing using the following procedures. The requirements in this appendix apply to all OSHA-accepted fit test methods, both QLFT and QNFT.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.

3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.

5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:

(a) Position of the mask on the nose

(b) Room for eye protection

(c) Room to talk

(d) Position of mask on face and cheeks

7. The following criteria shall be used to help determine the adequacy of the respirator fit:

(a) Chin properly placed;

(b) Adequate strap tension, not overly tightened;

(c) Fit across nose bridge;

(d) Respirator of proper size to span distance from nose to chin;

(e) Tendency of respirator to slip;

(f) Self-observation in mirror to evaluate fit and respirator position.

8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks described in Appendix B-1 of this section or those recommended by the respirator manufacturer which provide equivalent protection to the procedures in Appendix B-1. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask

on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.

9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

10. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.

11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

12. Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

14. Test Exercises. (a) The following test exercises are to be performed for all fit testing methods prescribed in this appendix, except for the CNP method. A separate fit testing exercise regimen is contained in the CNP protocol. The test subject shall perform exercises, in the test environment, in the following manner:

(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.

(3) Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

(4) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

Rainbow Passage

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

(6) Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT)

(7) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

(8) Normal breathing. Same as exercise (1).

(b) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

B. Qualitative Fit Test (QLFT) Protocols

1. General

(a) The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

(b) The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

2. Isoamyl Acetate Protocol

Note: This protocol is not appropriate to use for the fit testing of particulate respirators. If used to fit test particulate respirators, the respirator must be equipped with an organic vapor filter.

(a) Odor Threshold Screening

Odor threshold screening, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of isoamyl acetate at low levels.

(1) Three 1 liter glass jars with metal lids are required.

(2) Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions.

(3) The isoamyl acetate (IAA) (also known at isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor-free water in a 1 liter jar, closing the lid and shaking for 30 seconds. A new solution shall be prepared at least weekly.

(4) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.

(5) The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

(6) A test blank shall be prepared in a third jar by adding 500 cc of odor-free water.

(7) The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.

(8) The following instruction shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

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

(10) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

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

(b) Isoamyl Acetate Fit Test

(1) The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.

(2) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors.

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

(4) A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.

(5) Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.

(6) Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the test exercises; or to demonstrate some of the exercises.

(7) If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

(8) If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure described in (b) (1) through (7) above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

(9) If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.

(10) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

3. Saccharin Solution Aerosol Protocol

The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches in diameter by 14 inches tall with at least the front portion clear and that allows free movements of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a 3/4-inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a sweet taste.

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin USP in 100 ml of warm water. It can be prepared by putting 1 ml of the fit test solution (see (b)(5) below) in 100 ml of distilled water.

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

(7) Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted. If the test subject reports tasting the sweet taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the second ten squeezes, the screening test is completed. The taste threshold is noted as twenty regardless of the number of squeezes actually completed.

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as thirty regardless of the number of squeezes actually completed.

(10) The test conductor will take note of the number of squeezes required to solicit a taste response.

(11) If the saccharin is not tasted after 30 squeezes (step 10), the test subject is unable to taste saccharin and may not perform the saccharin fit test.

Note to paragraph 3. (a): If the test subject eats or drinks something sweet before the screening test, he/she may be unable to taste the weak saccharin solution.

(12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(13) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.

(b) Saccharin solution aerosol fit test procedure.

(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure described in 3. (a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected in section I. A. of this appendix. The respirator shall be properly adjusted and equipped with a particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.

(6) As before, the test subject shall breathe through the slightly open mouth with tongue extended, and report if he/she tastes the sweet taste of saccharin.

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of saccharin fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test. A minimum of 10 squeezes is required.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the original number of squeezes used initially (e.g., 5, 10 or 15).

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected. If the test subject does not report tasting the saccharin, the test is passed.

(11) If the taste of saccharin is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

(12) Since the nebulizer has a tendency to clog during use, the test operator must make periodic checks of the nebulizer to ensure that it is not clogged. If clogging is found at the end of the test session, the test is invalid.

4. Bitrex™ (Denatonium Benzoate) Solution Aerosol Qualitative Fit Test Protocol

The Bitrex™ (Denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol because that protocol is widely accepted. Bitrex is routinely used as a taste aversion agent in household liquids which children should not be drinking and is endorsed by the American Medical Association, the National Safety Council, and the American Association of Poison Control Centers. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) Taste Threshold Screening.

The Bitrex taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of Bitrex.

(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches (30.5 cm) in diameter by 14 inches (35.6 cm) tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts #14 and #15 combined, is adequate.

(2) The test enclosure shall have a \3/4\ inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his or her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a bitter taste.

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the Threshold Check Solution into the enclosure. This Nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The Threshold Check Solution is prepared by adding 13.5 milligrams of Bitrex to 100 ml of 5 % salt (NaCl) solution in distilled water.

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then released and allowed to fully expand.

(7) An initial ten squeezes are repeated rapidly and then the test subject is asked whether the Bitrex can be tasted. If the test subject reports tasting the bitter taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the second ten squeezes, the screening test is completed. The taste threshold is noted as twenty regardless of the number of squeezes actually completed.

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as thirty regardless of the number of squeezes actually completed.

(10) The test conductor will take note of the number of squeezes required to solicit a taste response.

(11) If the Bitrex is not tasted after 30 squeezes (step 10), the test subject is unable to taste Bitrex and may not perform the Bitrex fit test.

(12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(13) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every four hours.

(b) Bitrex Solution Aerosol Fit Test Procedure.

(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure as that described in 4. (a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected according to section I. A. of this appendix. The respirator shall be properly adjusted and equipped with any type particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 337.5 mg of Bitrex to 200 ml of a 5 % salt (NaCl) solution in warm water.

(6) As before, the test subject shall breathe through his or her slightly open mouth with tongue extended, and be instructed to report if he/she tastes the bitter taste of Bitrex..

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of the fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the number of squeezes used initially (e.g., 5, 10 or 15).

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of Bitrex is detected. If the test subject does not report tasting the Bitrex, the test is passed.

(11) If the taste of Bitrex is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

5. Irritant Smoke (Stannic Chloride) Protocol

This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

(a) General Requirements and Precautions

(1) The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

(2) Only stannic chloride smoke tubes shall be used for this protocol.

(3) No form of test enclosure or hood for the test subject shall be used.

(4) The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

(5) The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

(b) Sensitivity Screening Check

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

(1) The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

(2) The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

(3) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

(c) Irritant Smoke Fit Test Procedure

(1) The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).

(2) The test subject shall be instructed to keep his/her eyes closed.

(3) The test operator shall direct the stream of irritant smoke from the smoke tube toward the faceseal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.

(4) If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

(5) The exercises identified in section I.A. 14. of this appendix shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

(6) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

(7) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

(8) If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; Quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit; Quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. General

(a) The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly and ensure that test equipment is in proper working order.

(b) The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

2. Generated Aerosol Quantitative Fit Testing Protocol

(a) Apparatus.

(1) Instrumentation. Aerosol generation, dilution, and measurement systems using particulates (corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS] or sodium chloride) as test aerosols shall be used for quantitative fit testing.

(2) Test chamber. The test chamber shall be large enough to permit all test subjects to perform freely all required exercises without disturbing the test agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the test agent is effectively isolated from the ambient air, yet uniform in concentration throughout the chamber.

(3) When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high efficiency particulate air (HEPA) or P100 series filter supplied by the same manufacturer.

(4) The sampling instrument shall be selected so that a computer record or strip chart record may be made of the test showing the rise and fall of the test agent concentration with each inspiration and expiration at fit factors of at least 2,000. Integrators or computers that integrate the amount of test agent penetration leakage into the respirator for each exercise may be used provided a record of the readings is made.

(5) The combination of substitute air-purifying elements, test agent and test agent concentration shall be such that the test subject is not exposed in excess of an established exposure limit for the test agent at any time during the testing process, based upon the length of the exposure and the exposure limit duration.

(6) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs around the port (e.g., where the respirator is probed), a free air flow is allowed into the sampling line at all times, and there is no interference with the fit or performance of the respirator. The in-mask sampling device (probe) shall be designed and used so that the air sample is drawn from the breathing zone of the test subject, midway between the nose and mouth and with the probe extending into the facepiece cavity at least 1/4 inch.

(7) The test setup shall permit the person administering the test to observe the test subject inside the chamber during the test.

(8) The equipment generating the test atmosphere shall maintain the concentration of test agent constant to within a 10 percent variation for the duration of the test.

(9) The time lag (interval between an event and the recording of the event on the strip chart or computer or integrator) shall be kept to a minimum. There shall be a clear association between the occurrence of an event and its being recorded.

(10) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port shall be of equal diameter and of the same material. The length of the two lines shall be equal.

(11) The exhaust flow from the test chamber shall pass through an appropriate filter (i.e., high efficiency particulate or P100 series filter) before release.

(12) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 percent.

(13) The limitations of instrument detection shall be taken into account when determining the fit factor.

(14) Test respirators shall be maintained in proper working order and be inspected regularly for deficiencies such as cracks or missing valves and gaskets.

(b) Procedural Requirements.

(1) When performing the initial user seal check using a positive or negative pressure check, the sampling line shall be crimped closed in order to avoid air pressure leakage during either of these pressure checks.

(2) The use of an abbreviated screening QLFT test is optional. Such a test may be utilized in order to quickly identify poor fitting respirators that passed the positive and/or negative pressure test and reduce the amount of QNFT time. The use of the CNC QNFT instrument in the count mode is another optional method to obtain a quick estimate of fit and eliminate poor fitting respirators before going on to perform a full QNFT.

(3) A reasonably stable test agent concentration shall be measured in the test chamber prior to testing. For canopy or shower curtain types of test units, the determination of the test agent's stability may be established after the test subject has entered the test environment.

(4) Immediately after the subject enters the test chamber, the test agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed 5 percent for a half mask or 1 percent for a full facepiece respirator.

(5) A stable test agent concentration shall be obtained prior to the actual start of testing.

(6) Respirator restraining straps shall not be over-tightened for testing. The straps shall be adjusted by the wearer without assistance from other persons to give a reasonably comfortable fit typical of normal use. The respirator shall not be adjusted once the fit test exercises begin.

(7) The test shall be terminated whenever any single peak penetration exceeds 5 percent for half masks and 1 percent for full facepiece respirators. The test subject shall be refitted and retested.

(8) Calculation of fit factors.

(i) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration measured inside the respirator for each test exercise except the grimace exercise.

(ii) The average test chamber concentration shall be calculated as the arithmetic average of the concentration measured before and after each test (i.e., 7 exercises) or the arithmetic average of the concentration measured before and after each exercise or the true average measured continuously during the respirator sample.

(iii) The concentration of the challenge agent inside the respirator shall be determined by one of the following methods:

(A) Average peak penetration method means the method of determining test agent penetration into the respirator utilizing a strip chart recorder, integrator, or computer. The agent penetration is determined by an average of the peak heights on the graph or by computer integration, for each exercise except the grimace exercise. Integrators or computers that calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the requirements of the average peak penetration method.

(B) Maximum peak penetration method means the method of determining test agent penetration in the respirator as determined by strip chart recordings of the test. The highest peak penetration for a given exercise is taken to be representative of average penetration into the respirator for that exercise.

(C) Integration by calculation of the area under the individual peak for each exercise except the grimace exercise. This includes computerized integration.

(D) The calculation of the overall fit factor using individual exercise fit factors involves first converting the exercise fit factors to penetration values, determining the average, and then converting that result back to a fit factor. This procedure is described in the following equation:

$$\text{Overall Fit Factor} = \frac{\text{Number of exercises}}{1/ff_1 + 1/ff_2 + 1/ff_3 + 1/ff_4 + 1/ff_5 + 1/ff_6 + 1/ff_8}$$

Where ff_1, ff_2, ff_3, etc. are the fit factors for exercises 1, 2, 3, etc.

(9) The test subject shall not be permitted to wear a half mask or quarter facepiece respirator unless a minimum fit factor of 100 is obtained, or a full facepiece respirator unless a minimum fit factor of 500 is obtained.

(10) Filters used for quantitative fit testing shall be replaced whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media.

3. Ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol.

The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (Portacount ™) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) Portacount Fit Test Requirements.

(1) Check the respirator to make sure the respirator is fitted with a high-efficiency filter and that the sampling probe and line are properly attached to the facepiece.

(2) Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

(3) Check the following conditions for the adequacy of the respirator fit: Chin properly placed; Adequate strap tension, not overly tightened; Fit across nose bridge; Respirator of proper size to span distance from nose to chin; Tendency of the respirator to slip; Self-observation in a mirror to evaluate fit and respirator position.

(4) Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.

(5) Follow the manufacturer's instructions for operating the Portacount and proceed with the test.

(6) The test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(7) After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

(b) Portacount Test Instrument.

(1) The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.

(2) Since the pass or fail criterion of the Portacount is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance in this Appendix.

(3) A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

4. Controlled negative pressure (CNP) quantitative fit testing protocol.

The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer Dynatech Nevada also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his or her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as

milliliters per minute. The quality and validity of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) CNP Fit Test Requirements.

(1) The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.

(2) The CNP system defaults selected for test pressure shall be set at – 1.5 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

(**Note:** CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

(3) The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.

(4) The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.

(5) The test subject shall be trained to hold his or her breath for at least 20 seconds.

(6) The test subject shall don the test respirator without any assistance from the individual who conducts the CNP fit test.

(7) The QNFT protocol shall be followed according to section I. C. 1. of this appendix with an exception for the CNP test exercises.

(b) CNP Test Exercises.

(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during test measurement.

(3) Turning head side to side. Standing in place, the subject shall slowly turn his or her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the turning head side to side exercise, the subject needs to hold head full left and hold his or her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his or her breath for 10 seconds during test measurement.

(4) Moving head up and down. Standing in place, the subject shall slowly move his or her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his or her head full up and hold his or her breath for 10 seconds during test measurement. Next, the

subject shall hold his or her head full down and hold his or her breath for 10 seconds during test measurement.

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(6) Grimace. The test subject shall grimace by smiling or frowning for 15 seconds.

(7) Bending Over. The test subject shall bend at the waist as if he or she were to touch his or her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(8) Normal Breathing. The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.

(c) CNP Test Instrument.

(1) The test instrument shall have an effective audio warning device when the test subject fails to hold his or her breath during the test. The test shall be terminated whenever the test subject failed to hold his or her breath. The test subject may be refitted and retested.

(2) A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style and size of respirator used; and date tested.

Part II. New Fit Test Protocols

A. Any person may submit to OSHA an application for approval of a new fit test protocol. If the application meets the following criteria, OSHA will initiate a rulemaking proceeding under section 6(b)(7) of the OSH Act to determine whether to list the new protocol as an approved protocol in this Appendix A.

B. The application must include a detailed description of the proposed new fit test protocol. This application must be supported by either:

1. A test report prepared by an independent government research laboratory (e.g., Lawrence Livermore National Laboratory, Los Alamos National Laboratory, the National Institute for Standards and Technology) stating that the laboratory has tested the protocol and had found it to be accurate and reliable; or

2. An article that has been published in a peer-reviewed industrial hygiene journal describing the protocol and explaining how test data support the protocol's accuracy and reliability.

C. If OSHA determines that additional information is required before the Agency commences a rulemaking proceeding under this section, OSHA will so notify the applicant and afford the applicant the opportunity to submit the supplemental information. Initiation of a rulemaking proceeding will be deferred until OSHA has received and evaluated the supplemental information.

OSHA Respirator Standards, Appendix B-1

User Seal Check Procedures (Mandatory)

Appendix B-1 to § 1910.134: User Seal Check Procedures (Mandatory)

The individual who uses a tight-fitting respirator is to perform a user seal check to ensure that an adequate seal is achieved each time the respirator is put on. Either the positive and negative pressure checks listed in this appendix, or the respirator manufacturer's recommended user seal check method shall be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

I. Facepiece Positive and/or Negative Pressure Checks

A. Positive pressure check. Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

B. Negative pressure check. Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for ten seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

II. Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures provided that the employer demonstrates that the manufacturer's procedures are equally effective.

OSHA Respirator Standards, Appendix B-2

Respirator Cleaning Procedures (Mandatory)

Appendix B-2 to § 1910.134: Respirator Cleaning Procedures (Mandatory)

These procedures are provided for employer use when cleaning respirators. They are general in nature, and the employer as an alternative may use the cleaning recommendations provided by the manufacturer of the respirators used by their employees, provided such procedures are as effective as those listed here in Appendix B-2. Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth in Appendix B-2, i.e., must ensure that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user.

I. Procedures for Cleaning Respirators

A. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

B. Wash components in warm (43 deg. C [110 deg. F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

C. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain.

D. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 deg. C (110 deg. F); or,

2. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45 % alcohol) to one liter of water at 43 deg. C (110 deg. F); or,

3. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

E. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

F. Components should be hand-dried with a clean lint-free cloth or air-dried.

G. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.

H. Test the respirator to ensure that all components work properly.

OSHA Respirator Standards, Appendix C

OSHA Respirator Medical Evaluation Questionnaire (Mandatory)

Appendix C to § 1910.134: OSHA Respirator Medical Evaluation Questionnaire (Mandatory)

To the employer: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

To the employee:

Can you read (circle one): Yes/No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

Part A. Section 1. (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today's date:_____

2. Your name:_____

3. Your age (to nearest year):_____

4. Sex (circle one): Male/Female

5. Your height: _____ ft. _____ in.

6. Your weight: _____ lbs.

7. Your job title:_____

8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): _____

9. The best time to phone you at this number: _____

10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Yes/No

11. Check the type of respirator you will use (you can check more than one category):
a. _____ N, R, or P disposable respirator (filter-mask, non-cartridge type only).
b. _____ Other type (for example, half- or full-facepiece type, powered-air purifying, supplied-air, self-contained breathing apparatus).

12. Have you worn a respirator (circle one): Yes/No

If "yes," what type(s):_____

_____

Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: Yes/No

2. Have you ever had any of the following conditions?
a. Seizures (fits): Yes/No
b. Diabetes (sugar disease): Yes/No
c. Allergic reactions that interfere with your breathing: Yes/No
d. Claustrophobia (fear of closed-in places): Yes/No
e. Trouble smelling odors: Yes/No

3. Have you ever had any of the following pulmonary or lung problems?
a. Asbestosis: Yes/No
b. Asthma: Yes/No
c. Chronic bronchitis: Yes/No
d. Emphysema: Yes/No
e. Pneumonia: Yes/No
f. Tuberculosis: Yes/No
g. Silicosis: Yes/No
h. Pneumothorax (collapsed lung): Yes/No
i. Lung cancer: Yes/No
j. Broken ribs: Yes/No
k. Any chest injuries or surgeries: Yes/No
l. Any other lung problem that you've been told about: Yes/No

4. Do you currently have any of the following symptoms of pulmonary or lung illness?
a. Shortness of breath: Yes/No
b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No
c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No
d. Have to stop for breath when walking at your own pace on level ground: Yes/No
e. Shortness of breath when washing or dressing yourself: Yes/No
f. Shortness of breath that interferes with your job: Yes/No
g. Coughing that produces phlegm (thick sputum): Yes/No
h. Coughing that wakes you early in the morning: Yes/No
i. Coughing that occurs mostly when you are lying down: Yes/No
j. Coughing up blood in the last month: Yes/No
k. Wheezing: Yes/No
l. Wheezing that interferes with your job: Yes/No
m. Chest pain when you breathe deeply: Yes/No
n. Any other symptoms that you think may be related to lung problems: Yes/No

5. Have you ever had any of the following cardiovascular or heart problems?
a. Heart attack: Yes/No
b. Stroke: Yes/No
c. Angina: Yes/No
d. Heart failure: Yes/No
e. Swelling in your legs or feet (not caused by walking): Yes/No
f. Heart arrhythmia (heart beating irregularly): Yes/No
g. High blood pressure: Yes/No
h. Any other heart problem that you've been told about: Yes/No

6. Have you ever had any of the following cardiovascular or heart symptoms?
a. Frequent pain or tightness in your chest: Yes/No
b. Pain or tightness in your chest during physical activity: Yes/No
c. Pain or tightness in your chest that interferes with your job: Yes/No
d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No
e. Heartburn or indigestion that is not related to eating: Yes/ No
f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No

7. Do you currently take medication for any of the following problems?
a. Breathing or lung problems: Yes/No
b. Heart trouble: Yes/No
c. Blood pressure: Yes/No
d. Seizures (fits): Yes/No

8. If you've used a respirator, have you ever had any of the following problems? (If you've never used a respirator, check the following space and go to question 9:)
a. Eye irritation: Yes/No
b. Skin allergies or rashes: Yes/No
c. Anxiety: Yes/No
d. General weakness or fatigue: Yes/No
e. Any other problem that interferes with your use of a respirator: Yes/No

9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you ever lost vision in either eye (temporarily or permanently): Yes/No

11. Do you currently have any of the following vision problems?
a. Wear contact lenses: Yes/No
b. Wear glasses: Yes/No
c. Color blind: Yes/No
e. Any other eye or vision problem: Yes/No

12. Have you ever had an injury to your ears, including a broken ear drum: Yes/No

13. Do you currently have any of the following hearing problems?
a. Difficulty hearing: Yes/No
b. Wear a hearing aid: Yes/No
c. Any other hearing or ear problem: Yes/No

14. Have you ever had a back injury: Yes/No

15. Do you currently have any of the following musculoskeletal problems?
a. Weakness in any of your arms, hands, legs, or feet: Yes/No
b. Back pain: Yes/No
c. Difficulty fully moving your arms and legs: Yes/No
d. Pain or stiffness when you lean forward or backward at the waist: Yes/No
e. Difficulty fully moving your head up or down: Yes/No
f. Difficulty fully moving your head side to side: Yes/No
g. Difficulty bending at your knees: Yes/No
h. Difficulty squatting to the ground: Yes/No
i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes/No
j. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

Part B Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No
If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes/No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No
If "yes," name the chemicals if you know them:_____

_____

_____

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:
a. Asbestos: Yes/No
b. Silica (e.g., in sandblasting): Yes/No
c. Tungsten/cobalt (e.g., grinding or welding this material): Yes/No
d. Beryllium: Yes/No
e. Aluminum: Yes/No
f. Coal (for example, mining): Yes/No
g. Iron: Yes/No
h. Tin: Yes/No
i. Dusty environments: Yes/No
j. Any other hazardous exposures: Yes/No
If "yes," describe these exposures:_____

_____

_____

4. List any second jobs or side businesses you have:_____

_____

5. List your previous occupations:_____

_____

6. List your current and previous hobbies:_____

_____

7. Have you been in the military services? Yes/No
If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes/No

8. Have you ever worked on a HAZMAT team? Yes/No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No
If "yes," name the medications if you know them:_____

10. Will you be using any of the following items with your respirator(s)?
a. HEPA Filters: Yes/No
b. Canisters (for example, gas masks): Yes/No
c. Cartridges: Yes/No

11. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you)?:

a. Escape only (no rescue): Yes/No
b. Emergency rescue only: Yes/No
c. Less than 5 hours per week: Yes/No
d. Less than 2 hours per day: Yes/No
e. 2 to 4 hours per day: Yes/No
f. Over 4 hours per day: Yes/No

12. During the period you are using the respirator(s), is your work effort:
a. Light (less than 200 kcal per hour): Yes/No
If "yes," how long does this period last during the average
shift:_____hrs._____mins.
Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs.) or controlling machines.

b. Moderate (200 to 350 kcal per hour): Yes/No
If "yes," how long does this period last during the average
shift:_____hrs._____mins.
Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.

c. Heavy (above 350 kcal per hour): Yes/No
If "yes," how long does this period last during the average
shift:_____hrs._____mins.
Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs.).

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator: Yes/No
If "yes," describe this protective clothing and/or equipment:_____
_____

14. Will you be working under hot conditions (temperature exceeding 77 deg. F): Yes/No

15. Will you be working under humid conditions: Yes/No

16. Describe the work you'll be doing while you're using your respirator(s):

_____
_____

17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

_____
_____

18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):
Name of the first toxic substance:_____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift_____
Name of the second toxic substance:_____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift:_____

Name of the third toxic substance:_____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift:_____
The name of any other toxic substances that you'll be exposed to while using your respirator:

_____
_____
_____

19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security):

_____

OSHA Respirator Standards, Appendix D

(Non-Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

Appendix D to § 1910.134 (Non-Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, of if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.

2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.

3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.

4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

Appendix F

Maxymillian Technologies, Inc.

Trenching and Excavation Program

TABLE OF CONTENTS

1.0 OSHA STANDARD 1926.650(B) - 1926.652 SUBPART P – EXCAVATIONS

SUBPART P—EXCAVATIONS

Authority: Sec. 107, Contract Worker Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable, and 29 CFR part 1911.

1926.650—SCOPE, APPLICATION, AND DEFINITIONS APPLICABLE TO THIS SUBPART.

(a) Scope and application. This subpart applies to all open excavations made in the earth's surface. Excavations are defined to include trenches.

(b) Definitions applicable to this subpart.

Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed, specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross braces mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or sides means the vertical or inclined earth surfaces formed as a result of excavation work.

Failure means the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout means the accidental release or failure of a cross brace.

Protective system means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from 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 means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Sheeting means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structures. Sheilds can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with § 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sides. See "Faces."

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

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

Support system means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated data means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench box. See "Shield."

Trench shield. See "Shield."

Uprights means the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Wales means horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

1926.651—GENERAL REQUIREMENTS

(a) Surface encumbrances. All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

(b) Underground installations.

(1) The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

(2) Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.

(3) When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.

(4) While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

(c) Access and egress.

(1) Structural ramps.

(i) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

(ii) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

(iii) Structural members used for ramps and runways shall be of uniform thickness.

(iv) Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.

(v) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

(2) Means of egress from trench excavations. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

(d) Exposure to vehicular traffic. Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

(e) Exposure to falling loads. No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with

§ 1926.601(b)(6), to provide adequate protection for the operator during loading and unloading operations.

(f) Warning system for mobile equipment. When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

(g) Hazardous atmospheres.

(1) Testing and Controls. In addition to the requirements set forth in subparts D and E of this part (29 CFR 1926.50-1926.107) to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

(i) Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.

(ii) Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation in accordance with subparts D and E of this part respectively.

(iii) Adequate precaution shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.

(iv) When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

(2) Emergency rescue equipment.

(i) Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

(ii) Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a life-line securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

(h) Protection from hazards associated with water accumulation.

(1) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

(2) If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

(3) If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with paragraphs (h)(1) and (h)(2) of this section.

(i) Stability of adjacent structures.

(1) Where the stability of adjoining buildings, walls, or other structures is endangered by

excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

(2) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:

(i) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

(ii) The excavation is in stable rock; or

(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

(iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

(3) Sidewalks, pavements, and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

(j) Protection of employees from loose rock or soil.

(1) Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

(2) Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

(k) Inspections.

(1) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

(2) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

(l) Fall protection.

(1) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

(2) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

1926.652—REQUIREMENTS FOR PROTECTIVE SYSTEMS

(a) Protection of employees in excavations.

(1) Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when:

(i) Excavations are made entirely in stable rock; or

(ii) Excavations are less than 5 feet (1.52m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

(2) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

(b) Design of sloping and benching systems. The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (b)(1); or, in the alternative, paragraph (b)(2); or, in the alternative, paragraph (b)(3), or, in the alternative, paragraph (b)(4), as follows:

(1) Option (1)—Allowable configurations and slopes.

(i) Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.

(ii) Slopes specified in paragraph (b)(1)(i) of this section, shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil in Appendix B to this subpart.

(2) Option (2)—Determination of slopes and configurations using Appendices A and B. Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in appendices A and B to this subpart.

(3) Option (3)—Designs using other tabulated data.

(i) Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and shall include all of the following:

(a) Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;

(b) Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe;

(c) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) At least one copy of the tabulated data which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) Option (4)—Design by a registered professional engineer.

(i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include at least the following:

(a) The magnitude of the slopes that were determined to be safe for the particular project;

(b) The configurations that were determined to be safe for the particular project; and

(c) The identity of the registered professional engineer approving the design.

(iii) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the Secretary upon request.

(c) Design of support systems, shield systems, and other protective systems. Designs of support systems shield systems, and other protective systems

shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (c)(1); or, in the alternative, paragraph (c)(2); or, in the alternative, paragraph (c)(3); or, in the alternative, paragraph (c)(4) as follows:

(1) Option (1)—Designs using appendices A, C and D. Designs for timber shoring in trenches shall be determined in accordance with the conditions and requirements set forth in appendices A and C to this subpart. Designs for aluminum hydraulic shoring shall be in accordance with paragraph (c)(2) of this section, but if manufacturer's tabulated data cannot be utilized, designs shall be in accordance with appendix D.

(2) Option (2)—Designs Using Manufacturer's Tabulated Data.

(i) Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.

(ii) Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.

(iii) Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to the Secretary upon request.

(3) Option (3)—Designs using other tabulated data.

(i) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and include all of the following:

(a) Identification of the parameters that affect the selection of a protective system drawn from such data;

(b) Identification of the limits of use of the data;

(c) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) Option (4)—Design by a registered professional engineer.

(i) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2 or Option 3, above, shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include the following:

(a) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and

(b) The identity of the registered professional engineer approving the design.

(iii) At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available to the Secretary upon request.

(d) Materials and equipment.

(1) Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function.

(2) Manufactured materials and equipment used for protective systems shall be used and main-

tained in a manner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.

(3) When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.

(e) Installation and removal of support.

(1) General.

(i) Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

(ii) Support systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.

(iii) Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.

(iv) Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

(v) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

(vi) Backfilling shall progress together with the removal of support systems from excavations.

(2) Additional requirements for support systems for trench excavations.

(i) Excavation of material to a level no greater than 2 feet (.61 m) below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.

(ii) Installation of a support system shall be closely coordinated with the excavation of trenches.

(f) Sloping and benching systems. Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

(g) Shield systems.

(1) General.

(i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.

(ii) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

(iii) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.

(iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

(2) Additional requirement for shield systems used in trench excavations. Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

Appendix A to Subpart P

Soil Classification

(a) **Scope and application**—(1) *Scope.* This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

(2) **Application.** This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in § 1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This Appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in § 1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

(b) **Definitions.** The definitions and examples given below are based on, in whole or in part, the following: American Society for Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System, The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

Fissured means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil means gravel, sand, or silt, (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking or appreciable volume change.

Saturated soil means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or sheer vane.

Soil classification system means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil means soil which is underwater or is free seeping.

Type A means cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

(i) The soil is fissured; or

(ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or

(iii) The soil has been previously disturbed; or

(iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or

(v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means:

(i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or

(ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.

(iii) Previously disturbed soils except those which would otherwise be classed as Type C soil.

(iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or

(v) Dry rock that is not stable; or

(vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C means:

(i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or

(ii) Granular soils including gravel, sand, and loamy sand; or

(iii) Submerged soil or soil from which water is freely seeping; or

(iv) Submerged rock that is not stable, or

(v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) Requirements—(1) Classification of soil and rock deposits. Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(2) Basis of classification. The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

(3) Visual and manual analyses. The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(4) Layered systems. In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(5) Reclassification. If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) Acceptable visual and manual tests.—(1) Visual tests. Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

(ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.

(iii) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(v) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(vii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

(2) Manual tests. Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(i) Plasticity. Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as ⅛-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of ⅛-inch thread can be held on one end without tearing, the soil is cohesive.

(ii) Dry strength. If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with

difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

(iii) **Thumb penetration.** The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488—"Standard Recommended Practice for Description of Soils (Visual—Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

(iv) **Other strength tests.** Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

(v) **Drying test.** The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:

(A) If the sample develops cracks as it dries, significant fissures are indicated.

(B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as a unfissured cohesive material and the unconfined compressive strength should be determined.

(C) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Appendix B to Subpart P

Sloping and Benching

(a) Scope and application. This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in § 1926.652(b)(2).

(b) Definitions.

Actual slope means the slope to which an excavation face is excavated.

Distress means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

(c) Requirements—(1) Soil classification. Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.

(2) Maximum allowable slope. The maximum allowable slope for a soil or rock deposit shall be determined from Table B-1 of this appendix.

(3) Actual slope. (i) The actual slope shall not be steeper than the maximum allowable slope.

(ii) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least ½ horizontal to one vertical (½H:1V) less steep than the maximum allowable slope.

(iii) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with § 1926.651(i).

(4) Configurations. Configurations of sloping and benching systems shall be in accordance with Figure B-1.

TABLE B-1

MAXIMUM ALLOWABLE SLOPES

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V)[1] FOR EXCAVATIONS LESS THAN 20 FEET DEEP [3]
STABLE ROCK TYPE A [2] TYPE B TYPE C	VERTICAL (90°) 3/4 : 1 (53°) 1:1 (45°) 1½: 1 (34°)

NOTES:

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. A short-term maximum allowable slope of 1/2H:1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53°).
3. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

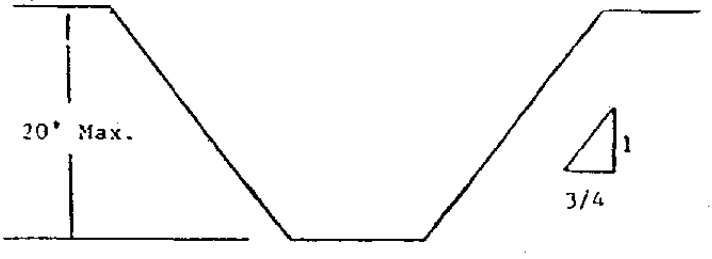
Figure B-

Slope Configurations

(All slopes stated below are in the horizontal to vertical ratio)

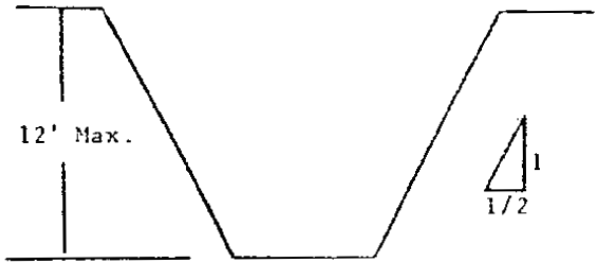
B-1.1 Excavations made in Type A soil.

1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of ¾:1.



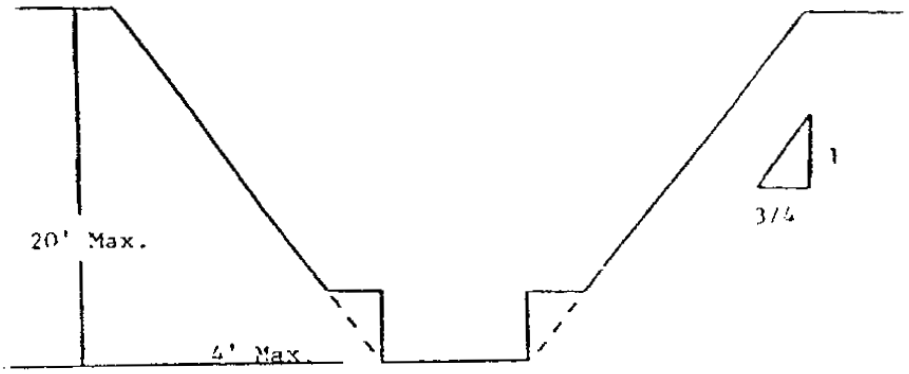
Simple Slope—General

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of ½:1.

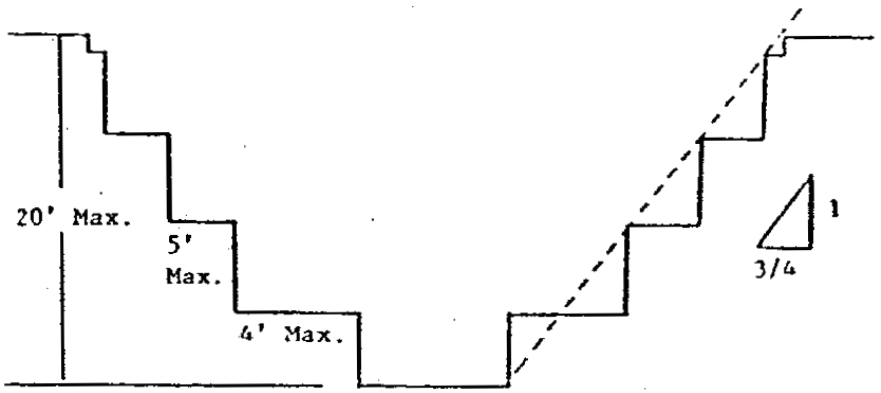


Simple Slope—Short Term

All benched excavations 20 feet or less in depth shall have a maximum allowable slope of ¾ to 1 and maximum bench dimensions as follows:

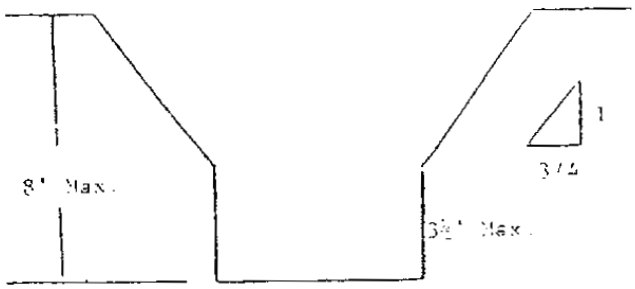


Simple Bench



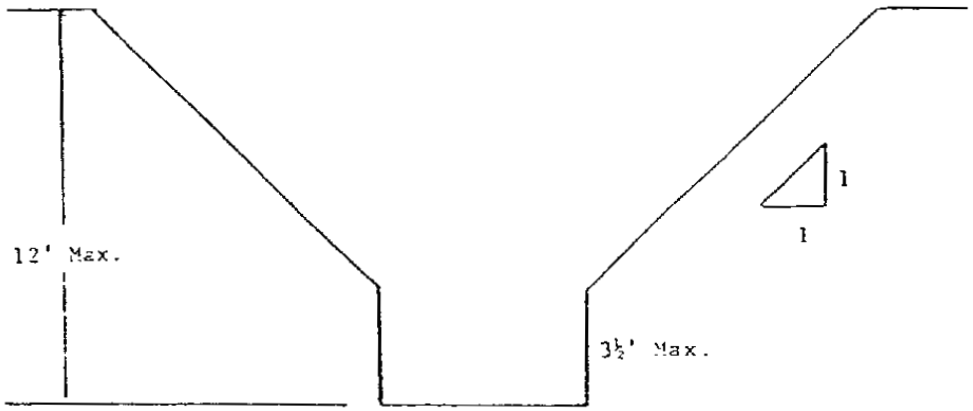
Multiple Bench

All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 4.



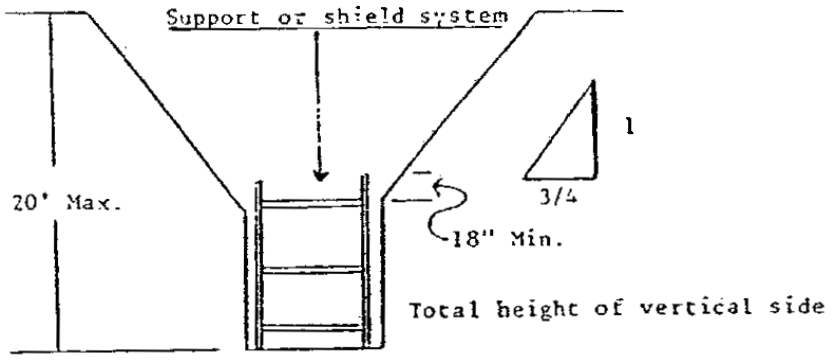
Unsupported Vertically Sided Lower Portion—Maximum 8 Feet in Depth

All excavations more than 8 feet but not more than 12 feet in depth which unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3½ feet.



Unsupported Vertically Sided Lower Portion—Maximum 12 Feet in Depth

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of ¾:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

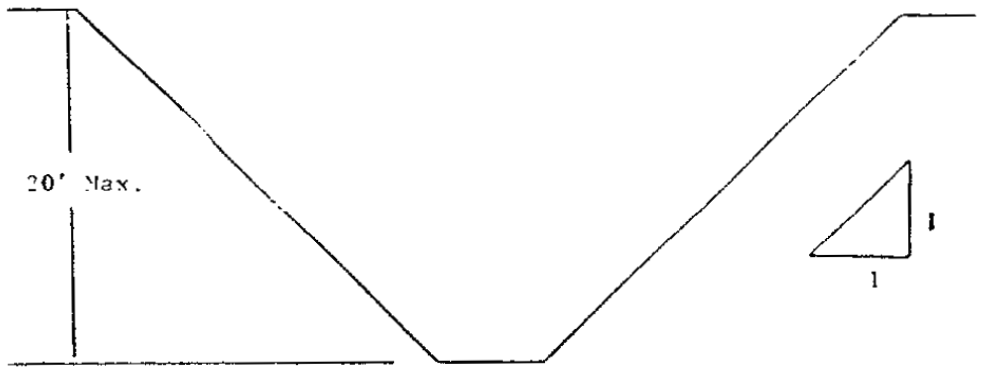


Suported or Shielded Vertically Sided Lower Portion

4. All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the othe. options permitted under § 1926.652(b).

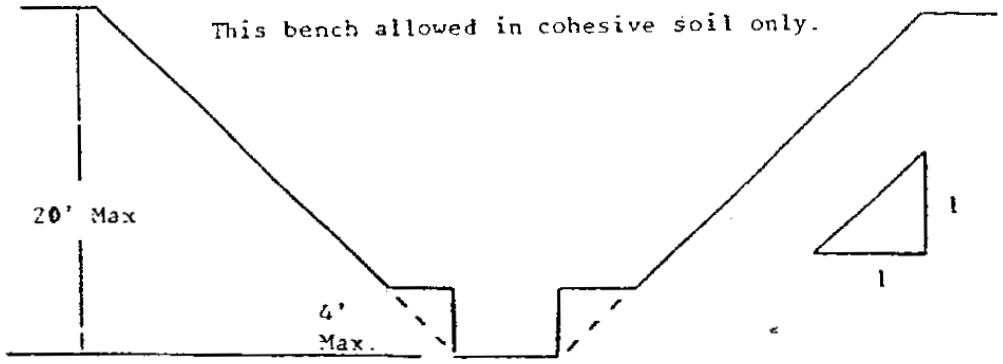
B–1.2 Excavations Made in Type B Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

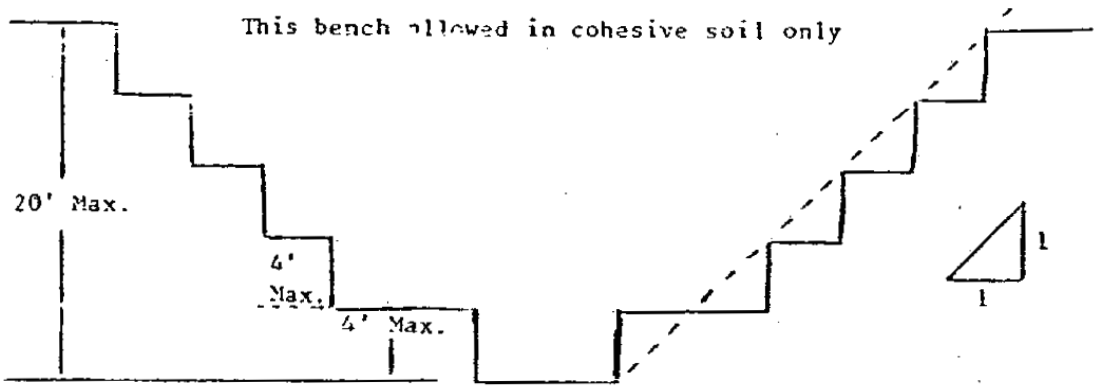


Simple Slope

All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as hows:

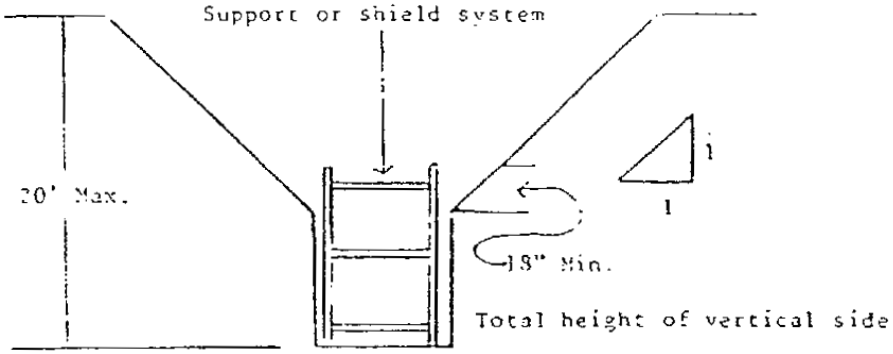


Single Bench



Multiple Bench

All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1.

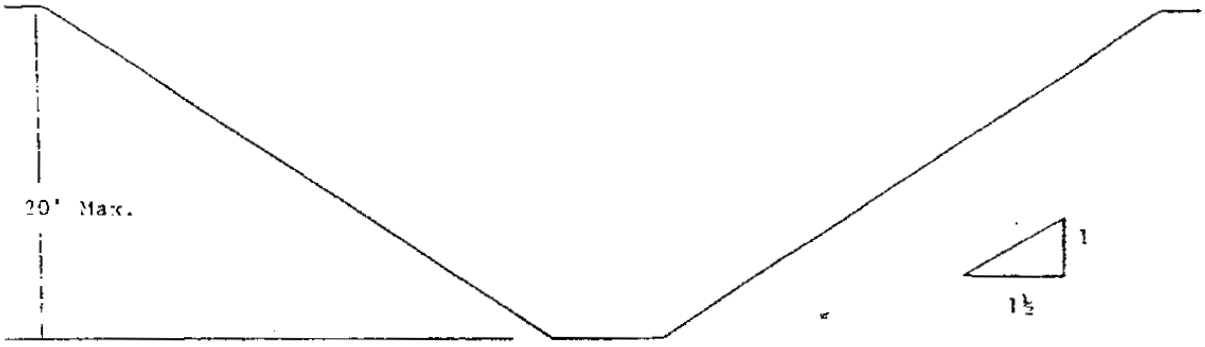


Vertically Sided Lower Portion

4. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

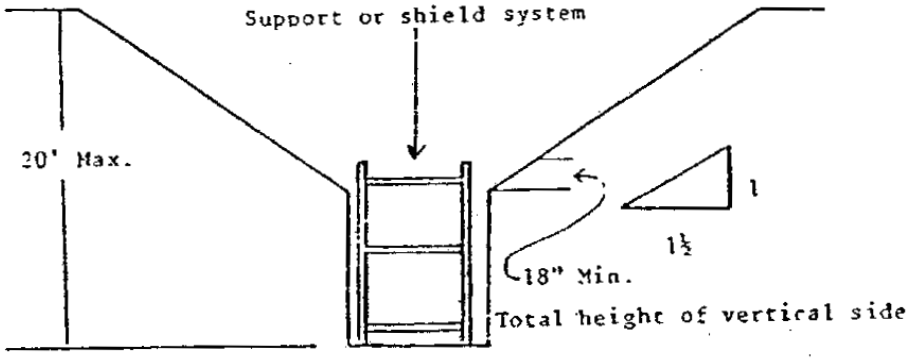
B-1.3 Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



Simple Slope

2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1½:1.

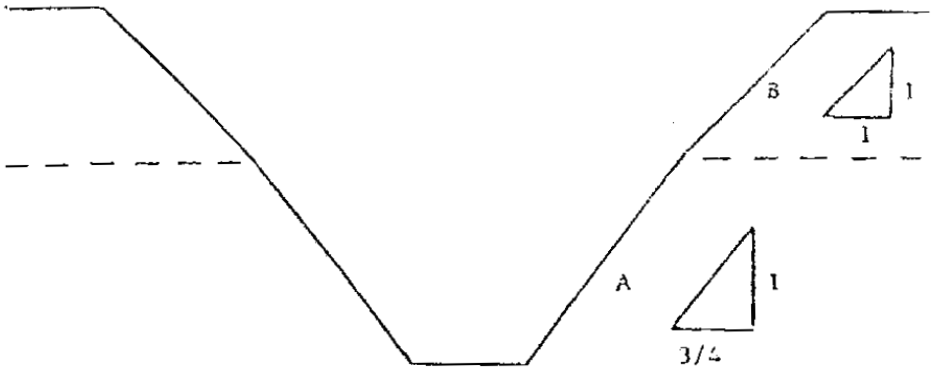


Vertical Sided Lower Portion

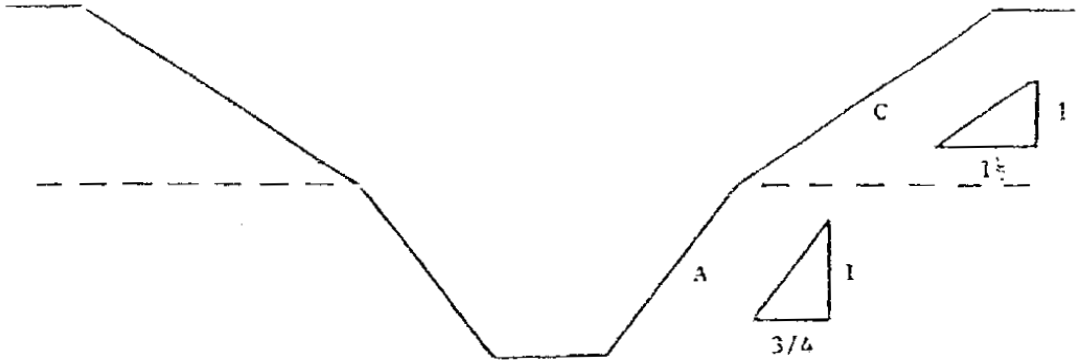
3. Al. other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

B-1.4 Excavations Made in Layered Soils

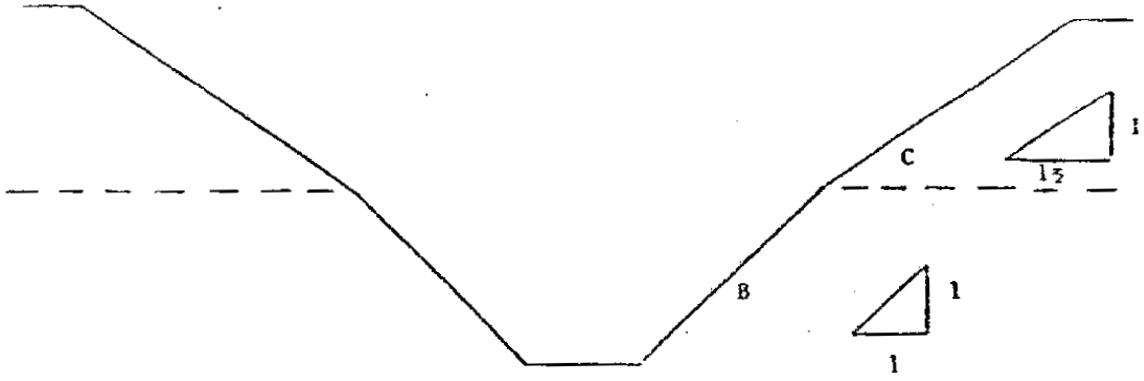
1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.



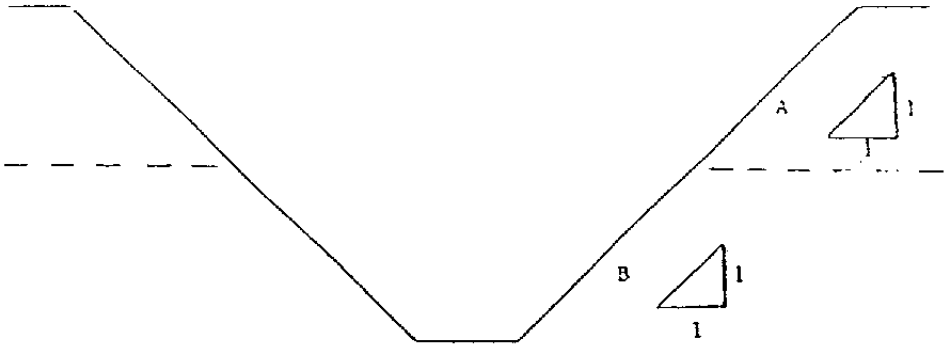
B OVER A



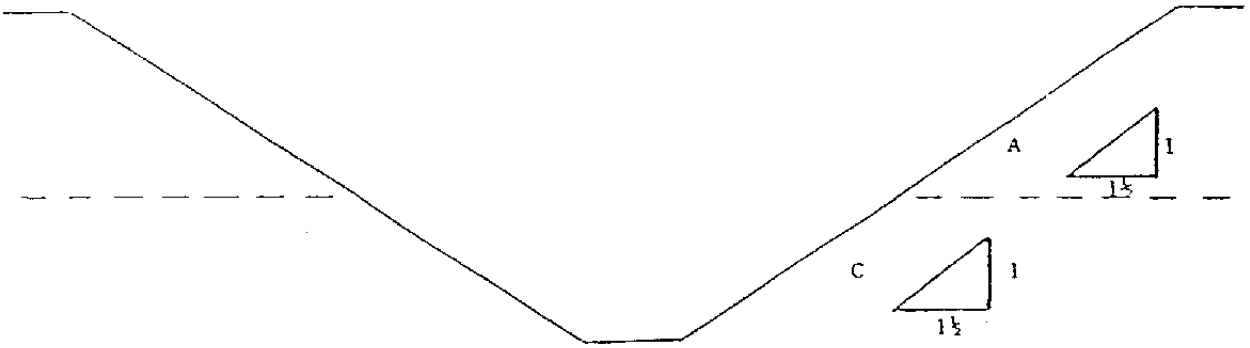
C OVER A



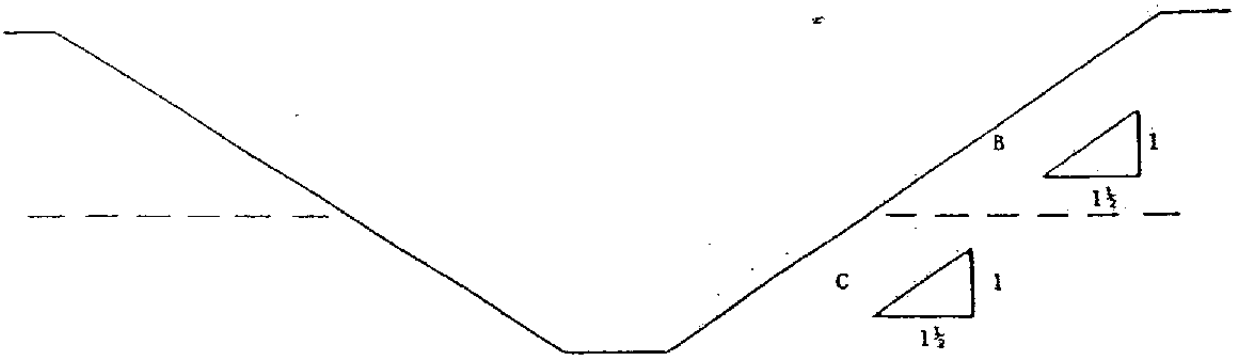
C OVER B



A OVER B



A OVER C



B OVER C

2. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

Appendix C to Subpart P

Timber Shoring for Trenches

(a) **Scope.** This appendix contains information that can be used timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 feet (6.1 m) in depth. This appendix must be used when design of timber shoring protective systems is to be performed in accordance with § 1926.652(c)(1). Other timber shoring configurations, other systems of support such as hydraulic and pneumatic systems, and other protective systems such as sloping, benching, shielding, and freezing systems must be designed in accordance with the requirements set forth in § 1926.652(b) and § 1926.652(c).

(b) **Soil Classification.** In order to use the data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in appendix A of subpart P of this part.

(c) **Presentation of Information.**

Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables C-1.1, C-1.2, and C-1.3, and Tables C-2.1, C-2.2 and C-2.3 following paragraph (g) of the appendix. Each table presents the minimum sizes of timber members to use in a shoring system, and each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. The data are arranged to allow the user the flexibility to select from among several acceptable configurations of members based on varying the horizontal spacing of the crossbraces. Stable rock is exempt from shoring requirements and therefore, no data are presented for this condition.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix, and on the tables themselves.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations regarding Tables C-1.1 through C-1.3 and Tables C-2.1 through C-2.3 are presented in paragraph (g) of this Appendix.

(d) **Basis and limitations of the data.—(1) Dimensions of timber members.** (i) The sizes of the timber members listed in Tables C-1.1 through C-1.3 are taken from the National Bureau of Standards (NBS) report, "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations." In addition, where NBS did not recommend specific sizes of members, member sizes are based on an analysis of the sizes required for use by existing codes and on empirical practice.

(ii) The required dimensions of the members listed in Tables C-1.1 through C-1.3 refer to actual dimensions and not nominal dimensions of the timber. Employers wanting to use nominal size shoring are directed to Tables C-2.1 through C-2.3, or have this choice under § 1926.652(c)(3), and are referred to The Corps of Engineers, The Bureau of Reclamation or data from other acceptable sources.

(2) **Limitation of application.** (i) It is not intended that the timber shoring specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be designed as specified in § 1926.652(c).

(ii) When any of the following conditions are present, the members specified in the tables are not considered adequate. Either an alternate timber shoring system must be designed or another type of protective system designed in accordance with § 1926.652.

(A) When loads imposed by structures or by stored material adjacent to the trench weigh in excess of the load imposed by a two-foot soil surcharge. The term "adjacent" as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

(B) When vertical loads imposed on cross braces exceed a 240-pound gravity load distributed on a one-foot section of the center of the crossbrace.

(C) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(D) When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) **Use of Tables.** The members of the shoring system that are to be selected using this information are the cross braces, the uprights, and the wales, where wales are required. Minimum sizes of members are specified for use in different types of soil. There are six tables of information, two for each soil type. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is then made. The selection is based on the depth and width of the trench where the members are to be installed and, in most instances, the selection is also based on the horizontal spacing of the crossbraces. Instances where a choice of horizontal spacing of crossbracing is available, the horizontal spacing of the crossbraces must be chosen by the user before the size of any member can be determined. When the soil type, the width and depth of the trench, and the horizontal spacing of the crossbraces are known, the size and vertical spacing of the crossbraces, the size and vertical spacing of the wales, and the size and horizontal spacing of the uprights can be read from the appropriate table.

(f) **Examples to Illustrate the Use of Tables C-1.1 through C-1.3.**

(1) **Example 1.**

A trench dug in Type A soil is 13 feet deep and five feet wide.

From Table C-1.1, for acceptable arrangements of timber can be used.

Arrangement #1

Space 4 × 4 crossbraces at six feet horizontally and four feet vertically.

Wales are not required.

Space 3 × 8 uprights at six feet horizontally. This arrangement is commonly called "skip shoring."

Arrangement #2

Space 4 × 8 crossbraces at eight feet horizontally and four feet vertically.

Space 8 × 8 wales at four feet vertically.

Space 2 × 6 uprights at four feet horizontally.

Arrangement #3

Space 6 × 6 crossbraces at 10 feet horizontally and four feet vertically.

Space 8 × 10 wales at four feet vertically.

Space 2 × 6 uprights at five feet horizontally.

Arrangement #4

Space 6 × 6 crossbraces at 12 feet horizontally and four feet vertically.

Space 10 × 10 wales at four feet vertically.

Spaces 3 × 8 uprights at six feet horizontally.

(2) Example 2.

A trench dug in Type B soil in 13 feet deep and five feet wide. From Table C-1.2 three acceptable arrangements of members are listed.

Arrangement #1

Space 6 × 6 crossbraces at six feet horizontally and five feet vertically.

Space 8 × 8 wales at five feet vertically.

Space 2 × 6 uprights at two feet horizontally.

Arrangement #2

Space 6 × 8 crossbraces at eight feet horizontally and five feet vertically.

Space 10 × 10 wales at five feet vertically.

Space 2 × 6 uprights at two feet horizontally.

Arrangement #3

Space 8 × 8 crossbraces at 10 feet horizontally and five feet vertically.

Space 10 × 12 wales at five feet vertically.

Space 2 × 6 uprights at two feet vertically.

(3) Example 3.

A trench dug in Type C soil is 13 feet deep and five feet wide.

From Table C-1.3 two acceptable arrangements of members can be used.

Arrangement #1

Space 8 × 8 crossbraces at six feet horizontally and five feet vertically.

Space 10 × 12 wales at five feet vertically.

Position 2 × 6 uprights as closely together as possible.

If water must be retained use special tongue and groove uprights to form tight sheeting.

Arrangement #2

Space 8 × 10 crossbraces at eight feet horizontally and five feet vertically.

Space 12 × 12 wales at five feet vertically.

Position 2 × 6 uprights in a close sheeting configuration unless water pressure must be resisted. Tight sheeting must be used where water must be retained.

(4) Example 4.

A trench dug in Type C soil is 20 feet deep and 11 feet wide. The size and spacing of members for the section of trench that is over 15 feet in depth is determined using Table C-1.3. Only one arrangement of members is provided.

Space 8 × 10 crossbraces at six feet horizontally and five feet vertically.

Space 12 × 12 wales at five feet vertically.

Use 3 × 6 tight sheeting.

Use of Tables C-2.1 through C-2.3 would follow the same procedures.

(g) Notes for all Tables.

1. Member sizes at spacing other than indicated are to be determined as specified in § 1926.652(c), "Design of Protective Systems."

2. When conditions are saturated or submerged use Tight Sheeting. Tight Sheeting refers to the use of specially-edged timber planks (e.g., tongue and groove) at least three inches thick, steel sheet piling, or similar construction that when driven or placed in position provide a tight wall to resist the lateral pressure of water and to prevent the loss of backfill material. Close Sheeting refers to the placement of planks side-by-side allowing as little space as possible between them.

3. All spacing indicated is measured center to center.

4. Wales to be installed with greater dimension horizontal.

5. If the vertical distance from the center of the lowest crossbrace to the bottom of the trench exceeds two and one-half feet, uprights shall be firmly embedded or a mudsill shall be used. Where uprights are embedded, the vertical distance from the center of the lowest crossbrace to the bottom of the trench shall not exceed 36 inches. When mudsills are used, the vertical distance shall not exceed 42 inches. Mudsills are wales that are installed at the toe of the trench side.

6. Trench jacks may be used in lieu of or in combination with timber crossbraces.

7. Placement of crossbraces. When the vertical spacing of crossbraces is four feet, place the top crossbrace no more than two feet below the top of the trench. When the vertical spacing of crossbraces is five feet, place the top crossbrace no more than 2.5 feet below the top of the trench.

TABLE C-1.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE A $P_a = 25 \times H + 72$ psf (2 ft Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS **												
	CROSS BRACES						WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	4	5	6	8
5 TO 10	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---				2X6	
	UP TO 8	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---					2X8
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			2X6		
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	8X8	4				2X6	
10 TO 15	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---				3X8	
	UP TO 8	4X6	4X6	6X6	6X6	6X6	4	8X8	4		2X6			
	UP TO 10	6X6	6X6	6X6	6X8	6X8	4	8X10	4			2X6		
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	10X10	4				3X8	
15 TO 20	UP TO 6	6X6	6X6	6X6	6X8	6X8	4	6X8	4	3X6				
	UP TO 8	6X6	6X6	6X6	6X8	6X8	4	8X8	4	3X6				
	UP TO 10	8X8	8X8	8X8	8X8	8X10	4	8X10	4	3X6				
	UP TO 12	8X8	8X8	8X8	8X8	8X10	4	10X10	4	3X6				
OVER 20	SEE NOTE 1													

* Mixed oak or equivalent with a bending strength not less than 850 psi.

** Manufactured members of equivalent strength may by substituted for wood.

TABLE C-1.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE B $P_a = 45 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**												
	CROSS BRACES						WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	2	3		
5 TO 10	UP TO 6	4X6	4X6	6X6	6X6	6X6	5	6X8	5			2X6		
	UP TO 8	6X6	6X6	6X6	6X8	6X8	5	8X10	5			2X6		
	UP TO 10	6X6	6X6	6X6	6X8	6X8	5	10X10	5			2X6		
	See Note 1													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5		2X6			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5		2X6			
	UP TO 10	8X8	8X8	8X8	8X8	8X10	5	10X12	5		2X6			
	See Note 1													
15 TO 20	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	3X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	3X6				
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6				
	See Note 1													
OVER 20	SEE NOTE 1													

* Mixed oak or equivalent with a bending strength not less than 850 psi.
** Manufactured members of equivalent strength may by substituted for wood.

TABLE C-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE C P_a = 80 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES								UPRIGHTS					
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE				
5 TO 10	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	2X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6				
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6				
	See Note 1													
10 TO 15	UP TO 6	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6				
	UP TO 8	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6				
	See Note 1													
	See Note 1													
15 TO 20	UP TO 6	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6				
	See Note 1													
	See Note 1													
	See Note 1													
OVER 20	SEE NOTE 1													

* Mixed Oak or equivalent with a bending strength not less than 850 psi.
** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE A P_a = 25 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **												
	CROSS BRACES						WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	4	5	6	8
5 TO 10	UP TO 6	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	Not Req'd				4X6	
	UP TO 8	4X4	4X4	4X4	4X6	4X6	4	Not Req'd	Not Req'd					4X8
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			4X6		
	UP TO 12	4X6	4X6	4X6	6X6	6X6	4	8X8	4				4X6	
10 TO 15	UP TO 6	4X4	4X4	4X4	6X6	6X6	4	Not Req'd	Not Req'd				4X10	
	UP TO 8	4X6	4X6	4X6	6X6	6X6	4	6X8	4		4X6			
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4			4X8		
	UP TO 12	6X6	6X6	6X6	6X6	6X6	4	8X10	4		4X6		4X10	
15 TO 20	UP TO 6	6X6	6X6	6X6	6X6	6X6	4	6X8	4	3X6				
	UP TO 8	6X6	6X6	6X6	6X6	6X6	4	8X8	4	3X6	4X12			
	UP TO 10	6X6	6X6	6X6	6X6	6X8	4	8X10	4	3X6				
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	8X12	4	3X6	4X12			
OVER 20	SEE NOTE 1													

* Douglas fir or equivalent with a bending strength not less than 1500 psi.
** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE B P_a = 45 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (SIZE) AND SPACING OF MEMBERS **													
	CROSS BRACES						WALES		UPRIGHTS					
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	2	3	4	6
5 TO 10	UP TO 6	4X6	4X6	4X6	6X6	6X6	5	6X8	5			3X12 4X8		4X12
	UP TO 8	4X6	4X6	6X6	6X6	6X6	5	8X8	5		3X8		4X8	
	UP TO 10	4X6	4X6	6X6	6X6	6X8	5	8X10	5			4X8		
	See Note 1													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5	3X6	4X10			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5	3X6	4X10			
	UP TO 10	6X8	6X8	8X8	8X8	8X8	5	10X12	5	3X6	4X10			
	See Note 1													
15 TO 20	UP TO 6	6X8	6X8	6X8	6X8	8X8	5	8X10	5	4X6				
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X12	5	4X6				
	UP TO 10	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6				
	See Note 1													
OVER 20	SEE NOTE 1													

* Douglas fir or equivalent with a bending strength not less than 1500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE C P_a = 80 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **													
	CROSS BRACES						WALES		UPRIGHTS					
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE				
5 TO 10	UP TO 6	6X6	6X6	6X6	6X6	8X8	5	8X8	5	3X6				
	UP TO 8	6X6	6X6	6X6	8X8	8X8	5	10X10	5	3X6				
	UP TO 10	6X6	6X6	8X8	8X8	8X8	5	10X12	5	3X6				
	See Note 1													
10 TO 15	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	10X10	5	4X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6				
	See Note 1													
	See Note 1													
15 TO 20	UP TO 6	8X8	8X8	8X8	8X10	8X10	5	10X12	5	4X6				
	See Note 1													
	See Note 1													
	See Note 1													
OVER 20	SEE NOTE 1													

* Douglas fir or equivalent with a bending strength not less than 1500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

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Appendix D to Subpart P

Aluminum Hydraulic Shoring for Trenches

(a) **Scope.** This appendix contains information that can be used when aluminum hydraulic shoring is provided as a method of protection against cave-ins in trenches that do not exceed 20 feet (6.1m) in depth. This appendix must be used when design of the aluminum hydraulic protective system cannot be performed in accordance with § 1926.652(c)(2).

(b) **Soil Classification.** In order to use data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in appendix A of subpart P of part 1926.

(c) **Presentation of Information.**
Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables D-1.1, D-1.2, D-1.3 and D-1.4. Each table presents the maximum vertical and horizontal spacings that may be used with various aluminum member sizes and various hydraulic cylinder sizes. Each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. Tables D-1.1 and D-1.2 are for vertical shores in Types A and B soil. Tables D-1.3 and D1.4 are for horizontal waler systems in Types B and C soil.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations (footnotes) regarding Table D-1.1 through D-1.4 are presented in paragraph (g) of this appendix.

(6) Figures, illustrating typical installations of hydraulic shoring, are included just prior to the Tables. The illustrations page is entitled "Aluminum Hydraulic Shoring: Typical Installations."

(d) Basis and limitations of the data.

(1) Vertical shore rails and horizontal wales are those that meet the Section Modulus requirements in the D-1 Tables. Aluminum material is 6061-T6 or material of equivalent strength and properties.

(2) Hydraulic cylinders specifications. (i) 2-inch cylinders shall be a minimum 2-inch inside diameter with a minimum safe working capacity of no less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe working capacity of not less than 30,000 pounds axial compressive load at extensions as recommended by product manufacturer.

(3) Limitation of application.

(i) It is not intended that the aluminum hydraulic specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be otherwise designed as specified in § 1926.652(c).

(ii) When any of the following conditions are present, the members specified in the Tables are not considered adequate. In this case, an alternative aluminum hydraulic shoring system or other type of protective system must be designed in accordance with § 1926.652.

(A) When vertical loads imposed on cross braces exceed a 100 Pound gravity load distributed on a one foot section of the center of the hydraulic cylinder.

(B) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(C) When only the lower portion or a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) Use of Tables D-1.1, D-1.2, D-1.3 and D-1.4. The members of the shoring system that are to be selected using this information are the hydraulic cylinders, and either the vertical shores or the horizontal wales. When a water system is used the vertical timber sheeting to be used is also selected from these tables. The Tables D-1.1 and D-1.2 for vertical shores are used in Type A and B soils that do not require sheeting. Type B soils that may require sheeting, and Type C soils that always require sheeting are found in the horizontal wale Tables D-1.3 and D-1.4. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is made. The selection is based on the depth and width of the trench where the members are to be installed. In these tables the vertical spacing is held constant at four feet on center. The tables show the maximum horizontal spacing of cylinders allowed for each size of wale in the waler system tables, and in the vertical shore tables, the hydraulic cylinder horizontal spacing is the same as the vertical shore spacing.

(f) Example to Illustrate the Use of the Tables:

(1) Example 1:

A trench dug in Type A soil is 6 feet deep and 3 feet wide. From Table D-1.1: Find vertical shores and 2 inch diameter cylinders spaced 8 feet on center (o.c.) horizontally and 4 feet on center (o.c.) vertically. (See Figures 1 & 3 for typical installations.)

(2) Example 2:

A trench is dug in Type B soil that does not require sheeting, 13 feet deep and 5 feet wide. From Table D-1.2: Find vertical

shores and 2 inch diameter cylinders spaced 6.5 feet o.c. horizontally and 4 feet o.c. vertically. (See Figures 1 & 3 for typical installations.)

(3) A trench is dug in Type B soil that does not require sheeting, but does experience some minor raveling of the trench face. The trench is 16 feet deep and 9 feet wide. From Table D-1.2.: Find vertical shores and 2 inch diameter cylinder (with special oversleeves as designated by footnote #2) spaced 5.5 feet o.c. horizontally and 4 feet o.c. vertically, plywood (per footnote (g)(7) to the D-1 Table) should be used behind the shores. (See Figures 2 & 3 for typical installations.)

(4) Example 4: A trench is dug in previously disturbed Type B soil, with characteristics of a Type C soil, and will require sheeting. The trench is 18 feet deep and 12 feet wide. 8 foot horizontal spacing between cylinders is desired for working space. From Table D-1.3: Find horizontal wale with a section modulus of 14.0 spaced at 4 feet o.c. vertically and 3 inch diameter cylinder spaced at 9 feet maximum o.c. horizontally. 3 × 12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(5) Example 5: A trench is dug in Type C soil, 9 feet deep and 4 feet wide. Horizontal cylinder spacing in excess of 6 feet is desired for working space. From Table D-1.4: Find horizontal wale with a section modulus of 7.0 and 2 inch diameter cylinders spaced at 6.5 feet o.c. horizontally. Or, find horizontal wale with a 14.0 section modulus and 3 inch diameter cylinder spaced at 10 feet o.c. horizontally. Both wales are spaced 4 feet o.c. vertically. 3 × 12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(g) Footnotes, and general notes, for Tables D-1.1, D-1.2, D-1.3, and D-1.4.

(1) For applications other than those listed in the tables, refer to § 1926.652(c)(2) for use of manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to § 1926.652(c)(2) and § 1926.652(c)(3).

(2) 2 inch diameter cylinders, at this width, shall have structural steel tube (3.5 × 3.5 × 0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

(3) Hydraulic cylinders capacities. (i) 2 inch cylinders shall be a minimum 2-inch inside diameter with a safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe work capacity of not less than 30,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(4) All spacing indicated is measured center to center.

(5) Vertical shoring rails shall have a minimum section modulus of 0.40 inch.

(6) When vertical shores are used, there must be a minimum of three shores spaced equally, horizontally, in a group.

(7) Plywood shall be 1.125 in. thick softwood or 0.75 inch, thick, 14 ply, arctic white birch (Finland form). Please note that plywood is not intended as a structural member, but only for prevention of local raveling (sloughing of the trench face) between shores.

(8) See appendix C for timber specifications.

(9) Wales are calculated for simple span conditions.

(10) See appendix D, item (d), for basis and limitations of the data.

ALUMINUM HYDRAULIC SHORING
TYPICAL INSTALLATIONS

FIGURE NO. 1

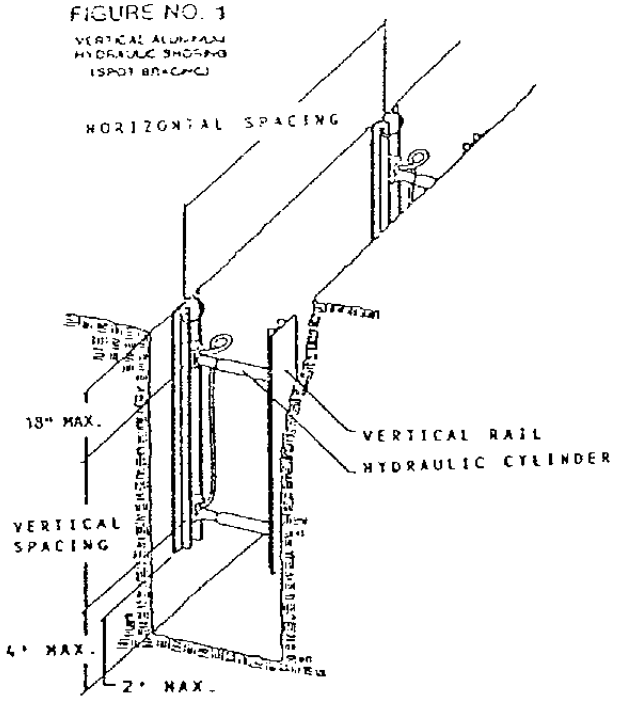


FIGURE NO. 2

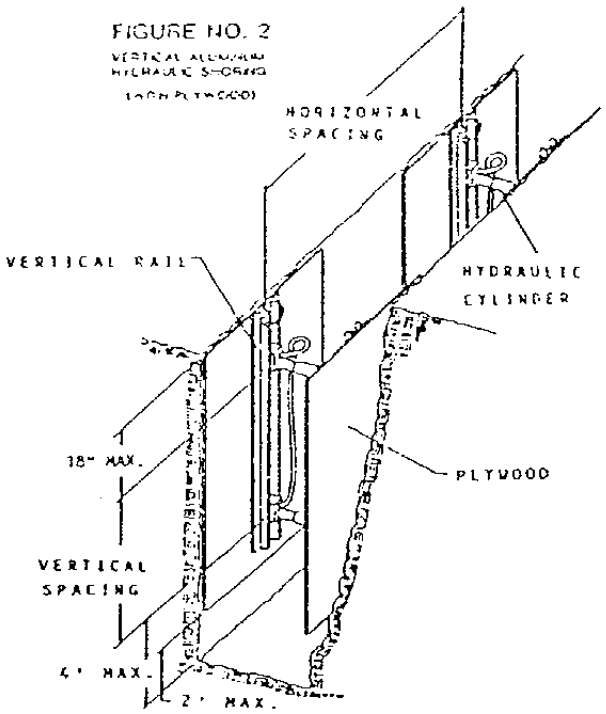


FIGURE NO. 3
VERTICAL ALUMINUM HYDRAULIC SHORING (STACKED)

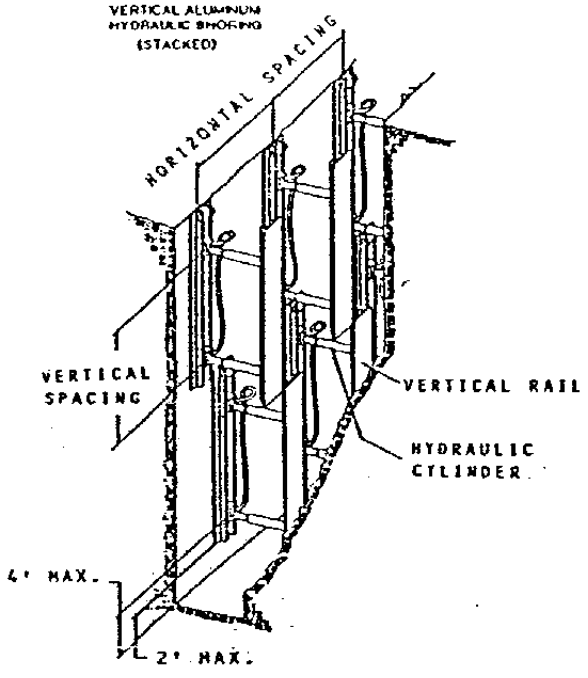


FIGURE NO. 4
ALUMINUM HYDRAULIC SHORING WALER SYSTEM (TYPICAL)

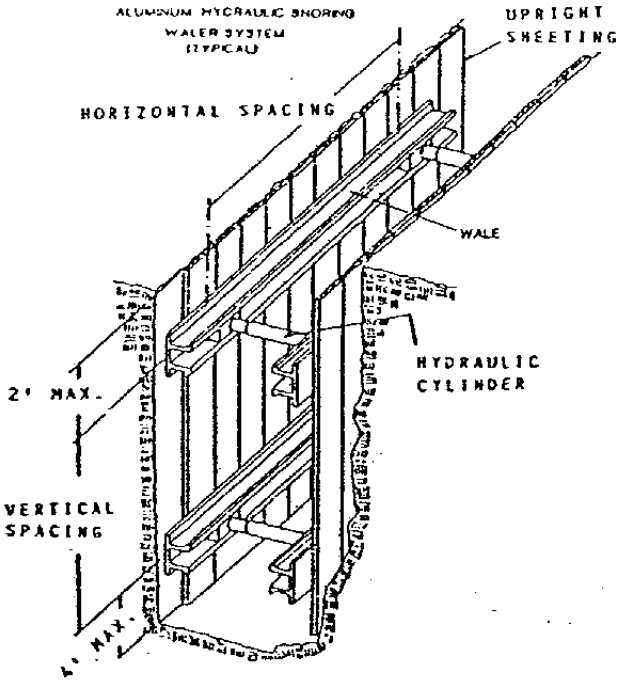


TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	8				
OVER 15 UP TO 20	7				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)
Note (1): See Appendix D, Item (g) (1)
Note (2): See Appendix D, Item (g) (2)

TABLE D - 1.2
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE B

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	6.5				
OVER 15 UP TO 20	5.5				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)
Note (1): See Appendix D, Item (g) (1)
Note (2): See Appendix D, Item (g) (2)

ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE B

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS		
			WIDTH OF TRENCH (FEET)						MAX.HORIZ.SPACING (ON CENTER)		
			UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO15				
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN³) *	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	SOLID SHEET	2 FT.	3 FT.
OVER 5 UP TO 10	4	3.5	8.0	2 IN	8.0	2 IN NOTE(2)	8.0	3 IN	—	—	3x12
		7.0	9.0	2 IN	9.0	2 IN NOTE(2)	9.0	3 IN			
		14.0	12.0	3 IN	12.0	3 IN	12.0	3 IN			
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN	—	3x12	—
		7.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 15 UP TO 20	4	3.5	5.5	2 IN	5.5	2 IN NOTE(2)	5.5	3 IN	3x12	—	—
		7.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
		14.0	9.0	3 IN	9.0	3 IN	9.0	3 IN			
OVER 20	NOTE (1)										

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)
Notes (1): See Appendix D, item (g) (1)
Notes (2): See Appendix D, Item (g) (2)
* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

TABLE D - 1.4
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE C

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS		
			WIDTH OF TRENCH (FEET)						MAX. HORIZ SPACING (ON CENTER)		
	VERTICAL SPACING (FEET)	SECTION MODULUS* (IN^3)	UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
OVER 5 UP TO 10	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN	3x12	—	—
		7.0	6.5	2 IN	6.5	2 IN NOTE(2)	6.5	3 IN			
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 10 UP TO 15	4	3.5	4.0	2 IN	4.0	2 IN NOTE(2)	4.0	3 IN	3x12	—	—
		7.0	5.5	3 IN	5.5	3 IN	5.5	3 IN			
		14.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
OVER 15 UP TO 20	4	3.5	3.5	2 IN	3.5	2 IN NOTE(2)	3.5	3 IN	3x12	—	—
		7.0	5.0	3 IN	5.0	3 IN	5.0	3 IN			
		14.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
OVER 20	NOTE (1)										

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, item (g) (1)

Notes (2): See Appendix D, Item (g) (2)

* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

Appendix E to Subpart P—Alternatives to Timber Shoring

Figure 1. Aluminum Hydraulic Shoring

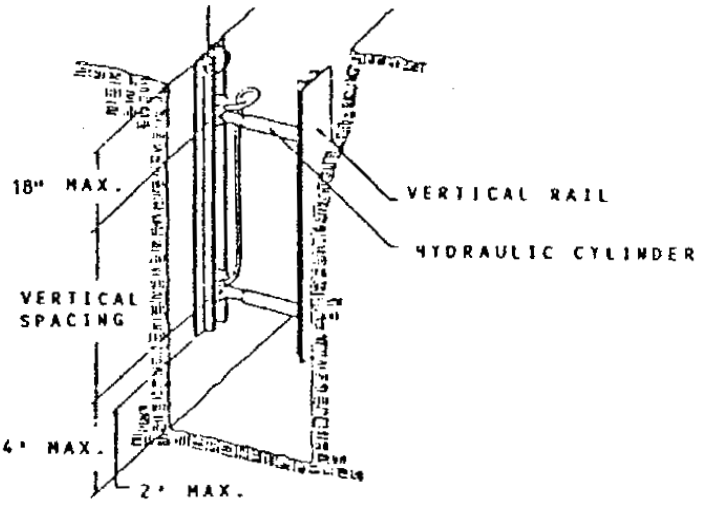
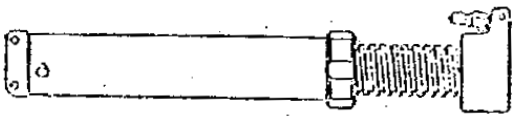


Figure 2. Pneumatic/hydraulic Shoring



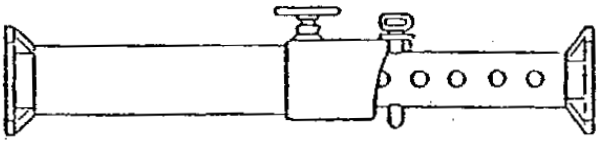


Figure 3. Trench Jacks (Screw Jacks)

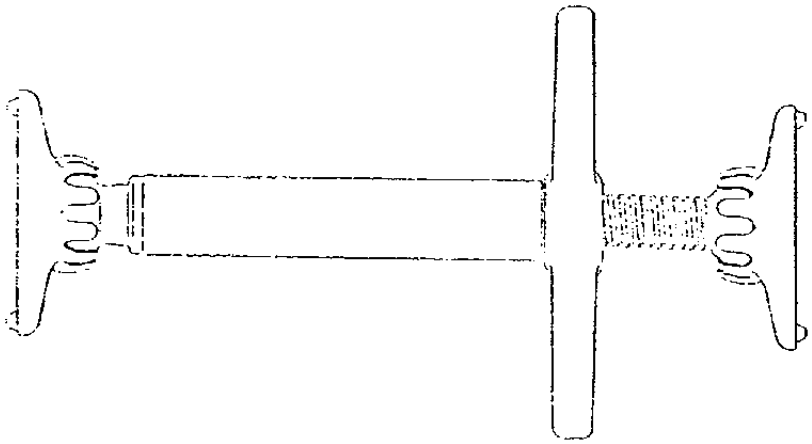
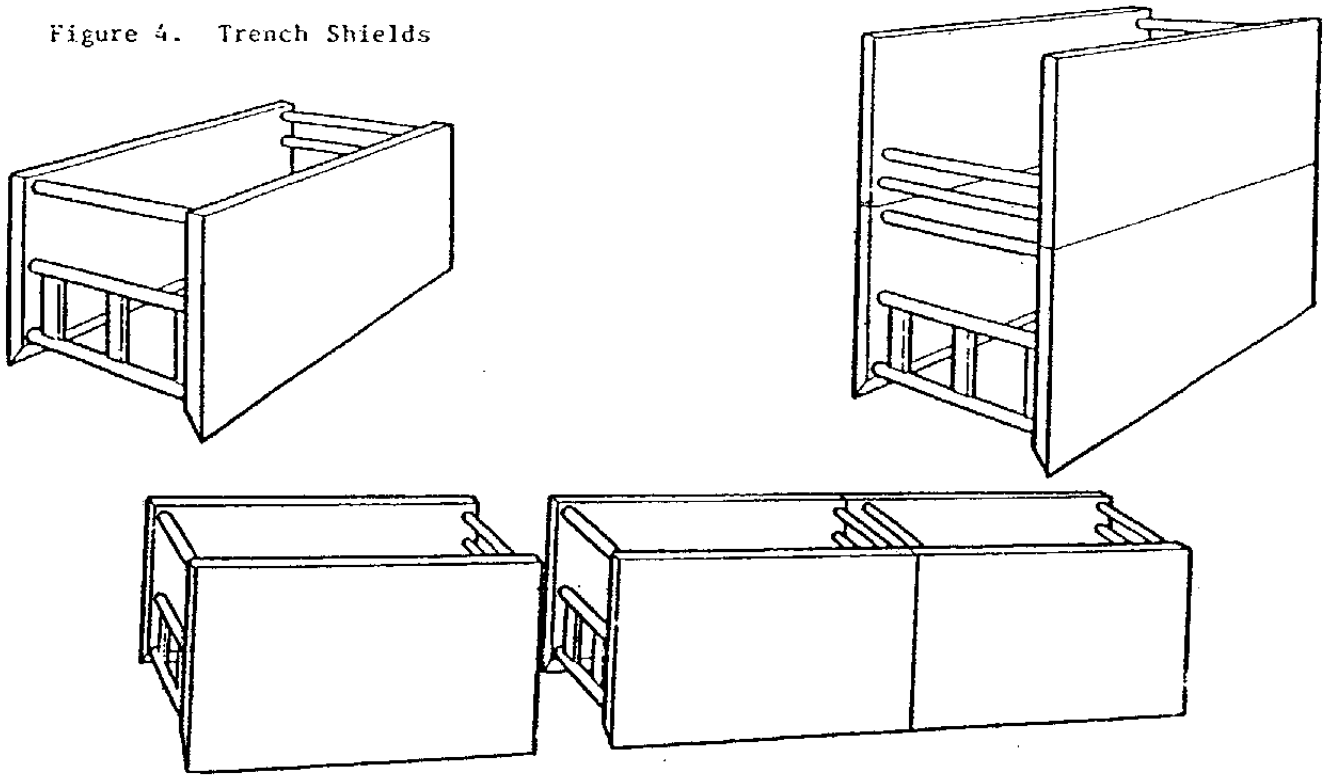


Figure 4. Trench Shields



Appendix F to Subpart P—Selection of Protective Systems

The following figures are a graphic summary of the requirements contained in subpart P for excavations 20 feet or less in depth. tective systems for use in excavations more than 20 feet in depth must be designed by a registered professional engineer in accordance h § 1926.652 (b) and (c).

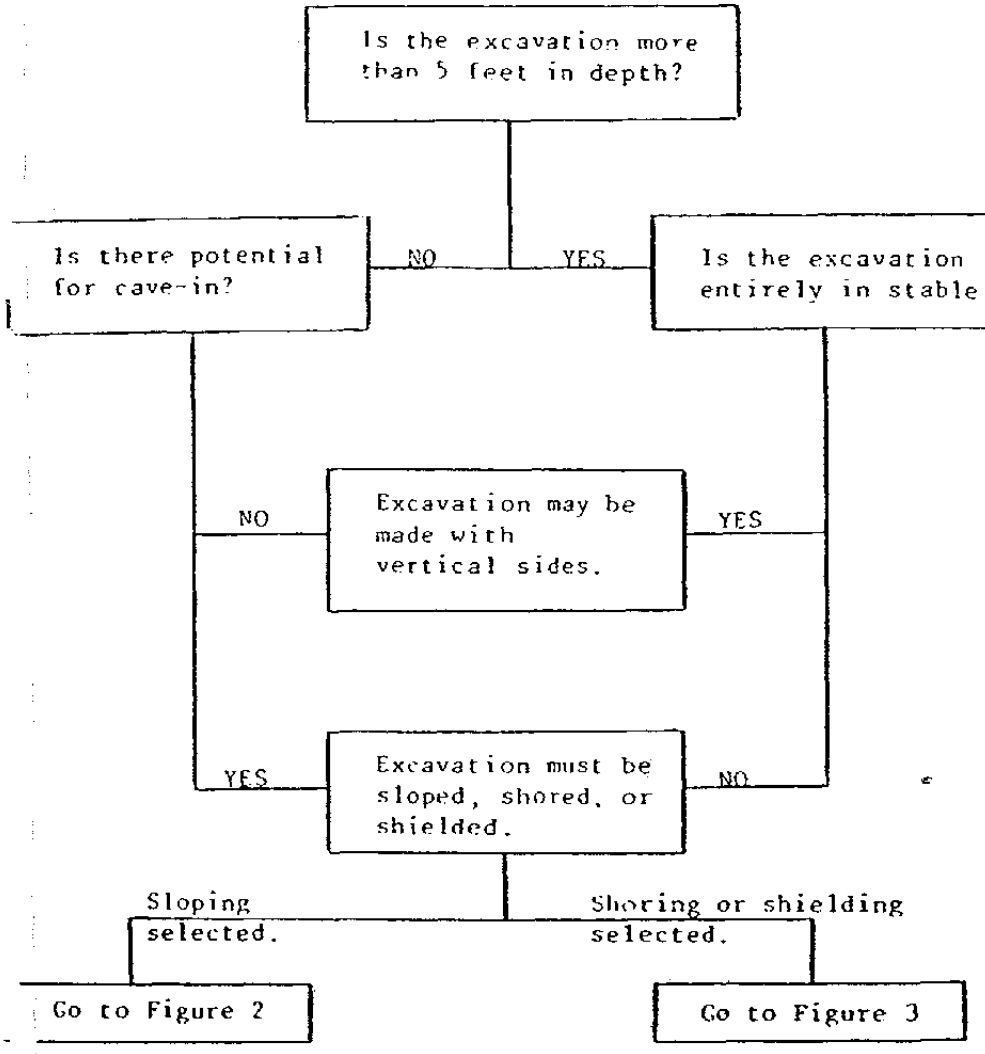


FIGURE 1 - PRELIMINARY DECISIONS

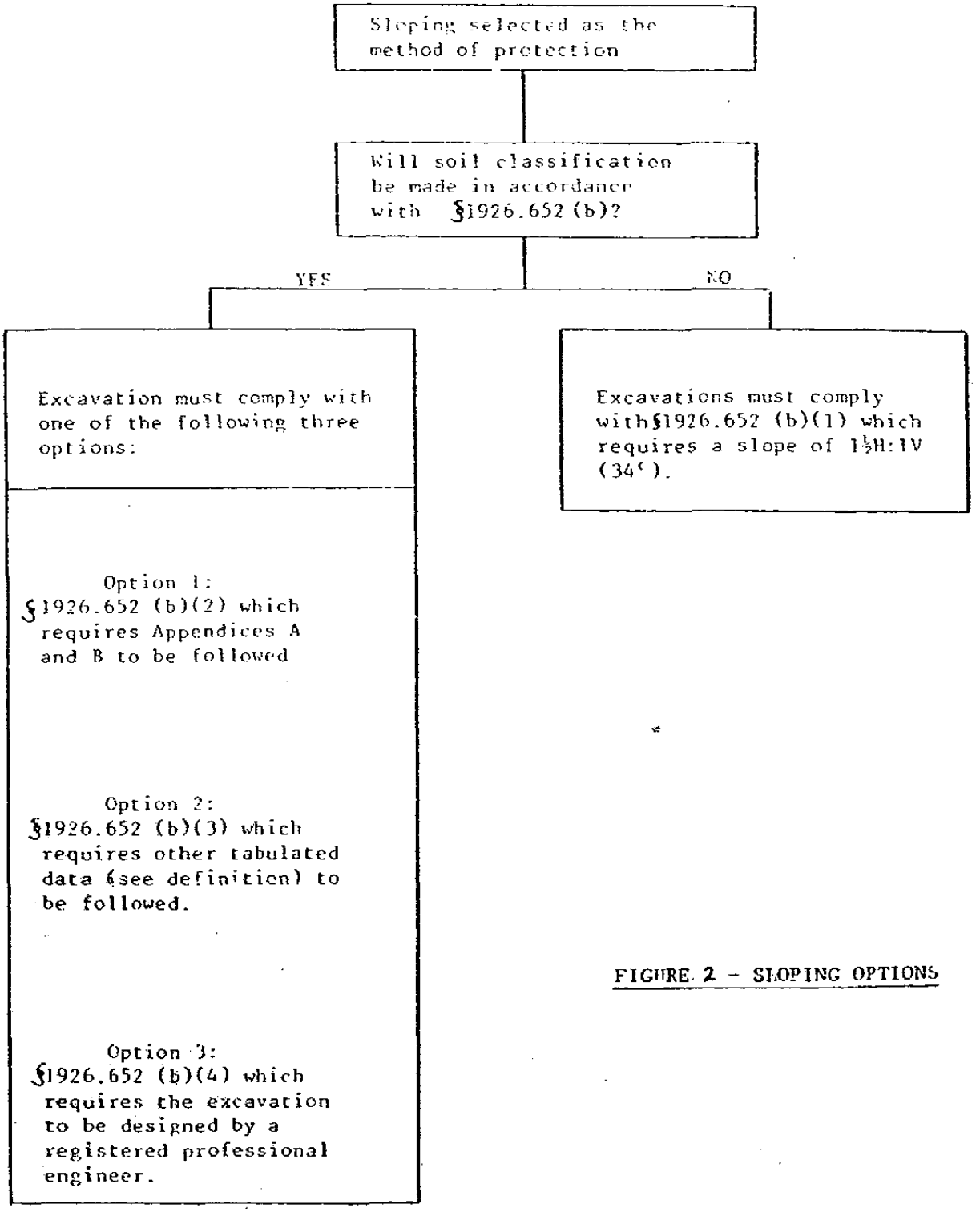


FIGURE 2 - SLOPING OPTIONS

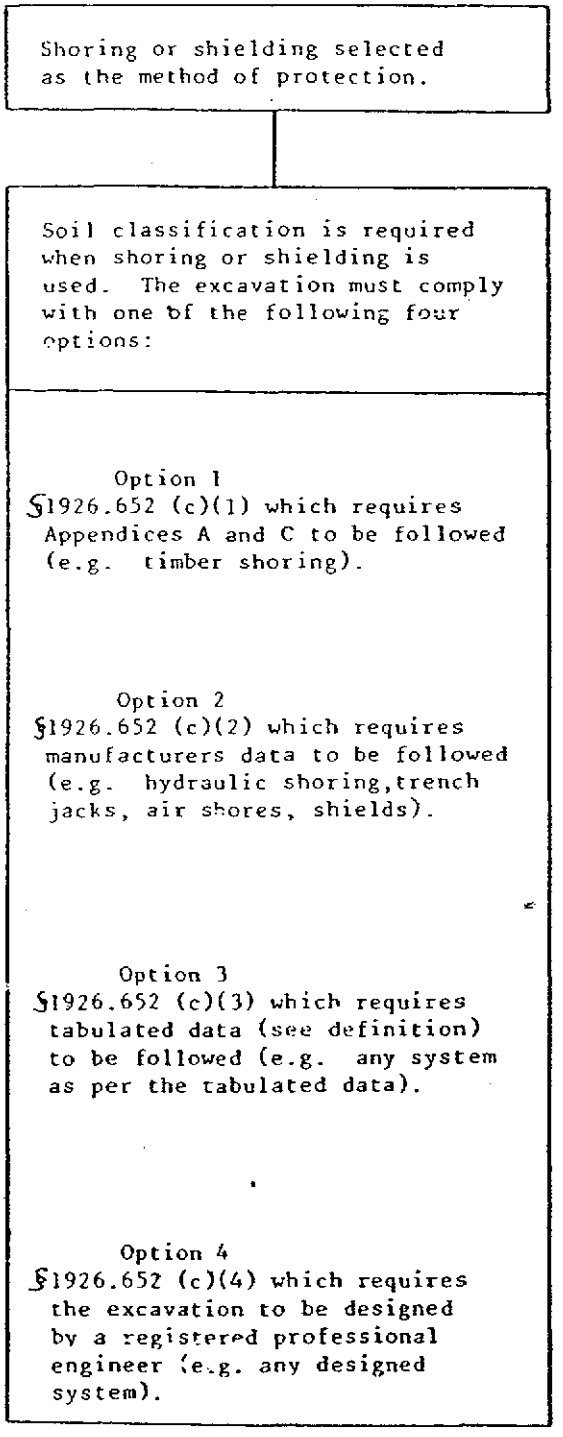


FIGURE 3 – SHORING AND SHIELDING OPTIONS

2.0 THE MECHANICS OF A TRENCH COLLAPSE

The mechanics of a trench collapse

By Jack L. Mickle
Professor of Civil Engineering
Iowa State University
Ames, Iowa

Why do several hundred people die each year in trenches? Why are several thousand injured or maimed? What is it that makes trenching so dangerous? Why, after decades of these accidents, is the situation unchanged?

Hundreds of thousands of trenches are opened every day in this country. Statistically, death and injury rates per 100,000 holes opened have improved over time. The lower numbers hold some encouragement, but they give little comfort to someone who has had a body broken by a cave-in, to someone who feels responsible for the death or injury of a fellow worker, or to those who have lost a friend or loved-one to a trench collapse.

We all know what trenches are and why they are created. And we know that trenches are normally temporary excavations open for hours at the most. For economy of operation, contractors favor the minimum possible excavation per foot of pipe installed. Worker safety usually dictates more excavation for time to install protective devices. Production and safety goals would seem to be at odds. Yet it's been shown time and again that safety pays. Many would-be contractors, however, remain unconvinced.

Nature shows us that an open trench is an unnatural condition. The average landscape displays no vertical or near-vertical slopes. Even rock cliffs slowly but surely weather and fall: river banks frequently collapse.

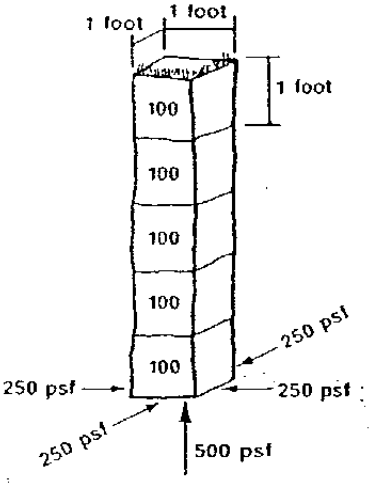


Figure 1. A cubic yard of soil is as heavy as an automobile. Each 1x1-foot soil cube contributes 100 pounds to the column's total weight. The stress, or load per unit area, is 100 pounds per square foot (psf). At a depth of 5 feet, a horizontal plane is carrying 5 cubic feet or 500 psf.

The soil that snuffs out life in a trench collapse is not only suffocating; it is crushing, weighing easily 120 pounds per cubic foot. A cubic yard of soil is as heavy as an automobile. In the cube of soil shown in Figure 1, each 1x1-foot soil cube contributes 100 pounds to the column's total weight. The stress, or load per unit area, is 100 pounds per square foot (psf). At a depth of 2 feet, a horizontal plane is carrying 2 cubic feet or 200 psf. Using the same logic, at a depth of 5 feet, the vertical stress is 500 psf.

The stresses that accrue from this column of soil not only push down; they push out horizontally—at a force approximately one-half as great as the vertical stresses. This 5-foot-tall soil column exerts a vertical (downward) stress at its base of 500 psf and a horizontal (or lateral) stress of 250 psf. Were this soil column not held in place by similar adjacent columns, it would soon collapse. The taller the column, the sooner the collapse. Note that lateral stresses are a function of the height of the column, not

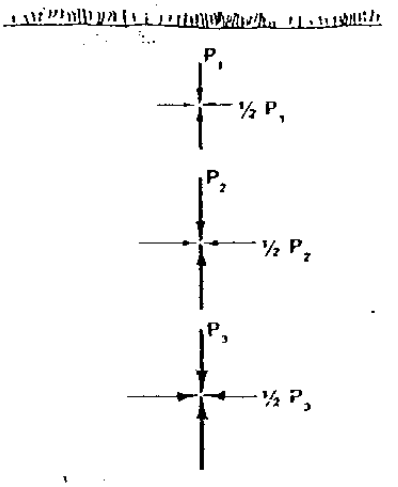


Figure 2. In the open field, imagine an infinite number of columns of soil (as shown in Figure 1) abutting one another. The vertical and horizontal stresses still exist and are of the same magnitude as shown on the individual soil column, but the system is in equilibrium.

its width. For example, the lateral force of water pressing against the face of a dam depends entirely on the depth of the water, not its expanse.

Figure 2 depicts an idealized site condition in an open, undisturbed field. Imagine an infinite number of columns of soil abutting one another. The vertical and horizontal stresses still exist and are of the same magnitude as shown on the individual soil column in Figure 1. The system is in equilibrium and is perfectly stable.

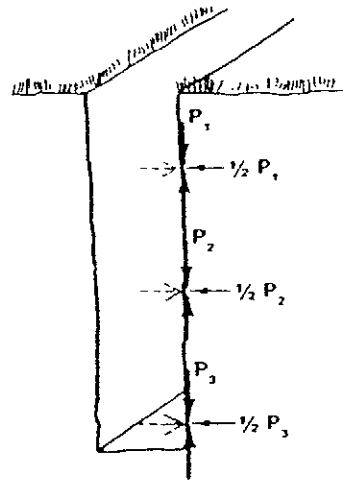


Figure 3. The lateral stresses that once pushed against the face of the trench wall (by the removed column of soil) no longer exist. The system is now unstable.

When a trench is cut, the system shown in Figure 2 is disturbed. As shown in Figure 3, lateral stresses that once pushed against the face of the trench wall (by the column of soil that was removed) no longer exist. The system is now unstable. The soil in the trench wall immediately begins to move into the trench. The movement may not be observable, but you can count on it.

At the same time, the surface of the ground next to the trench subsides. This creates an unnatural situation. The soil back from the edge of the trench holds onto the soil at the trench face, keeping it from caving into the trench. This creates a tensile stress at right angles to the trench wall. Soil, strong in compression, is weak in tension; as a result, tension cracks appear back from the edge of the trench and run parallel to the edge.

Also, prior to cracking, part of the weight of the soil in the trench face is carried by the soil back from the edge of the trench by shear. This can be visualized as a man carrying a large, heavy package against his chest. If the package is gripped firmly enough, it is prevented, by shear, from sliding down. However, if the grip is loosened, the package slides to the ground.

The grip of the person carrying the package is much the same as the stress in the soil; when the crack is opened, the soil tends to settle further, the same as the package sliding down the front of the person as the grip is released. The cracks occur at a distance equal to about one-third to two-thirds of the trench's depth (Figure 4). For example, if a 10-foot trench is dug, the cracks may be found somewhere from between 3 to 7 feet

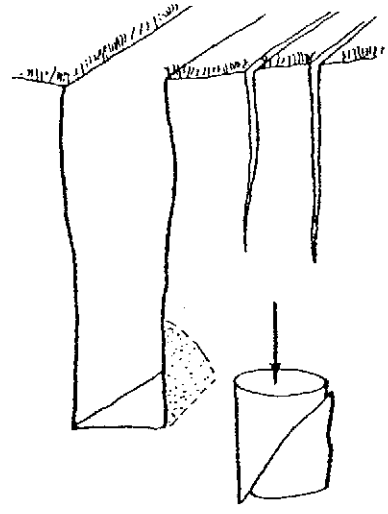


Figure 4. Cracks occur at a distance equal to about one-third to two-thirds of the trench's depth. This type of failure is similar to a standard soil engineering test called an unconfined compression test.

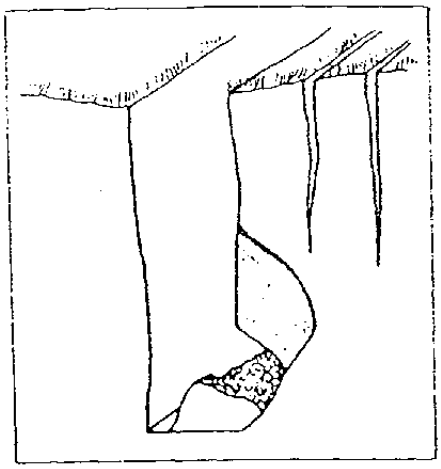


Figure 5. Next, the lower part of the trench wall fails under great stress from the weight of the soil above it.

back from the edge of the trench. There may be several cracks. The cracks are usually vertical and may be one-half as deep as the trench.

When these cracks develop, the weight of the soil in the trench wall is no longer carried by the soil back from the face of the wall (through shear). At this point, the soil in the trench wall looks very much like the column shown in Figure 1. Next, the lower part of the trench wall fails under great stress from the weight of the soil above it (Figure 5).

This type of failure is similar to a standard soil engineering test called an unconfined compression test. The test is run by selecting a soil sample, which is cylindrical and has a height that is twice the diameter. The sample is then compressed vertically until it fails. The maximum axial stress (the vertical load on the sample divided by its cross-sectional area) on the sample at failure will be reported as the unconfined compressive strength. The failure will often occur on a single plane at a specified, determinable slope (Figure 4). Note the similarity to the stressed portion of the trench wall in Figure 5.

The term *unconfined* means just that; there is no lateral support to prevent the failure of the specimen as there is no lateral support to prevent the failure of the trench

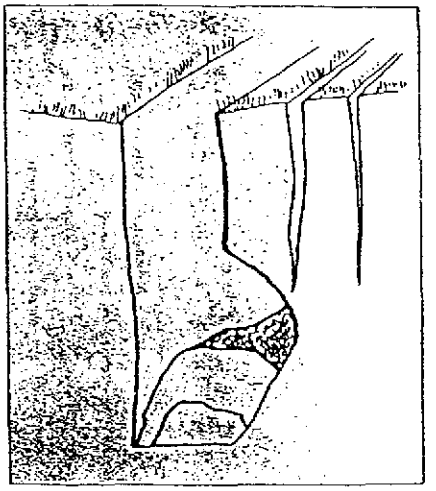


Figure 6. A second failure occurs.

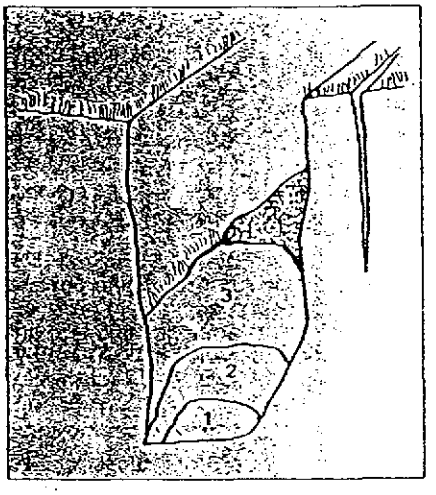


Figure 7. A third cave-in is not far behind.

wall. The only difference is that the specimen can fail in any direction; the trench wall, because of confinement on the other three sides, can only fail into the trench.

When the bottom of the trench wall fails, the support for the upper part of the trench wall is no longer effective. As shown in Figure 5, the upper part of the trench wall is now essentially hanging by shear and tensile forces. A second failure occurs (Figure 6). For the same reasons, a third cave-in is not far behind (Figure 7).

Soil, like concrete, is normally quite strong in compression, but not at all strong in tension. Reinforced concrete takes advantage of the compressive strength of concrete and the tensile strength of steel. Unfortunately, there is no steel in soil. There are those who contend that tree roots will serve that purpose. They are wishful thinkers.

The second failure, from the upper part of the trench, will occur very soon after the first failure at the bottom. Often, a worker will be trapped by a first cave-in,

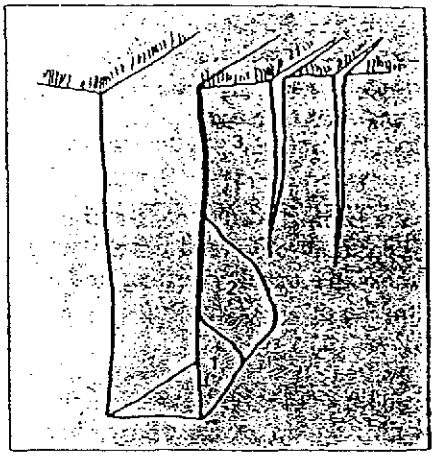


Figure 8. Cave-ins generally occur in multiples. If the first one doesn't get you, the second one may—or maybe the third one will.

and fellow workers will jump into the trench to help. The second and third cave-ins are generally the ones that kill or maim the would-be rescuers. There is at least one case where the second and third cave-ins caught and killed separate groups of rescuers.

Cave-ins generally occur in multiples (Figure 8). If the first one doesn't get you, the second one may. If not, the third one is always a possibility. Remember, soil weighs at least 3,000 pounds, or 1½ tons, per cubic yard. Even a small cave-in weighs as much as a piece of construction equipment; the human body was never designed to catch a truck.

Acknowledgment
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3.0 GUIDELINES FOR A COMPETENT PERSON

Guidelines for Competent Person

COMPETENT PERSON WILL CONDUCT:

1. Daily inspections before work begins and as needed throughout the work shifts when conditions change.

COMPETENT PERSON WILL CONDUCT:

2. Daily inspections of protective systems, unsanitary conditions, and testing for hazardous atmospheres or conditions when there is reasonable cause to believe they exist.

COMPETENT PERSON WILL:

3. Determine the degree to which actual slopes are reduced due to surcharge loading, operating equipment or traffic.

COMPETENT PERSON WILL:

4. Monitor the equipment and operations of water removal.

COMPETENT PERSON MAY:

5. Design structural ramps used by employees only. Structural ramps used by equipment will be designed by a registered professional engineer. Design must follow certain guidelines.

MINIMUM STANDARDS

TYPE A SOIL

Includes:

1. Cohesive soils with unconfined compressive strength which exceeds 1.5T/SF (stiff, very stiff, hard clay).
2. Cemented soils such as caliche and hard pan.

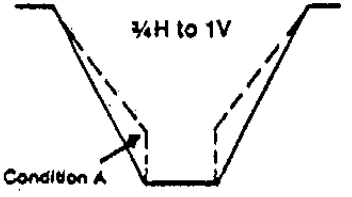
Excludes:

A. Soils which are fissured or subject to vibrations from heavy traffic, pile driving or similar effects.

B. Soil that has been previously disturbed.

C. Sloped layered system dipping into the excavation on a 4H to 1V or greater.

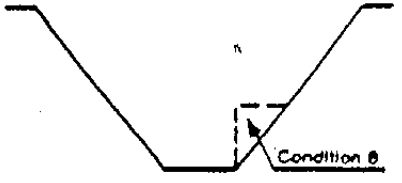
SIMPLE SLOPE GENERAL



Top width equals 1.5x depth plus bottom width.
If bottom width is 4 feet then:

Depth	Width
8	16
10	19
12	22
14	25
16	28
18	31
20	34

Note: ½H to 1V allowed in short term excavation to depth of 12 feet



Condition A - Maximum vertical bench of 3½ feet allowed in excavations up to 8 feet with a slope of ¾H to 1V and up to 12 feet with a slope of 1H to 1 vertical.

Condition B - Maximum vertical bench of 4 feet allowed up to 20 feet with a slope of ¾H to 1 vertical provided slope is calculated from toe of bench bottom.

NOTE: All slopes for depths of 20 feet or greater must be designed by a registered professional engineer.

MINIMUM STANDARDS

TYPE B SOIL

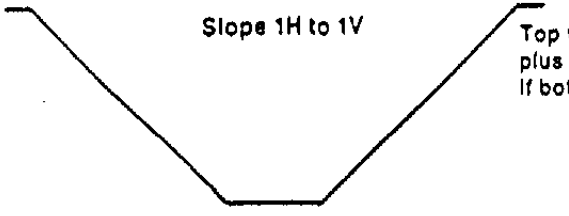
Includes:

1. Cohesive soil with an unconfined compressive strength of .5T/SF minimum to 1.5T/SF maximum (medium to stiff clay).
2. Granular cohesionless soils including angular gravel, silt, silt loam, sandy loam, and in some cases silty clay loam, and sandy clay loam.
3. Previously disturbed soils except those which could otherwise be classed as Type C soil.
4. Soil that meets Type A requirements but is fissured or subject to vibration.
5. Dry rock that is not stable.

Excludes:

A. Soils that are part of a sloped layered system dipping into the excavation on 4H to 1V.

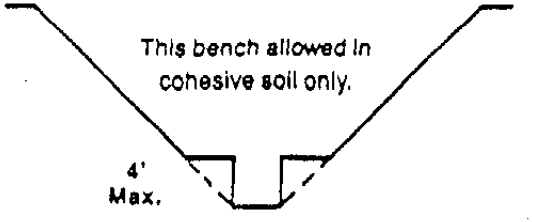
B. Soils that are submerged or from which water is freely seeping.



Simple Slope

Top width equals 2x depth plus bottom width.
If bottom width is 4 feet then:

Depth	Width
8 ft	20 ft
10 ft	24 ft
12 ft	28 ft
14 ft	32 ft
16 ft	36 ft
18 ft	40 ft
20 ft	44 ft



Simple Bench

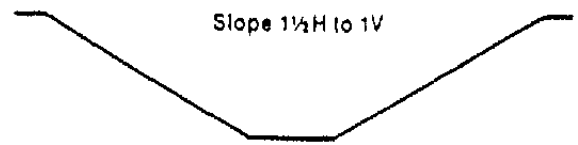
NOTE: All slopes for excavations 20 feet or deeper will be designed by a registered professional engineer.

MINIMUM STANDARDS

TYPE C SOIL

Includes:

1. Cohesive soils with unconfined compressive strength of 0.5 T/SF or less.
2. Granular soils including gravel, sand, and loamy sand or
3. Submerged soil or soil from which water is freely seeping or
4. Submerged rock that is not stable or
5. Material in a sloped, layered system dipping into the excavation of 4H to 1V or steeper.



Top width equals 3 X depth plus bottom width.
If bottom width is 4 feet, then:

Depth	Width
8	28
10	34
12	40
14	46
16	54
18	60
20	66

WARNING SIGNS OF FAILURE

- Tension Cracks
- Ground Settlement
- Changes in Wall Slope
- Trench Wall Bulge
- Spalling, Sloughing
- Water Seeping
- Piping of fine soils
- Boiling of trench bottom
- Unusual deformation of bracing struts
- Bowing of structural members beyond manufacturer's guidelines
- Crackling, popping sound

NOTE: This folder is meant to be a condensed guide only. Competent person should be furnished with a full and complete copy of Subpart P, Appendix A, for full information.

Waste, Inc.
32 Industrial Park Dr.
Concord, NH 03301
1-800-421-0125

4.0 EXCAVATION CHECKLIST

EXCAVATION CHECKLIST
(to be completed by a "Competent Person")

PART IV

'e location: _____

)ate: _____ Time: _____ Competent person: _____

l type(see attached form): _____

Soil classification: _____ Excavation depth: _____ Excavation width: _____

.)e of protective system used: _____

(Indicate for each item: Yes - No - or N/A for Not applicable)

I General inspection of job-site:
- A. Excavations, adjacent areas and protective systems inspected by a competent person daily prior to the start of work. _____
- B. Competent person has the authority to remove employees from the excavation immediately. _____
- C. Surface encumbrances removed or supported. _____
- D. Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation. _____
- E. Hard hats worn by all employees. _____
- F. Spoils, materials, and equipment set back at least 2' from the edge of the excavation. _____
- G. Barriers provided at all remotely located excavations, wells, pits, shafts, etc. _____
- H. Walkways and bridges over excavations 4' or more in depth are equipped with standard guardrails. _____
- I. Warning vests or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic. _____
- J. Employees required to stand away from vehicles being loaded or unloaded. _____
- K. Warning system established and utilized when mobile equipment is operating near the edge of the excavation. _____
- L. Employees prohibited from going under suspended loads. _____
- M. Employees prohibited from working on the faces of sloped or benched excavations above other employees. _____

II. Utilities:
- A. Utility companies contacted and/or utilities located. _____
- B. Exact location of utilities marked when approaching the utilities. _____
- C. Underground installations protected, supported or removed when excavation is open. _____

I. Means of access and egress:
- A. Lateral travel to means of egress no greater than 25' in excavations 4' or more in depth. _____
- B. Ladders used in excavations secured and extended 3' above the edge of the trench. _____
- C. Structural ramps used by employees designed by a competent person. _____
- D. Structural ramps used for equipment designed by a registered professional engineer (RPE). _____
- E. Ramps constructed of materials of uniform thickness, cleated together on the bottom, equipped with no slip surface. _____
- F. Employees protected from cave-ins when entering or exiting the excavation. _____

IV. Wet conditions:

A. Precautions taken to protect employees from the accumulation of water. ___

B. Water removal equipment monitored by a competent person. ___

C. Surface water or runoff diverted or controlled to prevent accumulation in the excavation. ___

D. Inspections made after every rainstorm or other hazard increasing occurrence. ___

V. Hazardous atmosphere:

A. Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficiency, combustible or other harmful contaminant exposing employees to a hazard.a) ___

B. Adequate precautions taken to protect employee from exposure to an atmosphere containing less than 19.5% oxy; and/or to other hazardous atmospheres. ___

C. Ventilation provided to prevent employee exposure to an atmosphere containing flammable gas in excess of 20% of the lower explosive limit of the gas. ___

D. Testing conducted often to ensure that the atmosphere remains safe. ___

E. Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmospheres could or do exist. ___

F. Employees trained to use personal protective and other rescue equipment. ___

G. Safety harness and life line used and individually attended when entering bell bottom or other deep confined excavations. ___

VI. Support systems:

A. Materials and/or equipment for support systems selected based on soil analysis, trench depth and expected loads. ___

B. Materials and equipment used for protective systems inspected and in good condition. ___

C. Materials and equipment not in good condition has been removed from service. ___

D Damaged materials and equipment used for protective systems inspected by an Registered Professional Engineer (RPE) after repairs and before being placed back into service. ___

E. Protective systems installed without exposing employees to the hazards of cave-ins, collapses or from being struck by materials or equipment. ___

F. Members of support system securely fastened to prevent failure. ___

G. Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc. ___

H. Excavations below the level of the base or footing approved by an RPE. ___

I. Removal of support systems progresses from the bottom and members are released slowly as to note any indication of possible failure. ___

J. Backfilling progresses with removal of support system. ___

K. Excavation of material to a level no greater than 2' below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth. ___

L. Shield system placed to prevent lateral movement. ___

M. Employees are prohibited from remaining in shield system during vertical movement. ___

VII. Remarks: _____

DATE: _____ SIGNATURE: _____

WEATHER: _____ PROJECT: _____

Was Dig Safe Contacted: YES _____ NO _____

Protective System: Trench Shield (Box) _____
Wood Shoring _____ Sloping _____ Other _____

Purpose of Trenching: Drainage _____ Water _____
Sewer _____ Gas _____ Other _____

Were Visual Tests Taken: YES _____ NO _____

Type of Soil: _____

Soil Strength: _____

Hazardous Atmosphere Exist: YES _____ NO _____ If yes, refer to Confined Space Entry Procedures Policy, complete Confined Space Entry Permit, Monitor for Toxic Gas(s).

(excavation in landfills or where hazardous substances as stored nearby) oxygen deficiency - 19.5 or less, flammable limit excess of 20 percent (4 ft. trenches or greater)

Is trenching or excavation exposed to public vehicular traffic (exhaust exission): YES _____ NO _____. If yes, refer to Confined Space Entry Procedures Policy, complete Confined Space Entry Permit, monitor for Toxic Gas(s)

Measurements of Trench: Depth _____ Length _____
Width _____

Is a ladder within 25 feet of Trench: YES _____ NO _____

Is excavated material stored 2 feet or more from edge of excavation: YES _____ NO _____

Are employees exposed to public vehicular traffic: YES _____ NO _____ (if yes, warning vests required)

Are other utilities protected: YES _____ NO _____ NOT REQUIRED _____ (Water, sewer, gas, or other structures)

Are sewer, or natural gas-line Exposed: YES _____ NO _____ (If yes, refer to Confined Space Entry Procedures Policy, Complete Confined Space Entry Permit, monitor for Toxic Gas(s)

Periodic Inspection: YES _____ NO _____ LAST _____ ___

Did Employees Receive Training in Excavating: YES _____ NO _____

5.0 SOILS CLASSIFICATION CHECKLIST

Soils Classification Checklist

The following checklist outlines the usual and manual test that the competent person must perform daily or each time soil conditions change. The new standard requires that one visual and one manual test be performed. However performing several tests is recommended so that the condition of the excavation is thoroughly examined.

I. Visual Tests -

I. Visual Tests - One or more test required each time soil conditions change.

		Yes	No
1.	Estimate range of particle sizes		
	a) fine-grained = cohesive material	___	___
	b) coarse grained = sand and gravel	___	___
2.	Observe soil excavated		
	a) clumps = cohesive material	___	___
	b) breaks up easily = granular material	___	___
3.	Observe opened excavation		
	a) sides	___	___
	b) surface area	___	___
	c) crack like openings	___	___
	d) spall of vertical sides	___	___
	e) indication of moving ground	___	___
4.	Previously disturbed soil		
	a) existing utilities	___	___
	b) underground structures	___	___
5.	Observe opened excavation		
	a) layered systems	___	___
	b) layers sloped towards excavation	___	___
	c) estimate degree of layered slope	___	___
6.	Water condition		
	a) surface water (creeks, etc.)	___	___
	b) run off	___	___
	c) seeping from sides	___	___
	d) water table	___	___
7.	Vibration present		
	a) general area (adjacent to)	___	___
	b) in excavation (tools, etc)	___	___

II. Manual Tests - One or more tests must be performed each time soil conditions change.

		Yes	No
1.	Plasticity - determines cohesive material		
	a) mold soil sample into small ball	___	___
	b) roll ball into threads 1/8" diameter	___	___
	c) pick-up 2" length of 1/8" thread by one end without breaking	___	___

a) mold soil into 2 1/2" - 3 1/2" ball ___ ___
b) roll ball into 1/2" - 5/8" rope ___ ___
c) mash entire length of rope into a 1/2" thickness, between thumb and forefinger ___ ___
d) if rope stays in one continuous piece and curls around hand the soil is cohesive ___ ___

(Type B)

3A. Dry Soil Strength - granular material
a) crumbles on its own ___ ___
b) crumbles with moderate pressure by hand ___ ___
c) breaks into individual grains or fine powder ___ ___

(Type C)

3B. Dry Soil Strength - cohesive material
a) falls into clumps ___ ___
b) breaks into smaller clumps ___ ___
c) smaller clumps only broken with difficulty (by hand) ___ ___

(Type A)

3C. Dry Soil Strength - cohesive material
a) breaks into clumps ___ ___
b) does not break into smaller clumps ___ ___
c) clumps broken with difficulty (by hand) ___ ___
d) visual indication of fissures ___ ___

(Cracks or separation of soil) (Type B)

4. Thumb Penetration Test - estimates the unconfined compressive strength of cohesive material.
a) Type A Soil - unconfined compressive strength = 1.5 tsf and up
1. can be readily indented by the thumb ___ ___
2. penetrated by thumb with great effort ___ ___

b) Type B Soil - unconfined compressive strength = 0.5 to 1.5 tsf
1. can be indented by thumb with effort ___ ___

c) Type C Soil - unconfined compressive strength = 0.5 tsf
1. easily penetrated several inches by thumb ___ ___
2. molded by light finger pressure ___ ___

d) All test should be run on
1. large clump of spoil material ___ ___
2. as soon as excavated ___ ___
3. later exposed to wetting influences ___ ___
4. reclassified ___ ___

5. Unconfined Compressive Strength - Saturated Soil Needed
a) Pocket Penetrometer reading (take 10 reading and average) ___ ___
1. 0.5 - Type C soil ___ ___
2. 0.5 - 1.5 - Type B soil ___ ___
3. 1.5 - 2.0 - Type A soil ___ ___

b) Shear Vane reading X 2 = Unconfined Compressive Strength - Saturated Soil Needed (use middle foot)
1. 0.5 - Type C soil ___ ___
2. 0.5 - 1.5 - Type B soil ___ ___
3. 1.5 - 2.0 - type A soil ___ ___

dry soil sample 1" thick X 6" diameter

a) develops cracks - significant fissures are indicated = fissured material (Type B or C) ___ ___

b) dries without cracks

1. breaks by hand with considerable force significant cohesive content = unfissured cohesive material (Type A) ___ ___

2. once unfissured cohesive material is established check for unconfined compressive strength using another soil sample (refer to #4 and #5 above) ___ ___

c) sample breaks easily by hand = fissured cohesive or granular material

1. distinguished between fissured or granular material ___ ___

d) pulverize dry clumps

1. by hand ___ ___

2. by stepping on them ___ ___

7. Hazardous Atmosphere

a) any predictable hazards ___ ___

b) air or contaminant testing ___ ___

c) ventilation required ___ ___

8. To determine percentage of granular material in soil sample ___ ___

a) fill 2 1/2" - 3" X 8" jar with 5" of water ___ ___

b) place 1 1/2" soil into water ___ ___

c) place lid on jar and shake contents will, giving jar 1/2 turn when set down on flat surface ___ ___

d) after 30 seconds granular material will settle to bottom ___ ___

e) to estimate percentage of granular material measure the height of the granular material then divide it by the height of the remaining material ___ ___

6.0 SOILS ANALYSIS CHECKLIST

This checklist must be completed when soil analysis is made to determine the soil type(s) present in the excavation. A separate analysis must be performed on each layer of soil in excavation walls. A separate analysis must also be performed if the excavation (trench) is stretched over a distance where soil type may change.

site location: _____

Date: _____ Time: _____ Competent person: _____

where was the sample taken from? _____

Excavation: Depth _____ Width _____ Length _____

Visual Test

Particle type: _____Fine grained (cohesive) _____Course grained (sand or gravel)

Water conditions: _____Wet _____Dry _____Surface water present _____Submerged

Previously disturbed soils? _____Yes _____No

Underground utilities? _____Yes _____No If yes, what type?_____

Layered soils? _____Yes _____No Layered soil dipping into excavation? _____Yes _____No

Excavation exposed to vibrations: _____Yes _____No If yes, from what?_____

Crack like openings or spalling observed? _____Yes _____No

Conditions that may create a hazardous atmosphere? _____Yes _____No
If yes, identify condition and source?_____

Surface encumbrances? _____Yes _____No If yes, what type?_____

Work to be performed near public vehicular traffic? _____Yes _____No

Possible confined space exposure? _____Yes _____No

Manual Test

Plasticity: _____Cohesive _____Non-cohesive

Dry strength: _____Granular (crumbles easily) _____Cohesive (Broken with difficulty)

Note: The following unconfined compressive strength tests should be performed on undisturbed soils.

Thumb test used to estimate unconfined compressive strength of cohesive soil:
Test performed: _____Yes _____No

_____Type A - soil indented by thumb with very great effort.

_____Type B - soil indented by thumb with some.

_____Type C - soil easily penetrated several inches by thumb with little or no effort. If soil is submerged, seeping water, subjected to surface water, runoff, exposed to wetting.

Penetrometer or Shearvane used to estimate unconfined compressive strength of cohesive
Test performed: _____Yes _____No Device used:_____

_____Type A - soil with unconfined compressive strength of 1.5 tsf or greater.

_____Type B - soil with unconfined compressive strength of 0.5 tsf to 1.5 tsf.

_____Type C - soil with unconfined compressive strength of 1.5 tsf or less.
If soil is submerged, seeping water, subjected to surface water, runoff, ex
to wetting.

Wet shaking test used to determine percentage of granular and cobesive materials. Con
results to soil textural classification chart to determine soil type.

_____Type A - clay, silty clay, sandy clay, clay loam, and in some cases, silty
loam and sandy clay loam.

_____Type B - angular gravel (similar to crushed rock), silt, silt loam, sandy
and, in some cases, silty clay loam and sandy clay loam.

_____Type C - granular soil including gravel, sand, and loamy sand.

_____% granular _____% cobesive _____% silt

Note: Type A - no soil is type "A" if soil is fissured; subject to vibra
previously disturbed; layered dipping into the excavation on a slope of 4H:1V.

Soil Classification

_____Type A _____Type B _____Type C

Selection of Protective System (Appendix F)

protective system: _____Sloping (appendix B) Specify angle _____

_____Timber shoring (appendix C)

_____Aluminum hydraulic shoring (appendix D)

Note: Although OSHA will accept the above tests in most cases, some states will
Check your state safety requirements for trenching regulations.

7.0 TRENCH SHIELD CERTIFICATION, INFORMATION ON TRENCHING SHIELDS

TRENCH SHIELD CERTIFICATION

Soil Conditions:

I. Dry to moist gravel, sand, silty sand, sandy silt, silt

II. Wet gravel, sand, silty sand, sandy silt, silt

III. Soft clay, silty clay

PIPE SHIELD CERTIFICATION

Pipe Shield No.	Certified Capacity [PSF]	Allowable Depth [ft] Soil Condition I	II	III
1	1760	58.0	21.4	30.0
2	2019	66.5	24.6	34.3
3	975	32.1	11.9	16.6
4	1075	35.4	13.1	18.3
5,6	1021	33.6	12.4	17.4
7,8	1188	39.1	14.5	20.2
10	398	13.1	4.8	6.8
11	1102	36.3	13.4	18.7
13	732	24.1	8.9	12.4
14	1097	36.1	13.4	18.7

ADDITIONAL COMPANY-OWNED SHIELDS

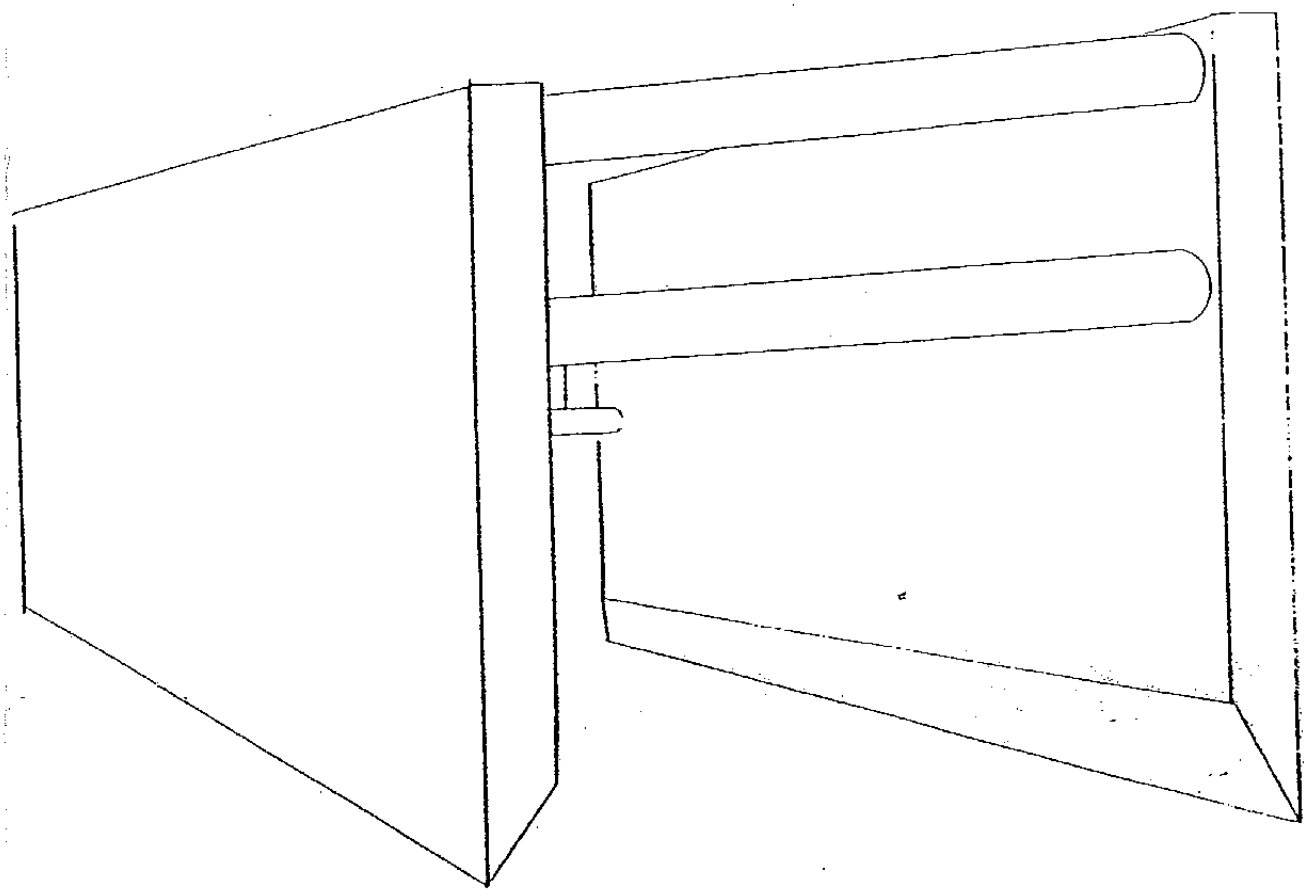
15 Lightweight Pipe Shield; 8'×16',

16 Mighty Lite

MANHOLE SHIELD CERTIFICATION

Manhole Shield No.	Certified Capacity [PSF]	Allowable Depth [ft] Soil Condition I	II	III
MH 1	1428	47.0	17.4	24.3
MH 2	1735	57.1	21.1	29.5
MH 3	1005	33.1	12.2	17.1
MH 4	1324	43.6	16.1	22.5

SHIELD # 1
(BOUNCE SHIELD)

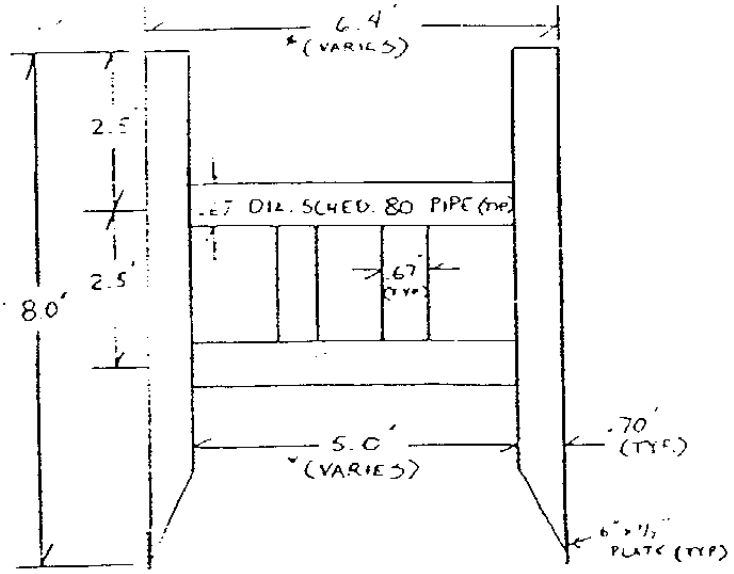


L 16' x H 8' x I.W. (VARIES)
4', 5', 6', 8' SPREADERS.

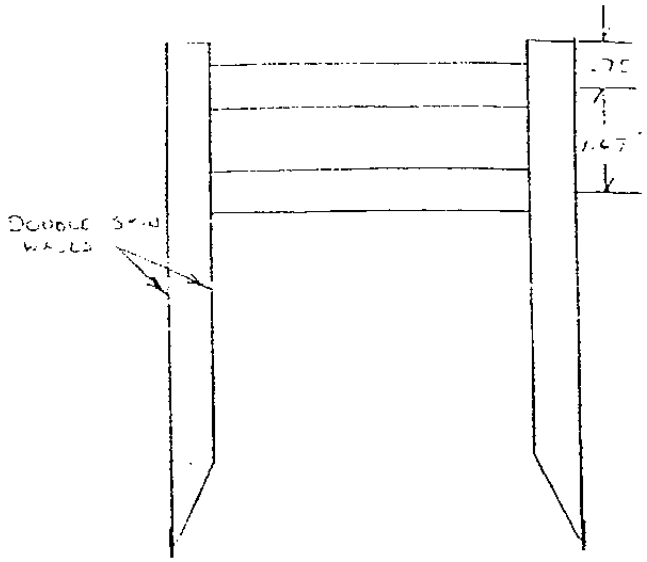
APPROXIMATE WEIGHT = 8760 LBS.

SHIELD # 1

FRONT

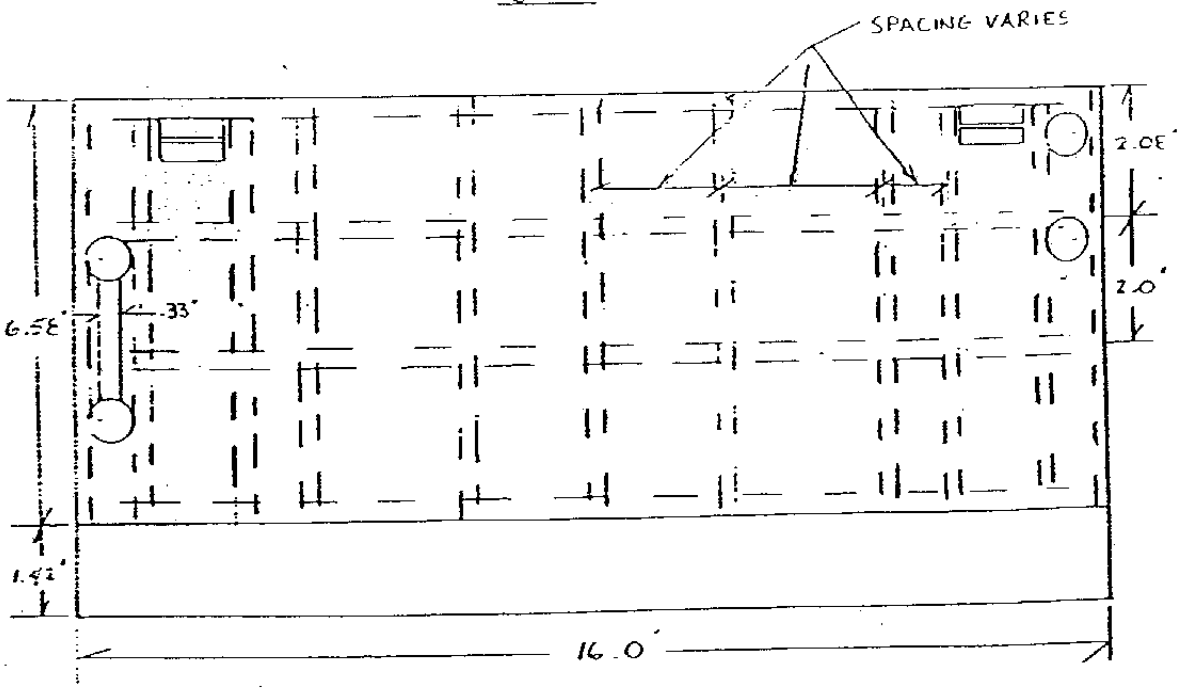


REAR



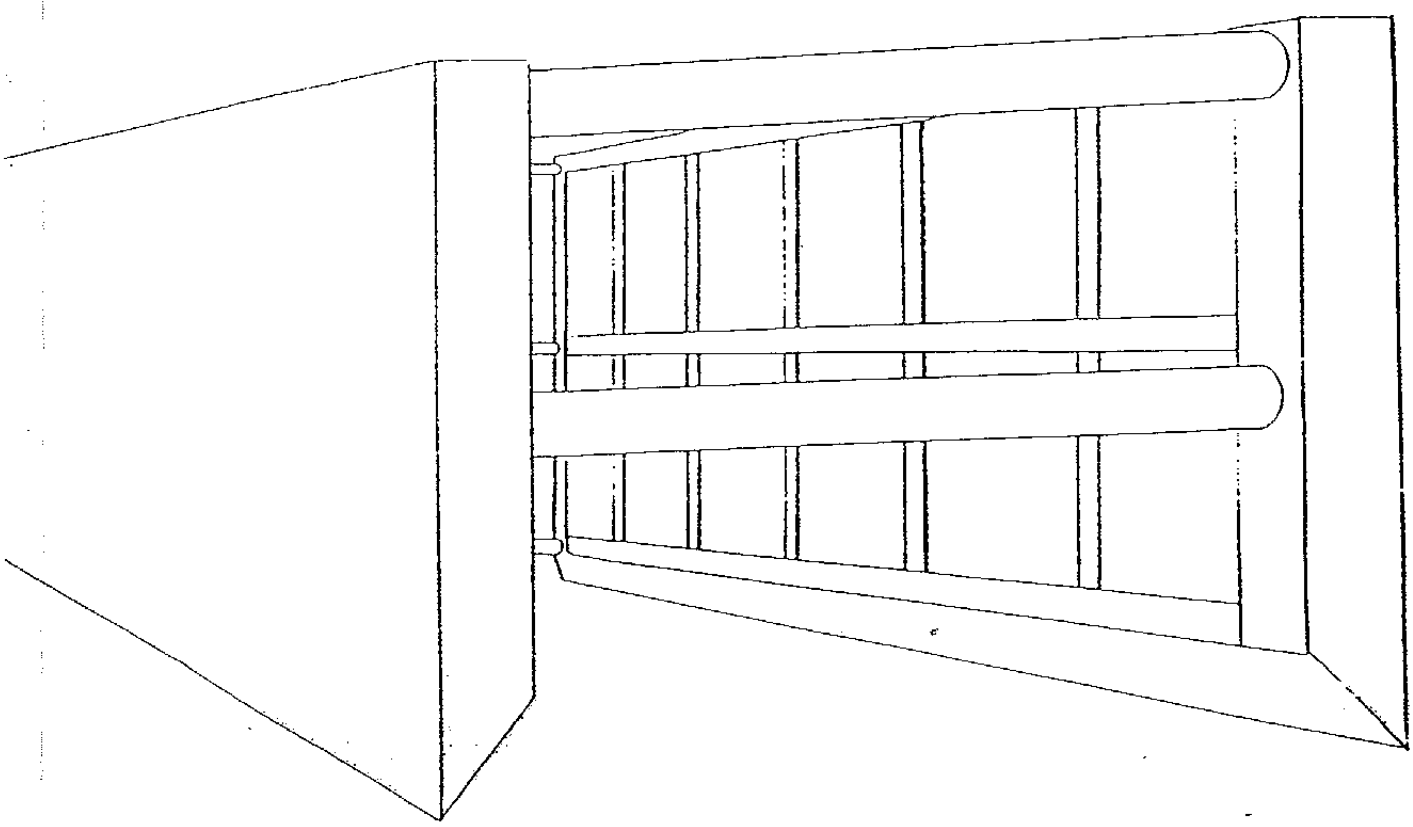
* SPREADERS OF 4', 5', 6' OR 8' MAY BE USED

SIDE



SCALE : 1" = 3.0'

SHIELD #2

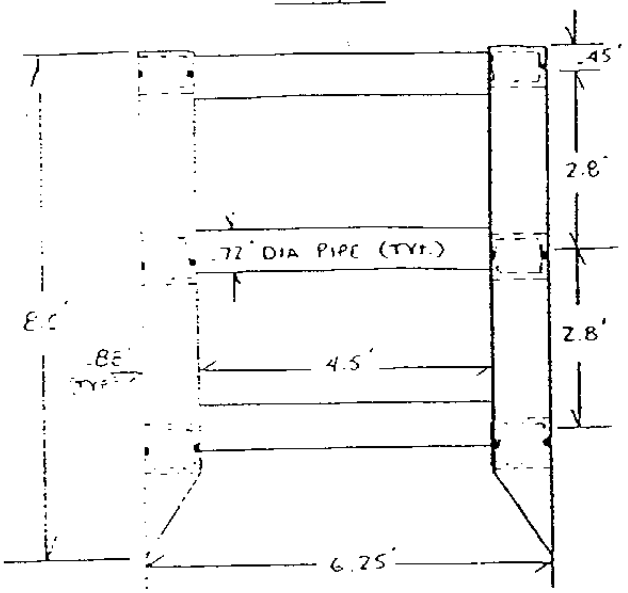


L 20' x H 8' x IW 4.5' (O.W. = 6.3')

APPROXIMATE WEIGHT = 17,098 LBS

SHIELD #2

FRONT



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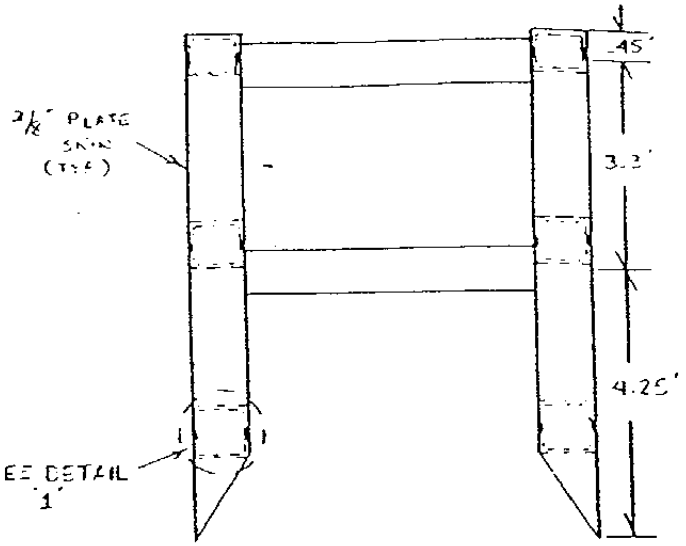

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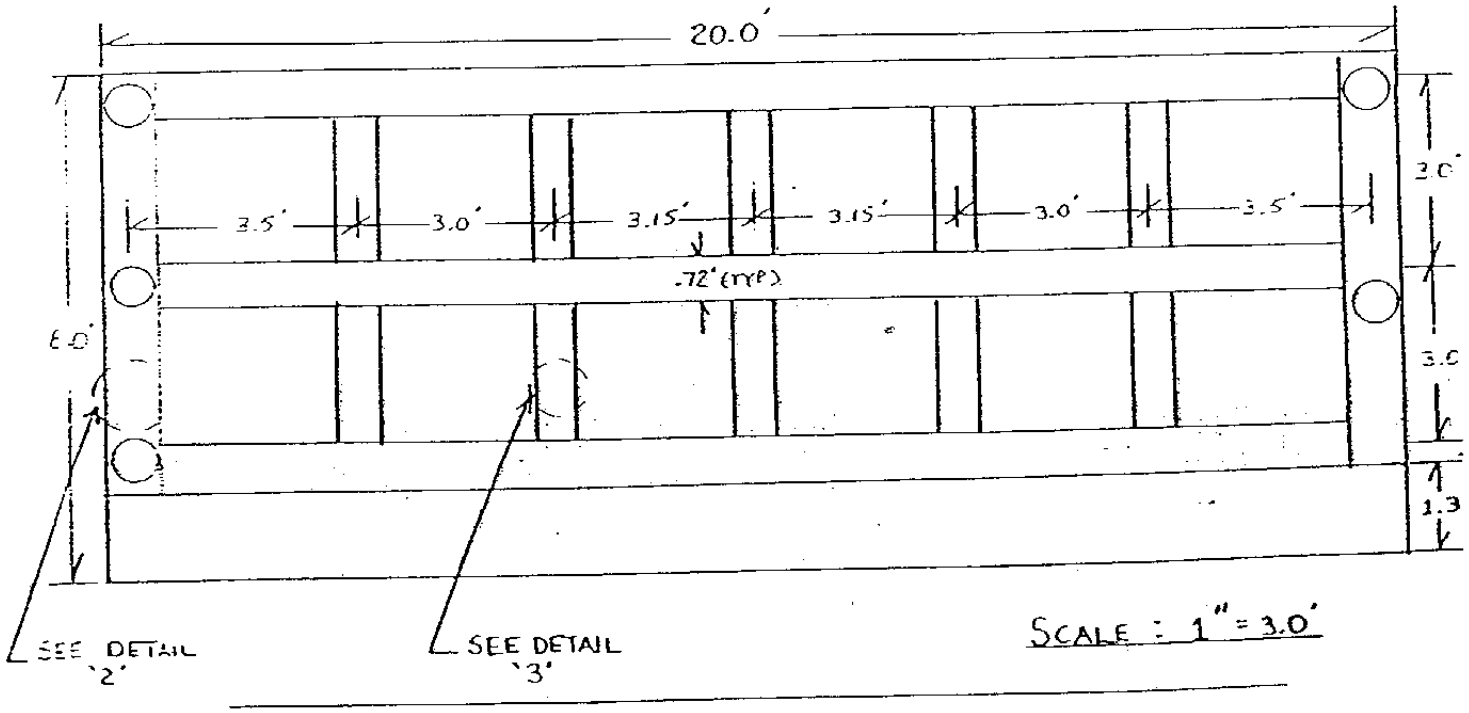
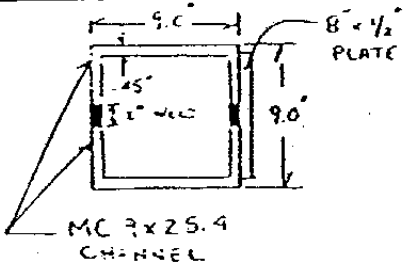
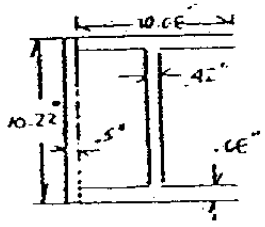


SCALE : 1" = 3.0'

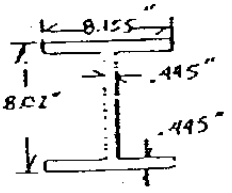
DETAIL '1'



DETAIL '2'

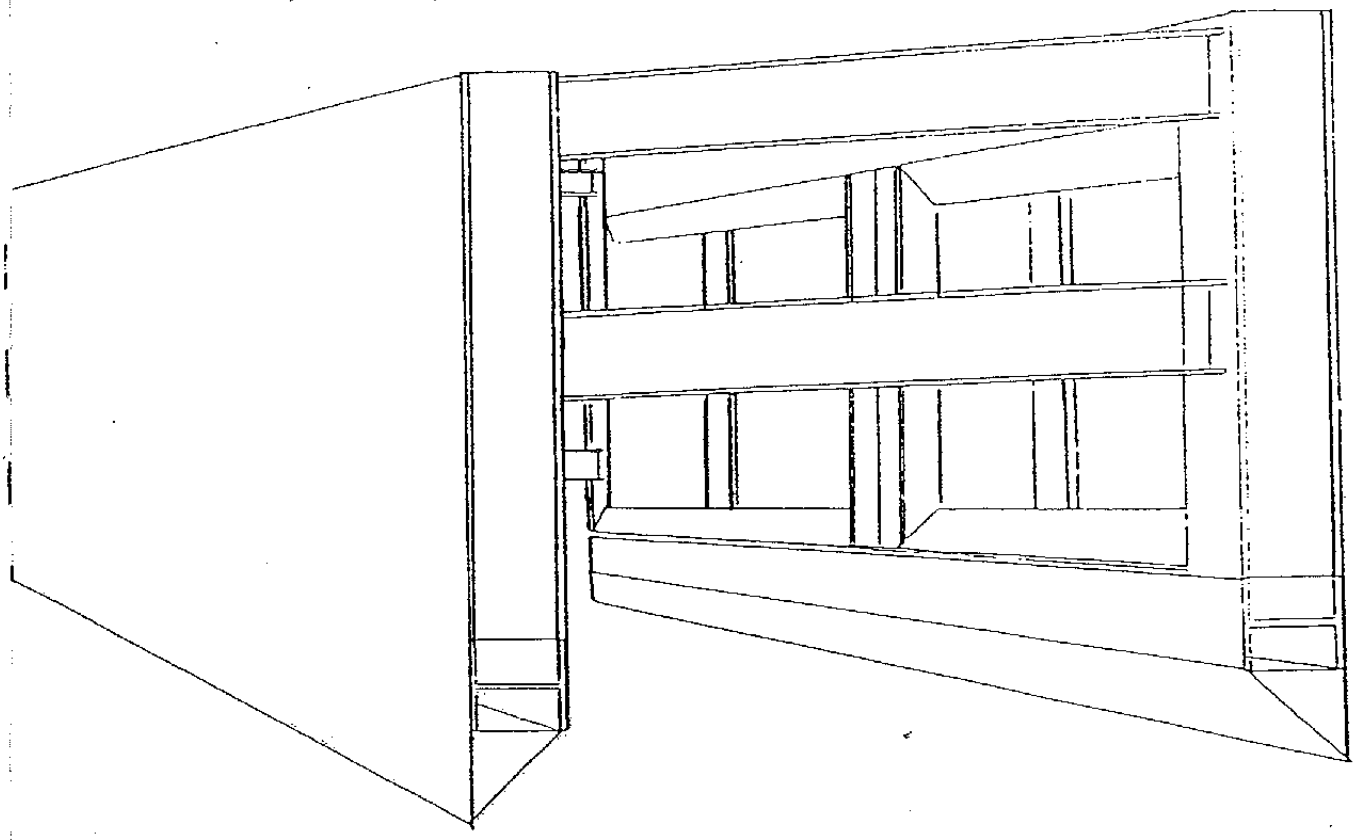


DETAIL '3'



SCALE : 1" = 1.0'

SHIELD #3

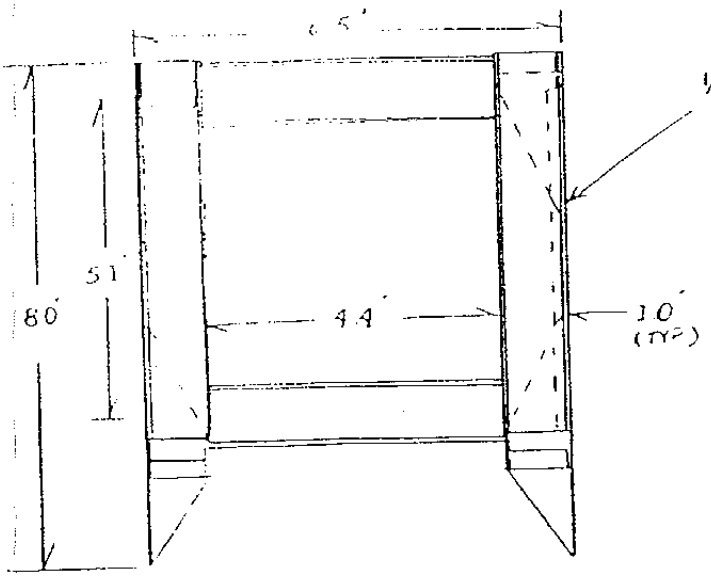


L 16' x H 8' x I.W. 4.4' (O.W. 6.5')

APPROXIMATE WEIGHT = 10,125 LBS

SHIELD #3

FRONT



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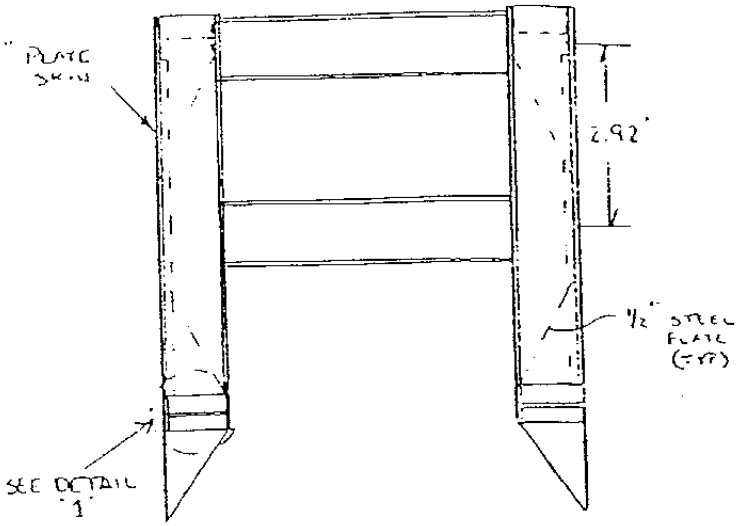

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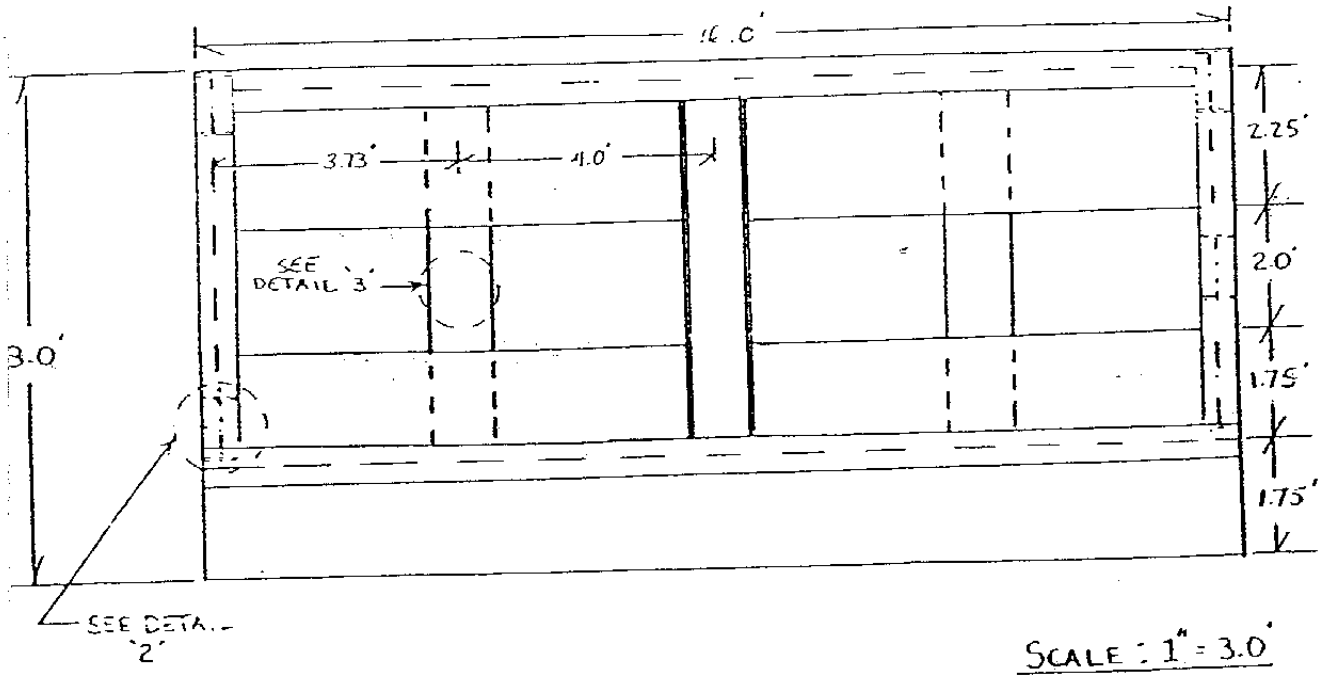
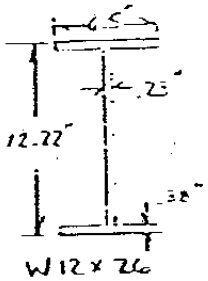


SCALE : 1" = 3.0'

DETAIL '1'



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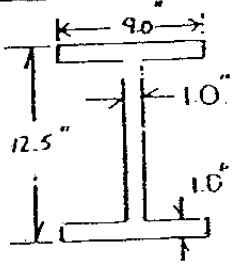
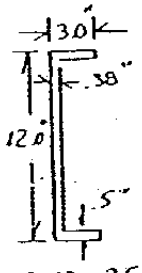
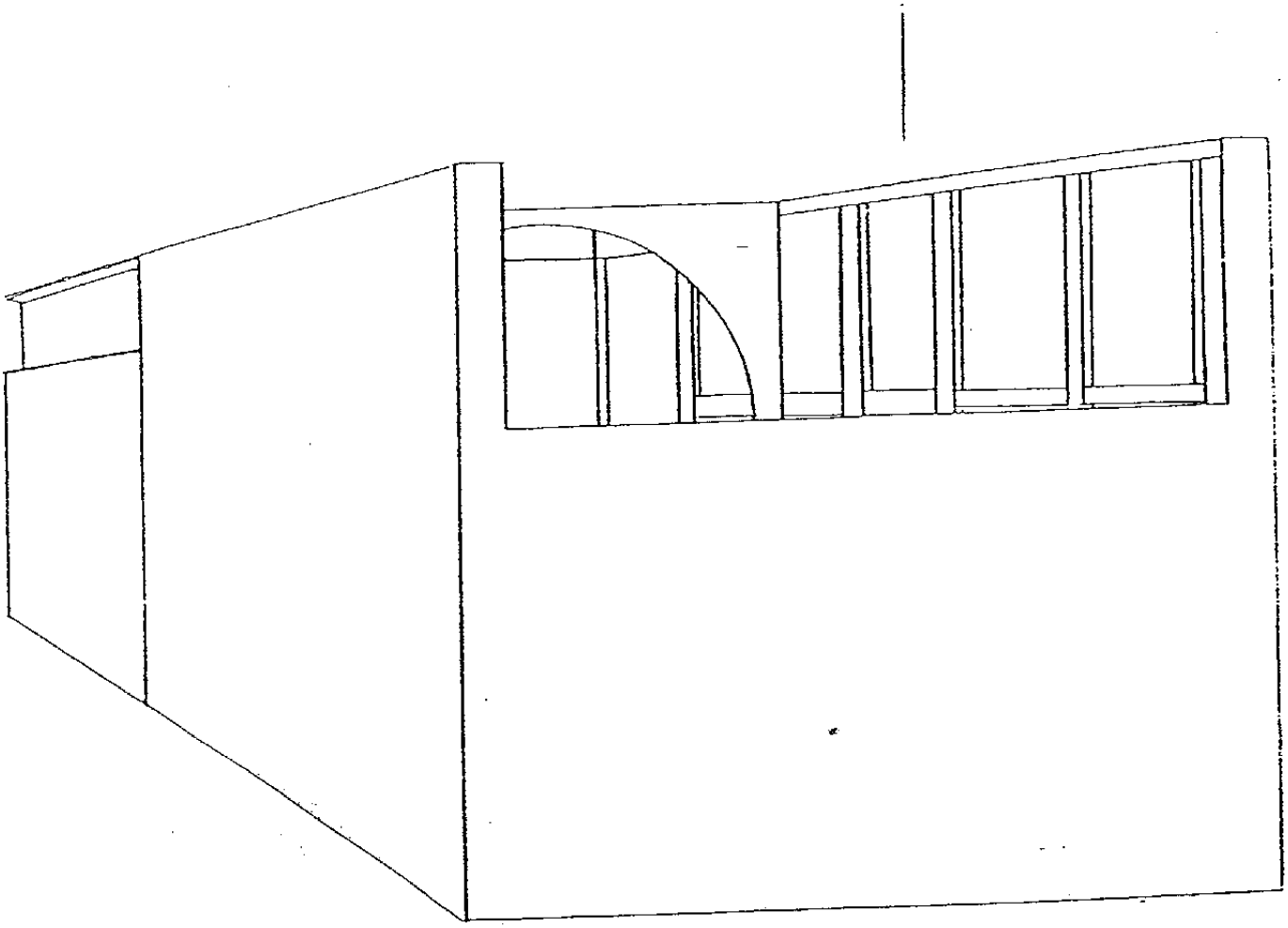


DETAIL '3'



SCALE : 1" = 1.0'

SHIELD #4

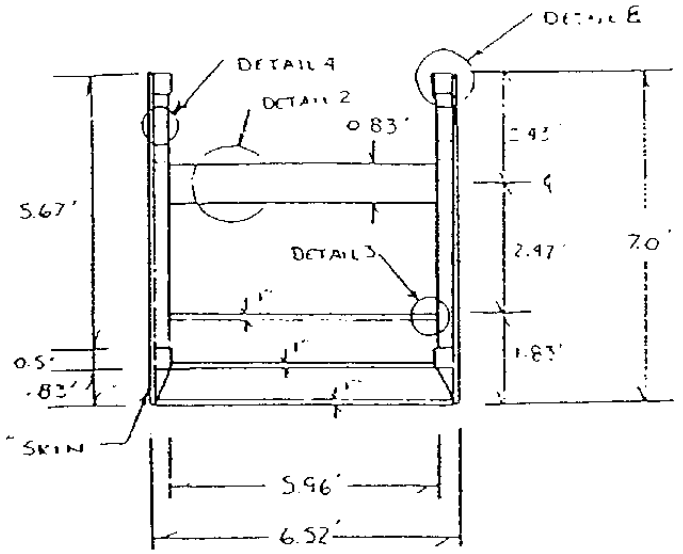


L 23.25' x H 7.0' x I.W. 5.9' (O.W. 6.52')

APPROXIMATE WEIGHT = 10,200 LB

PIPE SHIELD #4

FRONT



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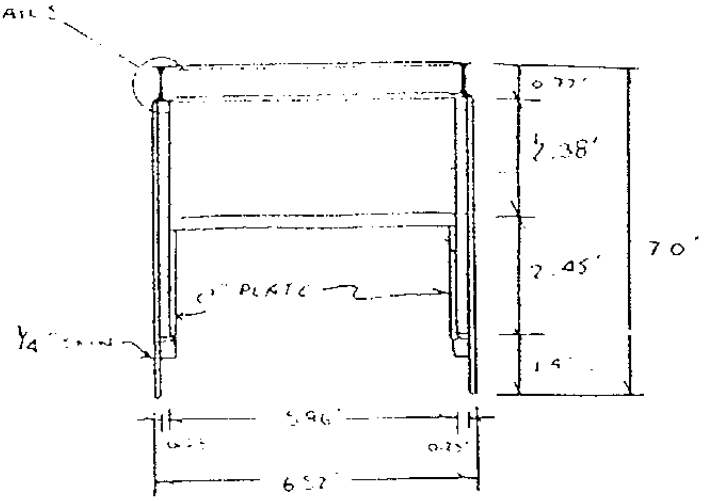

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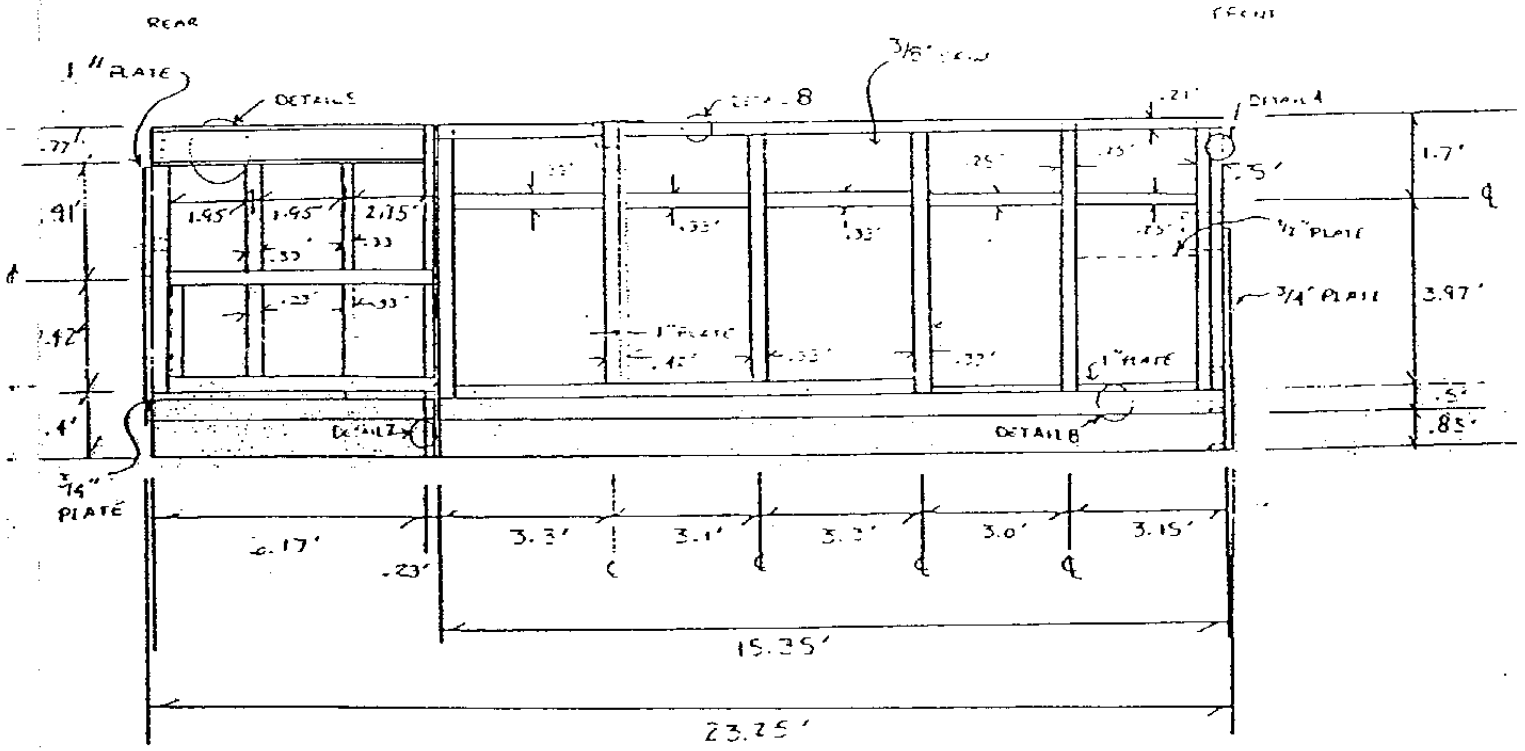
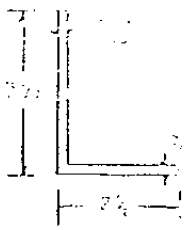


SCALE : 1"= 4.0'

PIPE SHIELD #4 DETAILS

DETAIL 1

L 3½" x 2½" x 5/16"

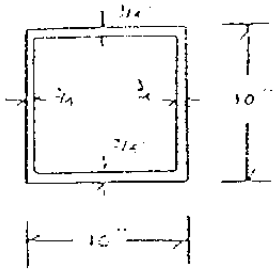


REPLACE BY 3" x 3" x 1/4" STRUCTURAL TUBING

SCALE: 1" = 4.0"

DETAIL 2

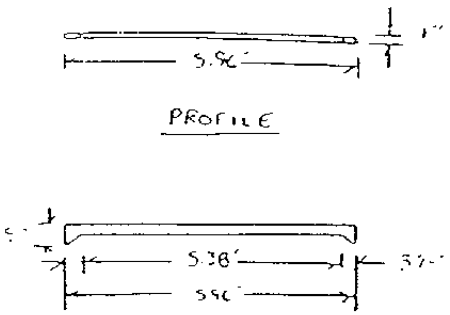
10" x 10" BOX SPREADER



SCALE: 1" = 1.0'

DETAIL 3

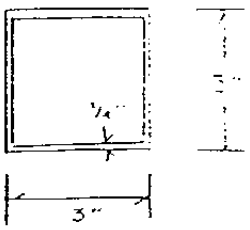
5.96" x 1" SPREADER



SCALE: 1" = 4.0'

DETAIL 4

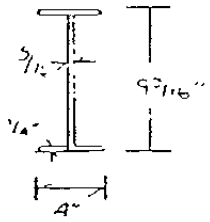
3" x 3" x ¼" STRUCTURAL TUBING



SCALE: 1" = 4.0"

DETAIL 5

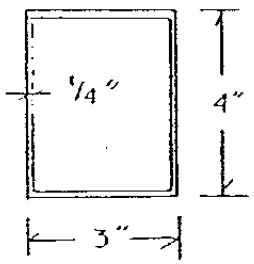
9 3/16" x 4" WALER/SPREADER



SCALE: 1" = 1.0'

DETAIL 6

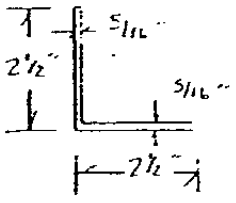
4" x 3" x ¼" STRUCT. T



SCALE: 1" = 4.0"

DETAIL 7

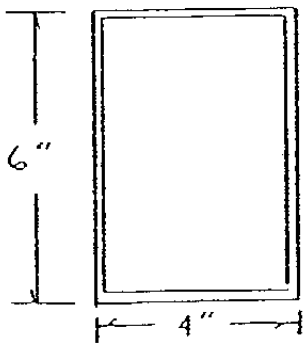
L 2½" x 2½" x 5/16"



SCALE: 1" = 4.0"

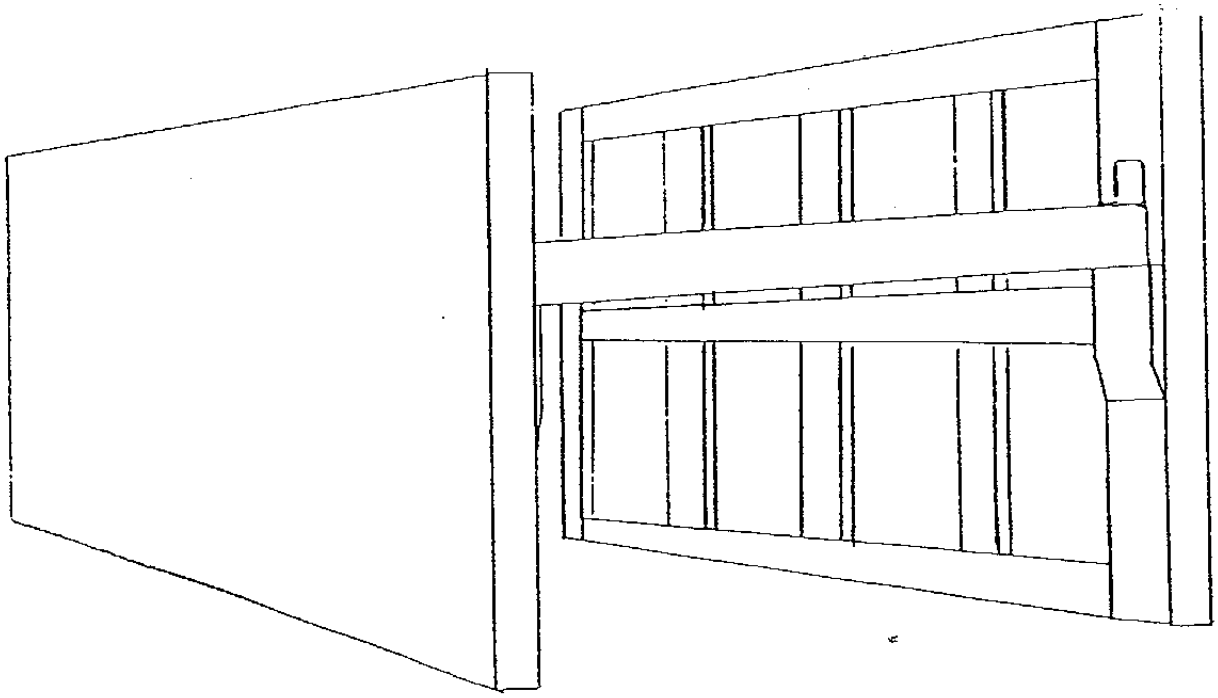
DETAIL 8

6" x 4" x ⅜" STRUCT. TUBE



SCALE: 1" = 4.0"

SHIELDS #5, #6

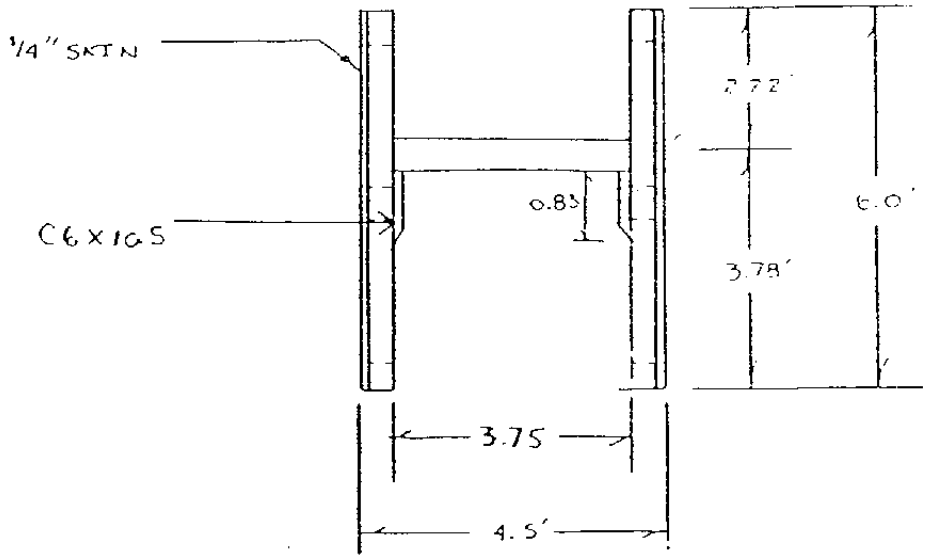


L 12' x H 6' x IW. 3.75' (O.W. 4.5')

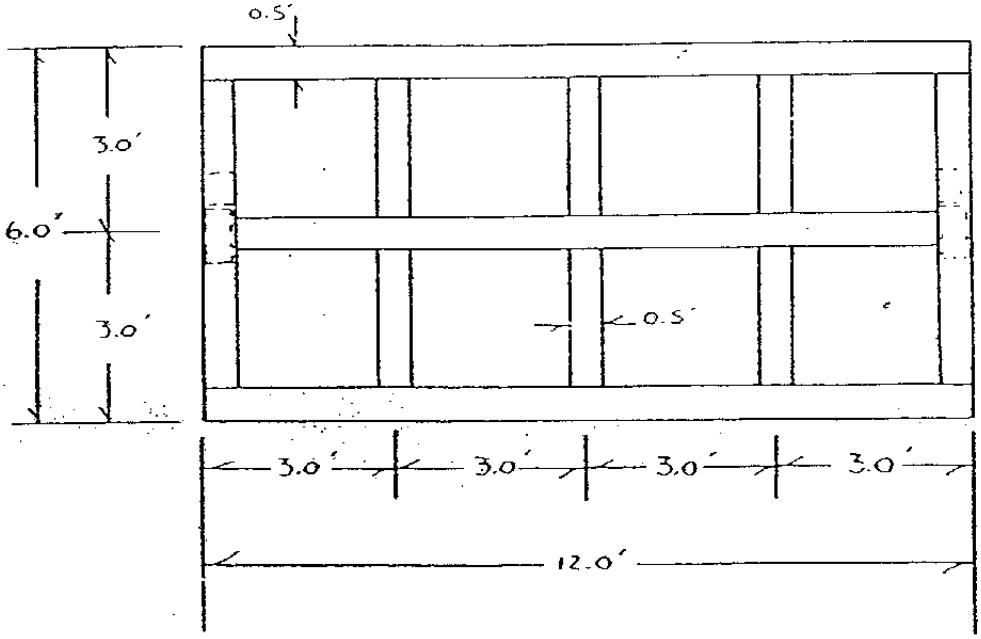
APPROXIMATE WEIGHT = 3,832 LBS

SHIELDS #5 & #6 (IDENTICAL)

FRONT / REAR



SIDE

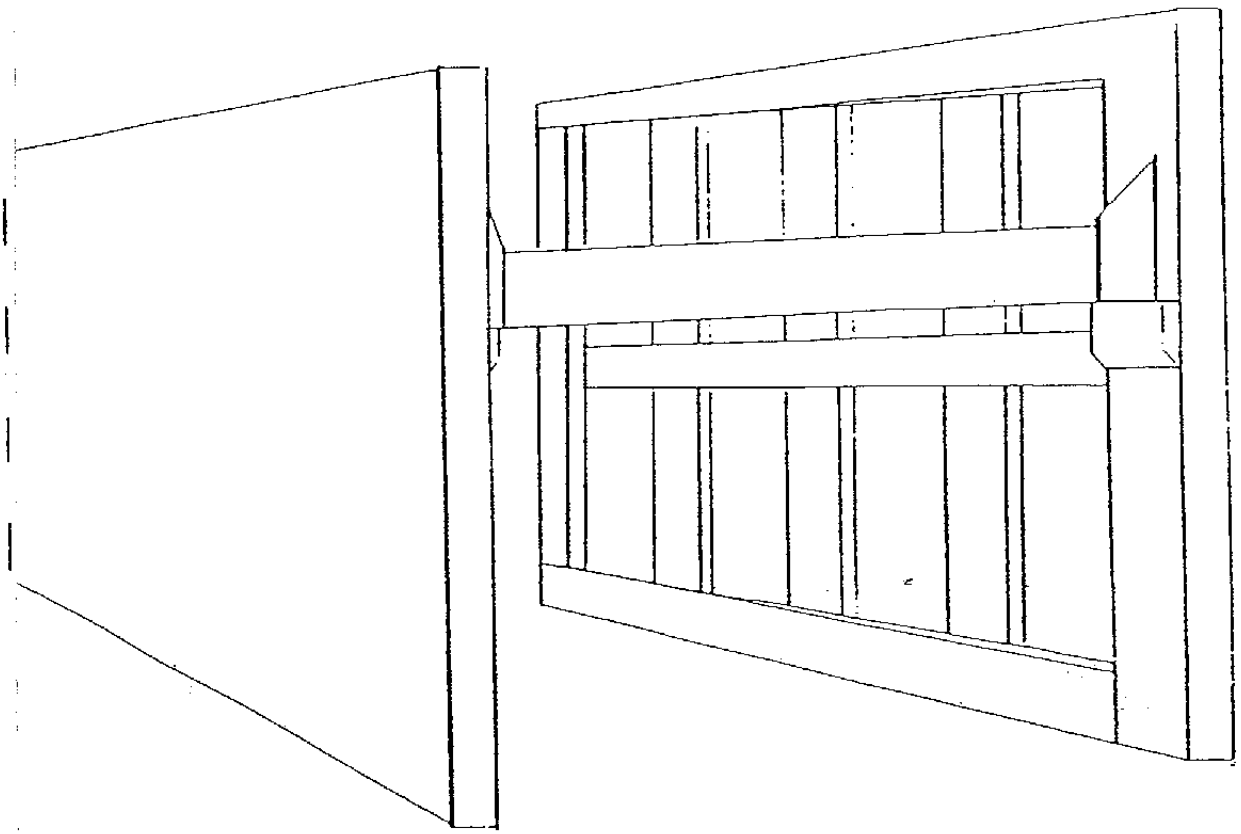


NOTE #1: ALL MEMBERS ARE 6" X 4" X 3/8" WALL STRUCTURAL STEEL TUBING

NOTE #2: UPRIGHT STIFFENERS ARE C6X10.5 CHANNEL

SCALE: 1" = 3.0'

SHIELDS #7, #8

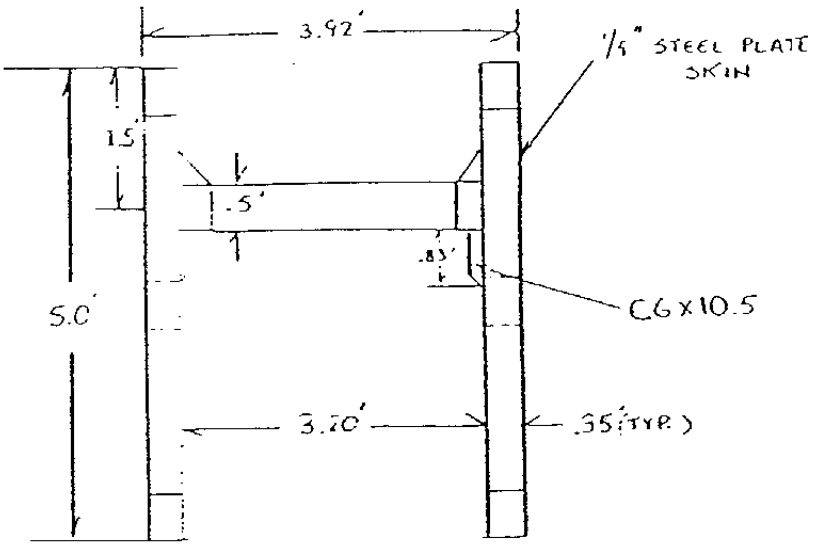


L 12' x H 5' x I.W. 3.20' (O.W. 3.92')

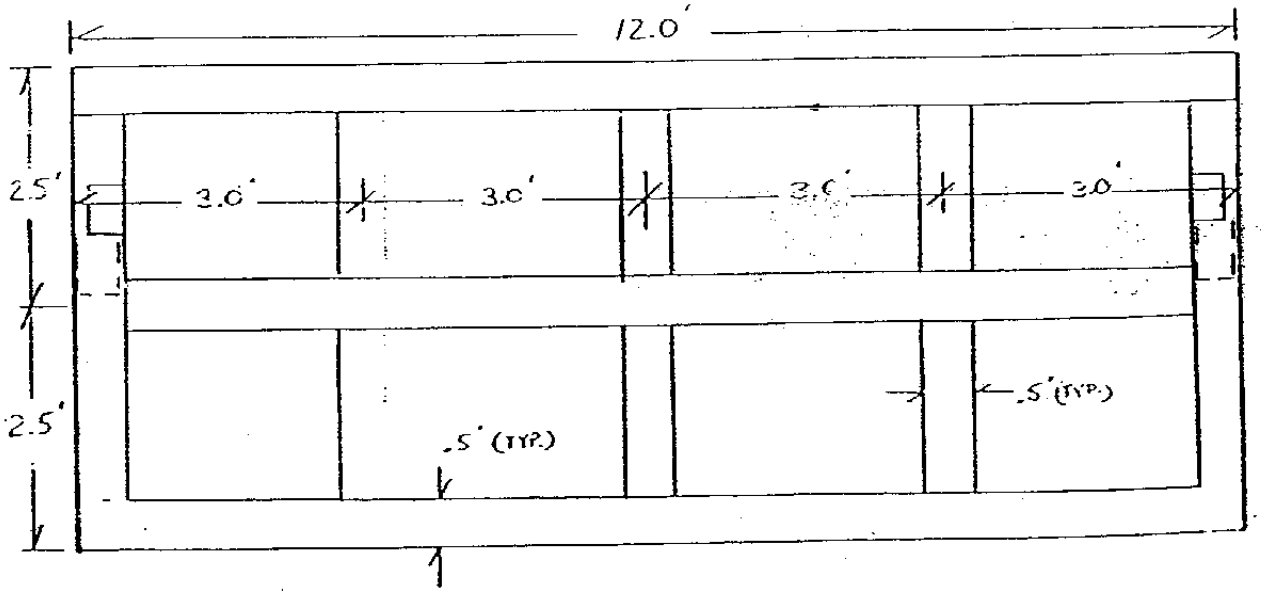
APPROXIMATE WEIGHT = 3139 LBS

SHIELDS #7, #8 (IDENTICAL)

FRONT/REAR



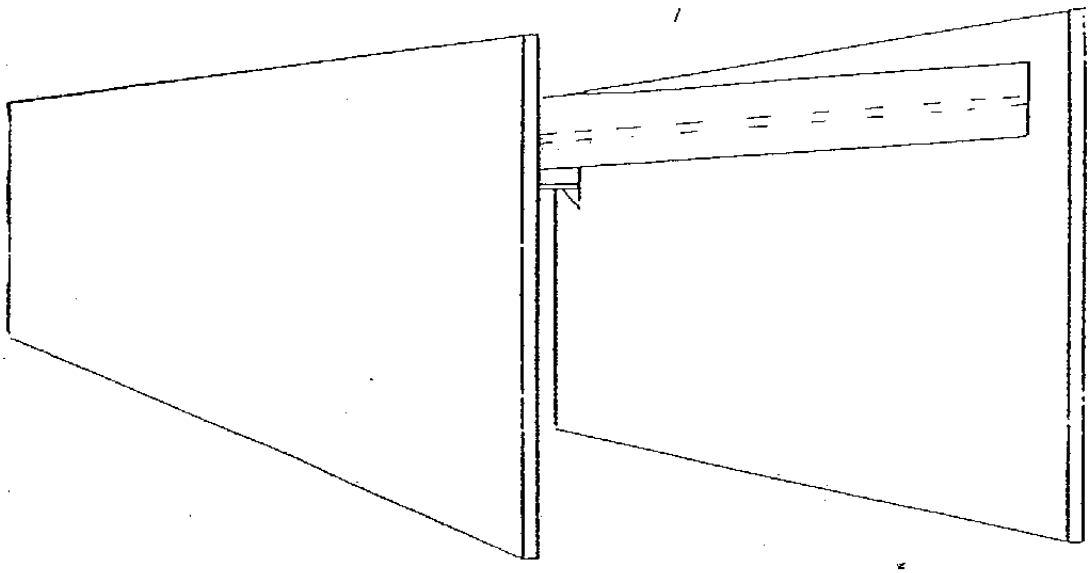
SIDE



NOTE: 1) ALL MEMBERS ARE 6" x 4" x 3/8" WALL STRUCTURAL STEEL TUBING
2) UPRIGHT STIFFENERS ARE C6x10.5 CHANNEL

SCALE: 1" = 2.0'

SHIELD #10

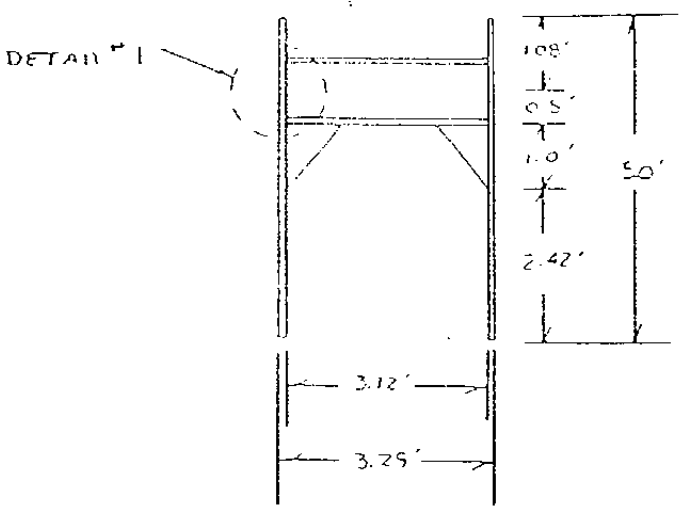


L 20' X H 5' X I.W. 3.125' (O.W. 3.29')

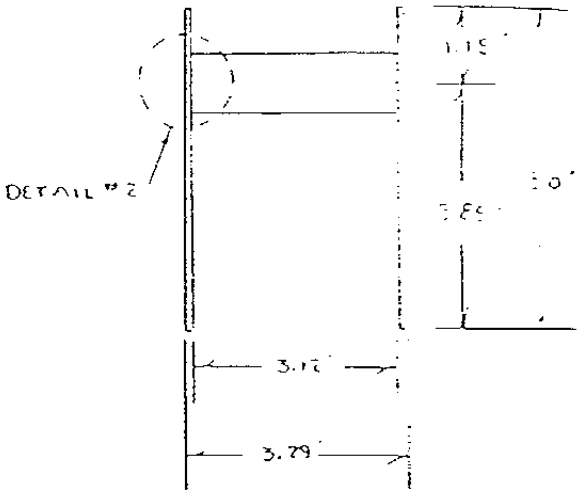
APPROXIMATE WEIGHT = 8713 LBS

SHIELD # 10

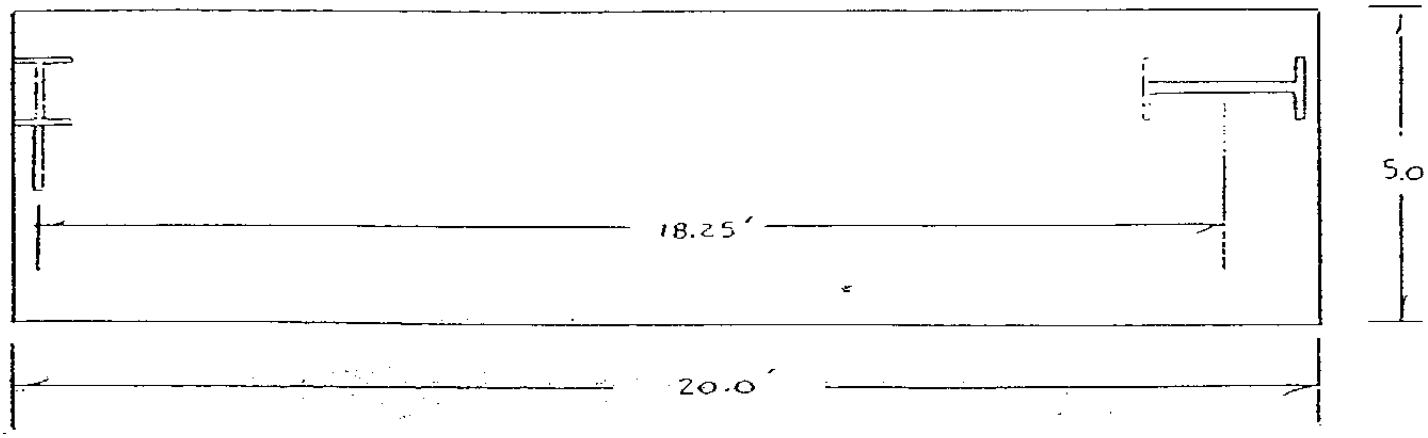
FRONT



REAR

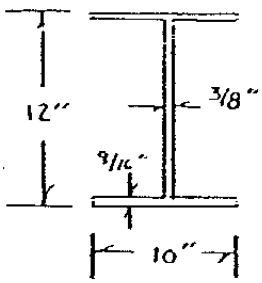


SIDE



SCALE: 1" = 3.0'

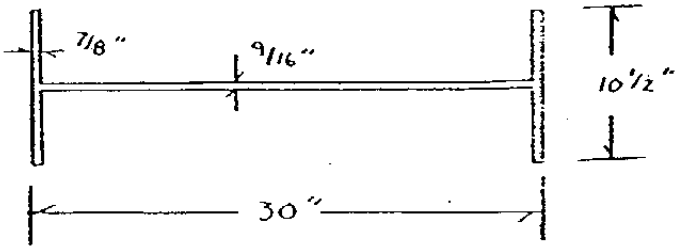
DETAIL # 1



W12X53

(SCALE: 1" = 1.0')

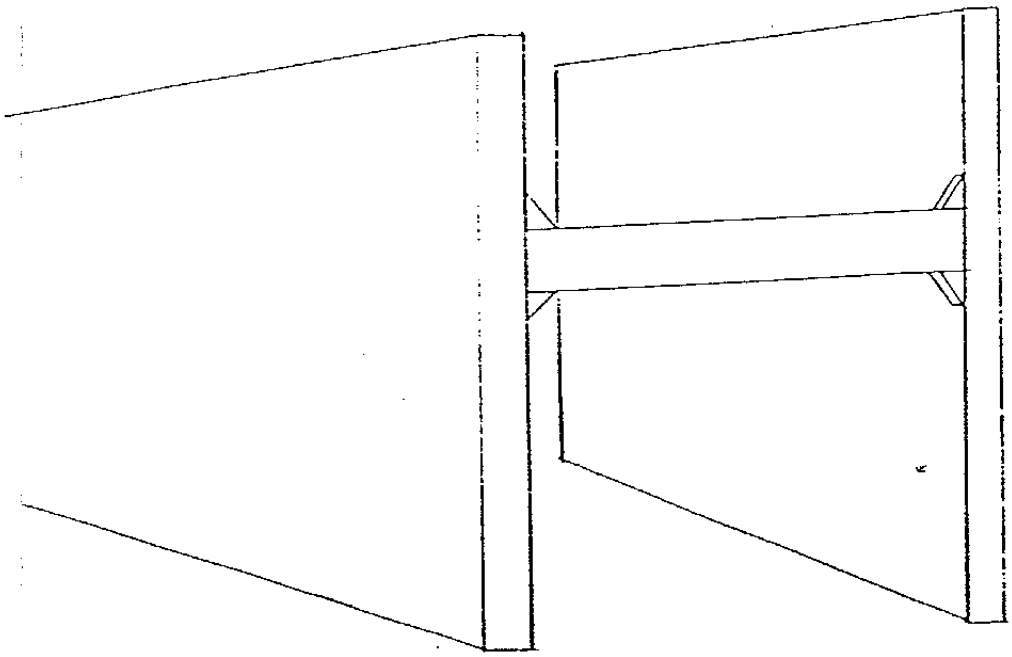
DETAIL # 2



W 30 X 116

(SCALE: 1" = 1.0')

SHIELD # 11

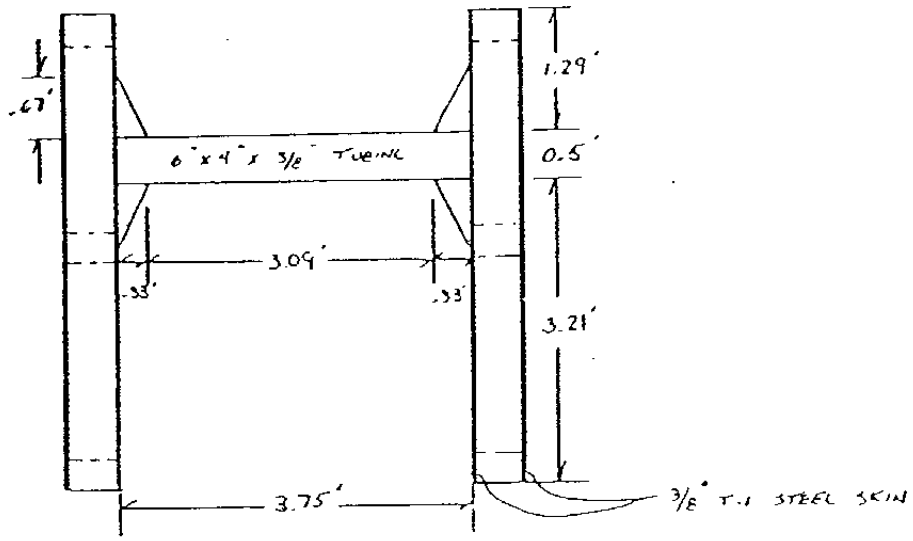


L 22' x H 5' x I.W. 3.75' (o.w. 4.075')

APPROXIMATE WEIGHT = 11,780 LB

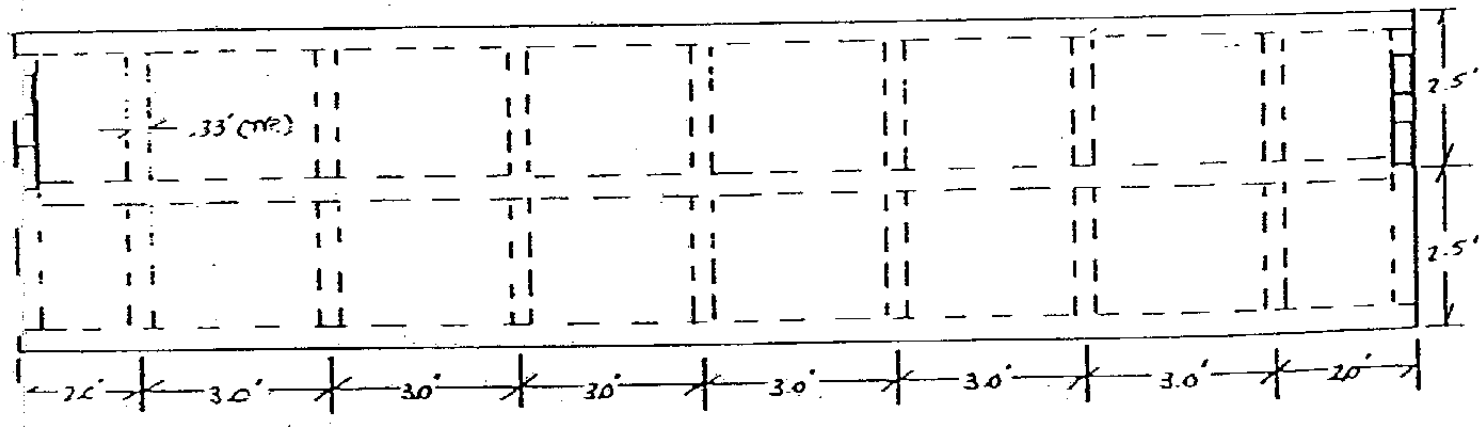
SHIELD # 11

FRONT / REAR



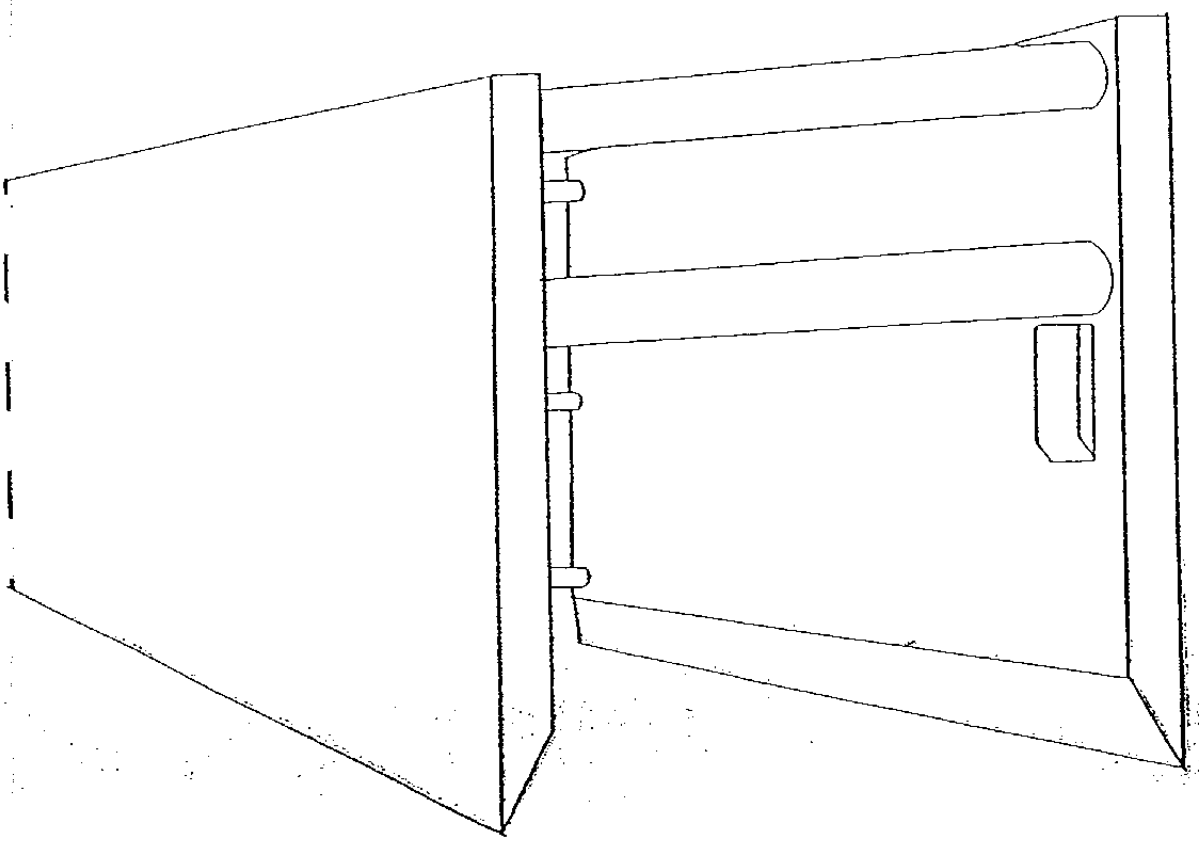
SCALE - 1" = 2.0'

SIDE



SCALE - 1" = 3.0'

SHIELD # 13

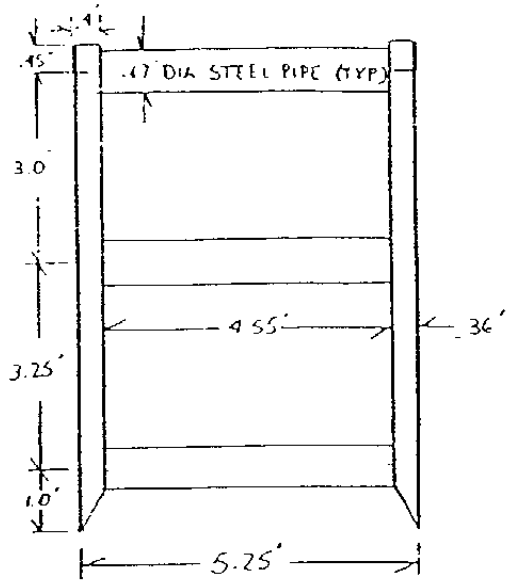


L 16' x H 7.7' x I W 4.55' (O.W. 5.25')

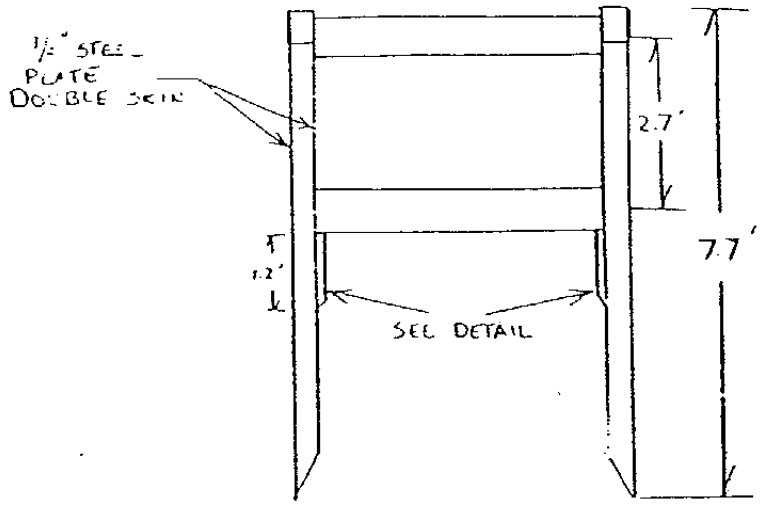
APPROXIMATE WEIGHT = 11,115 LBS

SHIELD = 13

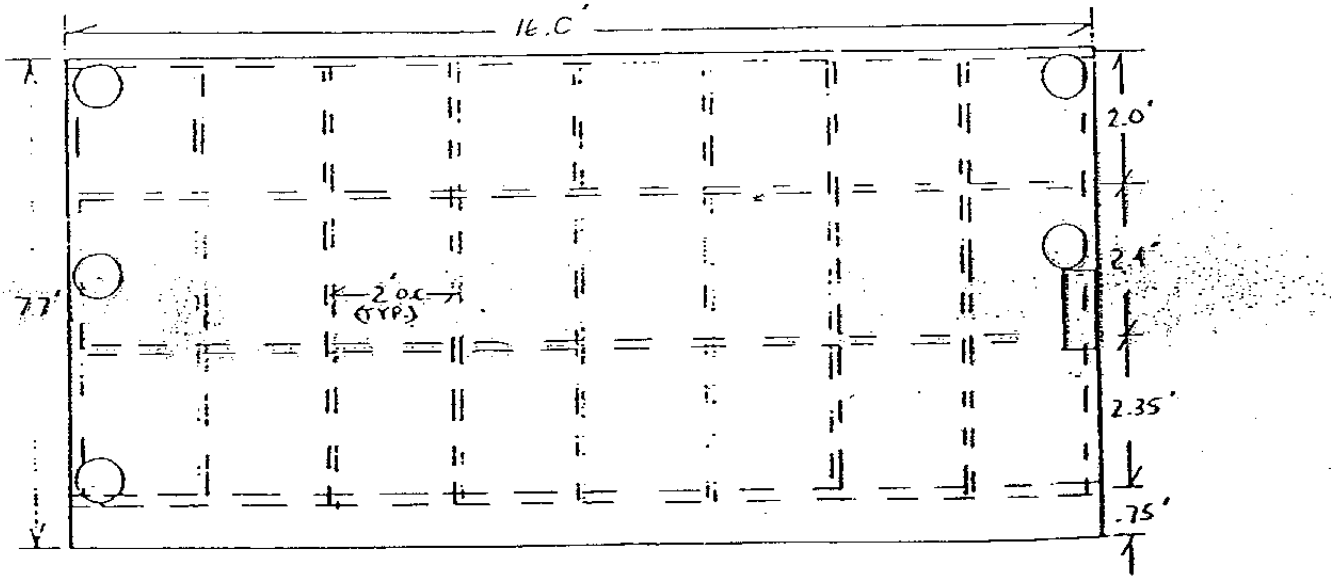
FRONT



REAR



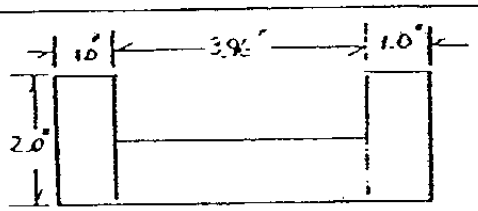
SIDE



NOTE: ALL MEMBERS ARE 4"x2"x3/8" WALL STRUCTURAL STEEL TUBING

SCALE: 1" = 3.0'

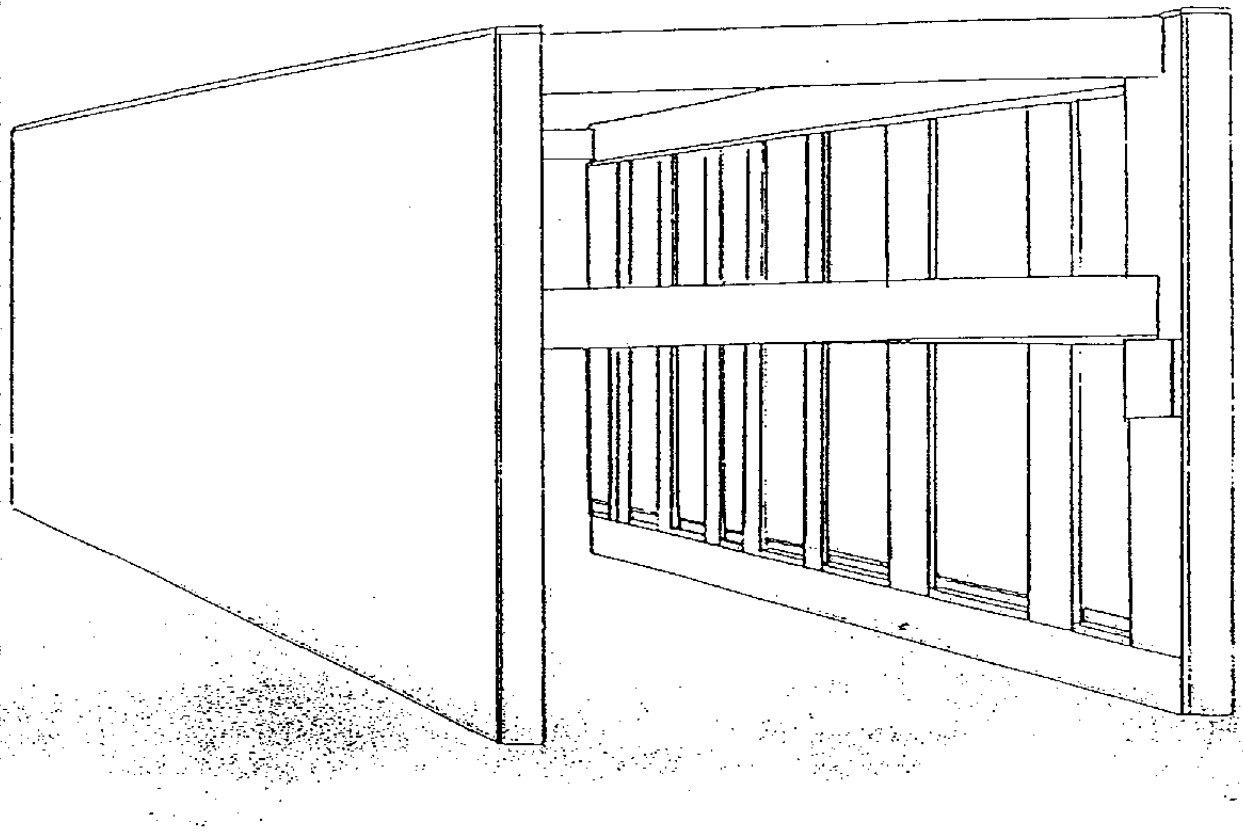
DETAIL:



C-SECTION MADE FROM 1" PLATE

SCALE: 1" = 3.0"

SHIELD #14

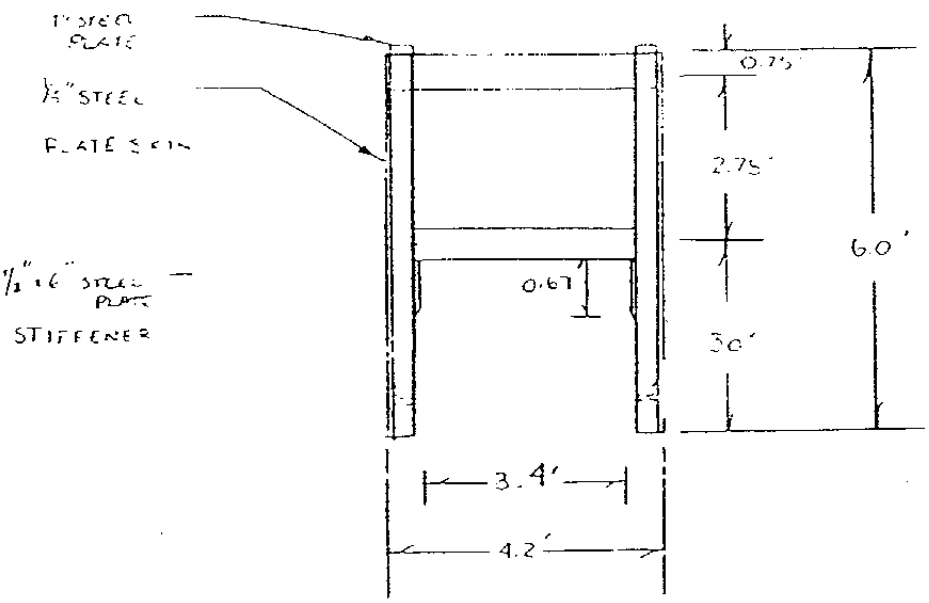


L 16.88' x H 6' x I.W 3.5' (O.W. 4.2')

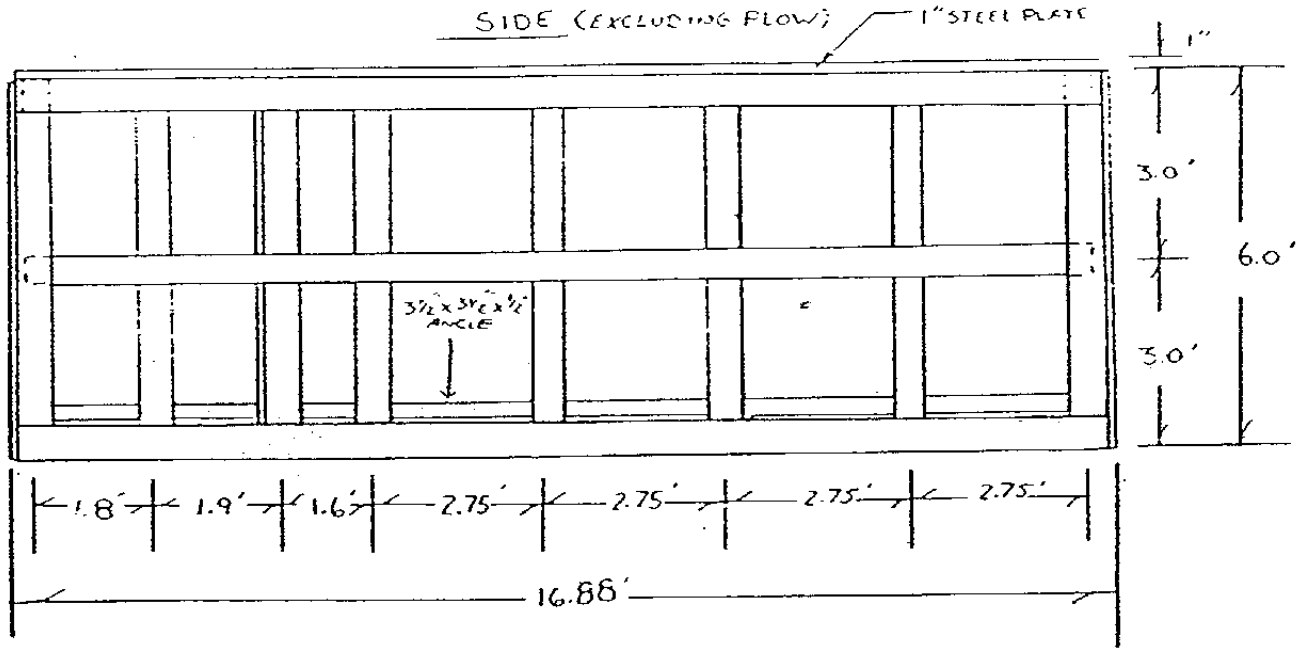
APPROXIMATE WEIGHT = 9378 LBS (INCLUDING PLOW

SHIELD #14

FRONT/REAR (EXCLUDING PLOW)



SIDE (EXCLUDING PLOW)



NOTE #1: ALL WALL MEMBERS ARE 6" x 4" x 3/8" STRUCTURAL STEEL TUBING.

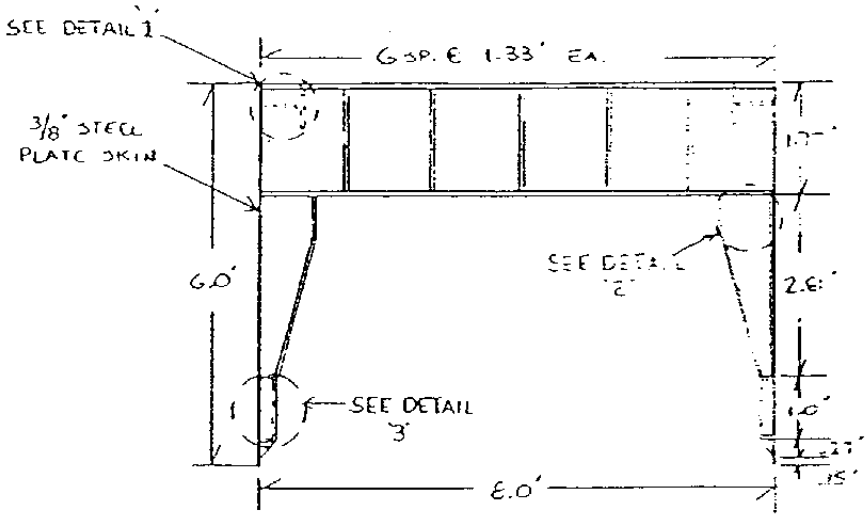
NOTE #2: UPRIGHT STIFFENERS ARE ½" x 6" STEEL PLATES

NOTE #3: PLOW DOES NOT ADD STRUCTURAL STRENGTH TO SIDES OF SHIELD.

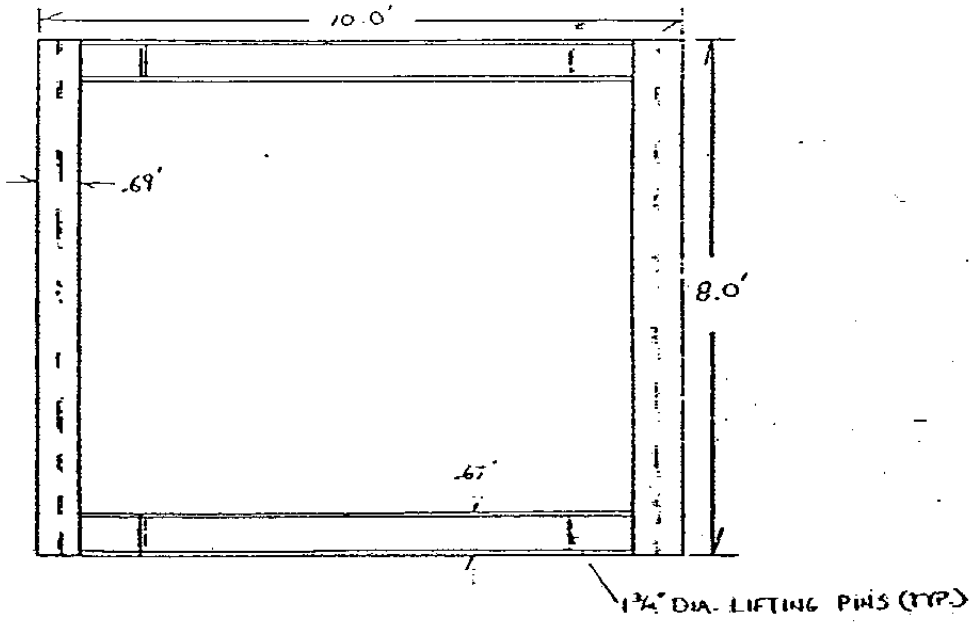
SCALE: 1" = 3.0'

MH SHIELD # 1 (APPROX. WEIGHT = 5031 LBS)

FRONT / REAR



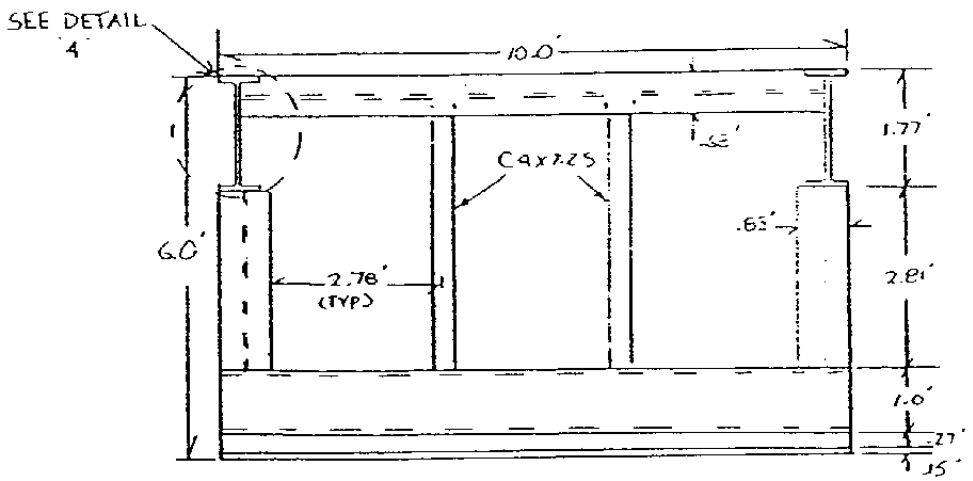
TOP



SCALE - 1" = 3.0'

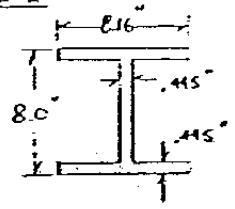
MH SHIELD #1 (CONT'D)

SIDE



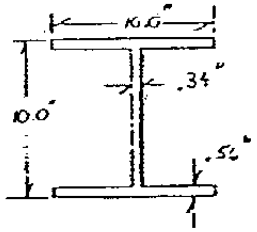
SCALE - 1" = 3.0'

DETAIL '1'



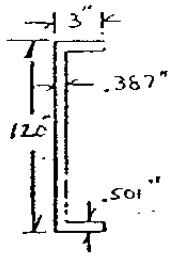
HP 8 x 36

DETAIL '2'



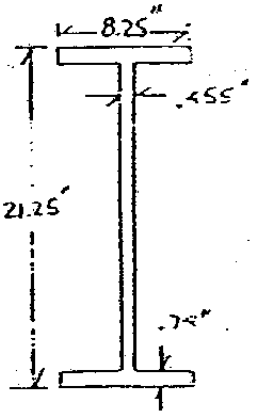
W 10 x 49

DETAIL '3'



C 12 x 25

DETAIL '4'

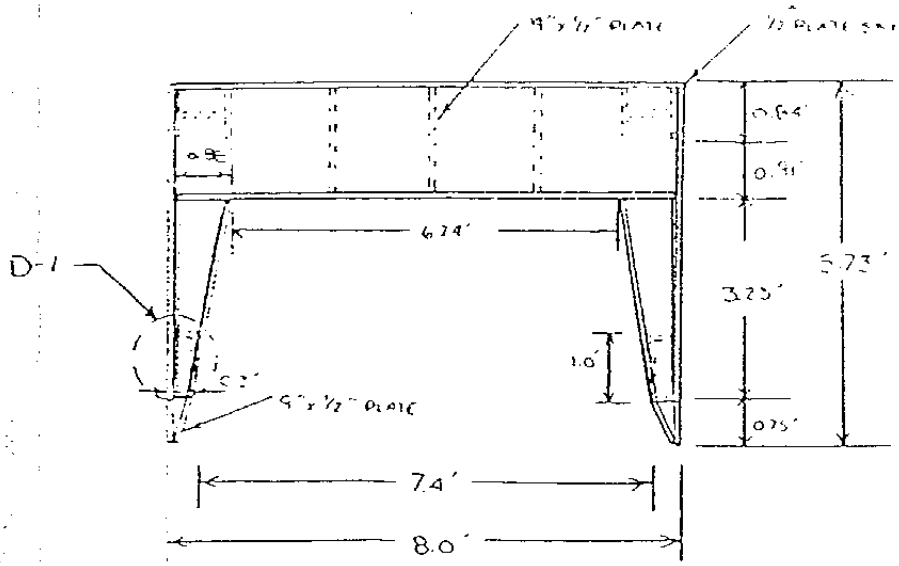


W 21 x 73

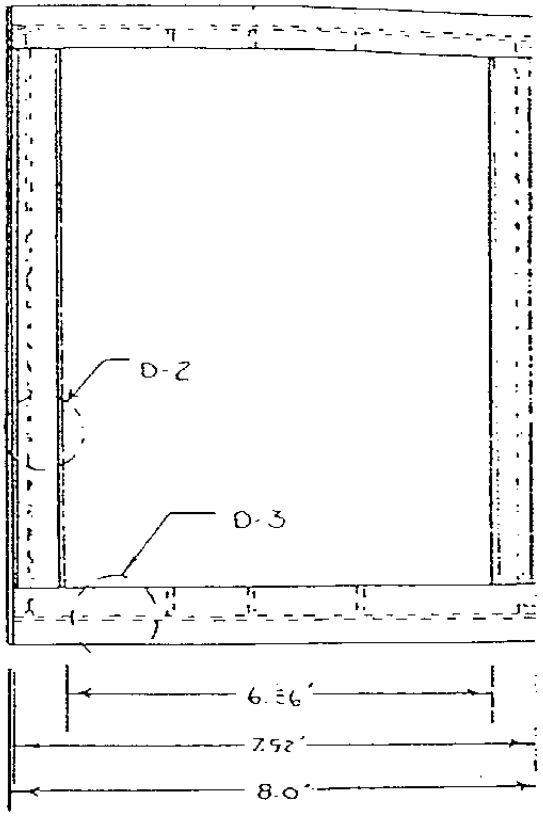
SCALE - 1" = 1.0'

MANHOLE SHIELD #2 (APPROX WEIGHT = 5516 LBS)

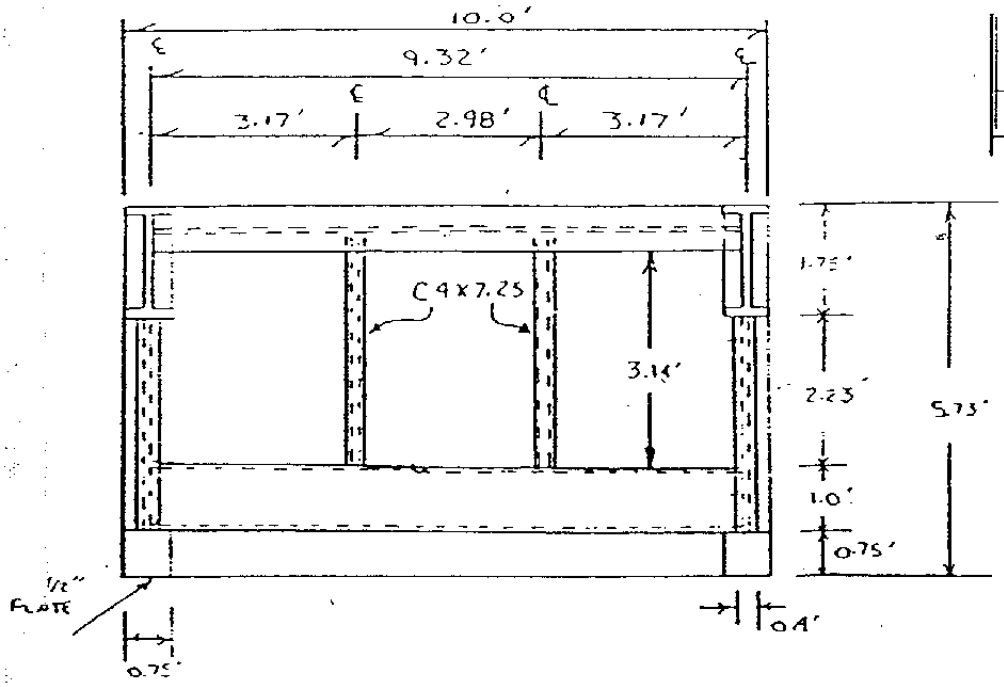
FRONT



TOP

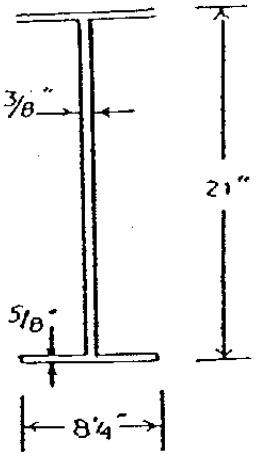


SIDE



D-3

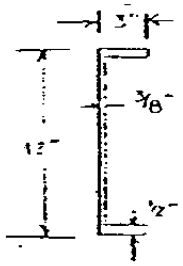
W21x62



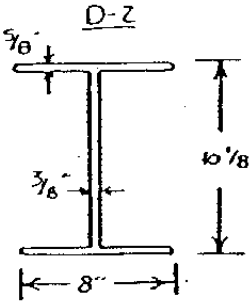
(SCALE: 1"=1.0')

SCALE: 1"=30'

D-1 (SCALE: 1"=1.0')



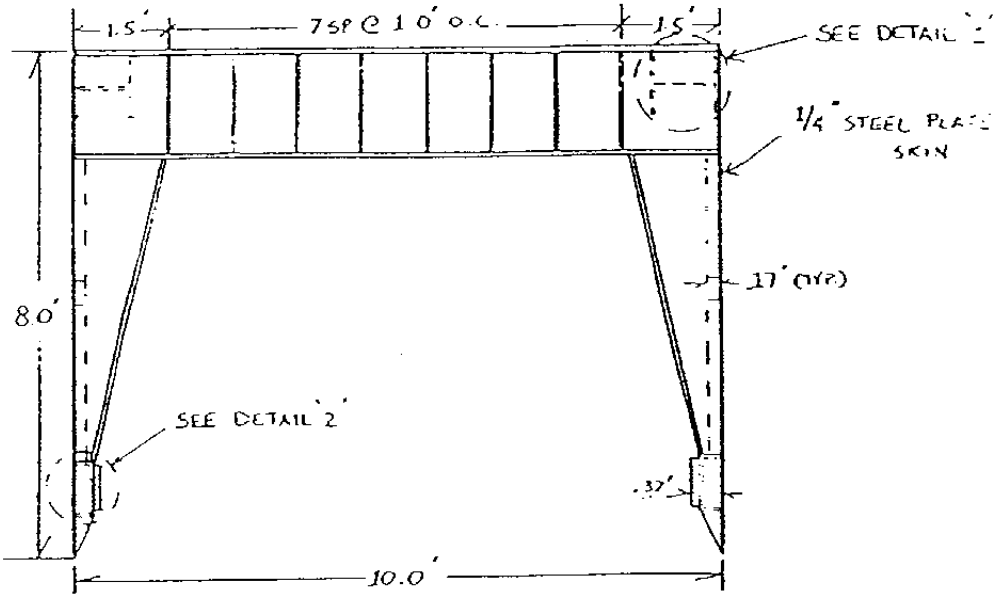
D-2



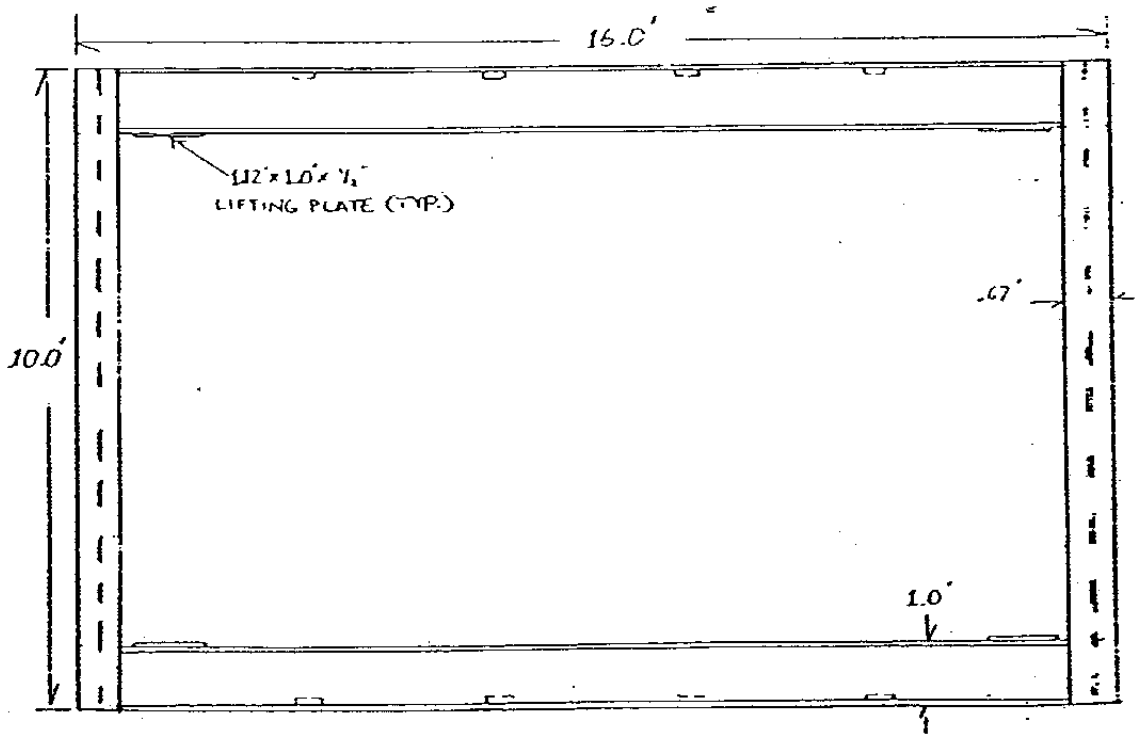
W10x45

MH SHIELD #3 (APPROX. WEIGHT = 8745 LBS)

FRONT / REAR



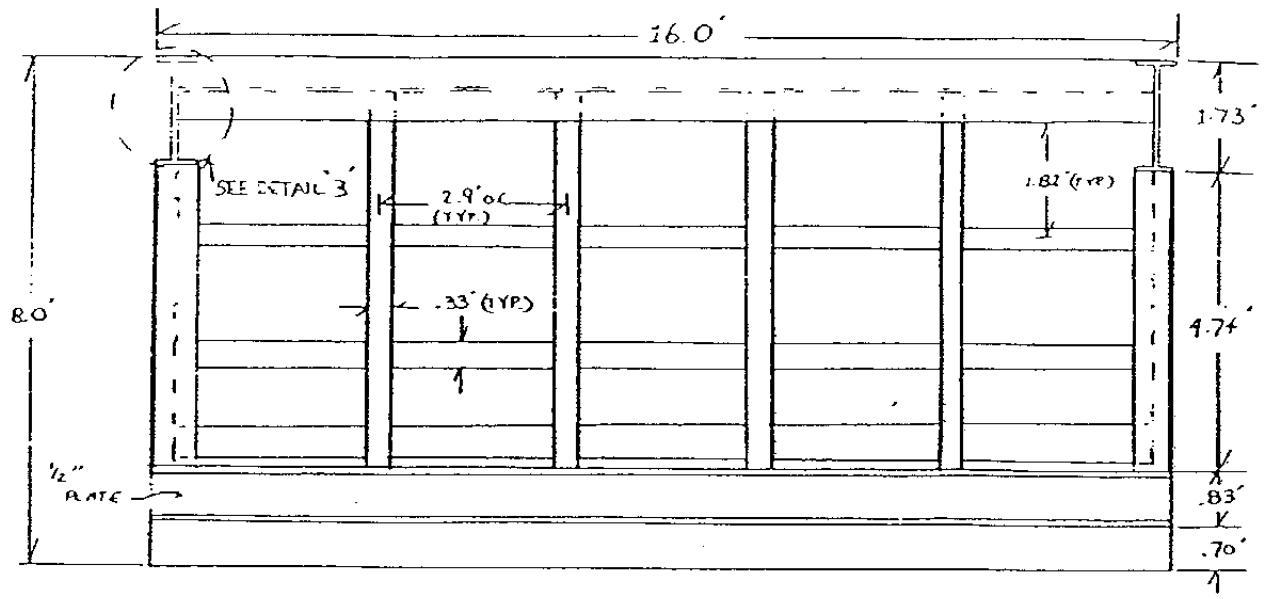
TOP



SCALE : 1" = 3.0'

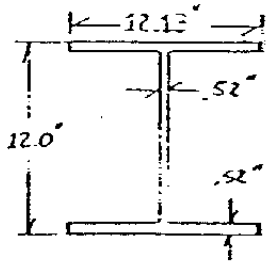
MH SHIELD #3 (CONT'D)

SIDE



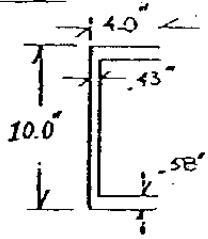
SCALE : 1" = 3.0'

DETAIL '1'



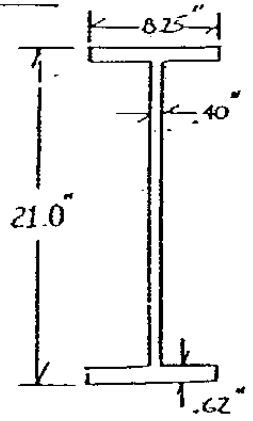
HP 12 x 63

DETAIL '2'



MC 10 x 28.5

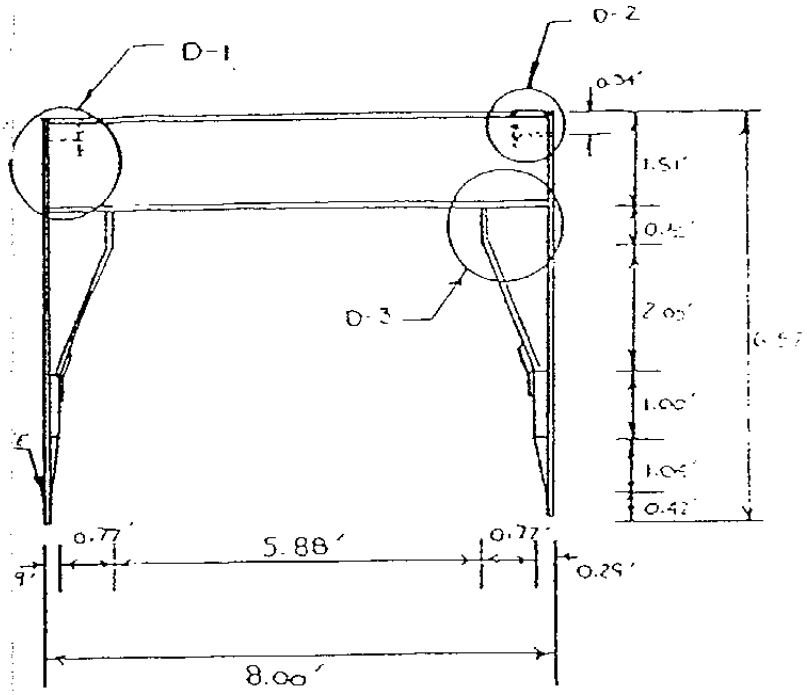
DETAIL '3'



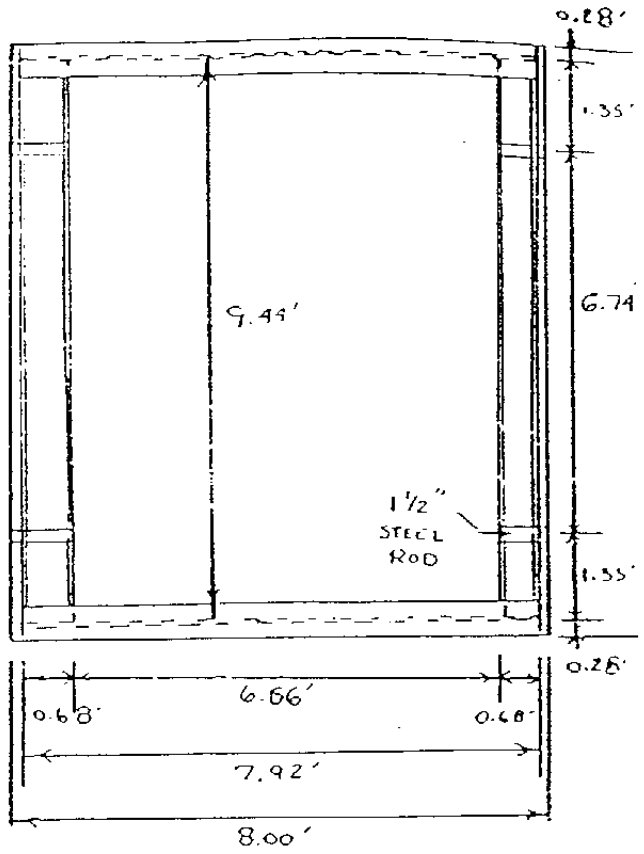
W21 x 62

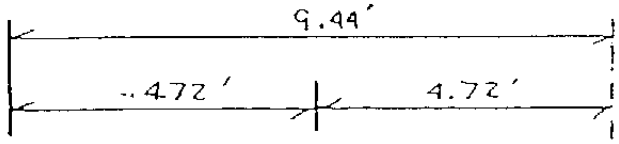
SCALE 1" = 1.0'

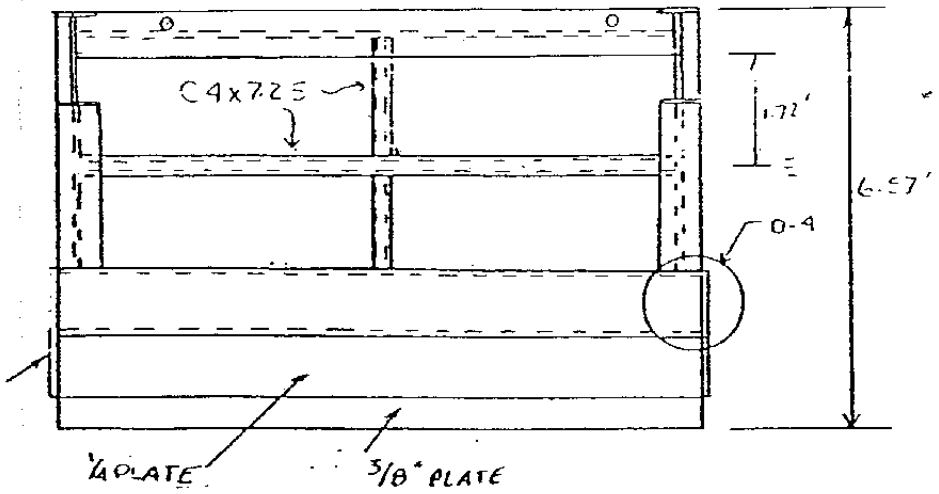
MANHOLE SHIELD # 4 (APPROX WEIGHT = 4516 LBS)



FRONT







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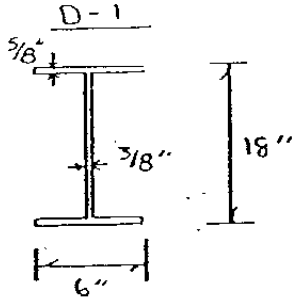
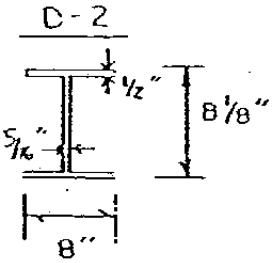


W18 x 46

SCALE: 1" = 3.0'

SIDE



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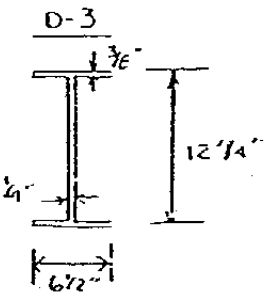
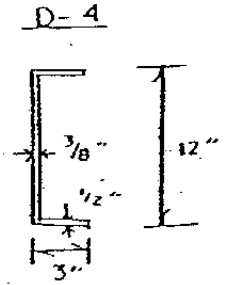


W12x26



C 12 x 25

(15)

Memorandum

To: All Supervisors

From: Vern Palen

Date: 7/23/98

Re: LightWeight Pipe Shield

We have recently purchased a lightweight 8' x 16' trench shield. This shield comes with 36" and 42" pipe spreaders. The shield weighs 6,500 #, the 36" spreaders weigh 700# and the 42" weigh 775#. This lightweight shoring shield is excellent for using lighter excavators like our PC200 or CAT225 size excavators.

The shield is an OSHA approved unit and will be designated as shield number 15.
Attached are the engineering certifications for this shoring system. Please put these with your current trench shield information. Also attached are catalog cuts for the new shoring system.

Supervisors
Aberdale, Joe
Anthony, John
Alibozek, Doug
Bishop, Joseph
Blood, Roland
Bohl, Harold
Connors, Dan
Consolini, Tony
Cullett, Mike
Curry, Tom
Czelusniak, Tom
DiLallo, Kim
Drury, Jay
Dupras, John
Flood, Perry
Hoag, Keith
Houle, Glenn
Johnson, Erik
Jones, Chris
Laviolette, Jack
Lindheimer, William
MacLean, Rob
Massimiano, John
Maxymillian, Jim
Maxymillian, Neal A
McCarthy, Matt
McCarthy, Tom
McCauley, Wayne
Millette, Lucy
Monette, Ron
Nichols, Kevin
O'Brien, Dennis
O'Brien, Dick
O'Brien, Rob't, Sr
Palen, Vern
Pisanelli, Tony
Polumbo, Gary
Randall, Ken
Raymond, Leonard
Rouse, Bill
Rustemeyer, Bruce
Rustemeyer, Geo.
Salvatore, Ernest
Simonelli, Tony
Smith, Dave
Smith, Ed
Smith, Jim
Steinhoff, Al
Strzepek, Dave
Taylor, John
Trostle, Ken
Trzcinski, Chet
Warren, Stephen
Williams, Pete
York, Casey
Zalewsky, David

MANUFACTURER'S TABULATED DATA

This Trench Shield will comply with O.S.H.A. REF: U.S. Dept. of Labor O.S.H.A. Safety and Health Standards (29 CFR 1926/1910) Revised March 5, 1990 Subpart P- Excavations, Trenching, & Shoring Selection of Protective Systems. 1926.652 Appendix F.

MODEL NO. 4SDW-816L HEIGHT 8' LENGTH 16' SERIAL NO. _____

DEPTH & CAPACITY CHART (LONG TERM)

SOIL TYPE	A	B	C
EFP	25	45	60
SHIELD CAP. LBS/PSF	900	900	900
MAXIMUM DEPTH (FT.)	36'	20'	15'

DEPTH & CAPACITY CHART (SHORT TERM)

SOIL TYPE	A	B	C
EFP	25	45	60
SHIELD CAP. LBS/PSF	1200	1170	1200
MAXIMUM DEPTH (FT.)	48'	26'	20'

BASIS AND LIMITATIONS OF DATA:

This tabulated data is to be used by the competent person as defined by O.S.H.A. CFR29, Part 1926, Subpart P Excavations. Soil types A, B, and C are defined within the O.S.H.A. Standard Type C is further defined by the manufacturer: Soil with an Equivalent Fluid Pressure (EFP) of 60 PSF per foot of depth.

Soil conditions can exceed the value of 60 PSF/FT. Consult a soils engineer to determine the actual soil condition and pressures prior to use. Consult the manufacturer if soil pressures exceed those listed in the depth and capacity chart.

The maximum depth is the distance from the ground level to the bottom of the trench. Surcharge loading is not calculated into the maximum allowable depth. Separate site specific P.E. calculations are needed to account for surcharge loading. Structures, equipment, buildings or stored materials adjacent to the trench contribute to surcharge loading. "Adjacent" means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

It is recommended that the Long Term Chart be used for the most conservative approach with the maximum amount of protection.

Long term exposure is for the shoring used in one position for over 24 hours. The short term chart may be used where the shoring system is used in one position for 24 hours or less.

Modifications to this equipment or use of "will fit" components may void the tabulated data unless otherwise permitted by the manufacturer in writing. In the event of major structural damage, the tabulated data is void until such time as repairs are made by the manufacturer or as specified by a registered professional engineer.

The use of the shoring system described shall be assembled, installed and used within the manufacturer's instructions and O.S.H.A. Standards. Anything not specifically addressed within the standards are not permitted.

For any subject not specifically covered by the Manufacturer's Tabulated Data, the competent person shall refer to the applicable O.S.H.A. Standards.

Usage other than specified, may create an unsafe condition that could result in shoring system failure, cave-in or situations resulting in serious injury or death. Therefore, the manufacturer shall not be liable for any usage other than what is specified herein.

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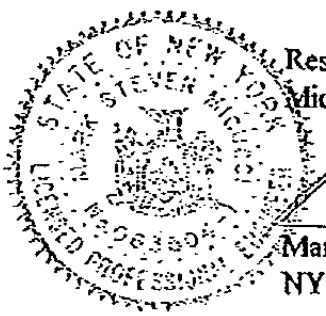
FOR SALES OR SERVICE CALL 1-800-407-4674
764 Bullville Road, Montgomery, NY 12549
1-800-407-4674 FAX: 1-800-361-1973



Respectfully Submitted By:
Micucci Engineering, P.C.

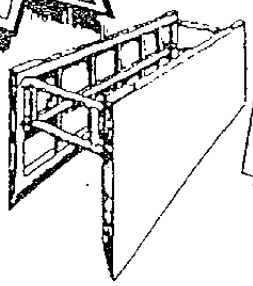
Mark S. Micucci, P.E.
NY License No. 63504

CERTIFIED BY REGISTERED PROFESSIONAL ENGINEERS

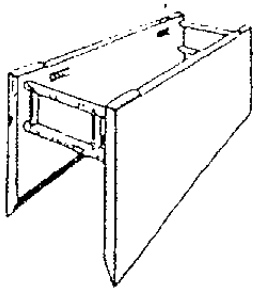
SKINNY BOX™ CONTRACTOR'S SERIES

LIGHTWEIGHT SHORING

LIGHTWEIGHT STEEL 4" WALL SHIELD



CONTRACTORS MODEL WITH HEAVY DUTY FEATURES



LIGHTWEIGHT STEEL SINGLE SIDEWALLS

MODEL	HEIGHT	LENGTH	WEIGHT	APPROXIMATE DIGGING DEPTH (FT.) SOIL TYPE A	B	C
4SSW 46L	4'	6'	1050#	69	38	29
4SSW 48L	4'	8'	1325#	52	29	22
4SSW 410L	4'	10'	1700#	48	26	20
4SSW 412L	4'	12'	2100#	38	21	16
4SSW 416L	4'	16'	2800#	26	14	11
4SSW 66L	6'	6'	1500#	64	36	27
4SSW 68L	6'	8'	1850#	64	36	27
4SSW 610L	6'	10'	2600#	52	29	22
4SSW 612L	6'	12'	3000#	38	21	16
4SSW 616L	6'	12'	4200#	26	14	11
4SSW 86L	8'	6'	1850#	45	25	19
4SSW 88L	8'	8'	2300#	43	24	18
4SSW 810L	8'	10'	3000#	43	24	18
4SSW 812L	8'	12'	3600#	33	18	14
4SSW 816L	8'	16'	4750#	12	12	9

*** PSF Ratings and depths are based on short term exposure with excavation open a period of time equal to 24 hours or less. Consult manufacturer should long term exposure be required. Depths are based on A, B, C soil types are described in OSHA's 29 CFR Part 1926 Subpart P, October 31, 1989 with Type A not exceeding 25 PSF per foot of depth, Type B not exceeding 45 PSF per foot of depth and Type C not exceeding 80 PSF per foot of depth. Determine actual soil pressure and consult Manufacturers Tabulated Data prior to each use.

LIGHTWEIGHT STEEL DOUBLE SIDEWALLS

MODEL	HEIGHT	LENGTH	WEIGHT	APPROXIMATE DIGGING DEPTH (FT.) SOIL TYPE A	B	C
4SDW 48L	4'	8'	1850#	96	53	40
4SDW 410L	4'	10'	2200#	96	53	40
4SDW 412L	4'	12'	2600#	67	37	28
4SDW 416L	4'	16'	3700#	52	29	22
4SDW 420L	4'	20'	5000#	43	24	18
4SDW 424L	4'	24'	5950#	33	18	14
4SDW 68L	6'	8'	3050#	86	48	36
4SDW 610L	6'	10'	3650#	84	46	35
4SDW 612L	6'	12'	4200#	81	45	34
4SDW 614L	6'	14'	5000#	57	32	24
4SDW 616L	6'	16'	5700#	52	29	22
4SDW 620L	6'	20'	8000#	36	20	15
4SDW 624L	6'	24'	9200#	33	18	14
4SDW 88L	8'	8'	3650#	72	40	30
4SDW 810L	8'	10'	4400#	72	40	30
4SDW 812L	8'	12'	5050#	60	33	25
4SDW 814L	8'	14'	5800#	57	32	24
4SDW 816L	8'	16'	6500#	48	26	20
4SDW 820L	8'	20'	8200#	38	21	16
4SDW 824L	8'	24'	10350#	33	18	14
4SDW 1016L	10'	16'	8550#	48	26	20
4SDW 1020L	10'	20'	10400#	38	21	16
4SDW 1024L	10'	24'	12800#	33	18	14

Please Specify When Ordering:

PIPE SPREADERS FOR STEEL SIDEWALLS

ULPS ULTRA LIGHT PIPE SPREADERS FOR SHALLOW CUT SIDEWALLS

HPS HEAVY PIPE SPREADERS FOR DEEP CUT SIDEWALLS

(4) 4"SCHEDULE 40 PIPES
(INCLUDES PINS & KEEPERS)

MODEL #	WIDTH	WEIGHT
ULPS 24	24"	110#
ULPS 30	30"	135#
ULPS 36	36"	158#
ULPS 42	42"	175#
ULPS 48	48"	200#
ULPS 54	54"	225#
ULPS 60	60"	250#
ULPS 72	72"	290#
ULPS 84	84"	345#
ULPS 96	96"	395#
ULPS 120	120"	490#

(4) 8"SCHEDULE 80 PIPES
(INCLUDES PINS & KEEPERS)

MODEL #	WIDTH	WEIGHT
HPS 24	24"	500#
HPS 30	30"	600#
HPS 36	36"	700#
HPS 42	42"	775#
HPS 48	48"	850#
HPS 54	54"	950#
HPS 60	60"	1025#
HPS 72	72"	1200#
HPS 84	84"	1400#
HPS 96	96"	1550#
HPS 108	108"	1700#
HPS 120	120"	1900#

COMPLIES WITH LATEST OSHA REGULATIONS

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LIGHTWEIGHT STEEL 4" WALL SHIELD
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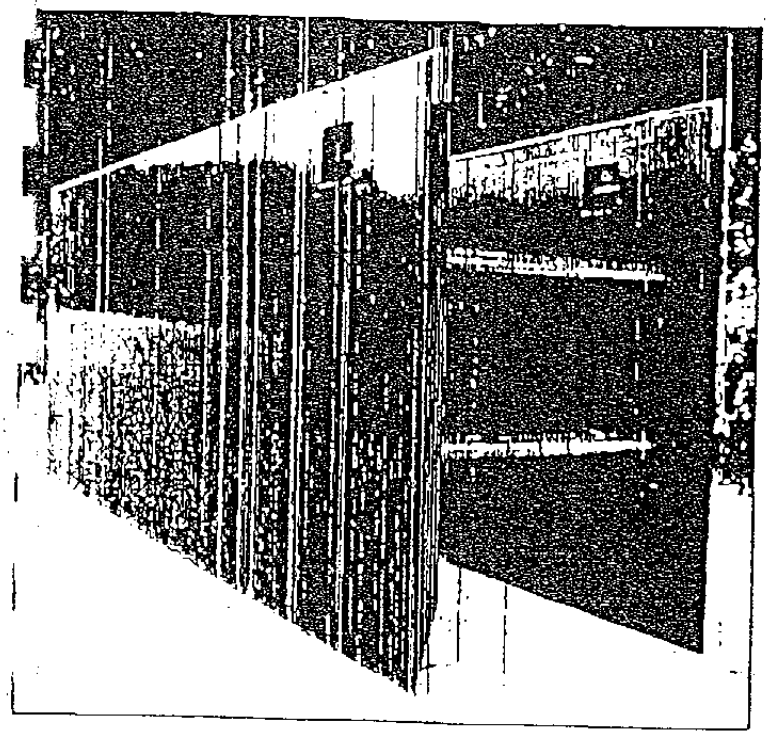
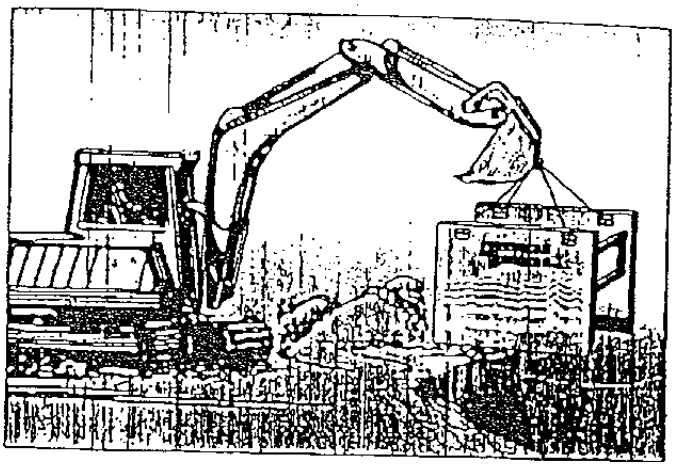
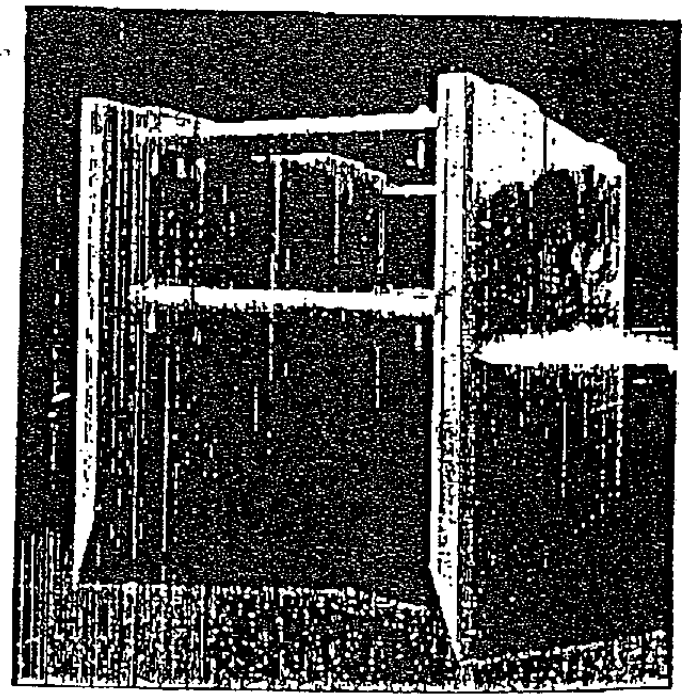


EXCELLENT FOR CONTRACTORS USING LIGHTER EXCAVATORS OR FOR MUNICIPAL APPLICATIONS HAVING HEAVIER EQUIPMENT AVAILABLE.

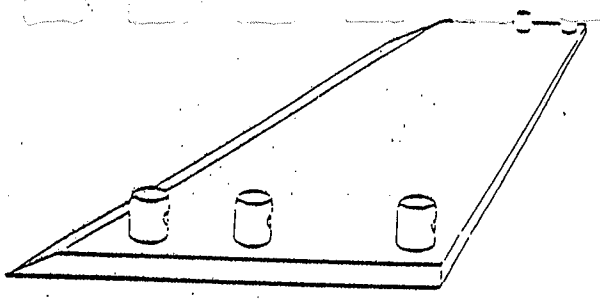


)W MODEL IS THE SAME AS THE 'SW' EXCEPT WITH THE ADDITION OF A FULL INTERIOR PLATE

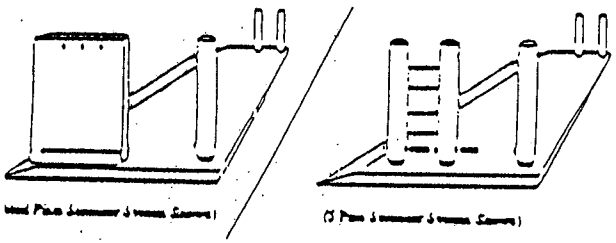
- 'ROFESSIONAL ENGINEER CERTIFIED
- HIGH STRENGTH STEEL CONSTRUCTION
  - " WALL THICKNESS STANDARD
  - " WALL THICKNESS ALSO AVAILABLE
- UTILIZES PINNED IN PLACE PIPE SPREADERS
- IFTING LUGS STANDARD
- REINFORCED BOTTOM CUTTING EDGES
- ANTI- WEAR BAR STANDARD
- ARDWOOD -FILLED TOP & FRONT RAILS
- STACKABLE
- ACTORY PAINTED
- OPTIONAL STYROFOAM FILLED
- 'EDIUM DUTY & HEAVY DUTY SERIES
- .SO AVAILABLE



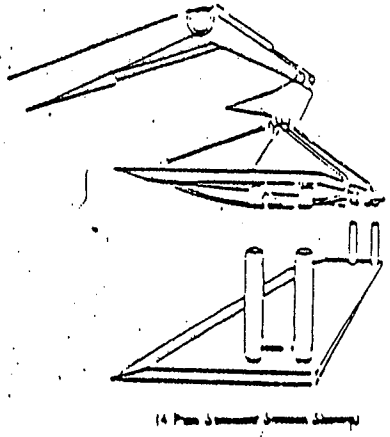
SW MODEL - SAME CONSTRUCTION AS THE "DW" LESS THE FULL INTERIOR PLATE

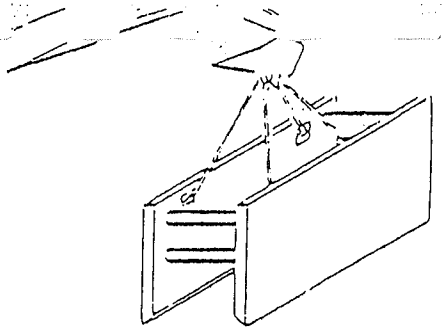


Place spreader pipe and/or plate onto collars or into brackets and pin in place. Secure pins with keepers. A minimum of 2 spreader units are required at each end of trench shield.



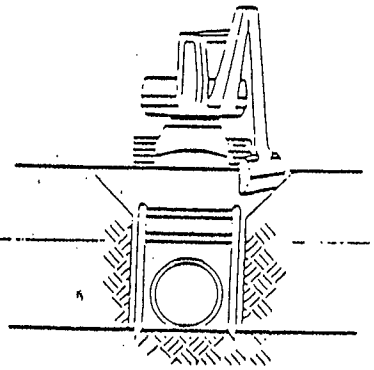
Lower second sidewall onto spreaders and pin.



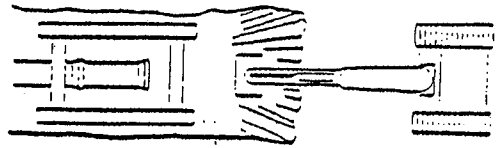


Using a trench shield in stable soil

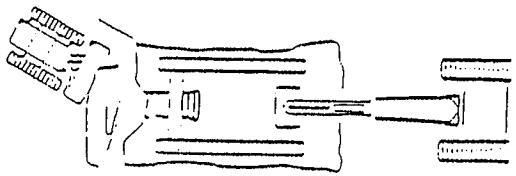
Excavate to grade just slightly wider than the trench shield. Dig walls vertical to a minimum of 18" below the top of the shield. Slope soil above shield according to OSHA regulations. Install shield in trench.



Excavate in front of the trench shield.

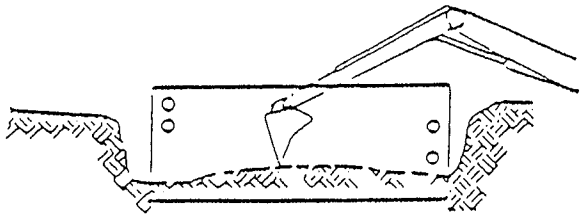


wider than 72" or when soil pressure is severe enough to cause spreader to deflect).

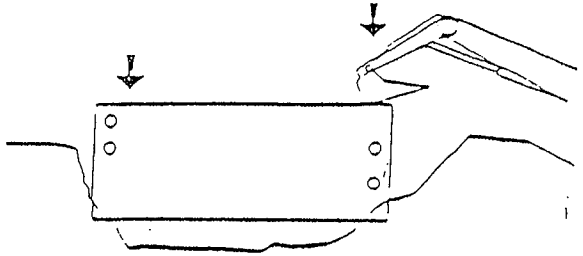


Using a shield in unstable soil

Excavate until soil begins to crumble beyond desired trench width. Place shield on line of excavation.



Press down on corners to push shield down to grade.



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MODULAR SOIL SUPPORT SYSTEM

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OICE OF (3) SPREADER SYSTEMS:
SCREW JACK (MANUALLY ADJUSTABLE)
2. PINNED IN PLACE PIPE SPREADERS
(INTERCHANGEABLE WIDTHS
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HOICE OF HEIGHTS:
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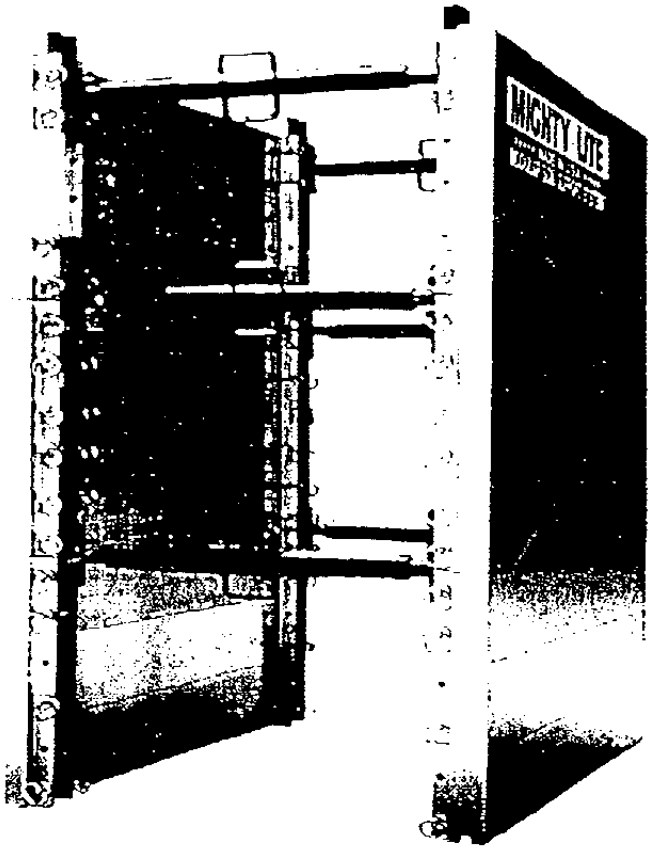
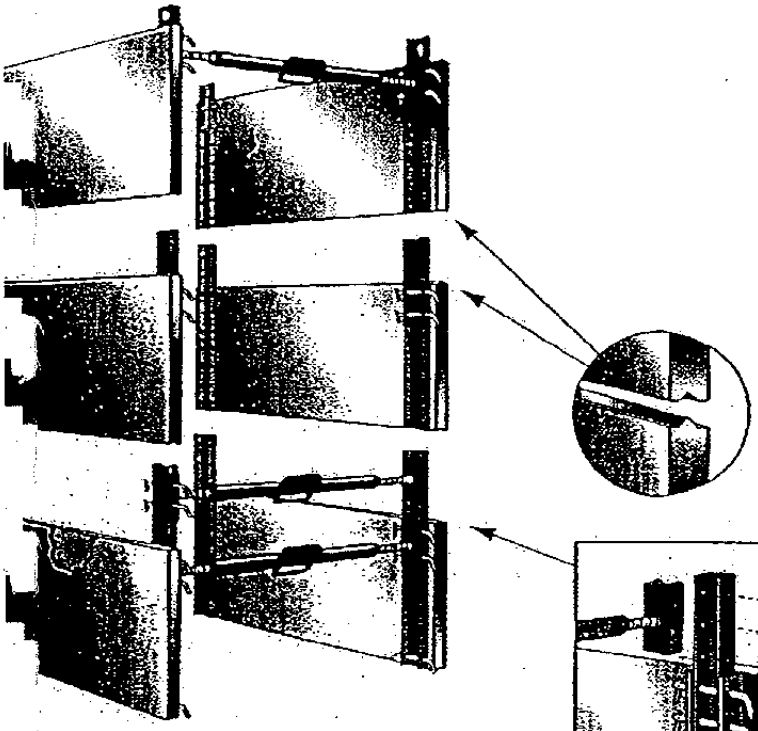
NSPORT AN ENTIRE SHORING SYSTEM IN A PICK-UP TRUCK.



THE **MIGHTY LITE SYSTEM** SHOWN ABOVE IS 6' HIGH X 10' LONG UTILIZING SCREW JACK ADJUSTABLE WIDTH SPREADERS. THE PANEL CONNECTORS IN THIS EXAMPLE CONNECT (3) 2' HIGH X 10' LONG PANELS. SEE INSIDE FOR SIZE AVAILABILITY.



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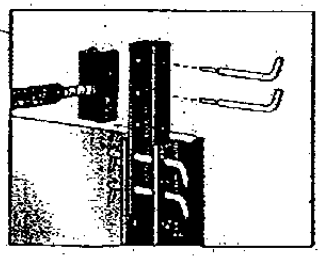
SEE DEPTH CHART FOR MAXIMUM DEPTH ALLOWABLE.



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QUOTE

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TIM Weir

REC. BY: TEL:

MENT DATE: 3/30/98 TEL. NO. JOB: OFFICE:

D BY: JOB NO: PURCHASE ORDER:

TITY	PART NUMBER	DESCRIPTION	PRICE	AMOUNT
	ML44	Mighty Lite Panels 4'x4'		
	ML24	" " " 2'x4'		
	RPC-4	Recessed Panel Connectors		
	SJ-35	Screw Jacks 3-5 Ft. Adjustable		
	LL	Lifting Lugs		
	NS	Nylon Sling 4000 lb. cap.		
		Price for above system		$3487.00
		For the above system only 6' lengths Add	$630.00	
		" " " " " 8' lenghts Add	$1320.00	
		Add to any three systems above for 5-9 Screw jacks	$ 68.00	

TOTAL	
SUB TOTAL	
TAX	
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TOTAL PRICE	
DOWN PAYMENT	
BALANCE DUE	

MENT OF RENTAL: PAYABLE IN ADVANCE - A CONSECUTIVE PRO-RATA RENTAL RATE OF:

___ + Tax PER MONTH; $ ___ + Tax PER WEEK; $ ___ + Tax PER DAY.

LOSING CHARGE OF $ ___ SHALL BE ADDED TO RENTALS OF LESS THAN ONE MONTH.

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= IMPORTANT =

* ALL RIGHTS THE CUSTOMER MAY HAVE TO RENT OR PURCHASE THE EQUIPMENT DESCRIBED HEREIN ARE EXPRESSLY SUBJECT TO TERMS AND CONDITIONS PRINTED ON THE REVERSE SIDE OF THIS AGREEMENT. SIGNATORY WARRANTS THEY HAVE FULL AUTHORITY TO SIGN AS CUSTOMER AGENT AND/OR PERSONALLY ASSUMES ALL INDEBTEDNESS OF ANY SUMS DUE WHICH MAY RESULT UNDER TERMS OF THIS AGREEMENT.

CUSTOMER SIGNATURE TITLE DATE BUNCE INDUSTRIES, INC.

MANUFACTURER'S TABULATED DATA

This Trench Shield will comply with O.S.H.A. REF: U.S. Dept. of Labor O.S.H.A. Safety and Health Standards (29 CFR 1926/1910) Revised March 5, 1990 Subpart P. Excavations, Trenching, & Shoring Selection of Protective Systems. 1926.652 Appendix F.

MODEL NO. ML-26 HEIGHT 2' LENGTH 5' SERIAL NO. _____

DEPTH & CAPACITY CHART (LONG TERM)

SOIL TYPE	A	B	C
EFP	25	45	60
SHIELD CAP. LBS/PSF	2340	2340	2340
MAXIMUM DEPTH (FT.)	93'	52'	39'

DEPTH & CAPACITY CHART (SHORT TERM)

SOIL TYPE	A	B	C
EFP	25	45	60
SHIELD CAP. LBS/PSF	3120	3120	3120
MAXIMUM DEPTH (FT.)	125'	70'	52'

BASIS AND LIMITATIONS OF DATA:

This tabulated data is to be used by the competent person as defined by O.S.H.A. CFR29, Part 1926, Subpart P Excavations. Soil types A, B, and C are defined within the O.S.H.A. Standard. Type C is further defined by the manufacturer: Soil with an Equivalent Fluid Pressure (EFP) of 60 PSF per foot of depth.

Soil conditions can exceed the value of 60 PSF/FT. Consult a soils engineer to determine the actual soil condition and pressures prior to use. Consult the manufacturer if soil pressures exceed those listed in the depth and capacity chart.

The maximum depth is the distance from the ground level to the bottom of the trench. Surcharge loading is not calculated into the maximum allowable depth. Separate site specific P.E. calculations are needed to account for surcharge loading. Structures, equipment, buildings or stored materials adjacent to the trench contribute to surcharge loading. "Adjacent" means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

It is recommended that the Long Term Chart be used for the most conservative approach with the maximum amount of protection.

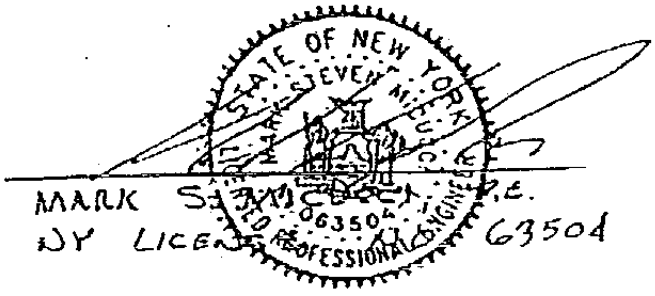
Long term exposure is for the shoring used in one position for over 24 hours. The short term chart may be used where the shoring system is used in one position for 24 hours or less.

Modifications to this equipment or use of "will fit" components may void the tabulated data unless otherwise permitted by the manufacturer in writing. In the event of major structural damage, the tabulated data is void until such time as repairs are made by the manufacturer or as specified by a registered professional engineer.

The use of the shoring system described shall be assembled, installed and used within the manufacturer's instructions and O.S.H.A. Standards. Anything not specifically addressed within the standards are not permitted.

For any subject not specifically covered by the Manufacturer's Tabulated Data, the competent person shall refer to the applicable O.S.H.A. Standards.

Usage other than specified, may create an unsafe condition that could result in shoring system failure, cave-in or situations resulting in serious injury or death. Therefore, the manufacturer shall not be liable for any usage other than what is specified herein.



AMERICAN SHORING INC.

CERTIFIED BY REGISTERED PROFESSIONAL ENGINEERS

MANUFACTURER'S TABULATED DATA

This Trench Shield will comply with O.S.H.A. REF. U.S. Dept. of Labor O.S.H.A. Safety and Health Standards (29 CFR 1926/1910) Revised March 5, 1990 Subpart P- Excavations, Trenching, & Shoring Selection of Protective Systems. 1926.652 Appendix F.

MODEL NO. ML-46 HEIGHT 4' LENGTH 6' SERIAL NO. _____

DEPTH & CAPACITY CHART (LONG TERM)

SOIL TYPE	A	B	C
EFP	25	45	60
SHIELD CAP. LBS/PSF	2340	2340	2340
MAXIMUM DEPTH (FT.)	93'	52'	39'

DEPTH & CAPACITY CHART (SHORT TERM)

SOIL TYPE	A	B	C
EFP	25	45	60
SHIELD CAP. LBS/PSF	3120	3120	3120
MAXIMUM DEPTH (FT.)	125'	70'	52'

BASIS AND LIMITATIONS OF DATA:

This tabulated data is to be used by the competent person as defined by O.S.H.A. CFR29, Part 1926, Subpart P Excavations. Soil types A, B, and C are defined within the O.S.H.A. Standard. Type C is further defined by the manufacturer: Soil with an Equivalent Fluid Pressure (EFP) of 60 PSF per foot of depth.

Soil conditions can exceed the value of 60 PSF/FT. Consult a soils engineer to determine the actual soil condition and pressures prior to use. Consult the manufacturer if soil pressures exceed those listed in the depth and capacity chart.

The maximum depth is the distance from the ground level to the bottom of the trench. Surcharge loading is not calculated into the maximum allowable depth. Separate site specific P.E. calculations are needed to account for surcharge loading. Structures, equipment, buildings or stored materials adjacent to the trench contribute to surcharge loading. "Adjacent" means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

It is recommended that the Long Term Chart be used for the most conservative approach with the maximum amount of protection.

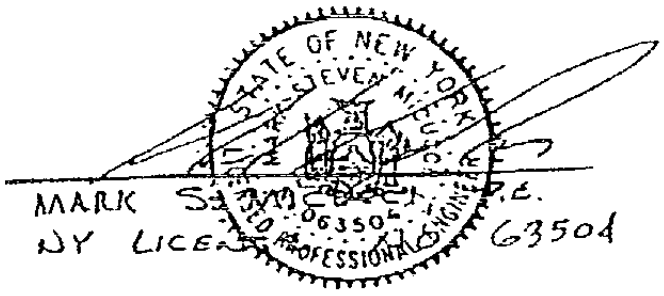
Long term exposure is for the shoring used in one position for over 24 hours. The short term chart may be used where the shoring system is used in one position for 24 hours or less.

Modifications to this equipment or use of "will fit" components may void the tabulated data unless otherwise permitted by the manufacturer in writing. In the event of major structural damage, the tabulated data is void until such time as repairs are made by the manufacturer or as specified by a registered professional engineer.

The use of the shoring system described shall be assembled, installed and used within the manufacturer's instructions and O.S.H.A. Standards. Anything not specifically addressed within the standards are not permitted.

For any subject not specifically covered by the Manufacturer's Tabulated Data, the competent person shall refer to the applicable O.S.H.A. Standards.

Usage other than specified, may create an unsafe condition that could result in shoring system failure, cave-in or situations resulting in serious injury or death. Therefore, the manufacturer shall not be liable for any usage other than what is specified herein.



MARK S[illegible] P.E.
NY LICE[illegible] 63504

AMERICAN SHORING INC.

CERTIFIED BY REGISTERED PROFESSIONAL ENGINEERS

8.0 PRE-CAST MANHOLE SPREADER BEAMS [5-TON CAPACITY]

CALCULATIONS ON PROPOSED PRECAST MANHOLE SPREADER BEAMS

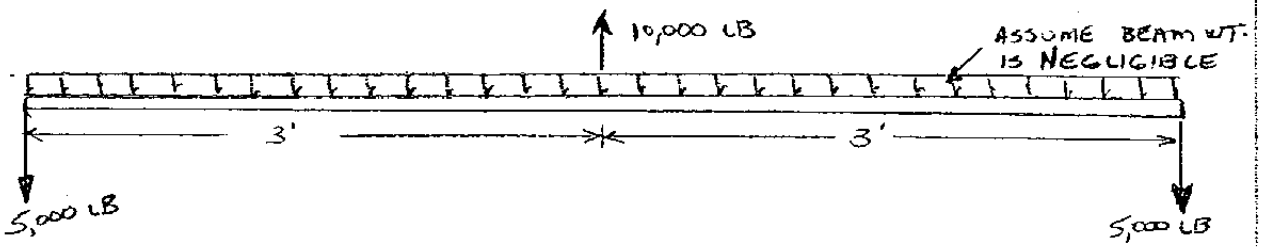
5' DIA. M.H. SPREADER BEAM:

(SEE ATTACHED DRAWING FOR PROPOSED ARRANGEMENT)

LOADING: ASSUME 5' DIA. M.H. BASE SECTION W/ 6' SUMP

TOTAL WT = 10,000 LB.

BEAM DIAG.: TRY S8 x 18.4 $A = 5.41\ in^2$ $I_x = 57.6\ in^4$
L = 6' $S_x = 14.4\ in^3$



$V_{MAX} = \frac{P}{2} = 5000\ LB = \underline{5}^{K}$

$M_{MAX} = \frac{Pl}{4} = \frac{10{,}000(6')}{4} = 15{,}000\ FT\text{-}LB = \underline{15}^{K\text{-}FT}$

CHECK BEAM W/OUT 3/4" x 6" PLATE ON TOP:

A36 STEEL: $F_v = .4F_y = .4(36) = 14.4\ ksi$
$F_b = .66F_y = .66(36) = 23.76\ ksi$

CHECK SHEAR - $f_v = \frac{V}{d\,t_w} = \frac{5^{K}}{8(.25)} = 2.5\ ksi$

2.5 KSI < 14.4 KSI ∴ OK IN SHEAR

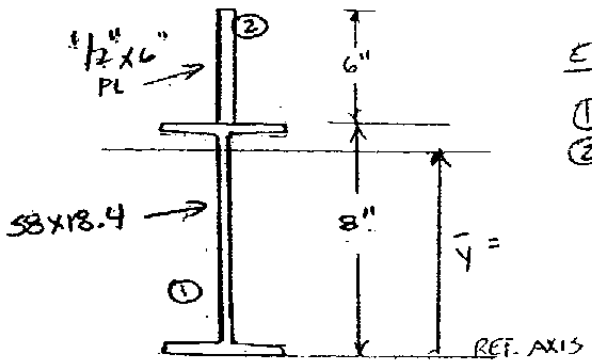
USING M_{MAX}, FIND $S_{X\ REQ'D}$ -

$$S_{X\ REQ'D} = \frac{M_{MAX}(12)}{F_b} = \frac{15(12)}{23.76} = \underline{7.6}\ in^3$$

$S_{X\ S8X18.4} = 14.4\ in^3$ > OK S.F. $= \frac{14.4}{7.6} = \underline{1.9}$

S8 X 18.4 HAS S.F. OF 1.9 W/ OUT 1/2" X 6" TOP PLATE.

DETERMINE S.F. @ LOCATION OF M_{MAX} W/ 1/2" X 6" PLATE:



SECTION @ M_{MAX}

EL.	A	y	Ay
①	5.41 IN²	4 IN	21.64
②	3	11 IN	33.0
	8.41		54.64

$$\bar{y} = \frac{\Sigma Ay}{\Sigma A} = \frac{54.64}{8.41} = 6.5 \text{ IN}$$

$$I_{xx} = I_{S8X18.4} + AD^2_{S8X18.4} + I_{PL} + AD^2_{PL}$$

$$I_{xx} = 57.6 + 5.41(1.5)^2 + \frac{.5(6)^3}{12} + 3(4.5)^2$$

$$I_{xx} = 57.6 + 12.17 + 9 + 60.75$$

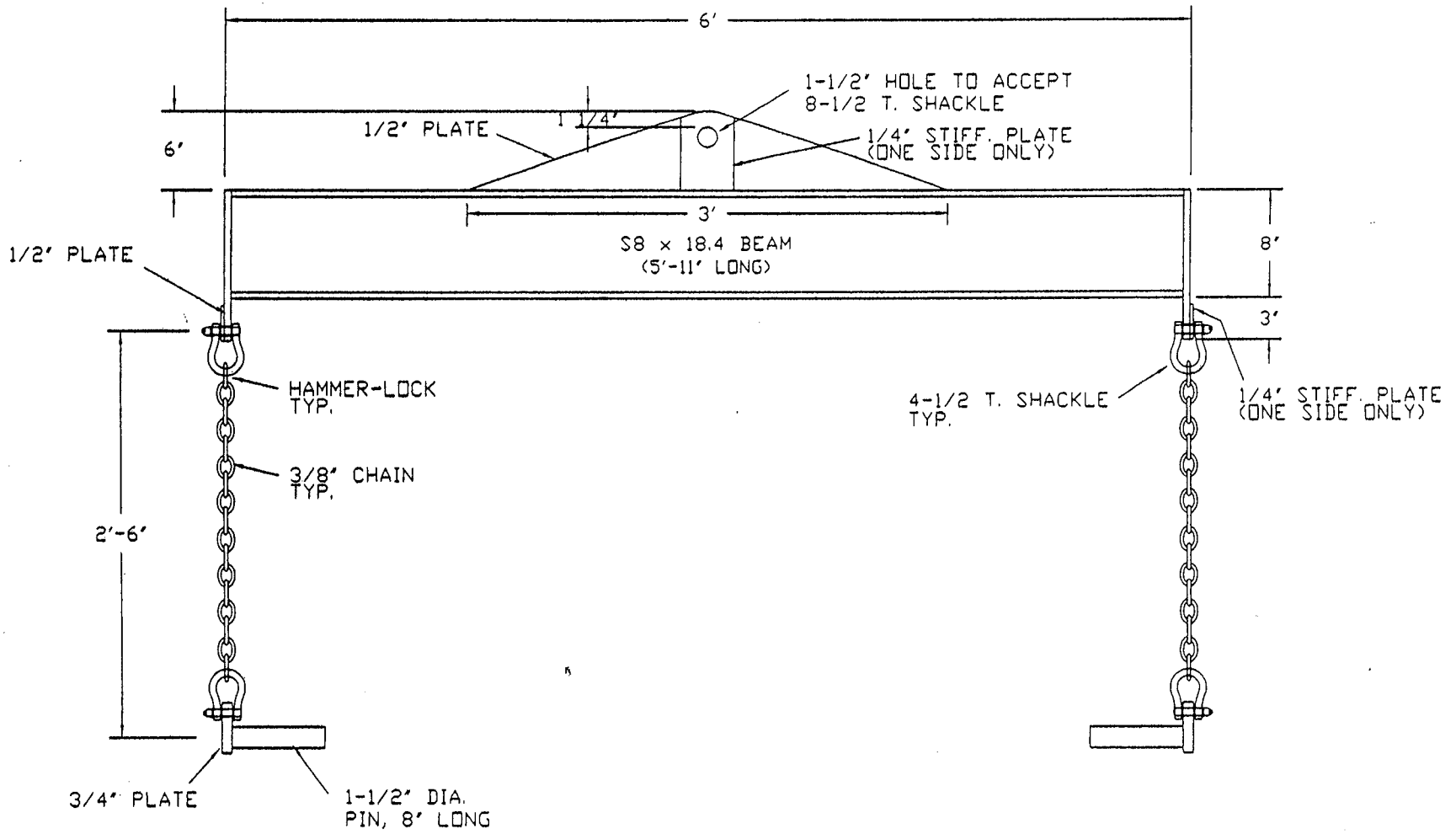
$$I_{xx} = 139.52$$

$$S_x = \frac{I_{xx}}{c} = \frac{139.52}{(14 - 6.5)} = 18.6 \text{ IN}^3$$

$S_{x\,REQ'D} = 7.6 \text{ IN}^3$ $\therefore$ F.O.S. $= \frac{18.6}{7.6} = 2.5$

W/ 1/2" X 6" PLATE @ LOC. OF M_{MAX}

OK TO USE S8 X 18.4 FOR SPREADER W/ 10,000 LB LOAD



TOT. WT. - APPROX. 160 LB

5 FT. DIA. MANHOLE - SPREADER BEAM

SCALE - 1" = 1'-0"

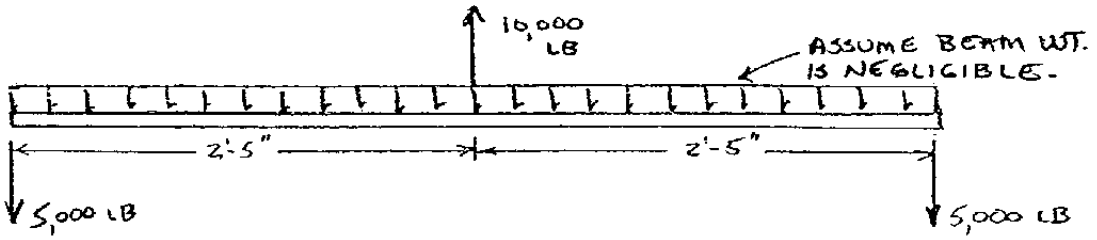
3/6

4' DIA. MH SPREADER BEAM:

(SEE ATTACHED DRAWING FOR PROPOSED ARRANGEMENT)

LOADING: ASSUME 4' DIA. M.H. BASE SECTION w/ SUMP
ASSUME TOT. WT OF 10,000 LB

BEAM DIAG: TRY S 8 X 18.4 $A = 5.41\ IN^2$ $I_X = 57.6\ IN^4$
$L = 4'-10"$ $S_X = 14.4\ IN^3$



$V_{MAX} = \frac{P}{2} = \frac{5000\ LB}{} = 5^K$

$M_{MAX} = \frac{PL}{4} = \frac{10,000(4.83')}{4} = 12,075\ FT\text{-}LB = 12.1^{K\text{-}FT}$

CHECK BEAM w/OUT 3/4" X 6" PLATE ON TOP:

A36 STEEL: $F_V = 14.4\ KSI$
$F_b = 23.76\ KSI$

CHECK SHEAR - $f_V = \frac{V}{d\,t_w} = \frac{5^K}{8(.25)} = 2.5\ KSI$

$2.5\ KSI < 14.4\ KSI$ ∴ OK IN SHEAR

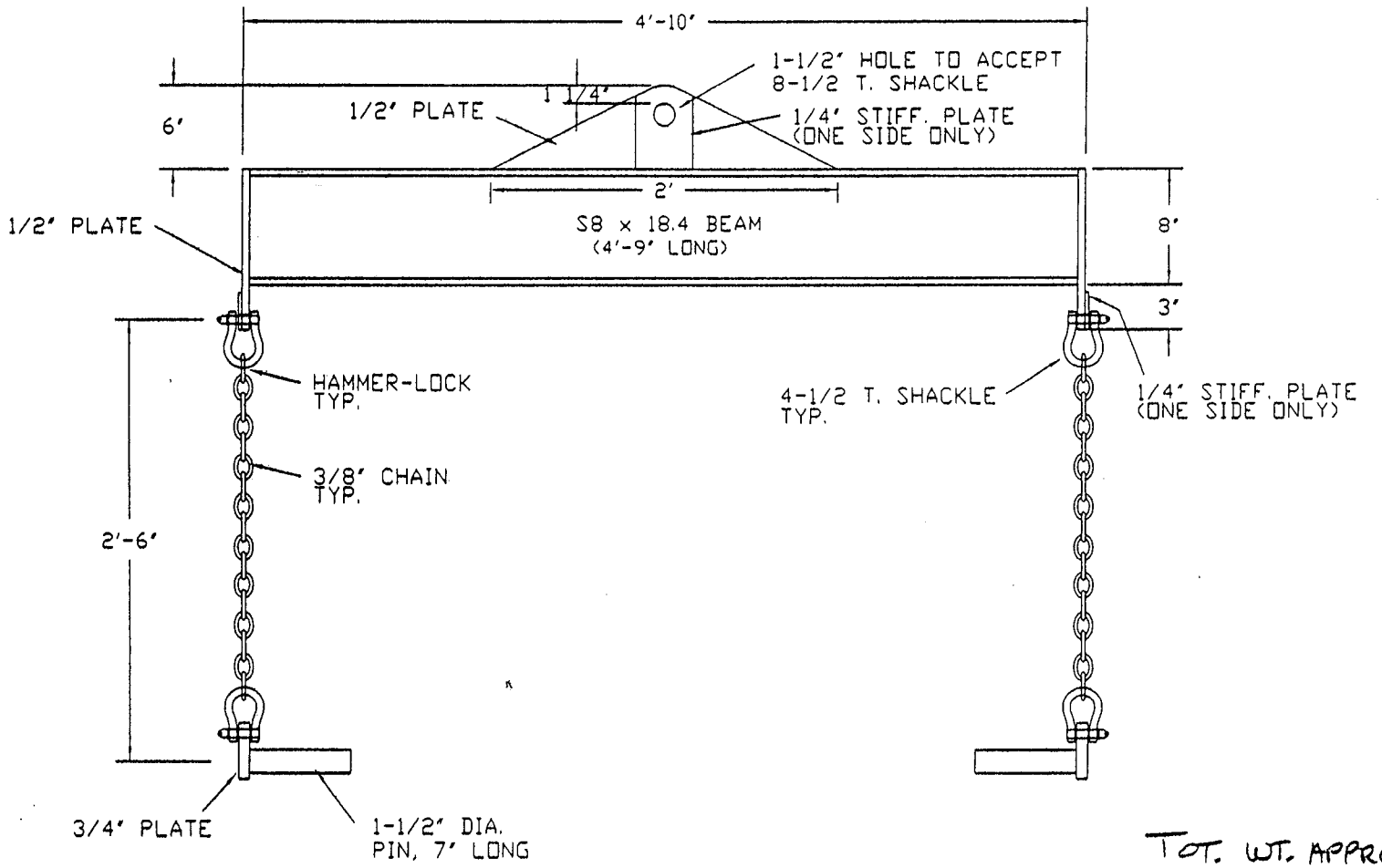
USING M_{MAX}, FIND $S_{X_{REQ'D}}$ -

$S_{X\ REQ'D} = \frac{12.1(12)}{23.76} = 6.1\ IN^3$

$S_{X\ S8X18.4} = 14.4\ IN^3$ ∴ OK S.F. $= \frac{14.4}{6.1} = 2.36$

S8 X 18.4 HAS A S.F. OF 2.36 W/OUT CONSIDERING THE 1/2" X 6" TOP PLATE. BY INSPECTION, AND AS SEEN IN THE PREVIOUS CALCULATION ON THE 5' DIA. MANHOLE SPREADER BEAM, THE S.F. WILL INCREASE WITH THE ADDITION OF THE TOP PLATE.

THEREFORE, OK TO USE S8 X 18.4 FOR SPREADER W/ 10,000 LB LOAD.



TOT. WT. APPROX. 135 LB.

4 FT. DIA. MANHOLE - SPREADER BEAM

SCALE - 1" = 1'-0"

9/9

Attachment C

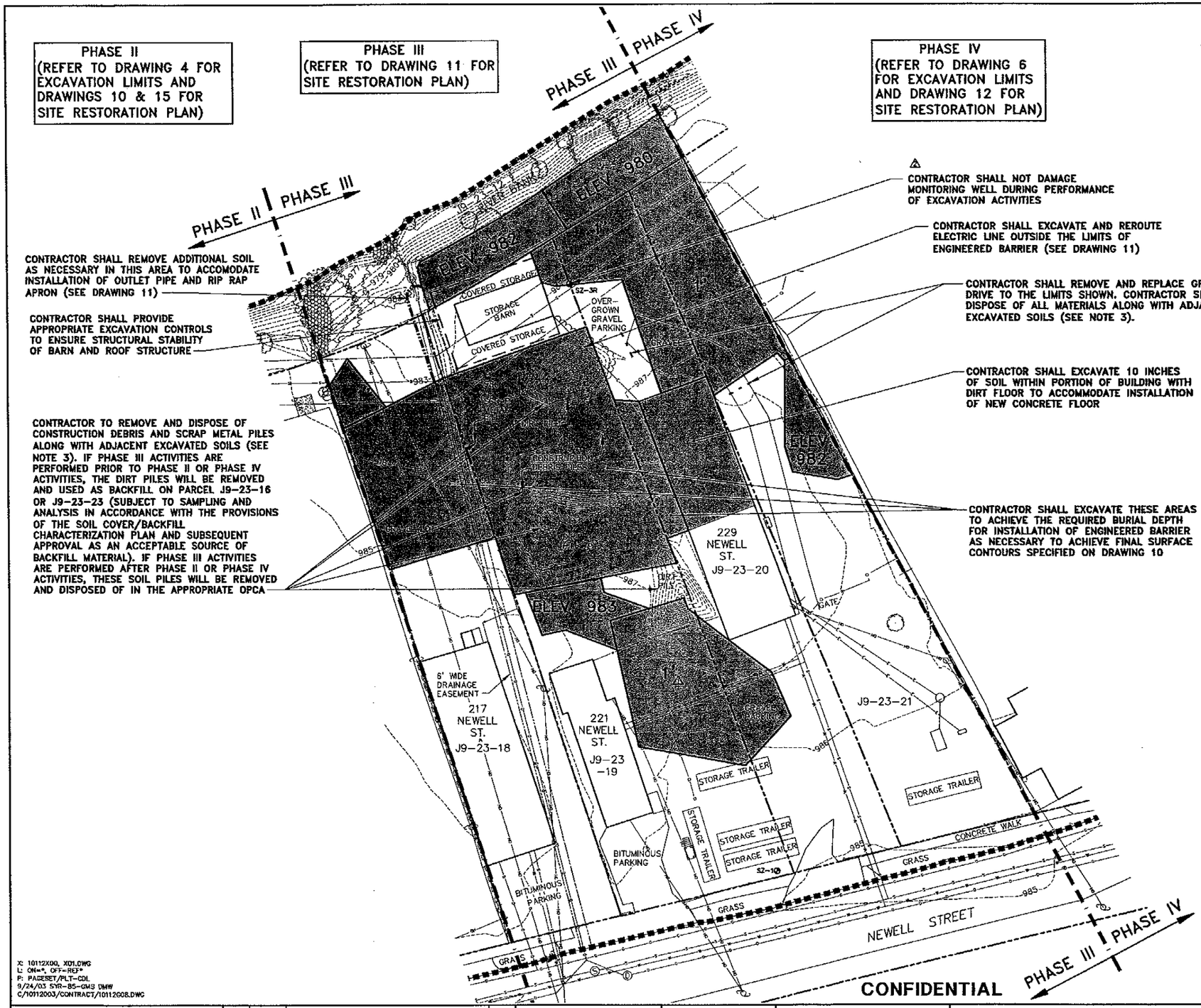
Revised Technical Drawings

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

PHASE II
(REFER TO DRAWING 4 FOR EXCAVATION LIMITS AND DRAWINGS 10 & 15 FOR SITE RESTORATION PLAN)

PHASE III
(REFER TO DRAWING 11 FOR SITE RESTORATION PLAN)

PHASE IV
(REFER TO DRAWING 6 FOR EXCAVATION LIMITS AND DRAWING 12 FOR SITE RESTORATION PLAN)



LEGEND:

- APPROXIMATE RAA BOUNDARY
- PARCEL BOUNDARY
- PHASE BOUNDRY
- EASEMENT
- TOP OF BANK
- WOODEN FENCE
- WIRE FENCE
- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- J9-23-19 PARCEL ID
- RIP RAP
- DECIDUOUS TREE
- EDGE OF BUSHES/HEDGE
- WATER SHUTOFF
- DRAIN MANHOLE
- CATCH BASIN
- GAS METER
- SANITARY MANHOLE
- UTILITY POLE
- SZ-1 MONITORING WELL
- DRAIN LINE
- OVERHEAD WIRES
- GAS SERVICE
- WATER SERVICE
- SANITARY SEWER
- UNDERGROUND ELECTRIC LINE
- BUILDING
- LIMITS OF TSCA/RCRA MATERIAL
- 1' DEPTH OF EXCAVATION
- ELEV. 983 BOTTOM ELEVATION OF EXCAVATION

NOTES:

1. BASE MAP MODIFIED FROM SURVEY BY HILL ENGINEERS, ARCHITECTS & PLANNERS, DATED 8/15/01. CONTOUR INTERVAL IS 1 FOOT.
2. UTILITY LOCATIONS ARE APPROXIMATE AND ALL UTILITIES MAY NOT BE SHOWN. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL CONTACT "DIG-SAFE" AND HAVE ALL UNDERGROUND UTILITIES LOCATED.
3. EXCAVATIONS SHALL BE COMPLETED TO DEPTH OR ELEVATION INDICATED WITHIN SPECIFIED LIMITS. ALL EXCAVATED MATERIALS TO BE DISPOSED OF AT THE APPROPRIATE OPCA.
4. CONTRACTOR SHALL RELOCATE CARS AND MISCELLANEOUS VEHICLES WITHIN THE PROPERTY IN QUESTION PRIOR TO INITIATION OF EXCAVATION ACTIVITIES AND RETURN SUCH VEHICLES UPON COMPLETION OF SITE RESTORATION ACTIVITIES. CONTRACTOR SHALL DOCUMENT (BY PHOTOGRAPHY OR VIDEOTAPE) EXISTING CONDITION OF ALL VEHICLES SUBJECT TO RELOCATION AND WILL BE RESPONSIBLE FOR ANY DAMAGE RESULTING FROM RELOCATION OF THE VEHICLES.
5. QUANTITY AND LOCATION OF STORAGE TRAILERS SHOWN WITHIN THIS DRAWING ARE APPROXIMATE. CONTRACTOR SHALL REMOVE ANY AND ALL STORAGE TRAILERS AS NECESSARY TO FACILITATE EXCAVATION ACTIVITIES, AND RESET AS PART OF RESTORATION ACTIVITIES.
6. THE DRAWING DOES NOT REFLECT ALL NEWLY RESTORED VEGETATION ON J9-23-12. CONTRACTOR IS REQUIRED TO INVENTORY ALL PREVIOUSLY RESTORED TREES AND SHRUBS PRIOR TO PERFORMANCE OF SOIL REMOVAL ACTIVITIES. CONTRACTOR SHALL THEN REMOVE AND DISPOSE OF ALL TREES AND SHRUBS IN ACCORDANCE WITH NOTE 7. ALSO, THE CONTRACTOR IS RESPONSIBLE FOR RESTORING ANY OTHER RIVERBANK RESTORATION MATERIALS IMPACTED DURING PERFORMANCE OF SOIL REMOVAL ACTIVITIES.
7. THE CONTRACTOR SHALL INVENTORY ALL TREES AND SHRUBS LOCATED WITHIN THE LIMITS OF EXCAVATION. THE CONTRACTOR SHALL THEN REMOVE AND DISPOSE OF ALL TREES AN SHRUBS (INCLUDING ROOT SYSTEMS). ABOVE-GRADE PORTIONS OF TREES AND SHRUBS TO BE DISPOSED OF AT A LOCAL PERMITTED RESOURCE RECOVERY FACILITY. PORTIONS OF TREES AND SHRUBS IN CONTACT WITH SITE SOILS WILL BE DISPOSED OF ALONG WITH ADJACENT EXCAVATED SOILS (SEE NOTE 3).

X: 10112X00, X01.DWG
L: ON=*, OFF=REF*
P: PAGESET/PLT-02L
9/24/03 SYR-BS-GMS DMW
C/10112003/CONTRACT/10112G08.DWG

Graphic Scale
30' 0 30' 60'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED BY ANY MEANS. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init
2	9/24/03	REVISED MONITORING WELL NOTE	CRA
1	8/5/03	CHANGED 1-FOOT EXCAVATION FROM NON-TSCA TO TSCA	CRA

Project Mgr. CRA
Designed by CRA/BSS
Drawn by KMD
Checked by LMN/WAR/CRA
Prof. Eng.
PE License

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

GENERAL ELECTRIC COMPANY • PITTSFIELD, MASSACHUSETTS
NEWELL STREET AREA I RAA REMEDIAL ACTION

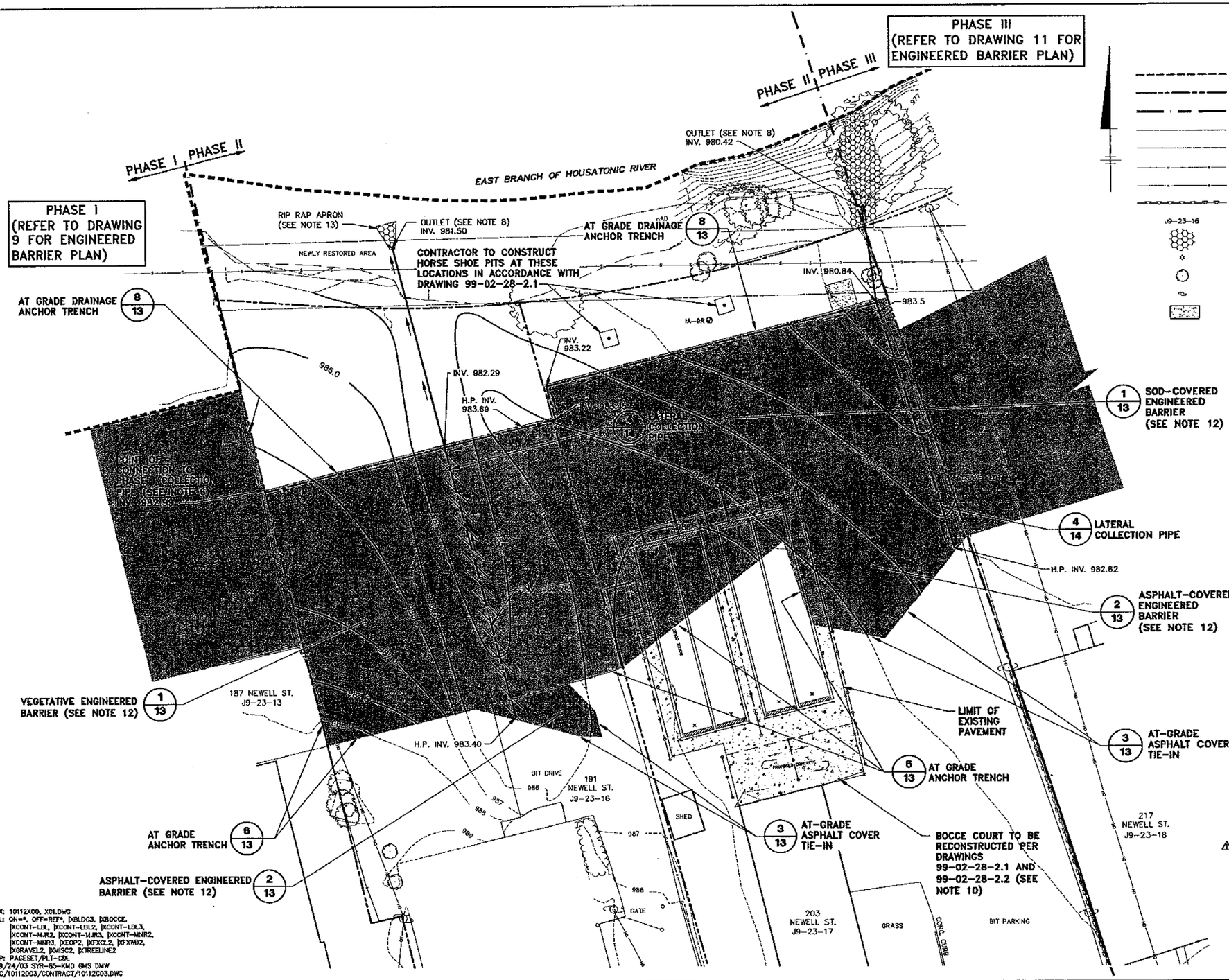
PHASE III EXCAVATION LIMITS

TECHNICAL DRAWINGS

File Number 101.12
Date JULY 2003

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

5



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P: PAGESET/PLT-ENL
9/24/03 SYR-85-KMD GMS DMW
C/10112003/CONTRACT/10112G03.DWG

LEGEND:

- APPROXIMATE RAA BOUNDARY
- PARCEL BOUNDARY
- PHASE BOUNDARY
- EASEMENT
- TOP OF BANK
- WOODEN FENCE
- WIRE FENCE
- GUARDRAIL
- J9-23-16 PARCEL ID
- RIP RAP
- LIGHT POLE
- DECIDUOUS TREE
- UTILITY POLE
- CONCRETE
- MONITORING WELL
- DRAIN LINE
- OVERHEAD WIRES
- SANITARY SEWER
- BUILDING
- ENGINEERED BARRIER (SEE NOTE 5)
- 987.5 PROPOSED CONTOUR (SEE NOTE 3)
- 987.5 EXISTING CONTOUR
- PROPOSED COLLECTION PIPE AND FLOW DIRECTION (SEE NOTE 7)
- PROPOSED OUTLET PIPE AND FLOW DIRECTION (SEE NOTE 9)
- H.P. HIGH POINT
- TEMPORARY EROSION CONTROL MAT (INSTALL PER MANUFACTURER'S RECOMMENDATIONS)

NOTES:

1. BASE MAP MODIFIED FROM SURVEY BY HILL ENGINEERS, ARCHITECTS & PLANNERS, DATED 8/15/01.
2. THIS DRAWING ONLY PRESENTS RESTORATION DETAILS ASSOCIATED WITH INSTALLATION OF ENGINEERED BARRIER. REFER TO DRAWINGS 2 AND 4 FOR OTHER PROPERTY-SPECIFIC RESTORATION DETAILS.
3. PROPOSED CONTOUR INTERVAL IS 0.5 FOOT. EXISTING CONTOUR INTERVAL IS 1 FOOT. PROPOSED CONTOURS REPRESENT TOP OF FINAL GRADE. CONTRACTOR SHALL ESTABLISH LINER GRADING BASED ON TOP OF FINAL GRADE AND REQUIRED COVER THICKNESS. LINER GRADING IN DRAINAGE ANCHOR TRENCHES SHALL BE ADJUSTED AS NECESSARY TO ACHIEVE PIPE INVERT ELEVATIONS.
4. UTILITY LOCATIONS ARE APPROXIMATE AND ALL UTILITIES MAY NOT BE SHOWN. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL CONTACT "DIG-SAFE" AND HAVE ALL UNDERGROUND UTILITIES LOCATED.
5. EDGE OF ENGINEERED BARRIER REPRESENTS OUTER LIMIT OF ANCHOR TRENCH.
6. COLLECTION PIPES FROM PHASE I ENGINEERED BARRIER CONTINUE ONTO PHASE II ENGINEERED BARRIER. IN THE EVENT OF A DELAY BETWEEN CONSTRUCTION OF ENGINEERED BARRIERS FOR ADJACENT PHASES, THE CONTRACTOR SHALL TEMPORARILY TERMINATE THE PHASE II ENGINEERED BARRIER AND EITHER INSTALL REMOVABLE END CAPS ON THE COLLECTION PIPES OR WRAP THE OPEN ENDS OF THE PIPES WITH TWO LAYERS OF NON-WOVEN GEOTEXTILE TO PREVENT THE ENTRY OF BACKFILL OR DEBRIS INTO THE PIPES.
7. COLLECTION PIPES SHALL BE 4"ø PERFORATED SMOOTH-BORE CORRUGATED HDPE. MINIMUM PIPE SLOPE SHALL BE 0.5%.
8. LOCATION OF DOWNSTREAM TERMINATIONS AND INVERT ELEVATIONS OF OUTLET PIPE ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL ADJUST BOTH AS NECESSARY SO THAT A MINIMUM 1% INVERT SLOPE IS MAINTAINED FROM THE EDGE OF THE ENGINEERED BARRIER TO THE DOWNSTREAM TERMINATIONS.
9. OUTLET PIPE SHALL BE 4"ø SOLID WALL CORRUGATED SMOOTH-BORE HDPE.
10. CONTRACTOR SHALL INSTALL NEW BOCCE COURT STRUCTURES REQUIRING LINER PENETRATIONS PRIOR TO LINER INSTALLATION. LINER SHALL THEN BE INSTALLED AROUND PENETRATIONS IN ACCORDANCE WITH DETAIL 6 ON DRAWING 14 (TYPICAL PENETRATION DETAIL). REFER TO DRAWINGS 99-02-28-2.1 AND 99-02-28-2.2 FOR LOCATIONS OF FOUNDATIONS. FOR FINAL GRADING ASSOCIATED WITH THE RECONSTRUCTION OF THE BOCCE COURT, CONTRACTOR SHALL REFER TO DRAWING 99-02-28-2.1.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING APPROPRIATE PIPE FITTINGS AT BENDS, CONNECTIONS, AND/OR INTERSECTIONS.
12. PARCEL J9-23-17 SHALL HAVE AN ASPHALT-COVERED ENGINEERED BARRIER IN THE EXISTING PAVED AREAS AND A SOD-COVERED ENGINEERED BARRIER ELSEWHERE WITH THE EXCEPTION OF THE NEW BOCCE COURTS, WHICH WILL HAVE A MODIFIED ENGINEERED BARRIER. PARCEL J9-23-16 SHALL HAVE AN ASPHALT-COVERED ENGINEERED BARRIER IN EXISTING PAVED AREAS AND A VEGETATIVE ENGINEERED BARRIER ELSEWHERE.
13. ⚠ RIP RAP APRON SHALL USE TYPE 2 RIP RAP. APRON SHALL BE 10 FEET IN LENGTH, 2 FEET IN WIDTH AT UPSTREAM END, AND 8 FEET IN WIDTH AT DOWNSTREAM END.
14. IF PHASE II SITE RESTORATION IS PERFORMED PRIOR TO PHASE I AND PHASE III SITE RESTORATIONS, THE CONTRACTOR WILL BE REQUIRED TO PERFORM A TEMPORARY TERMINATION FOR THE ENGINEERED BARRIER IN ACCORDANCE WITH DETAIL 9 OF DRAWING 13.
15. CONTRACTOR SHALL REPLACE AN EQUAL NUMBER AND TYPE OF TREES AND SHRUBS AS REMOVED DURING SITE PREPARATION ACTIVITIES. ALL RESTORED TREES AND SHRUBS MUST BE INSTALLED AT LEAST 10 FEET OUTSIDE THE LIMITS OF THE ENGINEERED BARRIERS.

CONFIDENTIAL

Graphic Scale
20' 0 20' 40'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED BY ANY MEANS. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init
⚠	9/24/03	REVISED NOTE 13	CRA

Project Mgr. CRA
Designed by BMS/CAA
Drawn by KMD
Checked by JMN/WAR/PHB
Prof. Eng.
PE License

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

GENERAL ELECTRIC COMPANY • PITTSFIELD, MASSACHUSETTS
NEWELL STREET AREA I RAA REMEDIAL ACTION

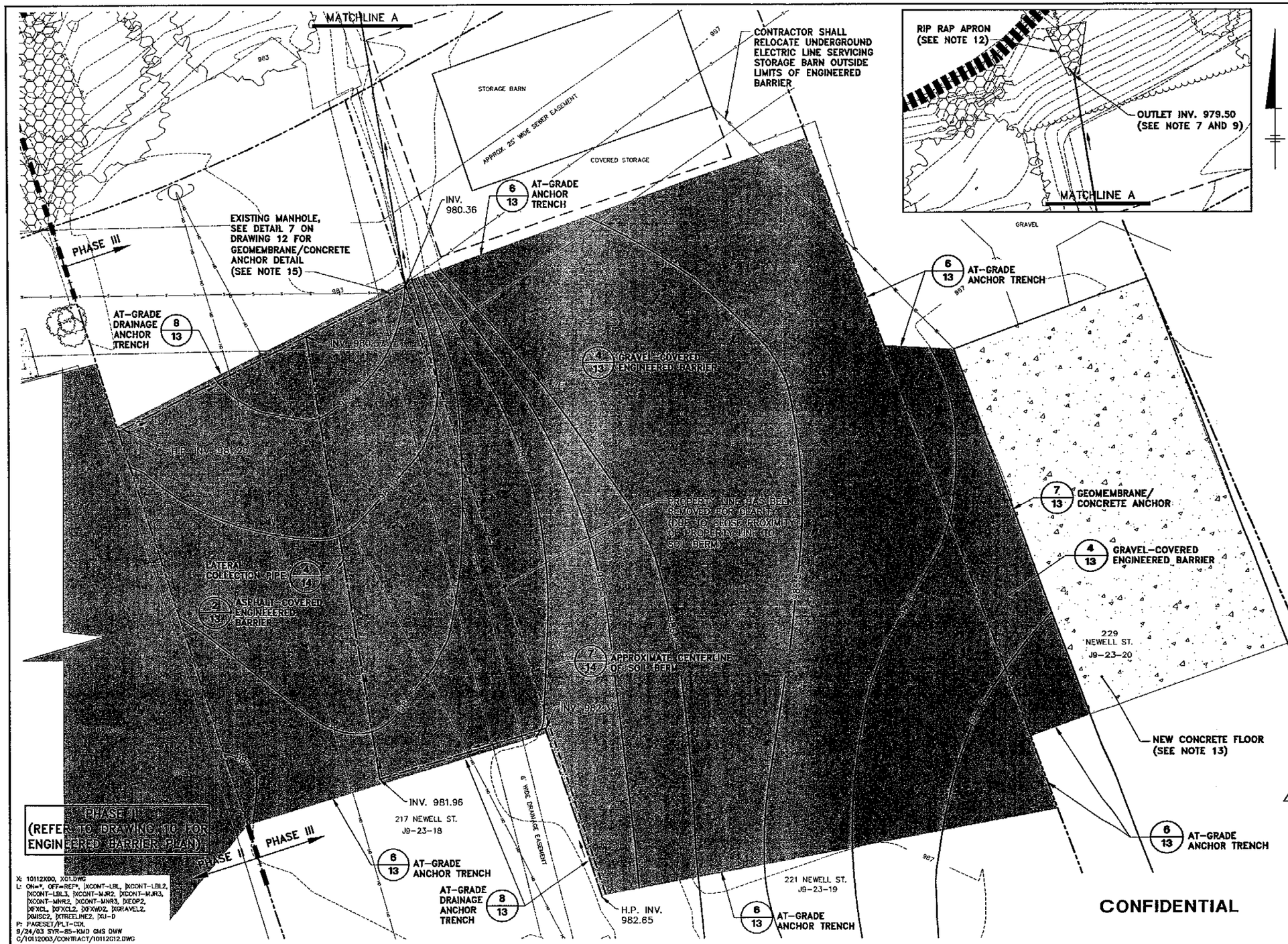
PHASE II
ENGINEERED BARRIER PLAN

TECHNICAL DRAWINGS

File Number 101.12
Date JULY 2003

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

10



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9/24/03 SYR-85-KMD GMS DMW
C/10112003/CONTRACT/10112N12.DWG

LEGEND:

- APPROXIMATE RAA BOUNDARY
- PARCEL BOUNDARY
- PHASE BOUNDRY
- EASEMENT
- TOP OF BANK
- WIRE FENCE
- J9-23-18 PARCEL ID
- RIPRAP
- LIGHT POLE
- DECIDUOUS TREE
- OVERHEAD WIRES
- BUILDING
- ENGINEERED BARRIER (SEE NOTE 5)
- 987.5 PROPOSED CONTOUR (SEE NOTE 3)
- 986 EXISTING CONTOUR
- PROPOSED COLLECTION PIPE AND FLOW DIRECTION (SEE NOTE 6)
- PROPOSED OUTLET PIPE AND FLOW DIRECTION (SEE NOTE 8)
- PROPOSED SOIL BERM (APPROXIMATE CENTERLINE)
- H.P. HIGH POINT

NOTES:

1. BASE MAP MODIFIED FROM SURVEY BY HILL ENGINEERS, ARCHITECTS & PLANNERS, DATED 8/15/01.
2. THIS DRAWING ONLY PRESENTS RESTORATION DETAILS ASSOCIATED WITH INSTALLATION OF THE ENGINEERED BARRIERS. REFER TO DRAWINGS 2 AND 5 FOR OTHER PROPERTY SPECIFIC RESTORATION DETAILS.
3. PROPOSED CONTOUR INTERVAL IS 0.5 FOOT. EXISTING CONTOUR INTERVAL IS 1 FOOT. PROPOSED CONTOURS REPRESENT TOP OF FINAL GRADE. CONTRACTOR SHALL ESTABLISH LINER GRADING BASED ON TOP OF FINAL GRADE AND REQUIRED COVER THICKNESS. LINER GRADING IN DRAINAGE ANCHOR TRENCHES SHALL BE ADJUSTED AS NECESSARY TO ACHIEVE PIPE INVERT ELEVATIONS.
4. UTILITY LOCATIONS ARE APPROXIMATE AND ALL UTILITIES MAY NOT BE SHOWN. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL CONTACT "DIG-SAFE" AND HAVE ALL UNDERGROUND UTILITIES LOCATED.
5. EDGE OF ENGINEERED BARRIER REPRESENTS OUTER LIMIT OF ANCHOR TRENCH.
6. COLLECTION PIPES SHALL BE 4"ø PERFORATED SMOOTH-BORE CORRUGATED HDPE. MINIMUM PIPE SLOPE SHALL BE 0.5%
7. LOCATIONS OF DOWNSTREAM TERMINATIONS AND INVERT ELEVATIONS OF OUTLET PIPE ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL ADJUST BOTH AS NECESSARY SO THAT A MINIMUM 1% INVERT SLOPE IS MAINTAINED FROM THE EDGE OF THE ENGINEERED BARRIER TO THE DOWNSTREAM TERMINATIONS.
8. OUTLET PIPE SHALL BE 8"ø SOLID WALL CORRUGATED SMOOTH-BORE HDPE.
9. THE OUTLET PIPE CONTINUES IN THIS DIRECTION HORIZONTALLY AND DAYLIGHTS AT THE DEFINED OUTLET INVERT ELEVATION. AT THE OUTLET A RIP RAP APRON SHALL BE INSTALLED AS DESCRIBED IN NOTE 12.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING APPROPRIATE PIPE FITTINGS AT BENDS, CONNECTIONS, AND/OR INTERSECTIONS.
11. IF PHASE III SITE RESTORATION IS PERFORMED PRIOR TO PHASE II SITE RESTORATION THE CONTRACTOR WILL BE REQUIRED TO PERFORM A TEMPORARY TERMINATION FOR THE ENGINEERED BARRIER IN ACCORDANCE WITH DETAIL 9 OF DRAWING 13.
12. ⚠ RIP RAP APRON SHALL USE TYPE 2 RIP RAP. APRON SHALL BE 10 FEET IN LENGTH, 2 FEET IN WIDTH AT UPSTREAM END, AND 8 FEET IN WIDTH AT DOWNSTREAM END.
13. CONTRACTOR SHALL PLACE A POLYETHYLENE VAPOR BARRIER BELOW A 4" LAYER OF STONE AND A 6" LAYER OF CONCRETE REINFORCED WITH GALVANIZED WIRE MESH. CONTRACTOR SHALL SUBMIT ALL DETAIL DESIGN INFORMATION (i.e. LOCATION OF CONTROL AND EXPANSION JOINTS).
14. CONTRACTOR SHALL REPLACE AN EQUAL NUMBER AND TYPE OF TREES AND SHRUBS AS REMOVED DURING SITE PREPARATION ACTIVITIES. ALL RESTORED TREES AND SHRUBS MUST BE INSTALLED AT LEAST 10 FEET OUTSIDE THE LIMITS OF THE ENGINEERED BARRIERS.
15. CONTRACTOR TO ADJUST HORIZONTAL ALIGNMENT OF COLLECTION PIPE AS NECESSARY TO CIRCUMVENT EXISTING MANHOLE. ADJUSTMENTS SHALL BE MADE USING 45° ELBOWS.

CONFIDENTIAL

Graphic Scale 10' 0 10' 20'

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No.	Date	Revisions	Init
⚠	8/24/03	REVISED NOTE 12	CRA

Project Mgr. CBA
Designed by BMS/CAA
Drawn by KMD
Checked by JMN/WAR/PHB
Prof. Eng.
PE License

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

GENERAL ELECTRIC COMPANY • PITTSFIELD, MASSACHUSETTS
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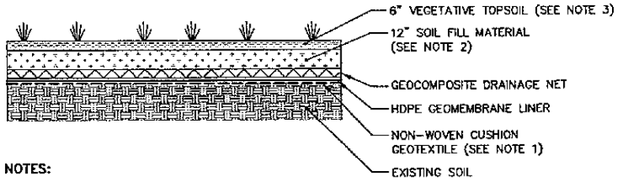
PHASE III
ENGINEERED BARRIER PLAN

TECHNICAL DRAWINGS

File Number 101.12
Date JULY 2003

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

11

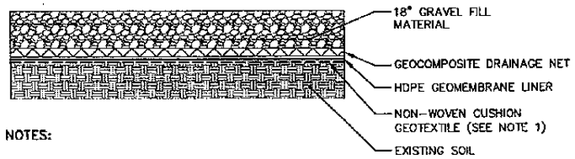


NOTES:

1. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.
2. AT CONTRACTOR'S DISCRETION, SOIL FILL MATERIAL MAY BE REPLACED WITH TOPSOIL.
3. 5 INCH VEGETATIVE TOPSOIL LAYER TO BE REPLACED BY 4 INCH TOPSOIL LAYER AND SOD WHERE NOTED.

VEGETATIVE ENGINEERED BARRIER (1)

NOT TO SCALE

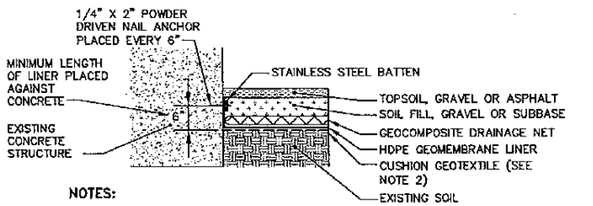


NOTES:

1. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.

GRAVEL-COVERED ENGINEERED BARRIER (4)

NOT TO SCALE



NOTES:

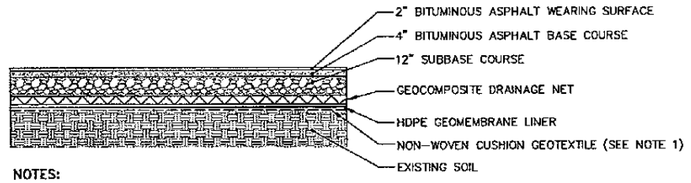
1. THIS DETAIL APPLICABLE TO COVER TERMINATIONS ADJACENT TO BUILDINGS, MANHOLES OR CONCRETE SLABS.
2. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.
3. CONTRACTOR SHALL EVALUATE THE FEASIBILITY OF USING THIS BATTEN STRIP METHOD ON THE MANHOLE PRIOR TO PROCEEDING.

GEOMEMBRANE/CONCRETE ANCHOR (7)

NOT TO SCALE

GENERAL NOTES:

1. GEOSYNTHETICS ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
2. "AT-GRADE" REFERS TO ENGINEERED BARRIERS THAT ARE RECESSED INTO EXISTING GRADE.

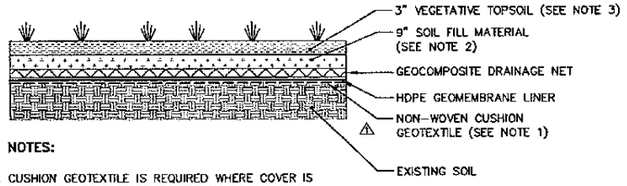


NOTES:

1. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.

ASPHALT-COVERED ENGINEERED BARRIER (2)

NOT TO SCALE

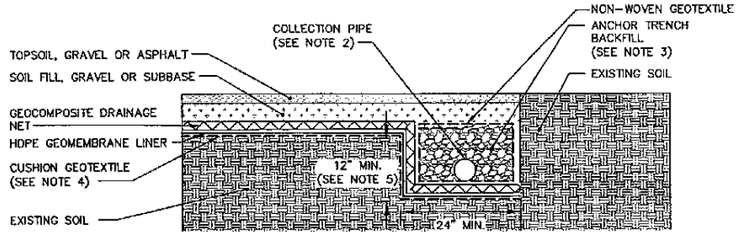


NOTES:

1. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.
2. AT CONTRACTOR'S DISCRETION, SOIL FILL MATERIAL MAY BE REPLACED WITH TOPSOIL.
3. PRIOR TO INSTALLATION OF THIS TYPE OF BARRIER, THE CONTRACTOR SHALL REMOVE AND DISPOSE OF EXISTING VEGETATION.

12" VEGETATIVE ENGINEERED BARRIER (5)

NOT TO SCALE

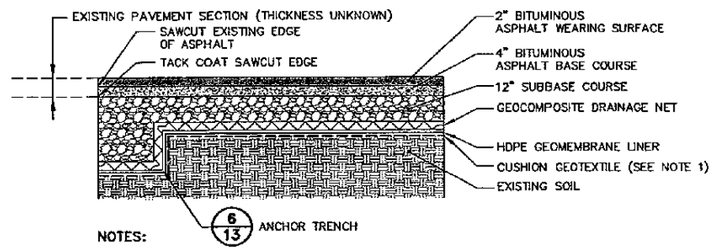


NOTES:

1. THIS DETAIL APPLICABLE TO AT-GRADE COVER TERMINATIONS WITH COLLECTION PIPES.
2. COLLECTION PIPE SHALL BE 4"ø PERFORATED SMOOTH-BORE CORRUGATED HDPE.
3. ANCHOR TRENCH SHALL BE BACKFILLED WITH FILTER STONE WRAPPED IN NON-WOVEN GEOTEXTILE.
4. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.
5. ANCHOR TRENCH DEPTH MAY EXCEED 12-INCH MINIMUM AS NECESSARY TO ACHIEVE COLLECTION PIPE INVERTS SHOWN ON DRAWINGS 9 THROUGH 12.

AT-GRADE DRAINAGE ANCHOR TRENCH (8)

NOT TO SCALE

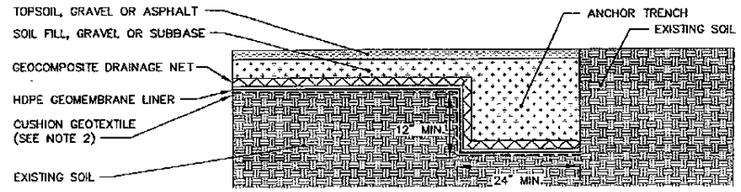


NOTES:

1. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.

AT-GRADE ASPHALT COVER TIE-IN (3)

NOT TO SCALE

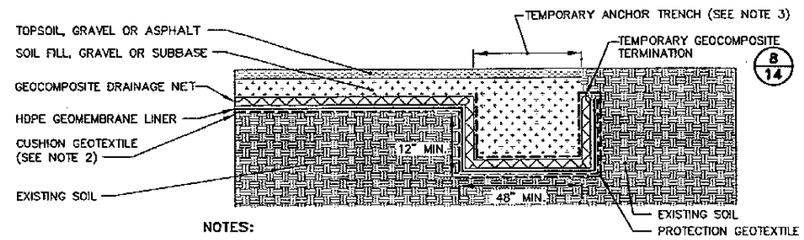


NOTES:

1. THIS DETAIL APPLICABLE TO AT-GRADE COVER TERMINATIONS WITHOUT COLLECTION PIPES.
2. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.

AT-GRADE ANCHOR TRENCH (6)

NOT TO SCALE



NOTES:

1. THIS DETAIL APPLICABLE TO TEMPORARY AT-GRADE COVER TERMINATIONS.
2. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE UNCOMPACTED NATIVE MATERIAL.
3. UPON CONTINUATION OF ENGINEERED BARRIER CONSTRUCTION, THE CONTRACTOR SHALL CAREFULLY EXCAVATE TEMPORARY ANCHOR TRENCH BACKFILL, DISCARD PROTECTION GEOTEXTILE, AND BACKFILL TEMPORARY ANCHOR TRENCH.
4. IT IS RECOMMENDED THAT THE CONTRACTOR MARK OR RECORD THE LOCATION OF THE TEMPORARY ANCHOR TRENCH TO MINIMIZE DAMAGE TO THE GEOSYNTHETICS FOR FUTURE CONTINUATION OF ENGINEERED BARRIER.

TEMPORARY AT-GRADE TERMINATION (9)

NOT TO SCALE

CONFIDENTIAL

X: 10112X00.DWG
L: ON=*, OFF=*REF*
P: PAGESET/PLT-CDL
9/24/03 SYR-BS-KMD ROC-BS-SLM SYR-BS-GMS, DMW
C/10112003/CONTRACT/10112G05.DWG

Graphic Scale: NOT TO SCALE

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No.	Date	Revisions	Init
1	9/24/03	REVISED DETAIL 1 AND DETAIL 5.	CRA

Project Mgr. CBA
Designed by DMS/CAA
Drawn by JER
Checked by JMN/WAR/PHG
Prof. Eng.
PE License

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

GENERAL ELECTRIC COMPANY • PITTSFIELD, MASSACHUSETTS
NEWELL STREET AREA I RAA REMEDIAL ACTION

COVER DETAILS

TECHNICAL DRAWINGS

File Number 101.12
Date JULY 2003

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
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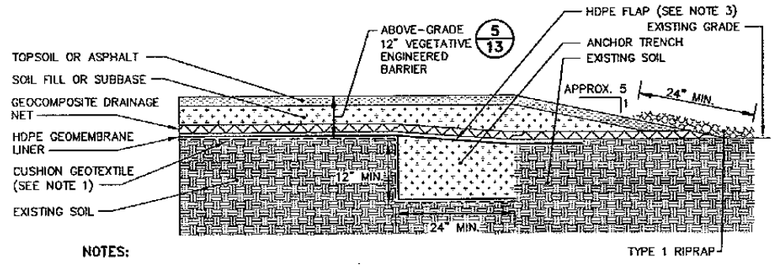
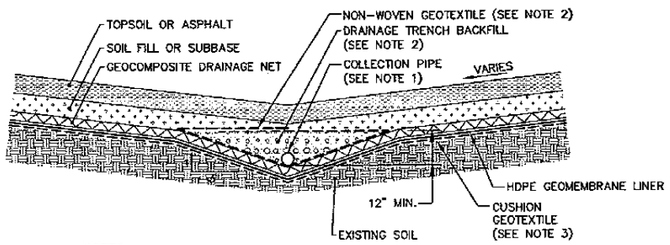


NOTES:

1. THIS DETAIL APPLICABLE TO ABOVE-GRADE COVER TERMINATIONS.
2. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE NATIVE MATERIAL.
3. THE CONTRACTOR SHALL INSTALL AN HDPE FLAP TO THE TOP OF THE LINER TO MINIMIZE PONDING WATER IN THE ANCHOR TRENCH. THE FLAP SHALL BE OF THE SAME MATERIAL AS THE LINER, BE LARGE ENOUGH TO SPAN THE ANCHOR TRENCH, AND BE CONTINUOUSLY WELDED TO THE TOP OF THE LINER. PRIOR TO INSTALLING THE FLAP, THE CONTRACTOR SHALL TERMINATE THE LINER IN THE ANCHOR TRENCH AND BACKFILL THE ANCHOR TRENCH.

⚠ ABOVE-GRADE TERMINATION (1)

NOT TO SCALE

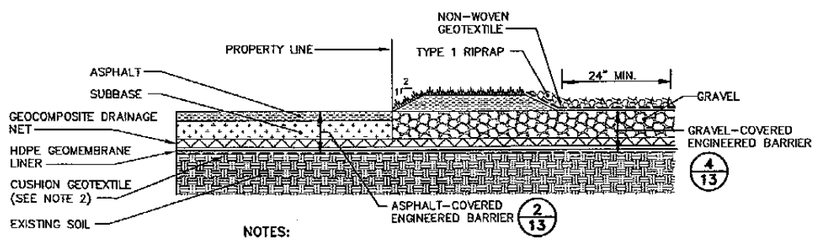


NOTES:

1. COLLECTION PIPE SHALL BE 4"ø PERFORATED SMOOTH BORE CORRUGATED HDPE.
2. DRAINAGE TRENCH TO BE BACKFILLED WITH FILTER STONE WRAPPED IN NON-WOVEN GEOTEXTILE. GEOTEXTILE SEAM TO BE SEWN.
3. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE NATIVE MATERIAL.

LATERAL COLLECTION PIPE (4)

NOT TO SCALE

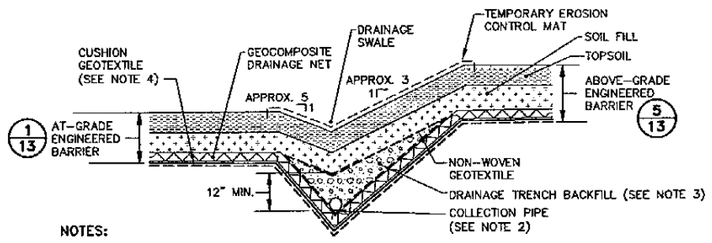


NOTES:

1. SOIL BERM SHALL BE COMPOSED OF TOPSOIL AND SOD.
2. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE NATIVE MATERIAL.

SOIL BERM (7)

NOT TO SCALE

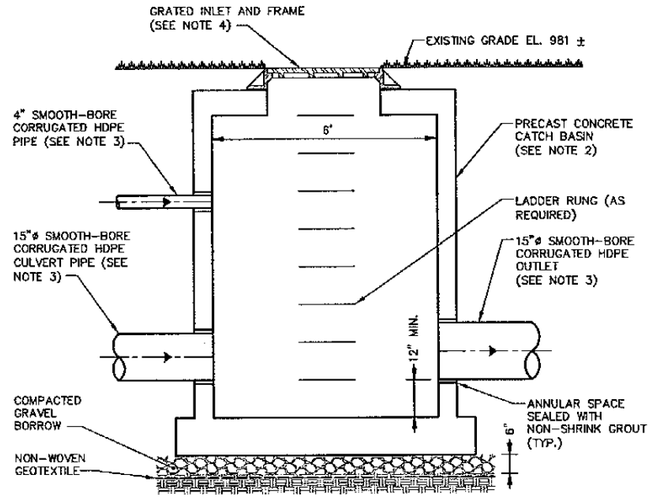


NOTES:

1. THIS DETAIL APPLICABLE TO DRAINAGE SWALES WITH A COLLECTION PIPE.
2. COLLECTION PIPE SHALL BE 4"ø PERFORATED SMOOTH-BORE CORRUGATED HDPE.
3. DRAINAGE TRENCH SHALL BE BACKFILLED WITH FILTER STONE WRAPPED IN NON-WOVEN GEOTEXTILE. GEOTEXTILE SEAM TO BE SEWN.
4. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE NATIVE MATERIAL.

DRAINAGE SWALE/LATERAL COLLECTION PIPE (2)

NOT TO SCALE



NOTES:

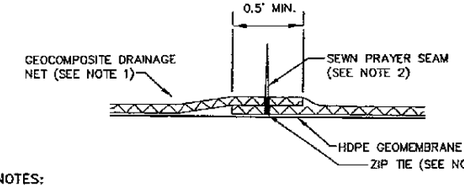
1. REFER TO DRAWING 12 FOR APPROXIMATE LOCATION OF CATCH BASIN.
2. PRECAST CONCRETE MANHOLE SHALL BE RATED FOR H-20 LOADING.
3. REFER TO DRAWING 12 FOR INVERT ELEVATIONS.
4. GRATED INLET AND FRAME SHALL BE RATED FOR H-20 LOADING. CONTRACTOR TO DETERMINE APPROPRIATE SIZE AND CONFIGURATION. GRATE SHALL BE CAPABLE OF PASSING 1 CFS WITH 1 INCH OF HEAD.

MANHOLE DETAIL (5)

NOT TO SCALE

GENERAL NOTES:

1. GEOSYNTHETICS ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
2. "ABOVE-GRADE" REFERS TO ENGINEERED BARRIERS THAT ARE CONSTRUCTED ON TOP OF EXISTING GRADE.
3. "AT-GRADE" REFERS TO ENGINEERED BARRIERS THAT ARE RECESSED INTO EXISTING GRADE.

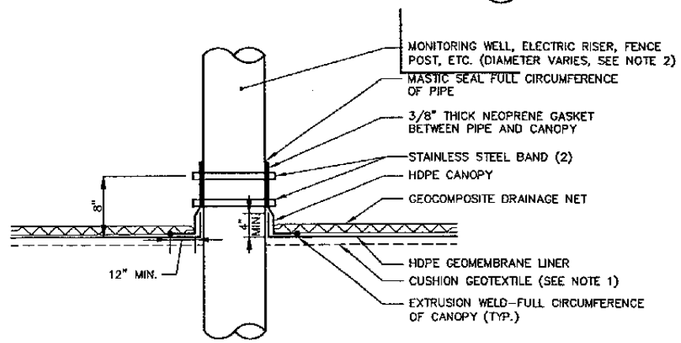


NOTES:

1. ALL GEOCOMPOSITE SHALL SHINGLE DOWNSLOPE.
2. THE TOP GEOTEXTILE COMPONENTS OF THE TWO GEOCOMPOSITE LAYERS SHALL BE PEELED BACK SO THAT A PRAYER SEAM MAY BE SEWN ABOVE THE GEOCOMPOSITE OVERLAP.
3. IF GEOTEXTILE IS UNABLE TO BE PEELED BACK WITHOUT CAUSING DAMAGE, A PATCH OF GEOTEXTILE SHALL BE HEAT BONDED TO THE TOP GEOTEXTILE LAYER OF THE OVER THE SEAM.
4. ZIP TIES SHALL BE PLACED EVERY 5' ALONG ADJACENT PANELS AND EVERY 6" ALONG BUTT SEAMS AND IN ANCHOR TRENCHES.

TYPICAL GEOCOMPOSITE SEAM (3)

NOT TO SCALE

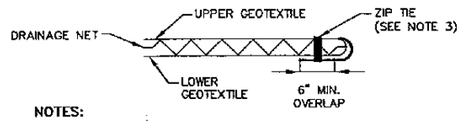


NOTES:

1. CUSHION GEOTEXTILE IS REQUIRED WHERE COVER IS INSTALLED ABOVE NATIVE MATERIAL.
2. THIS DETAIL MAY BE USED FOR OTHER PENETRATIONS THROUGH THE GEOSYNTHETICS.

GEOSYNTHETICS PENETRATION SEAL (6)

NOT TO SCALE



NOTES:

1. THIS DETAIL APPLICABLE TO TEMPORARY TERMINATION OF GEOSYNTHETICS, WHERE NECESSARY.
2. DRAINAGE NET AND LOWER GEOTEXTILE SHALL BE CUT SO THAT THE UPPER GEOTEXTILE MAY BE WRAPPED AROUND THE END OF THE GEOCOMPOSITE.
3. ZIP TIES SHALL BE PLACED EVERY 5' ALONG THE EDGES OF THE GEOCOMPOSITE.

TEMPORARY GEOCOMPOSITE TERMINATION (8)

NOT TO SCALE

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X: 10112X00.DWG
L: ON=*, OFF=REF*
P: PAGESET/PLT-CDL
9/24/03 SYR-85-KMD ROC-85-SLM SYR-85-GMS, DMW
C/10112003/CONTRACT/10112G11.DWG

Graphic Scale: NOT TO SCALE

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No.	Date	Revisions	Init
⚠	9/24/03	REVISED DETAIL 1 AND ADDED NOTE 3.	CRA

Project Mgr. CRA
Designed by BMS/CAA
Drawn by JER
Checked by JMN/WAR/PHB
Prof. Eng.
PE License

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

GENERAL ELECTRIC COMPANY • PITTSFIELD, MASSACHUSETTS
NEWELL STREET AREA I RAA REMEDIAL ACTION

COVER DETAILS

TECHNICAL DRAWINGS

File Number 101.12
Date JULY 2003

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

Attachment D

Revised Materials and Performance Specifications

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

MATERIALS AND PERFORMANCE - SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. All labor, materials, services, and equipment necessary to complete the earthwork activities as depicted on the Technical Drawings and/or as directed by GE or GE's Representative.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-01400 – Responsibilities of CQA Parties

B. Section MP-02207 – Restoration of Surfaces

C. Section MP-02222 – Fill Materials

D. Section 3.22 – Air Monitoring

E. Section 3.23 – Dust Suppression

F. Section 3.24 – Soil Removal and Disposition

G. Section 3.28 – Material Handling and Staging

1.03 SUBMITTALS

A. Contractor's proposed equipment and compaction method(s).

1.04 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS

A. American Society for Testing and Materials (ASTM).

1.05 DEFINITION

A. Earthwork is defined to include, but is not limited to, clearing, pavement removal, rough grading, excavation for subgrades, trenching, handling and disposal of surplus materials, maintenance of excavations, removal of water, backfilling operations, embankments and fills, and compaction.

PART 2 - PRODUCTS

Specified elsewhere.

PART 3 - EXECUTION

3.01 UNAUTHORIZED EXCAVATION

A. The Contractor shall not be entitled to any compensation for excavations carried beyond or below the lines and subgrades prescribed on the Technical Drawings. The Contractor shall refill such unauthorized excavations at its own expense and in conformance with the provisions of this section.

B. Should the Contractor, through negligence or for reasons of its own, carry its excavation below the designated subgrade, appropriate materials specified in Section MP-02222 - Fill Materials shall be furnished and placed as backfill in sufficient quantities to reestablish the required subgrade surface. Fill material used for backfilling shall be spread and compacted in conformance with the requirements of later subsections of this section and to the percentage compaction outlined therein. The cost of any tests required as a result of this refilling operation shall be borne by the Contractor.

C. All material that slides, falls, or caves into the established limits of excavations due to any cause whatsoever, shall be removed and disposed of at the Contractor's expense and no extra compensation will be paid to the Contractor for any materials ordered for refilling the void areas left by the slide, fall, or cave-in.

3.02 BACKFILL MATERIALS

A. Fill material shall be used as specified for backfill. Requirements for off-site fill material are specified in Section MP-02222 - Fill Materials.

B. Existing on-site material, designated as "native fill" or "existing soil" material shall not be used as backfill.

3.03 GENERAL BACKFILLING REQUIREMENTS

A. Backfill shall be started at the lowest section of the area to be backfilled.

B. Drainage of the areas being backfilled shall be maintained at all times.

C. Areas to be backfilled shall be inspected prior to backfilling operations. All unsuitable materials and debris shall be removed.

D. Backfill material shall not be placed when moisture content is too high to allow proper compaction.

E. When material is too dry for adequate compaction, water shall be added to the extent necessary.

F. Backfill material shall not be placed on frozen ground nor shall the material itself be frozen or contain frozen soil fragments when placed.

G. No calcium chloride or other chemicals shall be added to prevent freezing.

H. Material incorporated in the backfilling operation that is not in satisfactory condition shall be subject to rejection and removal at the Contractor's expense.

I. The maximum lift thickness is 12 inches (measured prior to compaction).

J. For backfill placed directly over geosynthetics (i.e., in areas where engineered barriers are installed), the minimum lift thickness is 12 inches. If the final backfill thickness is less than 12 inches, the contractor shall remove the excess material by back-blading to prevent operation of placement equipment on geosynthetics with less than 12 inches of cover.

K. With the exception of compaction equipment, all equipment used to place and grade backfill over geosynthethics shall be low ground pressure equipment.

3.04 METHOD OF COMPACTION

A. General

1. The Contractor shall adopt compaction methods that shall produce the degree of compaction specified herein, prevent subsequent settlement, and provide adequate support.
2. Methods used shall avoid disturbance to underlying fine-grained soils, subsurface utilities, and the geosynthetics used in the engineered barriers.
3. Before filling or backfilling is begun, the Contractor shall submit in its Operations Plan the equipment and method for compaction which it proposes to use.
4. Hydraulic compaction by ponding or jetting shall not be permitted.
5. Backfill material shall not be left in an uncompacted state at the close of a day's construction.
6. Prior to terminating work, the final layer of compacted fill, after compaction, shall be rolled with a smooth-drum roller if necessary to eliminate ridges of soil left by tractors, trucks or other equipment used for compaction.
7. As backfill progresses, the surface shall be graded such that no ponding of water shall occur on the surface of the fill.
8. Fill shall not be placed on snow, ice or soil that was permitted to freeze prior to compaction.
9. Unsatisfactory materials shall be removed prior to fill placement.

B. Equipment: Unless otherwise specified on the Technical Drawings or in this RFP, equipment for compaction shall be the largest equipment consistent with space limitations of the work areas and the need to protect adjacent facilities.

1. Compaction of fill material in confined areas shall be accomplished by means of a drum-type, power driven, hand-guided vibratory compactor, or by hand-guided vibratory plate tampers.
2. If the proposed method does not produce the degree of compaction required, an alternate method shall be adopted until the required compaction is achieved.
3. The moisture content of backfill or fill material shall be adjusted, if necessary, to achieve the required degree of compaction.

C. Minimum Compaction Requirements

1. Unless otherwise specified on the Technical Drawings or in this RFP, the degree of compaction specified for the various items listed in Table 1 shall be the minimum allowable.

2. Unless the Contractor can successfully demonstrate that its methods shall produce the required degree of compaction, materials to be compacted shall be placed in layers not exceeding the uncompacted thicknesses listed in Table 1.

3. In-place density tests shall be required at a minimum of one test per each lift of backfill placed or at a frequency of 1 passing test per 2,500 square feet of subgrade, 100 cubic yards of soil fill, or 100 linear feet of trench, whichever is greater.

4. GE or GE's Representative may order additional in-place density tests to ascertain conformance with the compaction requirements shown in Table 1.

5. The Contractor shall dig test holes at no additional cost to GE when requested for the purpose of taking an in-place density test below the current fill level.

6. The Contractor shall provide free access to trenches and fill areas for the purpose of making such tests. Payment for all compaction tests shall be made by the Contractor.

7. The Contractor shall anticipate time needed due to testing procedures and shall not have claims for extra compensation occasioned by such time.

8. Minimum field compaction requirements in Table 1 are expressed as a percentage of the maximum dry unit weight of the material compacted using the Modified Proctor Compaction Test (ASTM D1557).

TABLE 1

Type of Backfill	Maximum Uncompacted Lift Thickness[1] (inches)	Minimum Compaction (percent)
1. Subgrade -Native Soil	Not applicable	Proof-rolling
2. Embankments and Fills	12	90
3. Pipe Trenches	8	92
4. Pipe and Manhole Bedding	8	92
5. Road and Parking Lot Subbase	8	95
6. Topsoil	8	Compact by placing/grading only

Note:
1. Maximum uncompacted lift thicknesses do not apply to backfill placed directly over geosynthetics in areas receiving engineered barriers.

9. Laboratory compaction curves for the full range of soil materials shall be provided by the Contractor.

10. When proof-rolling existing (or native) soils, the layer shall be acceptable when deformations caused by substantial site equipment (e.g., roller, fully loaded dump truck) are no deeper than 1 inch. All soft or wet materials that continue to deform more than 1 inch shall be removed and replaced with suitable material.

3.05 GRADING

A. After the completion of all fill and backfill operations, the Contractor shall grade the site to the lines, grades, and elevations shown on the Technical Drawings, taking into account any subsequent site restoration requirements (e.g. installation of engineered barriers).

3.06 EXISTING FACILITIES

A. General

1. Existing subsurface facilities may be encountered during construction of the work, or located in close proximity to the work.

2. These facilities may include, but are not necessarily limited to, sewers, drains, water mains, conduits and their appurtenances. These facilities may not be shown on the Technical Drawings. However, the sizes, locations, and heights or depths, if indicated, are only approximate and the Contractor shall conduct its operations with caution and satisfy itself as to the accuracy of the information given. The Contractor shall not claim nor shall it be entitled to receive compensation for damages sustained by reason of the inaccuracy of the information given or by reason of its failure to properly maintain and support such structures.

3. There may be other subsurface facilities, the existence and/or location of which are not known, such as individual water and gas services, electrical conduits, storm drains, etc. The Contractor shall consult with GE or GE's Representatives of such facilities and, if possible, shall determine, prior to construction, the location and depth of any such facilities that may exist in the area to be excavated.

4. If underground facilities are known to exist in an area but their location is uncertain, the Contractor shall exercise reasonable care in its excavation technique to avoid damage to them.

5. The Contractor shall notify Massachusetts DIGSAFE at least 72 hours prior to any site work.

B. Notification and Protection Procedures

1. Except where superseded by state or local regulations, or in the absence of any applicable regulations, the Contractor shall, at a minimum, include the following procedures in its operations:

a) Prior to Excavating:

1) Determine correct field location of all nearby underground facilities or arrange for Representatives of the utilities to locate them.

2) Notify owners of nearby underground facilities when excavation is to take place, allowing them reasonable time to institute precautionary procedures or preventive measures which they deem necessary for protection of their facilities.

3) In cooperation with owners of nearby facilities, provide temporary support and protection of those underground facilities that may be especially vulnerable to damage by virtue of their physical condition or location, or those that could create hazardous conditions if damaged.

b) Immediately notify any utility owner of any damage to its underground facilities resulting from the Contractor's operations, and arrange for repairs to be made as soon as possible.

c) In case of an electrical short, or escape of gas or hazardous fluids (resulting from damage to an underground facility), immediately notify the local Fire Department and all persons who might be endangered and assist in evacuation of people from the area.

3.07 OTHER REQUIREMENTS

A. Unfinished work

1. When, for any reason, the work is to be left unfinished, all trenches and excavations shall be filled and all roadways and watercourses left unobstructed with their surfaces in a safe and satisfactory condition. The surface of all roadways shall have temporary pavement.

B. Hauling Material on Street

1. When hauling material over the streets or pavement, the Contractor shall provide suitably tight-sealing vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same as often as required to keep the crosswalks, streets, and pavements clean and free from dirt, mud, stone, and other hauled material.

2. When hauling materials that contain PCBs or other hazardous constituents, the Contractor shall abide by all applicable federal, state, and local codes, including, but not limited to, manifesting and placarding (if necessary).

C. Dust Control

1. It shall be the sole responsibility of the Contractor to control the dust created by any and all of its operations to such a degree that it will not endanger the safety and welfare of the general public.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02222

FILL MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Specified

1. Work under this section shall include, but not necessarily be limited to, supplying all labor and materials, excavating, transporting, dumping, spreading, and compacting fill material in the locations and to the depth shown on the Technical Drawings and/or as directed by GE or GE's Representative.

B. Applicable Standards and Specifications

1. American Society for Testing Materials (ASTM).
2. American Association of State Highway and Transportation Officials (AASHTO).

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-01400 – Responsibilities of CQA Parties

B. Section MP-02200 – Earthwork

1.03 SUBMITTALS

A. Refer to Sections 3.2 and 3.35 of the Conditions of Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fill materials shall be of the types listed below:

1. Soil Fill:

a. Soil fill material shall be free from excessive moisture, frost, stumps, trees, roots, sod, muck, marl, vegetable matter, or other unsuitable materials, and demonstrated to be clean based on chemical analysis. Soil fill shall consist of clean common earth fill free from organic material, coatings, sharp angular stones, and other deleterious materials, and shall have a maximum particle size of 3 inches. Soil fill shall have the following gradation by weight:

Percent Passing	Sieve
100	3-inch
10-30	No. 200

b. Soil fill placed in the upper 6 inches beneath geosynthetics in the engineered barrier areas shall have a maximum particle size of 1 inch. With the exception of maximum particle size, all other material requirements for 1-inch minus soil fill shall conform to 2.01(A)(1)(a) of this section.

Alternatively, the Contractor may propose the use of 3-inch minus soil fill (in accordance with 2.01(A)(1)(a) of this section) within the upper 6 inches in engineered barrier areas in lieu of 1-inch minus soil fill provided a non-woven cushion geotextile (conforming to 2.02(C) of Section 02232) is placed between the top surface of the soil fill and the HDPE flexible membrane liner. If the Contractor elects to exercise this option, the Contractor shall indicate the resulting cost savings to GE. The use of non-woven cushioning geotextile and 3-inch minus soil fill in lieu of 1-inch minus soil fill shall only be considered if it results in a cost savings to GE.

2. Subbase/Gravel:

a. Subbase/gravel shall have a percentage of wear, by the Los Angeles test, of not more than 45. Fine aggregate shall consist of natural or crushed sand. The composite material shall be free from clay, loam or other plastic material, and shall conform to the following grading requirements:

Sieve Designation	Percent Passing
2-inch	100
1.5-inch	70 - 100
3/4-inch	50 - 85
No. 4	30 - 55
No. 50	8 - 24
No. 200	3 - 10

b. Sampling and testing shall be in accordance with the following standard AASHTO methods:

Sieve Analysis – T27
Passing No. 200 (75μm) – T11

3. Filter Stone:

a. Material placed above collection piping shall be washed, rounded run-of-bank gravel, with a d_{max} of 1 ½-inches and a d_{min} of 3/4-inches.

b. Filter stone shall be wrapped with non-woven geotextile as shown on the Technical Drawings.

4. Riprap:

a. Type 1 Riprap shall have a d_{50} of 2 inches and a d_{max} of 4 inches and be placed in an 8-inch thick layer.

b. Type 2 Riprap shall have a d_{100} of 12 inches, a d_{85} of 10 inches, a d_{50} of 8 inches, and a d_{15} of 5 inches and be placed in an 18-inch thick layer.

c. Riprap shall be underlain by a layer of non-woven geotextile.

B. Backfill material shall be inspected prior to placement and all roots, vegetation, organic matter, or other foreign debris shall be removed.

C. With the exception of riprap, stones larger than 6 inches in any dimension shall be removed or broken. Additional size requirements for backfill placed within 6 inches of the bottoms of engineered barriers are as specified.

D. Stones shall not be allowed to form clusters with voids.

PART 3 - EXECUTION

3.01 FILL PLACEMENT

A. In general, fill material shall be placed and compacted in horizontal layers not exceeding those thicknesses indicated in Section MP-02200 - Earthwork. Subgrade that will receive fill material shall be first approved by GE or GE's Representative. Fill material shall not be placed on ground that will not support the weight of construction equipment.

B. Each layer of fill material shall be thoroughly tamped or rolled to the required degree of compaction by mechanical tampers or vibrators. Successive layers shall not be placed until the layer under construction has been thoroughly compacted.

C. Where required, the Contractor shall, at its own expense, moisture-condition the fill to meet the compaction requirements. If the material is too wet for satisfactory compaction due to rain or other causes, it shall be allowed to dry or be removed as required before compaction.

D. No compaction is required for riprap.

3.02 FIELD TESTING AND QUALITY CONTROL

A. In-place nuclear density testing (ASTM D2922 and D3017) shall be performed by an independent testing laboratory, at the Contractor's expense, at the frequency specified in Section MP-02200 - Earthwork.

B. If a defect (e.g., insufficient layer thickness, materials that exceed particle size requirements, etc.) is discovered in a finished fill material layer, GE or GE's Representative will determine the extent and nature of the defect by additional testing, observation, a review of records, or other means that GE or GE's Representative deems appropriate. The Contractor shall be responsible for correcting all deficiencies to the satisfaction of GE or GE's Representative.

3.03 CRITERIA AND TOLERANCES

A. Fill material shall be constructed to such heights as to make allowance for post-construction settlement. Any settlement that occurs before final acceptance of the Contract shall be corrected to make the backfill conform to the required lines and grades.

- END OF SECTION -