SAFETY PROGRAM

General Sheet Metal Contractor
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ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

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ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

HVAC Industrial Architectural Metal
EXPERTISE
PERFORMANCE • TRAINING • STANDARDS

I. POLICY STATEMENT ON SAFETY AND HEALTH

The safety and health of all employees of Ernest D. Menold, Inc. are of primary importance. The prevention of work-related injuries shall be given precedence over operating productivity. ALL personnel shall practice safety at ALL times. Only safe methods and equipment shall be used.

Recognizing that all must share the responsibilities for safety, we establish the following:

1. Ernest D. Menold, Inc. accepts responsibilities for enacting, maintaining and improving our company's safety and health standards and expects full cooperation toward the prevention of occupational (job-related) accidents, injuries and/or illnesses.

2. Ernest D. Menold, Inc. has designated Kevin Moore as the Ernest D. Menold, Inc. Safety Coordinator and is responsible to Ernest J. Menold, President, on all matters relating to safety and health.

3. The Safety Coordinator will be responsible for developing the proper attitudes toward safety and health in all employees and for insuring that all operations are performed with the utmost regard for the safety of all.

4. The Safety Coordinator will be responsible to see that all employees have received training in the safe performance of their job.

5. Each employee is responsible for wholehearted cooperation with all aspects of safety and health, including compliance with all rules and regulations and for continuously practicing safety while performing his or her duties.

6. Ernest D. Menold, Inc.'s safety standards shall include:
   - Compliance with all applicable safety laws, rules and regulations
   - Regular and frequent safety meetings to provide education and training on safety and health matters
   - Regular and frequent safety inspections to identify and eliminate unsafe working conditions and practices
   - Prompt and thorough investigation of every accident to determine what caused it and to correct the problem so that it will not happen again

The Ernest D. Menold, Inc. Safety and Health program is designed to reduce the number of injuries to a minimum. Our goal is ZERO Work-Related accidents, injuries and illnesses.

Ernest J. Menold, P.E.
President

Kevin Moore
Safety Coordinator

NOTE: This Policy Statement shall be posted on the Shop Bulletin Board and at all Job sites.

II. SAFETY DISCIPLINARY PROGRAM

POLICY

It is the responsibility of every employee at Ernest D. Menold Inc. to observe all company policies, work, and safety rules. The enforcement of these rules is the responsibility of the Safety Coordinator, Project Managers, and Shop Foreman. Disciplinary action will consist of a written "Notice of Noncompliance" (See Section XXXI. Miscellaneous Forms). A copy of which will be entered into the violators personnel file.

PROCEDURE

A safety violation is a failure to adhere to company safety policies. A list of these general policies can be found in Section VIII – GENERAL SAFETY PRACTICES CODE FOR SHOP OPERATIONS and Section X- GENERAL SAFETY PRACTICES CODE FOR FIELD OPERATIONS.

If a violation occurs it is up to the Safety Coordinator, Project Manager, or Shop Foreman to fill out a written "Notice of Noncompliance" form (See Section XXXI.) A copy of this form must be provided to the employee, the Safety Coordinator, and the Personnel Office.

After issuance of the "Notice of Noncompliance" form to the employee a meeting must be held within five days. This meeting must be attended by the violator, the issuer of the "Notice of Noncompliance", and the Safety Coordinator. This meeting will discuss the infraction and inform the individual(s) of the corrective action to be taken.

VIOLATIONS

First Offense - Written Reprimand.

Second Offense - Written Reprimand.

Third Offense - Termination of Employment.

Foremen, Project Managers, and Supervisors are also bound by the same levels of disciplinary action. If action is taken toward a foreman, supervisor, etc., it should be documented either by a memorandum or by a letter to the individual. It may be necessary to have the individual sign a separate statement confirming that they have received and understand the action taken, and then placing the statement along with the copy of the letter in the employees file.

III. INSPECTIONS & ACCIDENT INVESTIGATION POLICY

JOB SITE INSPECTIONS

The foreman of each job site and/or workplace must make a thorough inspection at least once each week. Even areas, which are used infrequently, shall be inspected weekly.

Housekeeping, stairway lighting, work methods, equipment, tools, etc., should be examined to discover hazardous conditions that may have escaped routine detection. Special attention should be paid to things or conditions that have caused injury or illness on the particular job or have caused injury or illness on other jobs.

Ladders, scaffolds and all rigging equipment shall be thoroughly inspected. Defective equipment or tools shall be immediately tagged and returned to the shop for repair or disposal.

Any and all unsafe or unhealthy places or conditions shall be immediately corrected or reported, in writing, to Kevin Moore, the company's designated safety coordinator.

Unsafe and unhealthy conditions at the job site, even though these conditions result from work performed by others and are the responsibility of the owner or the General Contractor, are of serious concern to the employees and management of Ernest D. Menold, Inc. It is absolutely essential that where Ernest D. Menold, Inc. does not have the responsibility or the authority to eliminate unsafe conditions at the job site, these conditions must be reported, in writing, to the owner's or General Contractor's safety coordinator.

SHOP INSPECTION

A thorough inspection of all shop areas shall be made at least once a week. Special attention should be given to areas, which are used infrequently, such as storage areas for volatile materials.

Housekeeping, stairways, lighting, work methods, equipment, tools, etc., should be examined to discover hazardous conditions that may have escaped routine detection. Special attention should be paid to things or conditions that have caused injury or illness.

All shop machinery and equipment should be inspected for proper setup, placement of safety guards, maintenance, etc.

Special attention should be given to the inspection of material handling and hoisting equipment in the shop. Slings and chains used for hoisting materials and equipment should be inspected and equipment limit switches activated to assure their proper operation.

INSPECTION REPORT

A "Weekly Inspection Report" form (See Section XXXI Miscellaneous Forms.) shall be used to record all unsafe conditions, recommendations for correction, and actions taken. This record shall be kept current and maintained in a clean and legible manner.
Any and all company activities are subject to immediate inspection at any time. All company activities shall be conducted in full compliance with applicable federal and state safety standards and shall be ready for compliance inspection at all times.

ACCIDENT REPORTING

All incidents/accidents regardless of the severity **must** be reported within the hour of occurrence. This will allow for a proper accident investigation as well as adequate reporting to insurance to safeguard both the employee as well as Ernest D. Menold Inc. Any employee and/or foreman who do not report an incident/accident within the designated time will be subject to disciplinary action under the Ernest D. Menold Inc. "Safety Disciplinary Program" (See Section II. Safety Disciplinary Program).

ACCIDENT INVESTIGATION

The job site foreman or the shop foreman must investigate each accident immediately. The Ernest D. Menold, Inc. "Accident Investigation Report" form (See Section XXXI. Miscellaneous Forms) shall be completely filled out by the job site foreman or shop foreman for each accident or injury when it occurs. The foreman shall transmit this form promptly to Kevin Moore, the designated Safety Coordinator for his review.

Corrective action shall be taken promptly. Remember, by correcting past mistakes we can help prevent future injuries.

IV. Incident Investigation Reporting

I. Purpose – Ernest D. Menold Inc. is dedicated to the safety of all of its employees. As an ongoing effort to protect them in the best manners available, Ernest D. Menold Inc. has implemented the Emergency Response Program as well as the Incident Investigation Reporting procedures contained in this document. While all incidents should be investigated, the extent of such investigations shall reflect the seriousness of the incident. These incidents will use a root cause analysis process for such investigations.

II. Scope

A. To set a standard for prompt reporting, investigation, and documentation of injuries, illnesses, and near misses for the purposes of:

1. Providing information to determine injury rates, identify trends and/or problem areas.
2. Identifying causal and root cause factors.
3. Indentifying deficiencies in overall safety program.
4. Suggesting and implementing corrective action(s).

III. Personnel Responsibility – The following is a list of job specific duties. All necessary duties must be Pre-determined and assigned prior to any incidents.

A. Employees

1. All employees, upon hire, must complete an Employee Emergency Medical Profile which provides Ernest D. Menold Inc. with medical information and contact persons in case of emergency.
2. Each employee must immediately report all incidents (with or without injuries), regardless of how minor to their supervisor or to the Safety Coordinator. If incidents are not reported in a timely manner violators will be subject to the Ernest D. Menold disciplinary procedures.
3. Any employees designated as first responders shall be properly trained in necessary rescue procedures as well as trained and qualified in first aid techniques.

B. Foremen and Project Managers

1. Upon notification by employee, the foreman/project manager must immediately take all steps necessary to provide emergency rescue/ and or medical help for the injured and ill.
2. Immediately take actions that will prevent or minimize the risk of further injury, or property damage.
3. Take necessary steps to secure the scene of the incident as later outlined in this document.
4. Must determine the severity of the incident and notify the appropriate persons accordingly. These steps can be found under Notification Procedure.

5. Must insure that all forms and reports are completed and submitted to the appropriate departments within 24 hours of incident.

IV. Notification Procedure

A. All reporting procedures **MUST** be posted.

B. The following is a general guideline to determine the severity of incidents and proper notification procedures: (When you are on a jobsite, the clients notification procedure takes precedence)

1. Call 911
2. Secure the scene following the procedures outlined in section V of this program.
3. Contact Owner Client regarding all incidents including injuries, spills, property damage, fires, explosions, vehicle damage etc. within 24 hours.
4. Contact the company Safety Coordinator.
5. OSHA must be reported to if the incident results in a fatality or the hospitalization of three or more employees.
6. Conduct an investigation using the procedures outlined in section VI of this program..

V. Securing the Scene

A. It is the Foreman/ Project Managers responsibility to secure the scene of the incident and to ensure a thorough investigation. This includes preventing exposure to body fluids as well as other hazardous conditions. All efforts must be made to secure the area, equipment, tools etc.

B. The foreman/project manager is responsible for taking the necessary steps to prevent any further losses. This would include possible evaluation of structural integrity, removal of hazardous materials, cleanup of spills etc.

C. Utilize one or more of the following to secure the scene:

1. Barricade the area.
2. Designate an employee(s) to monitor the area.
3. Provide for the collection of transient or perishable evidence.

VI. Investigation Procedure

A. The Ernest D. Menold Inc. Incident Investigation Report shall be utilized as the major investigation tool.

B. The proper equipment shall be available in the form of an investigation kit that will include:

1. Camera
2. Tape Recorder
3. Measuring Devices
4. Sample containers
5. Interview/ Investigation forms
6. Flashlight
7. Barricade markers
8. Tape
9. Tags
10. Padlocks
11. Bags for collecting evidence
12. Latex Gloves

C. The initial investigation will include a listing of people present, equipment, materials, environmental factors, illumination, temperature, etc.

D. Attention to preservation of evidence will include such things as position of equipment, papers, and other physical evidence. These will be preserved and collected through notes, photographs, witness statements, and seizing of documents if necessary.

E. Witness interviews will be conducted and the five W approach will be used for general questioning (Where. When, Who, What, Why). All interviews should be conducted in a quiet and private place. The witnesses should be made aware that they may be called for subsequent interviews.

VII. Training

A. Formal training on the Ernest D. Menold Inc. Incident Investigation and Reporting procedure will be conducted by the Company Safety Coordinator. All employees will be instructed on their duties as outlined in Section II. of this procedure. Other specific areas of training will include:

1. Providing emergency response.
2. Properly securing the area.
3. Proper use of the investigation kit.
4. Proper techniques of securing the evidence.
5. How to interview witnesses and proper documentation of said interviews.
6. All employees designated as first responders will be qualified in first aid and CPR.

7. How to fill out all applicable forms (See section XXXI. Miscellaneous Forms)
8. How to Identify Causal Factors using root cause analysis.

B. Refresher training will be conducted annually.

VIII. Incident Reports and Logs

A. All applicable investigating report forms and logs must be filled in entirety, leaving no blank spaces. Incident investigation forms should include a written introduction, methodology, summary of the incident, name of the investigator(s), synopsis of the event, photographs, witness testimonies, drawings, and any other evidence collected.

IX. Causal Factors and Corrective Action

A. The purpose of incident investigation and reporting is to identify Causal Factors and to eliminate those factors through corrective action.

B. Causal Factors and corrective actions will be determined and implemented through a team effort involving: supervisors, employees, safety personnel, and management. Trends can be recognized as a result of accurate reporting and this allows for continuous safety management improvements across the company. All corrective actions will be documented. Documentation will include assigned responsibilities and progress until close of implementation.

C. Lessons learned from investigations will be reviewed and communicated to all employees in an effort to prevent re-occurrences.

V. SAFETY INCENTIVE PROGRAM

The Ernest D. Menold, Inc. Safety Incentive Program is designed to recognize those employees who contribute through the safe performance of their assigned tasks and promote our Company Safety Program.

Rules for Safety Awards

1. There will be "Menold Safety Award" presented at the end of each Quarter and a "Special Safety Award" presented in December.

2. The value of the Year End Safety award will be determined by total number of lost time accidents and the total number of reportable accidents that occur during the year for the entire company.

3. "Lost Time" accidents, for the purpose of this program, shall be defined as any accident, which results in the employee losing one or more working days.

4. "Recordable" accidents, for the purpose of this program, shall be defined as any accident, which is reported on the OSHA 300 form, and results in medical expenses.

Eligibility Requirements for the Quarterly Safety award are:

1. All employees who are employed at the end of the Quarter and who meet the eligibility criteria listed below will receive a Safety Award.

2. Any employee who has a lost time accident during the Quarter will be ineligible.

3. Any employee who has a recordable accident during the Quarter will be ineligible.

Eligibility Requirements for the Year end award are:

1. All employees who have worked more than 800 hours during the calendar year and who meet the eligibility criteria listed below will receive a Safety Award. At the time of the award, hours will be projected to the end of December.

2. Any employee who has a lost time accident during the year will be ineligible.

3. Any employee who has two or more reportable accidents during the year will be ineligible.

4. Any accident occurring in the month of December will be carried forward to the next calendar year and will not be counted in the current year's Safety Award Program.

VI. Motor Vehicle Operating Policy

All employees operating company vehicles or operating personal vehicles on company business are subject to the following policy:

- Only authorized employees will drive a company vehicle in the course of work related activities.
- You are authorized only to operate the vehicle assigned to you by your supervisor. Vehicles should be used only for conducting the necessary company business that you have been specifically assigned. Supervisors must approve all tasks requiring the use of company vehicles and all other motor vehicles before they are performed.
- You must have a valid driver's license and the correct license needed for the vehicle you have been assigned. Notify your supervisor and DO NOT OPERATE THE VEHICLE if you are not properly licensed.
- NEVER OPERATE A VEHICLE unless you have received training in the inspection, operation and maintenance of the vehicle you have been assigned and understand what is required of you.
- Inspect your assigned vehicle before and after each trip following the established company procedure. NEVER operate a vehicle that does not pass your inspection. Document the results of your inspection on the appropriate form and notify your supervisor.
- Be sure all necessary documentation (driver's license, owner card, insurance card etc.) is in the vehicle before it is used.
- If seat belts and shoulder harnesses are installed, drivers and passengers must wear them at all times. DO NOT operate a vehicle unless you and your passengers are wearing safety belts and shoulder harnesses.
- DO NOT allow anyone to operate your assigned vehicle or be a passenger unless authorized by your supervisor.
- Immediately notify your supervisor of any legal citations received while operating a vehicle on or off the job.
- Report all accidents following established company procedures.
- Do not operate a vehicle under the influence of alcohol, illegal drugs or hazardous prescription medication. Do not ride with anyone under the influence of alcohol, illegal drugs or hazardous prescription medication.

- The use of cell phones unless hands free devices are used is prohibited.
- Texting while driving is prohibited.
- Obey all posted speed limits and traffic laws.
- Always maintain a safe driving distance between you and other drivers.
- Obey all traffic laws, and operate your vehicle in a safe and courteous manner at all times.
- Loads shall be secured and shall not exceed the vehicle manufacturer's specifications and legal limits.

Any one failing to obey these rules will be disciplined under the Safety Disciplinary Program.

VII. Sheet Metal Contractors Association of Philadelphia and Vicinity and Sheet Metal Workers' Local Union # 19

DRUG AND ALCOHOL FREE WORKPLACE POLICY

Sheet Metal Contractors Association of Philadelphia and Vicinity
and
Sheet Metal Workers' Local Union # 19

DRUG AND ALCOHOL FREE WORKPLACE POLICY

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Amended February 2008

PURPOSE FOR POLICY

It is the policy of Ernest D. Menold, Inc. to maintain a healthy work environment that is safe and conducive to high standards and production. This policy covers the possession or use of illegal drugs and/or alcohol by employees and contractors in the workplace. This policy was not designed to comply with any federally mandated drug testing programs.

Ernest D. Menold, Inc. recognizes that alcohol and illegal drug use present serious problems in the work place. We believe that prevention, education, and rehabilitation will significantly reduce these problems in the workplace. The objective of this policy is to ensure the safety, health, and general well-being of our employees and those individuals exposed to the workplace including the customers, the customer's employees, and the general public.

Ernest D. Menold, Inc.'s commitment is to maintain productive employees; to cooperate with the owners of our projects, their agents and representatives; to comply with all applicable Federal, State and Local regulations; and to prevent work related accidents and the loss of skilled and valued employees.

STATEMENT OF POLICY

1. The possession, use, manufacture, dispensation, sale or distribution of alcohol and/of illegal drugs while on-the-job or while on company or customer property is prohibited and may result in a referral for substance abuse testing, treatment and/or education or disciplinary action which may include termination.

2. For safety reasons, an employee who has been prescribed a drug or over-the counter medication should consult with his or her personal physician regarding any adverse reactions, which would impede mental or physical ability. If a threat exists to workplace safety, the employee must inform his/her supervisor accordingly. While on-the-job, all medications should be stored in its original container.

3. The use, possession, or dispensation of prescribed medications by anyone other than the person to whom it was prescribed or in any manner inconsistent with the prescription is in violation of this policy.

4. Employees are prohibited from being under the influence of any alcohol or

illegal drugs while on company premises or any job site, while on company business, or while in a company-supplied vehicle.

5. Upon observation by at least two (2) individuals (a company representative and a union steward, if available), any employee reasonably suspected of being under the influence of illegal drugs and/or alcohol will be immediately removed from the worksite. The employee will be referred to the industry sponsored Members Assistance Program (MAP) for an evaluation by a Substance Abuse Professional (SAP), which may include substance abuse testing. The employee will be transported to a substance abuse testing site and/or home pending an evaluation. In all cases, a representative of the union will be notified immediately.

6. Following the determination of the SAP, an employee who is suspended from work for reasons of this policy may be reinstated in accordance with the provisions of the Collective Bargaining Agreement.

7. Any employee who has been removed from a job in accordance with this policy is required to comply with all recommendations for substance abuse treatment and/or education awareness by the SAP, MAP or E/ASAP. All recommendations must be satisfactorily completed; any non-compliance may result in disciplinary action, including termination.

8. Employees who violate or are non-compliant with any aspect of this policy including, but not limited to, receiving a confirmed positive test result (GC/MS); refusing to submit to testing; or falsifying, tampering with, and/or influencing the outcome of the test results, may be subject to disciplinary action, including termination.

DEFINITIONS

1. Alcohol: means any alcoholic or intoxicating beverage, including all forms of distilled alcohol or other preparation containing distilled (methyl or ethanol) alcohol.

2. Illegal Drug: Refers to drugs and controlled substances of which the manufacture, distribution, dispensation, sale, possession, or use is illegal. The term “illegal drug” also refers to controlled substances, which include prescription drugs, which are not being used for prescribed purposes or in a prescribed manner. The term “illegal drugs” does not mean the use of a

controlled substance pursuant to a valid prescription or other uses authorized by law.

3. Controlled Substance: any substance falling within Schedules I through V of Section 812 of the Title 21 of the United States Code.

4. Prescribed Medication: means any medication and/or over-the-counter drug, legally obtained for medical purposes and used in a manner indicated by a physician or the manufacturer.

5. Employee: means any individual who performs work for Ernest D. Menold, Inc. and who is covered under the Collective Bargaining Agreement between Sheet Metal Workers' International Local Union # 19 and the Sheet Metal Contractors Association of Philadelphia and Vicinity, and non-collectively bargained employees of the Company.

6. Company Premises: Includes any company or customer facility, property or work site; any company or customer owned or leased vehicle, vessel, garage, tool box, storage facility, or other equipment.

7. On the Job: means any time the employee is acting on behalf of the company or customer, on compensatory time, or subject to company supervision.

8. Under the Influence: means that an illegal drug, controlled substance or alcohol is detected in an employee by means of a urine, blood, or breath test specimen for such substances, the results of which equal or exceed the cut-off levels established by the Department of Health and Human Services (DHHS). In some cases, a determination of 'under the influence' may be established by a Substance Abuse Professional's (SAP) opinion.

9. Substance Abuse Testing: means the obtaining of a urine, blood, or breath test specimen at an assigned collection site or at a qualified medical facility for the purpose of determining the presence or absence of illegal drugs or alcohol. Samples are sent to a Department of Health and Human Services (DHHS) qualified laboratory, maintaining DHHS Standards for the proper chain of custody. The samples are analyzed and all positive results are confirmed by a second Gas Chromatography/Mass Spectrometry (GC/MS) tests.

10. Collection Site or Medical Facility: means any laboratory, hospital, clinic, physician office or other designated facility, either off or on the company's premises at which test samples are collected. Samples shall be collected with

due respect to the privacy of the individual being tested, maintaining DHHS Standards for the proper chain of custody to prevent substitution or Interference with the sample.

11. Medical Review Officer (MRO): or Clinical Toxicologist means a person specifically trained in the area of substance abuse and qualified by the Department of Health and Human Services (DHHS) who is responsible for receiving donor test results and interpreting and evaluating an individual's medical history or other relevant information.

12. Confirmation Testing: means a second test is performed on the donor's initial Enzyme Immunoassay (EMIT) sample to substantiate results of a prior "positive" test by using the Gas Chromatography/Mass Spectrometry (GC/MS) principle which has greater accuracy to yield a "confirmed positive" test result.

TESTING

Reasonable Suspicion/For Cause: Substance abuse testing may be required when an employee is suspected of using or being under the influence of an illegal drug and/or alcohol based on observations of impaired job performance, behavior, or actions. At least (2) individuals (a company representative and a union steward, if available) must witness this behavior, action, or performance. Examples of such job performance, behavior or circumstances include, but are not limited to:

a) the physical symptoms or manifestations of being under the influence of a drug and/or alcohol on the job;

b) the direct observation of drug and/or alcohol use while on the job; or

c) the evidence that an employee is involved in the use, possession, sale, solicitation or transfer of drugs and/or alcohol while on the job, on company premises, or while operating the company's vehicle, machinery, or equipment.

All substance abuse testing pursuant to this policy will be performed by a laboratory selected by the MAP, and the test results will be interpreted by the Medical Review Officer (MRO). When a confirmed positive result has been

returned by the laboratory, the tested employee shall be interviewed by the MRO regarding the test results and given the opportunity to explain the positive result.

REPORTING/CONFIDENTIALITY

Under this Policy, all testing results will be reported to the Administrators of the Sheet Metal Workers' of Local Union No. 19 Health and Welfare Fund ("Fund"), only, and the Fund shall maintain the confidentiality of the information subject to the following provisions. The Fund, through a Confidentiality Officer, shall report positive test results received from the MRO to the employee's employer and to the Hiring Hall Administrator. No other persons will be given test results unless required by law or upon the written authorization of the employee.

The Fund shall maintain all test results and related information including, but not limited to, interviews, reports, statements and other communications, in the strictest of confidence and where required based on HIPAA confidentiality standards. Such records shall be maintained in secure files separate from any personnel or any other files, under the control of the Fund. After a period of two (2) years, the Fund shall destroy all test results and related information.

Unless required to monitor the return to work status of the employee, the Hiring Hall Administrator shall destroy any notices of positive results, and once any monitoring is completed such notices and records will be destroyed.

An employer receiving a positive test result notice shall keep such notice, and any further evidence of the completion of the program described in paragraph 7 of this Policy, confidential and shall not release such information to any other person unless required by law or upon written authorization of the employee. The Employer shall maintain all test results and related documentation in secure files, separate from any personnel or any other files. After a period of two (2) years, the employer shall destroy all test results and related information.

MEMBER ASSISTANCE PROGRAM

The Sheet Metal Contractors Association and the Sheet Metal Workers Local Union # 19 have made available a Member Assistance Program (MAP) that offers assistance with resolving personal problems including, but not limited to, alcohol and substance abuse. All eligible members or apprentices are encouraged to seek help for substance abuse, family difficulties, or other emotional problems. All voluntary self-referrals to the MAP are strictly confidential and no information will be disclosed without the employee's written authorization. All work related disciplinary referrals will be conducted in compliance with Ernest D. Menold, Inc.'s Drug and Alcohol Free Workplace Policy.

EDUCATION/AWARENESS SUBSTANCE ABUSE PROGRAM (E/ASAP)

The Sheet Metal Contractors Association and the Sheet Metal Workers Local Union # 19 have sponsored an education/awareness substance abuse program (E/ASAP) to address drug and/or alcohol abuse safety related issues and to increase awareness of their impact on quality of life in the workplace and union. The E/ASAP program will identify behavior, lifestyle issues and patterns of abuse that affect health, safety and productivity in the workforce. Employees are encouraged to incorporate a pattern of change and to develop a drug free philosophy. Any employee referred to this E/ASAP under this Drug and Alcohol Free Workplace Policy is required to successfully complete this program.

TERMS/CHANGES TO POLICY

1. This policy shall be governed in accordance with all applicable Federal, State, and Local regulatory or statutory requirements.

2. Nothing in this policy should be construed or is intended to supersede the Collective Bargaining Agreement.

3. Amendments to this policy may be developed jointly by the Sheet Metal Contractors Association and the Sheet Metal Workers Local Union # 19 to reflect changes subsequent to the effective date.

Joseph Sellers, Jr.
PRESIDENT/BUSINESS MANAGER
SMWIA/LOCAL UNION # 19

Ernest J. Menold
PRESIDENT
SHEET METAL CONTRACTORS ASSOCIATION OF PHILA. AND VICINITY

CERTIFICATE OF ACKNOWLEDGMENT

I hereby acknowledge that I have received and reviewed the Sheet Metal Contractors Association (SMCA) and the Sheet Metal Workers Local Union # 19 (SMWLU #19) Drug and Alcohol Free Workplace Policy.

I agree to comply with the requirements of the SMCA and SMWLU # 19 Drug Free Workplace Policy. Specifically, I consent to any and all drug testing called for by this policy as a condition of my employment.

I further agree to authorize the release of my drug and/or alcohol test results to the SMWLU #19 Health and Welfare Fund Administrators in accordance with this Policy. I also understand that the Medical Review Officer (MRO) will notify me of any positive test results.

I have read in full and understand the above statements and conditions of the SMCA and SMWLU #19 Drug Free Workplace Policy.

Date_____ _____

Employee Name (please print clearly)

_____

Employee Social Security Number

_____

Employee Signature

_____

Witness

DISTRIBUTION

Original—Employer's Personnel File
Copy—Employee
Copy—SMWIA/Local Union # 19 Funds Office

VIII. GENERAL SAFETY PRACTICES CODE FOR SHOP OPERATIONS

RESPONSIBILITIES OF THE SAFETY COORDINATOR
The company's designated Safety Coordinator shall insist that all employees observe and obey every rule, regulation and order as necessary for the safe conduct of the work.

RESPONSIBILITIES OF THE SHOP FOREMAN
The Shop Foreman shall be responsible for the day-to-day enforcement and implementation of this "Safety Practices Code for Shop Operations". In particular, the Shop Foreman shall have ultimate responsibility for seeing that all shop machinery is used in a safe manner and that all personnel operating shop equipment have had adequate training in the operation of this equipment.

RESPONSIBILITIES OF THE EMPLOYEES
All employees shall follow safe practices, use personal protective equipment as required, render every possible effort to safe operations and report all unsafe conditions or practices to his or her immediate supervisor, to the shop foreman, or to the company's Safety Coordinator. Any employee, who jeopardizes his/her safety and health, or the safety and health of others, is subject to disciplinary action.

SAFETY EDUCATION
All employees shall be given frequent accident prevention instructions.

ALCOHOL AND DRUGS - ALTERNESS
No one will be allowed in the shop while under the influence of alcohol or drugs. No one shall knowingly be permitted or required to work with impaired ability or alertness caused by fatigue, illness or other factors, which might cause the employee or others to be exposed to accident or injury. All employees will be subject to all rules laid out in the "Drug and Alcohol Free Workplace Policy" (See Section VII. Drug Abuse and Alcohol Policy).

DEPORTMENT
Horseplay, scuffling and other acts which have an adverse influence on the safety or well-being or employees are prohibited.

EQUIPMENT GUARDING
Employees shall be alert to see that all guards and other protective devices are in their proper places and adjusted prior to operating equipment. Employees shall report deficiencies promptly to the Shop Foreman.

SAFE OPERATION OF EQUIPMENT
Employees shall not handle or tamper with any tools, equipment, machinery of facilities not within the scope of their duties, unless they are thoroughly qualified. Questions regarding the proper and safe operation of any piece of shop equipment shall be directed immediately to the shop foreman.

CLOTHING
Employees shall not wear loose clothing as it may get caught in operating equipment. Watches, bracelets and dangling earrings shall not be worn around moving machinery. Medallions and necklaces must be removed or work inside clothing. Long hair or bears shall be properly restrained so that they do not present a hazard around moving equipment.

FOOT PROTECTION
Employees shall ear substantial work shoes with non-skid soles. Leisure shoes such as tennis shoes, sneakers, thongs, sandals, slipper or moccasins will not be permitted in the shop.

EYE PROTECTION
Safety glasses, goggles or face shields shall be worn by all employees at all times in the shop. Safety glasses are available in the Shop Foreman's office.

HEARING PROTECTION
Hearing protection is required in areas where noise levels exceed 85 dbA. Ear plugs are available in the tool cage area.

RESPIRATORY PROTECTION
OSHA-approved respirators shall be worn by employees who may be exposed to hazardous or toxic materials exceeding permissible exposure limits established by OSHA or other agencies. Employees required to wear respiratory protection shall be trained, fit tested, and medically qualified prior to wearing such devices (See Section XIV. Respiratory Protection Program).

MAINTENANCE/ADJUSTMENT OF OPERATING EQUIPMENT
Apparatus, tools, equipment and machinery shall not be repaired or adjusted while in operation, not shall oiling of moving parts be attempted except on equipment that is designed or fitted with safeguards to protect the person performing the work.

INSPECTION OF FIELD EQUIPMENT AND TOOLS
Equipment and tools to be shipped from the shop to a job site shall be inspected and/or tested before they leave the shop. In particular, all ladders, scaffolds and rigging equipment shall be thoroughly inspected and all ground fault interrupters; extension cords and power tools shall be tested.

WELDING FUME EXHAUST
Appropriated fume exhaust equipment shall be used during all welding operations in the shop.

HAZARD COMMUNICATION PROGRAM

All employees shall receive a briefing on the Ernest D. Menold, Inc. Hazard Communication Program. It shall be condition of employment for employees of Ernest D. Menold, Inc. to acknowledge, in writing, that they have received a briefing on this program and that they agree to follow all directions, written and visual, pertaining to this program. Material Safety Data Sheets and a copy of the Ernest D. Menold, Inc. Hazard Communication Program are on file in the Shop Foreman's office and will be made available to any employee upon request.

REPORTING OF INJURIES

All injuries shall be reported promptly to the Shop Foreman so that arrangements can be made for medical or first aid treatment. Any employee that does not report injuries in a timely manner will be subject to the "Safety Disciplinary Program" (see Section II.). The Ernest D. Menold, Inc. "Accident Report" form shall be completely filled out by the Shop Foreman for each accident when it occurs and shall be sent promptly to the Safety Coordinator.

IX. PRESS BRAKE DIE CHANGE PROCEDURE

THE FOLLOWING PROCEDURE SHALL BE USED WHEN CHANGING THE DIES ON THIS PRESS BRAKE:

1. TURN THE BRAKE POWER SWITCH "ON". SWITCH BOX IS LOCATED AT THE RIGHT HAND SIDE OF THE MACHINE.

2. USING THE BRAKE CLUTCH PEDAL, MOVE THE UPPER DIE TO THE LOWEST DOWNWARD POSTION OF ITS FULL STROKE. VERIFY THIS POSITION BY ALIGNING THE INDICATING ARROWS ON THE PRESS BRAKE RAM.

3. REMOVE THE CLUTCH PEDAL FROM THE CLUTCH OPERATING BAR TO PREVENT ACCIDENTAL MOVEMENT OF THE UPPER RAM AND PREVENT A TRIPPING HAZARD.

4. TURN THE BRAKE POWER SWITCH TO THE "OFF POSITION". (DO NOT TURN OFF THE MAIN DISCONECT SWITCH WHICH IS PAINTED YELLOW.)

5. USING THE RAM ADJUSTING SWITCH LOCATED ON THE FRONT RIGHT HAND SIDE OF MACHINE, MOVE THE RAM DOWNWARD UNTIL THE UPPER DIE RESTS ON THE LOWER DIE.

6. LOOSEN THE BOLTS HOLDING THE TOP DIE.

7. SLIDE THE TOP DIE OUT TO EITHER SIDE OF THE PRESS BRAKE. FOR ANY DIE OVER 4 FT IN LENGTH, HAVE AN ASSISTANT READY TO HELP HANDLE THE WEIGHT OF THE DIE. PLACE THE UPPER DIE IN THE DIE RACK.

8. IF THE LOWER DIE IS ALSO TO BE REPLACED, LOOSEN THE BOLTS HOLD IN LOWER DIE.

9. SLIDE THE LOWER DIE OUT TO EITHER SIDE OF THE PRESS BRAKE WITH AN ASSISTANT IF NEEDED, AND PLACE IT IN THE DIE RACK.

10. TAKE BOTTOM DIE FROM THE DIE RACK (IF IT IS BEING REPLACED) AND SLIDE IT INTO THE LOWER DIE HOLDER ON THE PRESS BRAKE. TIGHTEN THE LOWER DIE HOLDING BOLTS.

11. MEASURE THE NEW UPPER DIE AND CHECK SPACE BETWEEN LOWER DIE AND UPPER DIE HOLDER ON THE PRESS BRAKE. USE THE RAM ADJUSTING SWITCH TO MOVE UPPER DIE TO ITS PROPER POSITION (HEIGHT OF UPPER DIE PLUS 1/16") TO ALLOW INSERTION OF THE NEW UPPER DIE.

12. SLIDE NEW UPPER DIE INTO POSITION AND TIGHTEN THE DIE HOLDING BOLTS ON THE UPPER RAM.

13. USING THE RAM ADJUSTING SWITCH, ADJUST THE UPPER DIE TO ITS PROPER POSITION ALLOWING FOR THE THICKNESS OF MATERIAL TO BE BENT AND THE DEPTH OF THE BEND.

14. REPLACE CLUTCH PEDAL, TURN BACK POWER SWITCH TO THE “ON” POSITION AND PROCEED WITH THE BENDING OF MATERIALS AS REQUIRED.

X. GENERAL SAFETY PRACTICES CODE FOR FIELD OPERATIONS

RELATIONSHIP TO OWNER SAFETY PROGRAMS

The Ernest D. Menold, Inc. "Safety Practices Code for Field Operations" shall be considered minimum standards for safe field operations. Any requirements regarding safety that may be published by the owner of plant facilities in which our employees are working shall be strictly adhered to in addition to the requirements of this Ernest D. Menold, Inc. "Safety Practices Code for Field Operations". It shall be the responsibility of the job site supervisor to acquaint all Ernest D. Menold, Inc employees with the requirements of such owner-published safety programs and procedures.

RESPONSIBILITIES OF THE SAFETY COORDINATOR

The company's designated Safety Coordinator shall insist that all employees observe and obey every rule, regulation and order as necessary for the safe conduct of the work.

RESPONSIBILITIES OF THE JOB SITE SUPERVISOR

The Job Site Supervisor shall be responsible for the day-to-day enforcement and implementation of this "General Safety Practices Code for Field Operations". In particular, the Job Site Supervisor shall have ultimate responsibility for:

a. Inspecting machinery and tools to be certain that they are being used in a safe manner.

b. Making certain that job site conditions do not present a hazard to the company's employees and that all safety regulations have been met.

c. Notifying the Safety Coordinator of unsafe job site conditions.

RESPONSIBILITIES OF THE EMPLOYEES

All employees shall follow safe practices, use personal protective equipment as required, render every possible effort to safe operations and report all unsafe conditions or practices to his or her immediate supervisor, to the job site supervisor, or to the company's Safety Coordinator. Any employee, who jeopardizes his/her safety and health, or the safety and health of others, is subject to disciplinary action.

SUPERVISORS' SAFETY MEETINGS

The company's designed Safety Coordinator shall schedule Job Site Supervisors' Safety Meeting at least monthly. Topics discussed at these meetings must be chosen to assist each supervisor in supervising for safety. A record shall be kept of attendance and subject matter using the "Safety Meeting Log" form (See Section XXXI. Miscellaneous Forms) that shall be kept on file in the home office.

EMERGENCY PROCEDURES

Each job site supervisor shall be familiar with the emergency procedures for each job site or area. This shall include knowing the location of the nearest phone, fire pull box, first aid kit, fire extinguisher, hose reel, etc. The supervisor shall know the most expedient method of summoning aid in the event of an emergency and shall know how to obtain first aide treatment for any injured employee.

NEW HIRE SAFETY INFORMATION

Each new hire, prior to starting work at any job site, shall receive a thorough Safety Orientation from the job site supervisor. This Safety Orientation shall include, but not limited to, the following topics:

a. Employer and employee responsibilities under OSHA.

b. A thorough review of this Ernest D. Menold, Inc. "General Safety Practices Code for Field Operations".

c. A thorough review of any owner-published Safety Program that contains safety requirements specific to a particular job site.

d. Job site emergency procedures.

TOOL BOX SAFETY MEETINGS

The job site supervisor or his/her designated representative shall conduct weekly Tool Box Safety Meetings to provide employees with up-to-date safety information. Employee attendance shall be documented using the "Safety Meeting Log" form (see Section XXXI. Miscellaneous Forms) that shall be kept on file at the job site.

FIRST AID KIT

A First Aid Kit of OSHA approval and proper size shall be available on the job and shall be re-supplied as required.

FIRE HAZARDS

Job site supervisors shall maintain a constant awareness of the fire potential in their area of responsibility. If a potential fire hazard is observed, the supervisor must initiate corrective action and notify the owner's representative.

FIRE PROTECTION AND PREVENTION

A Fire Watch shall be required for any operation or procedure where open fires, sparks, flames or other heat-producing devices might ignite flammable materials or vapors. OSHA approved firefighting equipment shall be on hand during all such operations. The job site supervisor shall determine the specific requirements of the owner's Fire Protection Program and shall make sure that no "Hot Work" begins until all necessary permits, fire watches, etc. have been obtained.

BARRICADES
The job site supervisor shall see that suitable barricades are erected when needed to protect any and all personnel and equipment in the work area. The condition of such barricades shall be monitored on a daily basis.

FLOOR AND ROOF OPENINGS
The job site supervisor shall see that all floor and/or roof openings required for the installation of our work are guarded and marked in accordance with OSHA standards. No employee shall be allowed to work near unguarded floor or roof openings unless they are wearing approved fall-protection equipment. (See Paragraph 33 below for a description of Fall Arresting Equipment.) Floor or roof openings that are not our responsibility but which are unguarded or unmarked shall be reported to the job site supervisor who shall then notify the contractor responsible or the owner directly.

POSTING OF WARNING SIGNS
The job site supervisor shall be responsible for posting any signs or requirements that will advise all personnel of unsafe areas or conditions.

ALCOHOL AND DRUGS – ALERTNESS
No one will be allowed on the job site while under the influence of alcohol or drugs. No one shall knowingly be permitted or required to work with impaired ability or alertness caused by fatigue, illness or other factors that might cause the employee or others to be exposed to accident or injury. (For more information please reference Section VII. Drug Abuse and Alcohol Policy).

DEPORTMENT
Horseplay, scuffling and other acts, which have an adverse influence on the safety or well being of employees, are prohibited.

HARD HATS AND CLOTHING
Approved, non-conduction hard hats shall be worn in designated “Hard Hat Areas” or whenever an overhead danger exists. Employees shall not wear loose clothing as it may get caught in moving machinery. Watches, bracelets and dangling earrings shall not be worn around moving machinery. Medallions and necklaces must be removed or work inside clothing. Long hair or beards shall be properly restrained so that they do not present a hazard around moving equipment.

FOOT PROTECTION
Employees shall wear substantial work shoes with non-skid soles. Leisure shoes such as tennis shoes, sneakers, throngs, sandals, slipper or moccasins will not be permitted on the job site.

EYE PROTECTION
All employees when required shall wear safety glasses, goggles or face shields. Specifically, eye protection shall always be worn when grinding, drilling, spot-welding, sawing, chipping, punching and burning. Safety glasses must have side shields.

HEARING PROTECTION
Hearing protection is required in areas where noise levels exceed 80dbA or where posted by the plant owner. Earplugs will be available from the jot site supervisor.

RESPIRATORY PROTECTION
OSHA-approved respirators shall be worm by employees who may be exposed to hazardous or toxic materials exceeding permissible exposure limits established by OSHA or other agencies. Employees required to wear respiratory protection shall be trained, fit tested, and medically qualified prior to wearing such devices. (For more detailed information please reference Section XIV. Respiratory Protection Program).

VENTILATION
Adequate ventilation shall be provided when operations emitting smoke, dust, or vapors are performed in confined spaces. (See Paragraph 30 below for Confined Space Entry Procedure.)

POWER OPERATED HAND TOOLS
Electric power operated tools shall be of the approved double insulated type with three-wire grounded plugs. The use of electric cords for hoisting or lowering tools shall not be permitted.

Pneumatic power tools shall be secured to the hose by some positive means to prevent the tool from becoming accidentally disconnected. Compressed air shall not be used for cleaning purposes except when reduced to thirty pounds per square inch pressure.

EXTENSION CORDS
All extension cords shall have grounded three-wire plugs.

EQUIPMENT GUARDING
Employees shall be alert to see that all guards and other protective devices are in their proper places and adjusted prior to operating equipment. Employees shall report deficiencies promptly to the job site supervisor.

SAFE OPERATION OF EQUIPMENT
Employees shall not handle or tamper with any tools, equipment, machinery or facilities not within the scope of their duties, unless they are thoroughly qualified. Questions regarding the proper and safe operation of any tools, equipment, machinery or facilities shall be directed immediately to the job site supervisor.

MAINTENANCE/ADJUSTMENT OF OPERATING EQUIPMENT

Apparatus, tools, equipment and machinery shall not be repaired or adjusted while in operation, nor shall oiling of moving parts be attempted except on equipment that is designed or fitted with safeguards to protect the person performing the work.

CRANE SAFETY AND MATERIAL HANDLING PROGRAM

Any equipment or machinery brought to the job site and intended for material or personnel handling, shall have available written proof of a current annual inspection.

EQUIPMENT LOCKOUT PROCEDURE

This procedure shall be used to insure the personal safety of people working on equipment and shall be applied as stated herein.

No switch or circuit breaker or valve shall be opened or closed or operated except when an authorized representative of the owner is present. Each jot site supervisor/foreman whose crew works on any equipment must lock-out the main control device of that equipment. Te term “main control device” means a disconnect switch or circuit breaker or valve etc., it does not mean push buttons or similar operator devices. The switch or circuit breaker will usually be located within a MLC or MCC and feed a motor or transformer.

Each lock-out lock installed by a job site supervisor/foreman shall be tagged and identified with the date of lock-out, our company name and phone number, and the name, home phone number and signature of the job site supervisor/foreman.

Locks must be removed promptly upon completion of the work for which the tags and locks were placed.

Electrical shock boxes will be used in designated areas.
(For a complete detail of this process please reference Section XXII. Electrical Safety).

CONFINED SPACES

The intent of this section of the Safety Manual is to train personnel to recognize, understand and control the hazards that may be encountered when entering and working in a confined space.

a. Definition of Confined Spaces
   Confined Spaces are defined as areas which:
   i. Have a size and shape that allows a person to enter them.
   ii. Have small or obstructed ways of getting in and out that require use of hands for entry or exit.
   iii. Not designed to be occupied continuously.
   iv. Have one or more of the following characteristics:

- Contain or have a know potential to contain a hazardous atmosphere,
- Contain a material with the potential for engulfing an entrant,
- Have an internal configuration shaped in a way which could trap or asphyxiate an entrant,
- Contain any other recognized serious safety or health hazard.

b. Examples of Confined Spaces

Some examples of confined spaces are reactor vessels, tanks, silos, boilers, sewers and pipelines.

c. Potential Hazards Associated With Confined Spaces
   i. Hazardous Atmosphere
      - The air might not have enough oxygen.
      - The air can be flammable or toxic.
   ii. Engulfment – being trapped in liquid or solid material.
   iii. Danger from unexpected movement or machinery.
   iv. Electrocution.
   v. Heat stress.
   vi. Becoming wedged into a narrow part of the space and suffocating.
   vii. Physical dangers such as fall, debris, slipping ladders.

CONFINED SPACE ENTRY PROCEDURE

Please Reference Section XIII. for a complete procedure for Confined Space Entry.

COMPRESSED GAS CYLINDERS

Compressed gas cylinders shall be secured vertically to an adequate support. The protective cap must be on while not in use and during transit. Always transport cylinders in the cylinder dolly. Do not carry them on elevators or escalators. All cylinders shall be stored outside operating buildings unless specific permission is granted by the owner to do otherwise.

SCAFFOLDING

All scaffolding shall be erected level and plumb on a firm base. All scaffolds more than 10’ high shall be equipped with standard 42” high handrails, mid-rails and toe boards. Scaffolds less than 42” wide in the smallest horizontal dimension shall be equipped with handrails and toe boards if they are over 4’ high. If field conditions prevent the installation of handrails, employees working from such scaffolds shall wear approved fall arresting equipment as described in Paragraph 33 below. Scaffold tagging procedures shall be enforced where required (for more detailed information please reference Section XXVIII. Scaffolding Safety Program).

FALL ARRESTING EQUIPMENT

Fall arresting equipment shall be worn by all employees working under conditions that would allow a free-fall from their work location of more than 6 ft. AS A MINIMUM, FALL ARRESTING EQUIPMENT SHALL CONSIST OF A BOBY HARNESS AND SHOCK ABSORBING LANYARD. The fall arresting equipment shall be attached to a structural member capable of supporting a minimum dead weight of 5,400 lbs. Fall arresting equipment shall be carefully inspected and tested before use. UNDER NO CIRCUMSTANCES SHALL SAFETY BELTS BE USED IN PLACE OF A BODY HARNESS FOR FALL ARRESTING! Lanyards or other ropes used as part of a fall arresting system may not be used for lifting tools, equipment or material (For more detailed information please reference Section XV. Fall Protection Program).

DAMAGED OR DEFECTIVE TOOLS OR EQUIPMENT

Damaged or defective tools or equipment shall be tagged and returned to the shop for repair or disposal.

UNSAFE, UNHEALTHY OR HAZARDOUS CONDITIONS

All unsafe, unhealthy or hazardous conditions or places shall be immediately placed off limits, out of order, or out of bounds. Such conditions shall immediately be reported to the job site supervisor.

ASBESTOS REMOVAL

Asbestos will not be removed or handled by Ernest D. Menold, Inc. employees. It is known or suspected that asbestos may be present at a job site; the following procedures shall be followed:

a. Prior to beginning work at the job site, the job site supervisor shall inspect the job site for existing loose asbestos, asbestos insulation, or fireproofing that may be disturbed during the construction activities, or asbestos containing materials such as transit board that may have to be cut or removed, or could be damaged, during the construction activities.

b. If potential exposure to asbestos exists under any of the above circumstances, the job site supervisor shall immediately notify the plant owner, any contractors working in the area, and Ernest J. Menold, the Ernest D. Menold, Inc. designated Safety Coordinator.

c. Either the job site supervisor or the Safety Coordinator shall request the owner to remove all asbestos or asbestos containing materials from the jot site work area. UNDER NO CIRCUMSTANCES SHALL EMPLOYEES OF ERNEST D. MENOLD, INC. BE EITHER DIRECTLY OR INDIRECTLY INVOLVED IN THE REMOVAL OR DISPOSAL OF ASBESTOS OR ASBESTOS CONTAINING MATERIALS.

d. Prior to Ernest D. Menold, Inc. employees beginning work at the job site, a written certification that the area has been cleared of asbestos shall be obtained from the owner.

e. If, in spite of the above listed precautions, asbestos in any form is encountered during the course of the work, all Ernest D. Menold, Inc. employees shall be so informed and they shall be instructed to leave the area. The owner and all other contractors at the site shall immediately be notified of this situation. Work shall not begin again until the asbestos has been removed and written certification to that effect has been received.

HAZARDOUS WASTE

In the normal course of our job site activities we do not anticipate generating any hazardous wastes, however, if such wastes should be generated, they shall be disposed of in accordance with all local, state and federal laws governing such disposal.

HAZARD COMMUNICATION PROGRAM

All employees shall receive a briefing on the Ernest D. Menold, inc. Hazard Communication Program. It shall be a condition of employment for employees of Ernest D. Menold, Inc. to acknowledge, in writing, that they have received a briefing on this program and that they agree to follow all directions, written and visual, pertaining to this program. Material Safety Data Sheets and a copy of the Ernest D. Menold, Inc. Hazard Communication Program shall be on file at the job site trailer or at the home office and will be made available to any employee upon request.

REPORTING OF INJURIES

All injuries shall be reported promptly to the jot site supervisor so that arrangements can be made for medical or first aid treatment. If injuries are not reported in a timely manner the offenders shall be subject to discipline under the Safety Disciplinary Program (see Section II page 2). The Ernest D. Menold, Inc. “Accident Investigation Report” form (See Section XXXI Miscellaneous Forms) shall be completely filled out by the job site supervisor for each accident when it occurs and shall be sent promptly to the office secretary and then to the Kevin Moore, Safety Coordinator. A copy of this “Accident Investigation Report” shall be kept on file at the job site.

SUBCONTRACATOR SAFETY

The job site supervisor shall ensure that all subcontractors to Ernest D. Menold, Inc. perform all work activities in a safe manner, in compliance with all Federal, State, and local safety requirements and that they comply with the Ernest D. Menold, Inc. “General Safety Practices Code for Field Operations” and all owner safety requirements.

XI. Personal Protective Equipment Program

Purpose

Ernest D. Menold Inc. developed this program to protect employees from exposure to workplace hazards and to facilitate compliance with the requirements of the Occupational Safety and Health Administration 29 CFR 1910 Subpart I and 29 CFR 1926 Subpart E.

Personal protective equipment (PPE) protects employees from the risks of injury by creating a barrier against workplace hazards. PPE must be used when the eyes, face, hands, extremities, or other parts of the body are exposed to workplace hazards that cannot be controlled by other means. PPE is not a substitute for good engineering controls, administrative controls, or good work practices, but should be used in conjunction with those controls to ensure the safety and health of all employees. The use of PPE does not eliminate the hazard, and if the PPE fails or is used improperly, exposure to the hazard may occur.

Employees must be trained on the limitations of PPE, and on its proper use and maintenance. Employees must also be aware that PPE does not eliminate the hazard. If the equipment fails or is used improperly, they will be exposed to the hazard and may suffer injury.

Application

The Personal Protective Equipment Program will be monitored and administered by Kevin Moore, Safety Coordinator.

Hazard Assessment

Each Project Manager or Foreman is required to assess the hazards in their workplace(s) to determine which operations require personal protective equipment. This hazard assessment must be performed in accordance with the requirements outlined in this program.

- **Equipment selection.** If the work site hazard assessment or the review of the employee job duties indicate that there is exposure to a hazard(s) that requires the use of PPE, the Project Manager or Foreman will:

  - Select, and have each affected employee use the type(s) of PPE that will protect the employee from the hazards identified in the hazard assessment.

  - Inform the employee of the reasons for selecting the specific PPE.

- Select PPE that properly fits each affected employee.
- Verify that the hazard assessment has been performed through a written certification. This certification must identify the workplace or job duties evaluated, the name of the person performing the assessment, and the date of the assessment.

- **Employee owned equipment.** Where employees provide their own protective equipment, the company is responsible for assuring that it is adequate for the hazardous condition, and that this equipment is properly maintained as required by this program.
- **Design.** The company must assure that all PPE is of a safe design and construction for the work to be performed.
- **Defective and damaged equipment.** The company must assure that defective or damaged personal protective equipment is not used.
- **Training.** Kevin Moore Safety Coordinator, Project Manager(s) and Foremen must train each employee who is required to use PPE.
- **Recordkeeping.** Maintain records of hazard assessments, PPE assignments and training, and provide a copy of all records.
- **Reassessments.** A worksite will be reassessed when new hazards are introduced, or when processes are changed or added in the workplace.

Employees

Employees are responsible for following the requirements of this program. Employees are expected to:

- Attend required training sessions on PPE.
- Wear PPE as required.
- Clean, maintain, and care for PPE as required.

- Inform supervision of the need to repair or replace PPE.

Training

Each employee required to wear PPE must receive training in the proper use and care of their PPE. It is expected that either the supervisor or Safety Coordinator will provide the training. This training must include the following:

- When PPE is to be worn.
- What PPE is necessary.
- How to properly don, doff, adjust, and wear PPE.
- The limitations of PPE.
- The proper care, maintenance, useful life, and disposal of PPE.

The employee must demonstrate an understanding of the training and ability to use PPE properly before being allowed to perform work requiring the use of PPE.

The PPE Coordinator(s) must maintain a written certification that each affected employee has received and understood the required training. This certification must include the name of each employee trained, the date(s) of the training, and the subject of the training. A blank training certificate may be found in Appendix A.

When the PPE Coordinator(s) have reason to believe that an employee using PPE does not have the understanding and skill required to use this equipment safely, the employee must be retrained immediately. Retraining is also required when changes in workplace render previous training obsolete, or when changes in type of PPE to be used render previous training obsolete.

Hazard Assessment and Equipment Selection

Evaluation of Hazards

Two types of hazard assessments may need to be performed by the department. Workplace hazards should be evaluated when an employee works at one location or performs only one class of work. Job specific hazards should be evaluated when an employee does not work at a fixed location and is exposed to hazards at a number of work locations.

Workplace Hazards

The PPE Coordinator(s) will be reviewing workplaces to determine if hazards are present or are likely to be present that require the use of PPE. The workplace hazard assessment is conducted using the guidance provided in Appendix A and must be documented in writing. A copy of this assessment must be filed in the personnel office and with the Safety Coordinator.

The first step of the hazard assessment is to perform a walk-through survey of the worksite to observe and record potential hazards. Hazards are identified as follows:

- Electrical hazards
- Presence of sharp objects or edges
- Sources of light radiation
- Sources of rolling or pinching objects
- Exposed moving parts of machinery or equipment
- Layout of workplace
- Stacked or stored objects that could fall or roll
- Types of chemical exposure
- Sources of high and low temperature
- Sources of harmful dust

After the worksite survey is completed, hazards are grouped into the following categories:

- Impact
- Penetration
- Chemical
- Light
- Hearing

- Heat
- Compression (roll-over)

- Respiratory
- Electrical
- Harmful dust, mist, or fumes

Finally, organize your data by hazard, and assess the hazards as to the type, level of risk, and seriousness of potential injury. This evaluation should include the possibility of exposure to multiple hazards.

Job Specific Hazards

When an employee is exposed to hazards on multiple job sites the employee and/or their supervisor should be interviewed to identify the hazards to which he or she is exposed.

Appendix A:

Hazard Assessment and Personal Protective Equipment Selection

Hazard Identification:

The first step of the hazard assessment is to inspect the worksite and/or review the type of work performed by an employee if he or she conducts work at multiple sites. The purpose of the inspection and/or job review is to identify the hazards to which the employee is exposed. Your inspection findings should be documented on the Hazard Assessment Form (See Section XXXI. Miscellaneous Forms). During this inspection/ review pay particular attention to the following potential hazards:

- Moving equipment, parts of equipment, processes or personnel that could result in collision, compression or impact.
- Potential for objects to fall or drop from above an employee.
- Exposure to chemicals or potentially harmful dusts mists or fumes.
- Rolling or pinching objects or machinery processes that could crush body parts catch hair or shag clothing.
- Electrical hazards, either from equipment, wiring, or utilities.
- Presence or use of sharp objects that could cut or pierce the body.
- Hot or cold surfaces that could cause burns or freezing.
- Light (optical) radiation from welding, cutting, brazing or other sources.
- Use of tools or equipment that may generate flying debris, harmful dusts or noise.
- The layout of the workplace and the locations of coworkers and the way in which work is staged or performed.

Organize Your Data:

After you have completed your walk-through survey and/or employee interview, organize the data using the hazard assessment form found at the end of this section.

Analyze Your Data:

Determine the level of risk and the seriousness and type of potential injury from each of the hazards identified during your assessment. The possibility of exposure to several hazards simultaneously should also be considered.

Control or Eliminate the Hazard:

Before you select and provide PPE to an employee, first determine if the exposure to the hazard can be reduced or eliminated through the use of administrative or engineering controls. Ask the following questions:

- Does the manufacturer supply guards for the machinery or equipment? Do those guards completely contain or control exposure to the hazard if used properly?
- Can a shield, barrier, or guard be manufactured or purchased that will contain or control exposure to the hazard?
- Can older equipment be replaced with newer, safer equipment?
- Can the layout of the worksite be changed to eliminate or reduce exposure to the hazard?
- Can the product or chemical used be replaced with a less hazardous product or chemical?
- Can exposure to an airborne chemical or dust be controlled with exhaust ventilation?

If the answer to any of the above questions is “yes” or “maybe” it may be possible to use administrative or engineering controls to eliminate or reduce the hazard.

Select PPE Appropriate for the Hazard(s):

Your review of the potential hazards in relation to specific job activities forms the basis for selecting PPE. After identifying the basic hazards, the general procedure for selection of protective equipment is to:

- Review the types of protective equipment that are available.

- Compare the specifics of the hazard (i.e., how heavy and/or fast the object is moving, projectile shape, the type of light being emitted, duration of exposure, etc.) against the capabilities of the available protective equipment.

- Select protective equipment that provides a level of protection adequate to protect the employee from the hazard.

- The PPE must fit the user, and the employee must be given instructions on the care and use of their PPE. It is very important that end users be made aware of all warning labels and limitations of their PPE.

Fitting the Device

Give careful consideration to the comfort and fit of the PPE. PPE that fits poorly will not provide the necessary Protection and an employee is less likely to wear the device if it does not fit comfortably. Protective devices are generally available in a variety of sizes. Care should be taken to ensure the right size is selected for each individual wearer.
Particular care should be taken in fitting devices for eye protection against dust and chemical splash to ensure that the devices are sealed to the face. In addition, proper fitting of helmets is important to ensure that it will not fall off during work operations. In some cases a chinstrap may be necessary to keep the helmet on an employee's head. (Chinstraps, if provided, should break at a reasonably low force so as to avoid a strangulation hazard). Always review and follow the manufacture's instructions.

Reassessment

It is the responsibility of the Project Manager(s) and Foremen to reassess workplace hazards when new equipment, processes, or other hazards are introduced.

Training Record

This certifies that I have trained the following employee(s) on how to inspect, wear, clean, maintain, and care for his or her personal protective equipment (PPE). I have explained when PPE is required to be worn, and emphasized that the use of PPE does not eliminate the hazard and that caution must always be used.

Name of Trainer: _____ Date: _____

Name and Signature of Employee	Date Trained	Type(s) of PPE to Be Used

XII. Lockout/Tagout Program

Policy

It is the policy of Ernest D. Menold Inc. to prevent the unintended or unexpected startup or release of hazardous energy during servicing, maintenance, or modification activities. No employee shall install, service, remove, or perform any maintenance on any equipment or machinery that may involve an energy hazard, until the equipment has been de-energized, locked, tagged and verified to be in a zero energy state in accordance with this document.

Purpose

To establish minimum safety requirements for the lockout and tagout of hazardous energy sources and the verification of energy isolation through the use of isolating devices and techniques during service or maintenance on equipment.

Scope

This program applies to all workers who may be exposed to hazardous energy while performing any servicing, maintenance, or modification activity.
The lockout/tagout and verification procedures identified in this document must be strictly followed when it is necessary to work on any equipment that generates, holds, or may release, any form of hazardous energy while the equipment is shut down, including, but not limited to:

- Electrical
- Mechanical
  - Rotational
  - Gravity
- Chemical
- Pressure or Vacuum
  - Hydraulic
  - Pneumatic
  - Steam
- Ionizing and non-ionizing radiation sources

- Thermal
- Other

Where Required

Lockout/Tagout (known here out as LOTO) is required whenever service, maintenance, or modification is being performed on equipment or apparatus in which the unexpected energizing or start-up of the equipment, or the release of stored energy, could cause injury to people or damage to equipment.

Exclusions

LOTO procedures do not apply under the following three conditions:

1. Work on cord and plug connected electrical equipment, in which:
   - There is a single energy source, and
   - All of the hazardous energy is controlled by unplugging the equipment, and
   - The plug remains under the continuous positive control of the worker performing the servicing, maintenance, or modification.

2. Operations on energized equipment (e.g., measuring, troubleshooting, calibration), where continuity of service is essential to safety or shutdown of the system cannot be reasonably accomplished. Supervisor approval is always required for such operations, and documented safety procedures that provide an equivalent level of safety must be established and followed.

3. Minor tool changes, adjustments, and other minor servicing activities that take place during normal operations, provided that (a) such activities are routine, repetitive, and integral to the use of the equipment, and that (b) the work is performed using alternative measures that provide effective personnel protection.

Responsible Parties

1. All Workers

Each worker is responsible for his or her own safety. Never undertake a task that you feel is unsafe.
All workers are responsible for recognizing when LOTO is being used, the general reasons for LOTO, and the importance of not tampering with or removing a lock and tag.

2. LOTO Authorized Employees

LOTO Authorized Employees have the responsibility for recognizing the conditions of work that require LOTO, assessing all of the hazardous energy sources, using correct procedures and materials to implement LOTO, and maintaining control over their key.

Each LOTO Authorized Employee performing servicing, maintenance, or modification is responsible for applying their own lock and tag.

NEVER apply LOTO for anyone else.

3. Supervisors

Supervisors are responsible for:

- Prohibiting employees from working on equipment requiring LOTO until the worker(s) are trained in and authorized to perform LOTO.
- Generating and maintaining equipment- specific written procedures where required (see "Lockout/Tagout and Verification Procedures") and inspecting these procedures at least annually.
- Assigning and documenting employee LOTO authorization (outlined under "Training and Authorization"), including
    - Designating specific equipment or categories of equipment to be controlled.
    - Verifying that workers are qualified to perform the necessary energy-control procedures.
- Determining the appropriate levels of training required for each employee.
- Ensuring consistent policy implementation and reinforcing LOTO rules.
- Removing LOTO devices in case of emergency and controlling emergency keys for LOTO locks (outlined under "Emergency Removal of LOTO Devices).
- Keeping accurate LOTO logs, when required.
- Ensuring that necessary LOTO hardware is available.

4. Program Administrator

The Lockout/Tagout program administrator is Kevin Moore, Safety Coordinator and as such is responsible for:

- Maintaining, administering, and revising the LOTO program as needed.

- Ensuring the LOTO equipment is available and consistent with OSHA standards.
- Developing and implementing the Lockout/Tagout course.
- Periodically auditing LOTO compliance.

5. **Project Managers and Foremen (onsite)**

Are responsible for ensuring that all outside contractors operating under the supervision of Ernest D. Menold Inc. are informed of, and adhere to, Ernest D. Menold Inc. Lockout/Tagout Program (see "Subcontractors").

Lockout/Tagout and Verification Procedures

All LOTO operations shall utilize either equipment- specific written procedure or the General LOTO procedure, as applicable. Regardless of the procedure used, it is important that the following LOTO principals are strictly adhered to:

- All sources of hazardous energy must be shut off and secured.
- LOTO must be performed at each identified hazardous energy control point by each LOTO Authorized Employee who works with the equipment.
- Each LOTO Authorized Employee must apply their personal LOTO device whenever servicing, maintaining, or modifying machinery or equipment, regardless of the duration of the job or their proximity to the energy isolating device (e.g., circuit breaker, switch, or valve).
- Each LOTO Authorized Employee must personally witness or verify the absence of hazardous energy, or assure that the verification has been performed.

Equipment Specific Written Energy Control Procedure

An equipment specific written energy procedure must be developed and used whenever equipment or apparatus undergoing service, modification, or maintenance:

- Has more than one hazardous energy source, or
- Requires the operation of more than one device to isolate the hazardous energy, or
- Has potential for stored, residual, or accumulated hazardous energy.

The procedure must be posted on or near the equipment, or provided in such a manner as to ensure that all LOTO Authorized Employees are provided this information before starting the work.

Preparing and Posting Equipment Specific Written Procedures

A written energy control procedure must be generated by the department, group, or LOTO Authorized Employee most familiar with the equipment. This procedure must be used by any LOTO Authorized Employee who will LOTO the equipment.

> **The procedure must be reviewed and updated as necessary ant time there is a change in the equipment or associated hazards.**

Supervisors must ensure that equipment requiring written procedures is so identified and that the procedure is posted on the equipment or is readily available to the worker(s) authorized to LOTO the equipment.

If the written procedure is not posted on the equipment, the equipment must be clearly labeled to indicate the availability and location of the procedure. The supervisor or worker responsible for the equipment may determine the appropriate format and content of the label. For example:

> ***Caution**: An equipment specific written procedure exists for the locking and tagging of this equipment. This equipment specific written procedure may be obtained from* _____

Elements of an Equipment Specific Written Procedure

The written hazardous energy control procedure must be specific to each piece of equipment, and must be inclusive of all energy types it contains. More complex equipment may require a separate procedure for each type of hazardous energy to be controlled, or a separate procedure for each type of maintenance or servicing task expected to take place. Maintenance and service manuals must be consulted to ensure accuracy and sufficient level of detail.

Required Content

Equipment specific written procedures must incorporate all of the applicable elements of each step (see "General LOTO Procedure"). It is essential that the specific application of each LOTO step be clearly explained in the context of the specific equipment or apparatus.

In addition, each written Hazardous Energy Control procedure must identify the specific equipment or apparatus to which the procedure applies, and must identify the following elements:

1. The procedure that will be performed that requires the control of hazardous energies.

2. The components or locations that are generating the hazardous energies to be controlled.

3. The energy types that will be controlled.

4. The specific locations for shutting down, isolating, blocking, safe releasing, and securing all potentially stored or residual hazardous energies.

5. The type of LOTO hardware to use.

6. How to test for verification of hazardous energy control.

Appendix A contains the necessary forms and written documentation for LOTO of equipment.

General LOTO Procedure

Before starting any LOTO procedure, the LOTO Authorized Employee(s) performing the work shall physically locate and identify all isolating devices to be sure which switches, valves, or other energy isolating devices apply to the equipment or apparatus to be locked out. Any questionable identification of electrical or other energy sources shall be resolved by the LOTO Authorized Employee(s) with their supervisor before proceeding.

If safety would ever be compromised by following this prescribed sequence of procedures, the LOTO Authorized Employee, with the supervisor's approval, may modify the sequence. However, all steps must be performed.

LOTO Application Steps

Step 1- Preparation

a. **Review the written procedure, if applicable.** The LOTO Authorized Employee must determine if an Equipment Specific Written Energy Control Procedure is required for the task. If so, the LOTO Authorized Employee must obtain and follow the equipment-specific written procedure. If a new written procedure must be generated, or an existing procedure needs to be changed or updated, the LOTO Authorized Employee must contact his or her Supervisor.

b. **Assess energy type and magnitude.** The LOTO Authorized Employee must assess the type, magnitude, and hazards of the energy to be controlled.

c.

d. **Determine methods of energy isolation.** The LOTO Authorized Employee must determine the appropriate methods of controlling the hazardous energy. Methods for energy isolation may include such things as circuit breakers, disconnect switches, or valves.

Push buttons, selector switches, interlock circuits, and other control-type devices are *not* energy-isolating devices.

Step 2- Notification

a. Notify all affected employees. The LOTO Authorized Employee must notify all Affected Employees of the impending shutdown. These persons must be informed that they are not to disturb the lockout device or attempt to re-start the equipment until they are informed that the lockout has been cleared and it is safe to resume normal operations.

Step 3- Shutdown

a. Verify that it is safe to shut down equipment. The LOTO Authorized Employee must verify that it is safe to shut down the equipment.

b. Perform a normal equipment shutdown. The LOTO Authorized Employee must turn off or shut down the equipment using established methods for that equipment.

Step 4- Isolation and Verification

a. Isolate all energy sources. The LOTO Authorized Employee must operate (switch off, valve off, etc.) energy isolating device(s).

b. Verify that the correct energy isolation device has been operated. The LOTO Authorized Employee must take steps to ensure that the means used (disconnect, valve, etc.) for energy isolation correctly correspond to the equipment on which LOTO is being performed.

Note: For verification of electrical energy isolation, a best practice (if safe to do so) may include an "on off on" procedure, wherein: (1) the equipment is placed in an operating condition; (2) the disconnect is operated; (3) the equipment is confirmed to have switched off; (4) the disconnect is re-energized; (5) equipment is confirmed to have switched on; (6) the disconnect is operated; (7) Equipment is confirmed to have switched off.

Step 5- LOTO Device Application

a. **Lock out energy sources.** The lock must be affixed so as to hold the energy-isolating device in an off or safe position that physically prohibits normal operation of the energy-isolating device.

b. **Write name and date, along with any other relevant information, on the tag and apply with lock or plastic locking tie.** If the placement of the tag would compromise safety by obscuring indicator lights or controls, the tag may be located as close as is safely possible to the device, in the position that will be immediately obvious to anyone attempting to operate the device.

Step 6- Additional Measures if Necessary

a. **Insert physical restraints or disconnect components.** Insert blocks or chocks for moving or raised parts, insert blind flanges for pressurized piping, disconnect springs (only if safe to do so), etc., to ensure potential moving parts are physically restrained or disconnected.

b. **Release stored energy.** The LOTO Authorized Employee must completely release or otherwise control any stored energy and block any unexpected motion. The presence of stored energy usually indicates that an Equipment Specific Written Procedure is required. The equipment must be in a zero energy state. A zero energy state is conditions that are reached when all energy sources to or within equipment are isolated, blocked, or otherwise relieved, with no possibility of re-accumulation.

- In the case of stored mechanical energy, vent valves, spring releases, blocking devices, or equipment repositioning (as appropriate) must be utilized.
- In the case of stored electrical energy, approved grounding wands or discharge devices must be used. If there is a possibility of re-accumulation of stored energy to a hazardous level, verification of isolation (such as leaving the ground wand in place) must be continued until the servicing, maintenance, or modification is complete.

  This can only be accomplished by an electrically qualified and LOTO Authorized Person (see Ernest D. Menold Inc. "Electrical Safety Program" for definition of Electrical Qualified Person(s)).

Step 7- Isolation Verification Confirmation

a. **Attempt to restart the equipment.** The LOTO Authorized Employee must physically attempt to operate the energy isolating device and attempt to restart the equipment using the normal equipment controls.

b. **Test equipment for zero-energy state.** The LOTO Authorized Employee must test potential energy sources using appropriately rated instruments. Any instrument used to test for voltage, pressure or temperature must be checked for proper operation both before and after use. If the LOTO Authorized Employee is not qualified to test the energy being isolated, he or she must ensure that the energy being isolated, he or she must ensure that the energy is tested by a qualified person.

Only electrically Qualified and LOTO Authorized Persons can test for verification of electrical de-energizing. The qualified tester, if other than the LOTO Authorized Employee, must be identified in the Remarks section on the tag.

ALL ENERGY IS TO BE TREATED AS PRESENT UNTIL POSITIVELY PROVEN OTHERWISE.

Step 8- Keeping Devices in Place

The lock and tag shall remain in place until work on the equipment is 100 percent complete. In rare circumstances, it may be necessary to temporarily remove LOTO devices before work is 100 percent completed (such as for adjustment or repositioning equipment). See "Temporary Removal of LOTO devices").

Release from LOTO Steps

Step 1- Preparation & Notification

a. **Notify all Affected Persons that the system is to be returned to service.** Ensure all persons remain clear of the equipment point of operation or hazard zone.

b. **Clear all tools and personnel.** The LOTO Authorized Employee must check the work area to ensure that all tools, debris and personnel are at a safe distance from the equipment.

c. **Replace safety guards.** The LOTO Authorized Employee must check the equipment to ensure that any removed guards are re-installed.

Step 2- Removal of Additional Devices

a. **The LOTO Authorized Employee must remove any additional devices applied under LOTO Application**

b. **Remove all safety grounding devices**

c. **Verify that it is safe to re-energize.** The LOTO Authorized Employee must verify that the work for which the LOTO was applied has been completed and that it is safe to re-energize equipment.

Step 3- Removal of All Locks and Tags

a. **Remove lock(s) and tag(s).** Each LOTO device must only be removed by the LOTO Authorized Employee who applied it. If the person who placed the locks and tags is not available, an emergency removal procedure must be followed (see "Emergency Removal of LOTO devices").

b. **Notify all Affected Employees that the lockout condition has been cleared.**

c. **Energize the equipment and restore the equipment to the normal condition.**

Training and Authorization

General Requirements

General awareness training shall be done to ensure that every employee knows and understands the purpose, contents, and application of this program to the level necessary for their job requirements. The awareness level LOTO course described below for Affected and Other Employees fulfills this initial training requirement. The training will be conducted and monitored by Kevin Moore, Safety Coordinator.

LOTO may only be performed by LOTO Authorized Employees who have completed the Ernest D. Menold Inc. LOTO training, have received task and equipment specific on the job training, and been authorized by their supervisor.

Affected and other employees

Affected and other employees are required to be trained in LOTO awareness, which describes the use of this energy control program, how to recognize LOTO, why LOTO is implemented, and about the prohibition of attempts to restart or re-energize equipment that has been locked and tagged out.

Tampering with or removing someone else's LOTO devices can cause serious injury or fatalities, and is a serious safety violation!

LOTO Authorized Employees

A LOTO Authorized Employee is a worker who is:

1. Trained, and
2. Specifically authorized by their supervisor to perform LOTO

LOTO Authorized Employee Training Requirements

As the outcome of LOTO training, LOTO Authorized Employees must be able to recognize applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and procedures for their isolation and control.

LOTO Authorized Employees may also need to be Qualified Electrical Workers to perform verification of electrical de-energizing.

Supervisor Authorization

Specific Authorization is to be provided by the supervisor after the employee satisfies the classroom training requirements and has received equipment specific training. The supervisor must ensure that the employee is thoroughly familiar with the equipment (within the context of his or her job function) and with the energy control procedures. A practical exercise may be required by the Supervisor to demonstrate proficiency. The content of this exercise will depend on the types of hazardous energy control and the complexity of the procedures steps.

Once satisfied that both the training and authorization requirements have been met, the supervisor may authorize an employee to perform LOTO. This authorization stipulates the specific equipment or types of equipment on which the LOTO Authorized Employee may perform LOTO.

Reauthorization and Retraining

Reauthorization is required when:

1. A LOTO Authorized Employee's job changes or he or she is reassigned, or
2. New equipment is to be used, or
3. New hazards are introduced, or
4. New energy control procedures are to be implemented.

Retraining and/or reauthorization may be required when:

1. A supervisor has reason to believe that an employee has insufficient knowledge of LOTO procedures or policy, or
2. A periodic inspection shows a deficiency in the LOTO Authorized Employee's ability or interest to implement LOTO policy correctly.

Training Documentation

Documentation of equipment specific training must be in writing. Training documentation must be retained for 3 years, and be readily available for inspection upon request. The training must be documented, signed and certified.

LOTO Equipment

Locks

Only Ernest D. Menold Inc. Company approved locks may be used when performing LOTO. The current approved lock is a Master brand #3 (see Figure 1).

Figure 1. LOTO LOCKS

Ernest D. Menold Inc. locks may only be used for LOTO. All other uses are prohibited.

The following are additional requirements pertaining to LOTO locks:

- A LOTO lock must always be accompanied by an Ernest D. Menold Inc. Company approved tag (see Figure 2).
- Supervisors may elect to use a checkout system that allows LOTO Authorized Employees to borrow locks from a common local supply.

Tags

The following are requirements for LOTO tags:

- Only company approved LOTO tags may be used (see Figure 2).
- A tag must always be used in conjunction with a lock unless the energy-isolating device is not physically capable of being locked. (See "Tag-Out Only" section)
- The LOTO Authorized Employee performing LOTO must write his/her name, telephone extension, and date on the tag. The back of the tag is reserved for any other information relevant to the lockout.

Figure 2. LOTO TAGS

Temporary Removal of LOTO Devices

When LOTO devices must be temporarily removed from the energy-isolating device so that the equipment or component can be re-energized for adjustment or positioning, the following sequence of eight actions must be taken:

1. The Supervisor must verify that the LOTO Authorized Employee is not at the work-site.
2. The Supervisor must make every reasonable attempt to contact the LOTO Authorized Employee. This may include a telephone call to the employee's home or other location.

    - These efforts must be documented (email, registered letter, voicemail, telephone, verbal assurance to the Supervisor and one other person, etc.).
    - If the employee is contacted, the Supervisor must inform the employee that his or her LOTO devices are being removed.
3. The Supervisor must verify that it is safe to remove the LOTO devices.
    - The Supervisor may use the key to remove the lock or the lock may be cut if necessary.

4. Before the worker returns to **any work duty,** the Supervisor must ensure that the LOTO Authorized Employee is presented with the removed lock upon returning to work and is informed of the reasons for the emergency removal.

    - The emergency procedure must be duly recorded in the company's lockout/tagout records and signed by the Supervisor and the LOTO Authorized Employee.

Tag-Out Only

In the rare cases that a device is not capable of being locked out, a "tag-out only" procedure may be used, subject to the following conditions. The following criteria must be met before using a "tag- out only" procedure:

- A justifiable and verifiable need must be identified; and
- Formal approval must be obtained from the immediate Supervisor.

Any energy-isolating device capable of being locked must be locked WITHOUT EXCEPTION.

To conduct a tag-out only procedure, the LOTO Authorized Employee must follow all of the steps outlined in "General LOTO Procedure" with the following two changes:

1. Omit the placement of the lock.

2. Instead, the LOTO Authorized Employee must utilize a second means of isolating the hazardous energy. Removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnect device, or removal of a valve handle are all examples of secondary measures. The second means of isolation must be identified on the tag, and the tag must be affixed outlined in Step 8 of the "General LOTO Procedure".

Extra caution must be exercised when using a Tag-Out Only Procedure. Tags may evoke a false sense of security by the at-risk employee. Tags Are warning devices and do not provide the physical restraint provided by a lock.

Group LOTO Procedure

When multiple LOTO Authorized Employees perform servicing, maintenance, or modification on the same piece of equipment or apparatus, the Supervisor may determine that the use of a group LOTO is appropriate.

1. The project Supervisor determines that a group LOTO procedure is appropriate.
2. The Supervisor must convene a meeting of all members of the group to be covered under the procedure.

    - The Supervisor must describe the tasks to be performed.
    - The Supervisor must delegate primary responsibility to a designated LOTO Authorized Employee for a specified group of employees working under the protection of the group LOTO procedure.
    - Each member of the specified group must be trained and LOTO Authorized as described under “Training and Authorization”.

3. The designated LOTO Authorized Employee is responsible for ensuring that each step of the equipment-specific written procedure has been completed.
4. The designated LOTO Authorized Employee must apply his or her personal LOTO lock(s) and tag(s) to the energy control device(s) and indicate on the tag(s) that a group LOTO is in effect.
5. The designated LOTO Authorized Employee shall place his/her key(s) inside of a gang lock box. The gang lock box shall be constructed in such a way as to permit multiple locks to be attached to the outside of the enclosure, preventing it from being opened until all locks are removed.
6. The designated LOTO Authorized Employee shall also place a LOTO lock and tag on the outside of the gang lock box.
7. All other workers performing work on the equipment shall assure that each step of the equipment-specific written procedure has been completed, and then lock and tag the gang lock box in a manner that prevents access to the key inside until all locks have been removed.
8. When the work has been completed and after each worker has removed his/her respective lock from the gang box, the designated LOTO Authorized Employee removes his or her LOTO lock from the outside of the gang lock box, obtains the keys from the lock box, and returns the equipment to service as outlined in “Release From LOTO Steps”.

Shift Changes

If equipment will remain de-energized after the end of a shift, and the work will continue by the oncoming shift, an orderly transfer of LOTO devices between LOTO Authorized Employees from the off-going and on-coming shifts must be performed, subject to the following conditions:

- A justifiable and verifiable need must be identified; and
- Supervisory approval must be obtained.

Shift Change LOTO Procedure

1. The LOTO Authorized Employees from both shifts must be present at the lock-out device.
2. The off-going LOTO Authorized Employee must remove his or her lock and tag, and the on-coming LOTO Authorized Employee must immediately place his or her lock and tag on the group LOTO device.
3. The LOTO Authorized off-going Employee must inform the LOTO on-coming Employee of any potential hazards.
4. Before work begins, the on-coming worker(s) shall:
    a. Re-verify that all safety devices (such as blocking) are in place, and
    b. Re-verify that there is zero energy in the system, and
    c. Attempt to restart or re-energize the system before anyone enters the hazard zone.

Subcontractors

All outside subcontractors involved in construction or maintenance for Ernest D. Menold Inc. who engage in activities covered by the LOTO Program shall be required to include in their safety plans LOTO procedures that conform to the requirements of this program. All subcontractors' employees are responsible for personally locking out and tagging out of the equipment they are working on.

Periodic Inspections

Each job-site is responsible for conducting an inspection and certification of its energy-control procedures annually. The periodic inspection must be performed and documented by a LOTO Authorized Employee other than the one utilizing the procedures being inspected. Specifically, the inspector must be able to determine whether:

1. The inspected procedures are adequate
2. They are understood; and
3. Are being followed by employees.

The periodic inspection must be designed to correct any deviations or inadequacies observed. The inspection should provide for a demonstration of the procedures. Following the inspection, there must be a review of each employee's responsibilities under the energy control procedure that was inspected.

The certification must state that the periodic inspection has been performed. The certification must identify the machine(s) or the equipment on which the energy control procedure was utilized, the date of the inspection, the employees included in the inspection, and the employee performing the inspection (see Appendix B "LOTO Inspection Form").

Tag-On

Sump pumps, emergency lights, or equipment that must be shut down in a controlled manner fall into a class of equipment that should not be accidentally de-energized.

When a circuit breaker, disconnect switch, or energy-securing device is readily accessible to any employee, the circuit breaker or disconnect switch may be tagged to indicate that it is not to be turned off.

The energy securing device must not be locked by any means that would prevent the device from being used as an emergency disconnect.

The tag must include the name of the responsible person and an alternate, date, and phone number.

Appendix A

Equipment-Specific Lockout/Tagout Posted Procedure

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

Equipment Specific Lockout/Tagout Posted Procedure

Name of Equipment or Apparatus: _____

1. **Purpose:** An equipment-specific written energy control procedure must be developed and used whenever equipment or apparatus: a) Has more than one energy source; b) Requires the operation of more than one device to isolate the hazardous energy; or c) Has the potential for stored, residual, or accumulated hazardous energy.

The attached LOTO posted procedure provides specific information on how to properly lock-out the equipment or apparatus identified above. This information includes specific methods and devices for locking out hazards and describes how to establish a verified de-energized state.

Note: The verification of a de-energized state can only be performed by a "Qualified and Authorized Person(s). These person(s) are the only ones who may perform testing on potentially energized electrical circuits or components, including meter testing and energy dissipation.

2. **Authorization:** Only trained LOTO Authorized Employees may apply LOTO devices to energy control points on this equipment or apparatus. This designation must be in writing after classroom LOTO training and hands-on-training for this particular energy control procedure.

3. **LOTO Devices:** Only approved Ernest D. Menold Inc. lockout/tagout devices are to be used. Advise all Affected Employees that LOTO procedures will be performed and lockout/tagout will occur.

4. **Procedural Steps:** Refer to Ernest D. Menold Inc. Lockout/Tagout Program for requirements and General Procedures. Specific energy control locations are provided in the attached posted procedure.

5.**Procedure Approval and Training Record:**

Procedure Written By (Print): _____

Signature: _____ Date: _____

Procedure Approved By (Print): _____

Signature: _____ Date: _____

The undersigned LOTO Authorized Employee has demonstrated LOTO proficiency for each form of hazardous energy on this equipment or apparatus, and has successfully completed equipment-specific LOTO training per the attached posted procedure.

Trainers Name: (PRINT): _____

Trainers Signature: _____ Date: _____

LOTO Authorized Employee's Name (PRINT): _____

LOTO Authorized Employee's Signature: _____ Date: _____

LOTO Authorized Employee's Name (PRINT): _____

LOTO Authorized Employee's Signature: _____ Date: _____

Equipment-Specific Lockout/Tagout Posted Procedure

Name of Equipment or Apparatus: _____

Procedure Requiring LOTO	Energy Source (s)	Energy Types Being Controlled	Where To LOTO	What LOTO Device To use	How to Test for Verification of Hazardous Energy Control

Restoring equipment to service (to be performed by the LOTO Authorized Employee):

- Remove all blocking and replace any critical parts removed during the lockout procedure.
- Ensure that all tools or equipment have been removed from the hazard zone.
- Close and secure all cover panels and doors. If all panels and doors can not be closed, which may occur when testing, place barricades or rope-off a safety zone with non-conductive material and post prominent warning signs around the area.
- Advise all Affected Employees that the system is to be re-energized.
- Ensure all persons remain clear of the equipment/hazard zone.
- Remove locks and tags. NOTE: Only the person who placed the locks and tags may remove them. If the person who placed the locks and tags is not available, the procedure for Non-Standard Lock/Tag Removal must be followed.
- Energize the equipment and re-store the equipment to normal condition.
- Notify all Affected Employees that the lockout condition has been cleared.

Appendix B

LOTO Inspection Form

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

LOTO Inspection Form

This form shall be completed by the designated LOTO Authorized worker who inspected the LOTO Authorized worker's use of LOTO procedures. The work supervisor confirms performance of the inspection by signing this form.

Date _____

1. List the equipment/machines on which the LOTO procedure is being used.

_____

_____

2. Provide the names of the LOTO Authorized workers who performed the LOTO procedure that was inspected.

_____

_____

3. Identify any discrepancies uncovered by completing the LOTO Inspection Checklist. List any corrective actions.

_____

_____

Signature of Inspector: _____ Date: _____

Signature of Safety Coordinator: _____ Date: _____

Lockout/Tagout Procedures for Shop Equipment

The following is the machine specific Lockout/Tagout procedure for each piece of equipment located in the Ernest D. Menold Inc. shop:

Chicago 10 ft. Brake:

Wait for the flywheel to stop spinning when shutting down the machine. This keeps the ram from moving when the pedal is depressed. Put the lockout device on the Main Disconnect on right side of the machine.

Cincinnati Press Brake:

Main Disconnect is located on the right side behind the machine. Wait for the flywheel to stop spinning. This will keep the ram from moving when the pedal is depressed. Pneumatic energy acts as counter balance to ram weight. Shut off valve is located behind the machine.

Do All Band Saw:

Breaker is located on the opposite side of the on/off switch on the back side of the machine. Use extra caution around the saw blade even when the machine is shut down.

Five Foot Break:

Breaker is located on the right side of the machine. Wait for the flywheel to stop spinning. This will keep the ram from moving when the pedal is depressed.

Flat Slip Notcher:

Wait for the flywheel to stop spinning before servicing the machine. Place the lockout device on the power plug.

New Shear:

Wait for the flywheel to stop spinning before servicing the machine. Place the lockout device on Main Disconnect on the left side of the machine. Pneumatic energy is used. Shut off valve is located on the column next to the shear. Stay clear from back gauge during operation and shut down.

Old Shear:

Wait for the flywheel to stop spinning before servicing the machine. Place the lockout device on the Main Disconnect on the left side of the machine. Stay clear from the back gauge during operation and shut down.

Radial Saw:

Breaker is located on the bus bar. Disconnect is located on the left side of the Chicago 10 ft. Brake. Pneumatic energy used to turn off the shut off valve before servicing. Use caution around the saw blade even when stopped.

Spot Welder:

Breaker is located on the Bus Bar. The disconnect is located on the left side of the Chicago 10 ft. Brake. Pneumatic energy used to turn off shut off valve before servicing. Stay clear of pinch points when servicing.

All other equipment:

Unplug, cover receptacle with hinged door. Place the lockout device on the power plug.

XIII. CONFINED SPACE ENTRY PROCEDURE

Purpose: This procedure outlines the minimum requirements for work inside a "confined space environment" as specified in OSHA 29 CFR 1910.146. This procedure also covers training and a list of necessary requirements associated with the protection of individuals entering a vessel or confined space from hazards such as but not limited to oxygen deficiency, hazardous materials, and blocked escape routes.

General

It is the responsibility of every employer to compile a list of any vessels and confined spaces as well as to determine any and all associated hazards in those areas. This documentation shall be made available to all employees working in said areas prior to performing any task in or around these vessels or confined spaces. Each of these confined spaces shall be evaluated prior to entry to determine acceptable conditions.

A vessel or confined space:

- Is large enough and configured so a worker can affectively enter.
- Have small or obstructed ways of getting in and out, which require use of hands for entry or exit.
- Not to be occupied continuously.
- Have one or more of the following characteristics:
    - Contain or have a known potential to contain a hazardous atmosphere
    - Contain a material with the potential to contain a hazardous atmosphere
    - Have an internal configuration shaped in a way which could trap or asphyxiate an entrant.
    - Contain any other recognized serious safety health hazard.

A permit required vessel/ confined space entry program is required for the control of potential hazards and for regulating employee entry when one or more of the following conditions exist within the vessel and/ or confined space:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential to create a hazardous atmosphere.
- Has an internal configuration which would enable an entrant to be trapped or asphyxiated.
- Electrocution hazard
- Heat Stress
- Engulfment- being trapped in liquid or solid material.
- Any other recognized serious safety or health hazards.

Examples include tanks, tank cars, vessel skirts, silos, boilers, trenches, pits, duct work, and pipelines. Vessels/confined spaces shall be clearly identified throughout the workplace identifying existence, location, and potential hazards.

Client Communication and Coordination:

Supervision will:

- Coordinate with the client's designated qualified person when the existence of a vessel/ confined space is determined and establish if entry is allowed via a written plan and permit program. Review the client's written procedure to determine if it contains more stringent requirements than company procedure.
- Inform the client of any known or potential hazards associated with the vessel/ confined space.
- Discuss and document to the client all of the precautions or procedures that have been taken to protect employees.
- Coordinate client entry operations and define co- occupational activities and responsibilities.
- Review the vessel/ confined space process at the conclusion of scope of work. Maintain a written record of all work performed as well as cancelled permits for annual vessel/ confined space review.

Written Program

Prior to granting permission for employees to enter vessel/ confined space a written vessel/ confined space program shall be developed. The written vessel/ confined space program shall be available for inspection by workers and/ or their authorized representatives.

The following elements shall be covered:

- Use of locking, chaining, and/ or other physical barriers or barricades as necessary to prevent unauthorized entry or personnel.
- Review the work area and vessel/ confined space identification list prior to working in or around the vessel/ confined space.
- Review the client's standard operating practices for vessel/ confined spaces.
- If a list identifying vessel/ confined space practices is not available, apply the following standards to minimize potentially hazardous conditions:
  - Specify acceptable entry levels: (oxygen – 19.5% to 22.5%, explosive potential – 5% of LEL or LFL, toxic levels at <5% of AEL, physical isolation, etc.)
  - Isolate the vessel/ confined space by identifying all points for disconnection of process lines and lockout of additional services. Complete isolation of vessel/ confined space.
  - Purge, flush, ventilate or otherwise decontaminate to eliminate or minimize hazards.
  - Provide pedestrian, vehicle, or other barriers to protect entrants from hazards. This includes posting an attendant where applicable.
  - Monitoring of confined spaces shall be performed prior to initial entry and shall be repeated as necessary to guarantee compliance with acceptable conditions. Confined space monitoring shall always measure for and in order of: oxygen content, presence of explosive gasses, toxic hazards,

and any other hazards anticipated in the confined space. Continuous monitoring is the acceptable standard.
  - Periodic monitoring will assist in validating the effectiveness of the continuous monitoring device.

- Recommended Equipment (Proper Use Ensured through training)

  - Testing and Monitoring Equipment which has been properly certified and tested.
  - Ventilating Equipment which has been properly certified and tested.
  - Communications Equipment
  - Personal Protective Equipment where engineering controls are not adequate.
  - Lighting Equipment (12 V recommended)
  - Physical Access Barriers and Shielding
  - Appropriate access/ egress equipment
  - Rescue and Emergency Equipment
  - Any other equipment deemed by the Client as necessary.
  - Identify equipment that will signal required emergency evacuation from the vessel/ confined space.
  - Review site conditions for any additional requirements.

- Provide at least one attendant/ standby person outside the vessel/ confined space while personnel are working in or near a vessel/ confined space. If multiple spaces are monitored by a single attendant, the permit shall identify the means and procedures by which response to situations will not distract from the responsibilities of the other permit spaces.
  Note: Multiple Attendendants are not recommended.

- **If multiple Employers' are to be working in or around the same vessel/ confined space a briefing must be held amongst all entrants and attendants prior to start of work. This briefing will be held daily. Attendants for all companies will stay in close contact throughout entire scope of work.**

- Designate specific active roles including but not limited to authorized entrants, attendants, entry supervisors, and testing and monitoring personnel. Identify each persons particular duties and provide training on the following:

  - Understanding, knowledge, and skills necessary for the performance of duties.
  - Establishing proficiency with said job duties.
  - Certify Training- including name, signatures of trainers, dates of training areas covered.

- Review with entrants and attendants procedures for summoning the proper rescue and emergency services. Post the following information on the vessel/ confined space permit:

  - The plan of rescue
  - The plan for preventing unqualified personnel from attempting a rescue.

- Clearly identify the system and responsible person for tracking permits

- Each job supervisor shall identify the position or person responsible to coordinate entry operations and permits.

- Review current entry operations whenever evidence exists that control measures have not been adequate to protect workers or when scope of work changes.

Permit Requirements

The permit shall document the completion of required measures prior to authorization of entry.

Prior to entry the designated supervisor must sign the entry permit. The completed permit will be made available to all authorized entrants. Limit the duration of the vessel/ confined space permit to an effective time necessary to complete the assigned task.

The entry supervisor shall terminate the entry and cancel the permit when:

- The task is complete
- A condition that changes arises near the vessel/ confined space.
- When unauthorized entry of a vessel/ confined space occurs.

The canceled permit shall be maintained for one year and be used for evaluation purposes.

Training

Each location having responsibility for a vessel/ confined space shall identify the training required to comply with this procedure. The employer shall provide training to ensure employees have the necessary understanding, knowledge, and skills to safely perform vessel/ confined space duties. This training as a minimum shall address safe work practices, roles and responsibilities of employees, use of safety equipment, and effective communications while working in and around the vessel/ confined space. This includes being able to recognize potential hazards and how to get them rectified.

The training shall be completed for each effected employee:

- Prior to first assigned duties
- Before a change in duties
- Whenever the scope of work changes
- Annual Refresher Training

The training shall develop qualified employees and shall be continually improved to address changes in the vessel/confined space program. The employer shall certify that the training has been accomplished.

Duties of Authorized Entrants

Authorized entrants shall be qualified for the job duties they are expected to perform and shall be confident in their understanding of the following:

- Awareness of the hazards faced during entry, including warnings and consequences.
- Proper use of equipment (includes inspection)
- Line of communication
- Alert the attendants whenever
  - Entrant recognizes hazard
  - Entrant detects prohibited conditions
  - Scope of work changes
- Exit the vessel/ confined space quickly when they:
  - Are order to evacuate
  - Recognize danger signs
  - Detect a prohibited condition
  - Hear an evacuation alarm

Duties of Attendants

The attendant's duty first and foremost is to monitor and protect authorized entrants. The attendant:

- Knows the potential hazards of the vessel/ confined space.
- Is always vigilant of any change in conditions that require procedural adjustment.
- Continuously maintains accurate count of authorized entrants.
- Remains outside the vessel/ confined space at all times until properly relieved.
- Keeps the line of communication open at all times with the entrants.
- Monitors the activity inside and outside of the vessel/ confined space to determine safe conditions.
- Orders entrants to evacuate if necessary
- Shall summon rescue or emergency services as needed for assistance to escape vessel/ confined space but shall not lose visual contact with the entrants in doing so.

- Shall take the following actions when necessary toward unauthorized persons near vessel/ confined space.
  - Warn away unauthorized persons.
  - Direct the unauthorized persons to immediately exit the area.
- Performs NON-ENTRY rescues as specified.

Duties of Entry Supervisor

The entry supervisor shall ensure each person involved in the vessel/ confined space entry complies with the requirements of this procedure and the permit during the vessel/ confined space entry:

- Assures isolation points are identified and isolation is complete. This includes site lockout if necessary.
- Insures the necessary permits are completed and posted.
- Knows the potential hazards that may be faced during entry.
- Verifies specified tests have been performed.
- Verifies the equipment specified by permit is in place.
- Signs the entry permit authorizing entry.
- Terminates and cancels the permit.
- Verifies rescue and emergency services are available and ensures that emergency procedures are known to entrants and attendants.
- Determines that entry operations remain consistent with the permit requirements and acceptable entry conditions are maintained.

Rescue and Emergency Services

The following requirements apply to locations who allow employees or on-site rescue teams to enter vessel/ confined space and perform rescue services:

- Provide and train employees on personal protective equipment and rescue equipment pertinent for making a rescue from a vessel/ confined space.
- Each member shall be trained to provide rescue duties.
- Each member shall practice making vessel/ confined space rescues.
- Each member shall be trained in basic First Aid and CPR.

When outside/ offsite rescue services are used:

- Inform rescue service of potential hazards.
- Provide rescue services access to vessel/ confined space areas where rescue may be necessary to develop appropriate plans and training.

Facilitate non-entry rescue by use of retrieval systems in vessel/ confined spaces unless increase in overall risk. Retrieval systems shall provide:

- Each entrant with a full body harness as a primary device.
- A mechanical device at the opposite end of the retrieval line.
- Identify an alternative to the mechanical device in the event of failure or multiple needs.

The MSDS or other information shall be immediately available to rescue and emergency services.

Confined Space Entry Procedure – Summary

THE FOLLOWING PROCEDURE SHALL BE FOLLOWED BEFORE ANY WORK IS ALLOWED TO BEGIN IN AN AREA MEETING THE DEFINITION OF A CONFINED SPACE:

I. The Ernest D. Menold Inc. written Confined Space Procedure shall be posted in it's entirety at the job site.

II. Confined Space Training shall be given in accordance to stipulations set out under the section "Training" in the Confined Space Entry Procedure".

III. Evaluation of the vessel/ confined space to determine what hazards are present by completing a Pre-Entry Checklist on the Confined Space Entry Permit. Additional copies of the Confined Space Entry Permit are available via the Main Office.
PLEASE NOTE THAT THIS PRE- ENTRY CHECKLIST REQUIRES THAT THE ATMOSPHERE WITHIN THE VESSEL/ CONFINED SPACE BE TESTED AND THE TEST RESULTS RECORDED. PROOF OF CALIBRATION MUST ACCOMPANY ANY EQUIPMENT USED IN SUCH TESTING.

IV. After completing the Pre-Entry Checklist, complete the remainder of the Confined Space Entry Permit. The Permit must contain the following details:
   - Identification of the confined Space.
   - Purpose of Entry.
   - Date and authorized duration of permit.
   - List of Authorized Entrants.
   - Names of the current Attendants and Entry Supervisor.
   - List of the Hazards in the Permit space.
   - List of the measures to be taken to isolate permit space and eliminate or control hazards.
   - Emergency rescue procedure.

V. Notify client, general contractor and/ or other contractors in the area that work is scheduled in the confined space.

VI. Supervisor in charge of the confined entry (as listed in the entry permit) shall develop an Emergency Rescue Procedure based on conditions at the site of the vessel/ confined space entry point and in

VII. consultation with the owner and any other contractors or subcontractors involved in the confined entry. Such Emergency Rescue Procedure shall be entered on the Entry Permit and shall be reviewed with the attendant stationed at the point of entry of the vessel/ confined space.

VIII. Erection of appropriate barricades and posting of warnings near vessel/ confined space entry.

IX. Lock-out any equipment or machinery that may create a hazard if running while entrants are occupying vessel/ confined space. Lock-out must be performed in accordance with the Ernest D. Menold Inc. Lock-out Procedure (See Section XII. Lockout / Tagout Safety Program).

X. Issue appropriate protective clothing, if required, to personnel before entrance to vessel/ confined space.

XI. Supervisor in charge of the vessel/ confined space entry (as specified in the permit) shall post the Entry Permit at the point of entry, shall post an attendant at the point of entry, and shall instruct the attendant of their responsibilities. These responsibilities are covered under “Duties of Authorized Entrants”. Attendant shall be proficient in basic First Aid and CPR. Supervisor shall make sure that all ladders, scaffolding, fall protection and other safety devices that may be required are properly installed and secured.

XII. In the event that it is deemed necessary that personnel either working in the confined space or involved in a rescue effort within the confined space require a breathing apparatus, only personnel who have received training in the use of such apparatus shall be allowed entry into vessel/ confined space.

XIV. Respiratory Protection Program

Purpose

The purpose of this document is to increase awareness of respiratory hazards in the workplace while being employed by Ernest D. Menold Inc., and inform employees of means available to protect themselves and others from those hazards. This program will also act as a helpful tool, providing information that will guide respirator users and their supervisors through the new respiratory protection regulation OSHA 1910.134 and help with making the changes necessary to meet its requirements.

Policy

This program outlines requirements and responsibilities for the Ernest D. Menold respiratory protection program. Specific respiratory requirements for protection against toxic air contaminants are covered in OSHA regulation 29 CFR 1910.134.

The requirements outlined in this program apply to all Ernest D. Menold worksites where operations may cause the release of harmful air contaminants. These air contaminants can be dangerous or lethal if inhaled and cause occupational disease or death. Respiratory protection is mandatory whenever personnel may be exposed to harmful contaminants and/or when oxygen deficient atmospheres exist or are likely to exist.

Respiratory hazards can occur in the form of harmful dusts, fogs, fumes, mists, gases, smoke, sprays, or vapors. The best means of protecting employees to such potentially hazardous materials is through the use of accepted engineering control measures such as local exhaust ventilation. However, the use of engineering control measures may not always be technologically or economically feasible due to the nature and/or location of the activities. In these situations the use of appropriate respiratory protection must be used to assure personnel protection.

Application

The requirements of this program shall apply to all employees of Ernest D. Menold Inc. who must enter an area where the use of respiratory protection equipment is required, regardless of the amount of time they will be in the area. All such individuals shall be provided with all necessary equipment and training free of charge. All employees required to wear respiratory protective equipment shall be enrolled in the Ernest D. Menold Inc. respiratory protection program. The program administrator is Kevin Moore, Safety Coordinator.

Responsibility

A. The shop at the Main Office and any and all jobsites are responsible for:

- Implementing this Respiratory Protection Program, when required.
- Ensuring all appropriate individuals are enrolled and participate in the program.
- Appointing a qualified person to oversee the program.

B. Project Managers and Foremen are responsible for:

- Anticipating and planning for routine and emergency use of respirators.
- Informing the program administrator of job conditions that are suspected of exposing employees to respiratory hazards.
- Assuring that all employees whose jobs require the wearing of respiratory protection equipment receive instruction in the selection, use, and maintenance of such equipment.
- Ensuring employees are provided with and properly use required respiratory protection equipment.
- Taking appropriate action to implement and enforce the Respiratory Protection Program.
- Ensure employees leave the exposure area to wash and change cartridges or if they detect breakthrough or resistance.

C. Employees are responsible for:

- Notifying their supervisor or program administrator of conditions that could result in exposure to respiratory hazards:
- Obtaining and wearing the appropriate respiratory protection equipment whenever required and in accordance with instructions and training received.
- Participating in training and fit-testing sessions provided by Kevin Moore Safety Coordinator.

- Reporting any malfunction of respiratory protection equipment to their supervisor and insuring that equipment is maintained in good working order.

D. The program Administrator is responsible for:

- Determining if respiratory protection is required based upon the nature and/or extent of the hazard.
- Advising supervisors and users on proper selection of respiratory protection equipment.
- Providing training to supervisors and employees in the respiratory protection program, as required.
- Conducting random inspections to ensure that respirators are being properly selected, used maintained and stored.

PROGRAM REQUIREMENTS

- Standard operation procedures governing the selection, care, issuance and use of respirators must be in writing at each operation which requires a respiratory protection program. Procedures must include guidance on emergency and rescue operations.
- Respirators must be selected on the basis of hazards to which the worker is exposed.
- All users must be instructed and trained in the proper use and limitations of respirators.
- Respirators must be regularly cleaned and disinfected. Those used by more than one worker must be cleaned and disinfected after each use.
- Respirators must be stored in convenient, clean, and sanitary locations.
- Respirators used routinely must be inspected during cleaning. Worn or deteriorated parts must be replaced.
- Respirators for emergency use, such as self contained devices, must be thoroughly inspected at least once a month and after each use.

- Appropriate surveillance of work are conditions and degree of employee exposure or stress must be maintained.

- Regular inspections and evaluations must be performed to determine the continued effectiveness of the program. These evaluations must include employees input on fit, selection, use, and maintenance of equipment.

- Persons must not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The respirator user's medical status must be reviewed at least annually.

- Approved or accepted respirators must be used when they are available.

Types of Respirators

There are two basic categories or types of respiratory protective equipment: Air purifying respirators and atmosphere-supplying respirators.

A. Air-purifying respirators use mechanical filters or sorbents (chemical cartridges) to remove harmful substances from the air. Air-purifying respirators may not be used in oxygen deficient atmosphere (less than 19.5 percent by volume) or under immediately-dangerous-to-life-or-health (IDLH) conditions. Air-purifying respirators can be classified as follows:

    1. Particulate removing respirators, which filter out dusts, fibers, fumes, and mists. These respirators may be single-use (disposable) filter respirators or respirators with replaceable filter cartridges.

    2. Gas and vapor-removing respirators, which remove specific individual contaminants or a combination of contaminants by absorption or by chemical reaction. Gas masks and chemical-cartridge respirators are examples of gas and vapor-removing respirators.

    3. Combination particulate/gas and vapor-removing respirators, which combine the respirator characteristics of both kinds of air-purifying respirators.

B. Atmosphere-supplying or supplied-air respirators provide clean breathing air from a source outside the contaminated area. The breathing air may be supplied through a hose (air-line) from a cylinder, an air compressor, or another source of clean air.

Only certain types of atmosphere-supplying respirators may be used in oxygen-deficient or IDLH conditions. The breathing air supplied to these respirators must meet the requirements of Class D breathing air as outlined in 29 CFR 1910.134(d). Supplied-air respirators, also called air-line respirators, are classified as follows:

1. Demand. This type of respirator supplies air to the user on demand (inhalation), which creates a negative pressure within the face piece. Leakage into the face piece may occur if there is a poor seal between the respirator and the user's face.

2. Pressure-demand. This type of respirator maintains a continuous positive pressure within the face piece, thus preventing leakage into the face piece.

3. Continuous flow. This type of respirator maintains a continuous flow of air through the face piece and prevents leakage into the face piece.

C. If IDLH equipment must be worn, proper outside standby persons, notification procedures, and training standards must be adhered to as outlined in Ernest D. Menold's Confined Space Entry Program.

Selection and Use

A. All respirators selected for use must be "approved" for protection from the toxic material to which the employee is exposed. Only respirators with a NIOSH/MSHA approval shall be used. Respirators are approved as a whole unit; components may not be interchanged between respirators.

B. The selection of the appropriate respirator for the task to be performed shall be made according to guidance from the American National Standard of Practices for Respiratory Protection Z88.2-1969 (ANSI Z88.2-1969). As a minimum, the following factors must be considered when selecting the appropriate respirator:

1. Whether an oxygen deficient, oxygen rich, or IDLH atmosphere exists or may be produced.

2. The nature of the hazard, i.e., the physical and chemical properties, the physiological effects on the body, the concentration of the toxic material including the peak and the average concentration expected, and the degree of protection necessary.

3. Permissible Exposure Limit (PEL) for the contaminant(s).

4. Whether toxic, flammable, or explosive by-products are present or may be produced.

5. The nature, extent, frequency and duration of the duties to be performed by personnel (e.g., welding, painting, etc.) in the work area.

6. Sorbent efficiency of cartridge or canister.

7. Any possibilities of high heat of reaction with sorbent material in the cartridge or canister.

8. Any possibilities of high heat of reaction with sorbent material in the cartridge canister.

9. Any possibility of shock sensitivity (explosion hazard) of the substance adsorbed on cartridge or canister sorbent.

10. The degree of protection required and the protection factor of the respirator.

C. Table A is the flow chart which will aid in determining the proper selection of respiratory protection equipment. It is recommended that the simplest and most comfortable and convenient respirator which will adequately protect against the hazard in question be selected. Table A provides a listing of some common exposures requiring the use of respirators and the type of respirator required.

D. A respirator user must be aware of warning signs and what action to take if there are signs of respirator failure. They are as follows:

1. Particulate Air-Purifying Respirators. Difficulty in breathing due to resistance. Usually caused by partial clogging of filter. Filter must be replaced. Disposable filter respirators must be discarded.

2. Gas or Vapor Air-Purifying Respirators. Detection of warning properties such as odor or taste, eye irritation, or respiratory irritation. Promptly leave the area. Check equipment assembly. If no discrepancies are observed, replace the cartridge or canister. If any of the warning properties appear again, the concentration of the contaminants may exceed the cartridge of canister design specifications. When this occurs, a supplied air respirator is required.

3. Supplied Air Respirator. Compressor failure alarm is activated or air pressure drop is sensed. Leave the area immediately. Check equipment. Replace air supply.

E. Service Life of Air-Purifying Respirator, canisters, and cartridges. The canisters or cartridges of air-purifying respirators are intended to be used until filter resistance precludes further use, or chemical sorbent is expended as signified by a specific warning property. New canisters, cartridges or filters must always be provided when a respirator is reissued. When in doubt about the previous use of the respirator, obtain a replacement canister or cartridge.

Medical Examination

Employees assigned to tasks requiring the use of a respirator must be physically able to perform the work while wearing the respirator. Employees must be examined by a physician at least annually. The examining physician shall determine which health and physical factors are pertinent for the employee's ability to work while wearing a respirator.

Factors to be considered include a history of emphysema, chronic obstruction, bronchial asthma, hypertension, epilepsy, anemia, diabetes, claustrophobia, pneumoconiosis, or pneumomediastinum. A chest X-ray and pulmonary function test shall be part of the examination.

The examination(s) will be scheduled during normal working hours and will be convenient and understandable. The employee is open to discuss the results of the exam freely with the examining physician.

Fit Testing

A. All employees using respirators must be fit tested so that the respirators fit properly and provide the degree of protection necessary under actual wearing conditions.

B. A quantitative and qualitative fit test shall be performed initially, and at least annually thereafter, whenever an employee is required to wear a respirator. The type of fit test will be determined based on the degree of the hazard involved and pertinent regulations.

1. A quantitative fit test involves exposing the employee to a test atmosphere containing an easily detectible, non-toxic, test agent and quantitatively measuring the penetration of the test agent into the respirator. During the test, the employee will be asked to perform a number of exercises which simulate the work environment and could induce leakage of the face plate. A quantitative fit test provides the most accurate information about the respirator fit.

2. A qualitative fit test involves the introduction of an odorous or irritating substance into the breathing zone of the respirator wearer. A subjective determination that the substance can be detected indicates an improper fit for the respirator.

C. The results of the quantitative and qualitative fit test are used to select specific types, makes, and models of respirator face plates which provide the best fit and which will provide the best protection against harmful substances for the individual employee. An employee must only use the specific make(s) and model(s) of respirators with which a satisfactory fit was obtained.

D. Respirator fit testing must be documented and must include the type of respirator, brand name and model, method of test and test results, test date, and the name of the instructor/tester.

E. Respirators shall not be worn when conditions prevent a good face seal or interfere with respirator function. Conditions which prevent a good face seal include (but not limited to) beard growth, sideburns, the absence of teeth or dentures, unusual facial configuration, temple bars on glasses, or the wearing of any object that projects under the face piece.

Training

A. Employees must receive training in the proper use of the respiratory equipment and the limitations of the equipment. The training must include instructions on fitting the respirator and

how to check the face piece-to-face seal using the qualitative fit test (See Appendix B). Prior to first using a respirator in a work situation, the employee must be given the opportunity to handle

the respirator, wear it in normal air for a period of time, practice adjusting it, and become familiar with it. Training must be performed at least annually.

B. Training for employees should include an explanation of the following:

1. The nature of the hazard and what may happen if the respirator is not used properly and exposure occurs.

2. Engineering controls in use, if any, and the need for added protection of the respirator.

3. Reasons for the selection of a particular type of respirator and the limitations of the respirator selected.

4. The proper method of donning and wearing the respirator, checking the fit and the operation of the respirator.

5. Proper inspection, maintenance and storage of the respirator.

6. How to handle emergency situations that may arise while wearing the respirator.

Cleaning and Storage

A. Respirators shall be cleaned and disinfected after each day's use or more frequently if necessary. Cleaning may be accomplished by hand cleaning or machine cleaning. When machine cleaning is used, care must be taken to insure against excessive tumbling or extreme temperature (usually above 120 º F). Disinfection is required when the respirator is used by more than one person and is not individually assigned.

B. The most commonly used cleaning solution us warm soapy water, but commercial cleaning solutions may also be used. Disinfection solutions commonly used include 50PPM solution of chlorine (about 2 ml bleach to 1 liter of water) and an aqueous iodine solution (about 0.8 ml tincture of iodine in 1 liter of water). Commercial disinfection or decontamination solutions are also available. The manufacturer's instructions should be followed for all commercial solutions used.

C. Respirators should be stored in convenient, clean, and sanitary location, where they are protected from dust, harmful chemicals, sunlight, excessive heat or cold, and moisture. Suggested storage

containers to protect the respirator from harmful agents include plastic bags capable of being sealed (such as Zip-Lock bags), plastic containers with tight fitting lids, or cans with tight fitting lids. The respirators should be allowed to rest in a normal position in the container. Respirators must not be hung by the respirator straps.

D. Respirators used strictly for emergency purposes should be stored in an easily accessible and well marked location.

Inspection and Maintenance

Respirators must be inspected regularly for damage, preferably prior to each use. The condition of the face piece, straps, inhalation and exhalation valves, cartridges, canisters, air hoses, and air cylinder should be checked. Any damaged parts must be replaced. Respirators must be maintained in operating condition, especially emergency use respirators.

Recordkeeping

The following records must be maintained:

a) Records of employee training.

b) Records of employee fit test results.

c) Records of inspection dates and findings must be kept for all respirators maintained for emergency use.

d) All records must be retained and made available in accordance with 29 CFR 1910.1020

Appendix A

Procedures for Cleaning Respirators

Remove filters cartridges, or canisters. Disassemble face pieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or components recommended by the manufacturer.

Wash components in warm (110º F [43º C] maximum) water with 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.

Rinse components thoroughly in clean, warm (110º F [43º C] maximum), preferably running water. Drain remaining water.

When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

a) Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 110º F or,

b) Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

c) Rinse components thoroughly in clean, warm (110º F [43º C] maximum), preferably running water. Drain remaining water. **The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on face pieces may result in dermatitis**. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

   Components should be hand dried with a clean lint-free cloth or air dried.

   Reassemble pace piece replacing filters, cartridges, and canisters where necessary.

   Test the respirator to ensure that all components work properly.

Appendix B

Steps for Positive Pressure Check

- Place hand over exhalation port and lightly breathe out and hold breath.
- After breathing out, the mask should be slightly inflated, and should remain inflated for approximately 10 seconds.
- If the mask does remain inflated, it has passed the positive pressure fit check. Now proceed to the negative fit check.

Steps for Negative Pressure Check

- Place hands over the inhalation ports and gently breathe in and hold breath.
- After breathing in, the mask should collapse slightly, and should remain collapsed for approximately 10 seconds.
- If the mask does remain collapsed, it has passed the negative pressure fit check. You are now ready to go to work.

Respiratory Protection

Airborne concentration of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals	Requested respirator
Not in excess 0f 2 f/cc (10 x PEL).	Half mask air purifying Respirator with high Efficiency filters.
Not in excess of 10 f/cc	Full face piece air purifying respirator equipped with high efficiency filters.
Not in excess of 20 f/cc (100 x PEL).	Any powered air purifying respirator operated in continuous flow mode. **OR** Any supplied air respirator operated in continuous flow mode.
Not in excess of 200 f/cc (1,000 x PEL).	Full face piece supplied air Respirator operated in pressure demand mode.
Greater than 200 f/cc (>1,000 x PEL) or unknown concentration.	Full face piece supplied air respirator operated in pressure demand mode equipped with an auxiliary positive pressure self contained breathing apparatus.

XV.FALL PROTECTION PROGRAM

Purpose

The purpose of this fall protection program is to establish guidelines to protect all of our employees engaged in work activities that expose them to potential falls from elevations. This includes all areas and situations that would expose anyone to heights of 6 feet or more. The goal of this program will be accomplished through effective education, engineering, administrative controls, fall protection systems, and enforcement program. This Fall Protection Program will be continually reviewed and monitored by Kevin Moore, Safety Coordinator in order to keep abreast of any changes in regulations or improvements in procedure.

Training

A proper fall prevention training program will be provided by Kevin Moore, Safety Coordinator for each employee who may be exposed to fall hazards. The training program will include recognition of the hazards of falling and procedures to follow to minimize these hazards. Training materials must be reviewed to verify that each employee has been trained, as necessary, by Kevin Moore, Safety Coordinator in the following areas:

- The nature and hazards in the work area.
- The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used.
- The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, and other protection to be used.
- The role of each employee in the safety monitoring system when this system is used.
- The correct procedures for handling and storage of equipment and materials and the erection of overhead protection.
- The role of employees in fall protection plans

Written certification records will be maintained for each employee completing the necessary training. These records will contain but are not limited to:

- The name of the employee trained
- The date(s) of the training
- The signature of the qualified person who conducted the training.

When the employer has reason to believe that any employee who has already been trained does not have the understanding and skill required by 29CFR 1926.503(a), the employer will retrain the employee. Retraining is also mandatory in the following circumstances:

- Changes in the workplace render previous training obsolete
- Changes in the types of fall protection systems and/ or equipment used rendering the previous training obsolete.
- Inadequacies in an affected employees knowledge or use of fall protection systems or equipment.

Job-Site Training will consist of designating a Monitor if no other alternate methods are used. A Monitor will be a competent person trained in the following duties:

- The ability to readily recognize and rectify any fall hazards.
- Warn employees if they are unaware of a fall hazard or are behaving in an unsafe manner.
- Be on the same working surface and in clear sight.
- Stay close enough to workers to maintain verbal contact.
- Monitoring duties are the person's sole job task. Attention is to be focused only these duties.

Rescue Procedures

In the unlikely event that a fall arrest occurs, all employees will be rescued in due haste by on-site personnel if applicable with the use of an articulating man lift or ladders where feasible. Alternate rescue would be through local emergency services.

Communication Issues

In the event of a fall, the following people will be notified as soon as possible:

- Rescue personnel
- Fire Department or emergency medical services.
- Kevin Moore, Safety Coordinator

At the beginning of any work activity where fall protection is an issue, *rescue plans must be identified and discussed* with all employees in case of a fall. The designated Monitor will develop the rescue plan.

All employees involved in a fall arrest or fall will be sent for a medical evaluation to determine the extent of any injuries.

Fall Investigation

All fall investigations will be conducted by the Project Manager and Kevin Moore, Safety Coordinator.

The following documentation will be completed as part of the fall investigation:

- Interviews with employees and witnesses
- Employee accident report

Program Review

This program will be reviewed periodically to determine effectiveness. The following will be used to monitor its effectiveness:

- Accident reports

- Compliance with the program components
- Periodic Audits
- Staff Feedback

Personal Fall Protection Systems

All employees on any project that will be required to wear a personal fall arrest or restraint system will follow these guidelines:

- All equipment must meet or exceed ANSI & ASTM requirements.
- A full body harness must be used at all times.
- All personal fall arrest systems will be inspected before each use by the employee. Any deteriorated, bent, damaged, impacted and/or harness showing excessive wear will be removed from service.
- Connectors will be inspected to ensure they are drop forged, pressed, or formed steel or are made or equivalent materials and that they have a corrosion resistant finish as well as that all surfaces and edges are smooth to prevent damage to interfacing parts of the system.
- Verify that the D rings and snaphooks have a minimum tensile strength of 5,000 lbs. and that the D rings and snaphooks are proof tested to a minimum tensile load of 3,600 lbs. without cracking, breaking, or taking permanent deformation.
- Only shock absorbing lanyards or retractable lanyards are to be used so as to keep impact forces at a minimum on the body.
- Only nylon rope or nylon straps with locking snap hooks are to be used for restraints.
- All lanyards will have self-locking snaphooks.
- Verify that unintentional disengagement of snaphooks is prevented by either of the following means:
  - ✓ Snap hooks are a compatible size for the member to which they are connected
  - ✓ Locking type snaphooks are used.
- Verify that unless the snaphook is a locking type and is designed for the following connections, snap hooks are not engaged in the following manners:
  - ✓ Directly to webbing, rope, or wire rope
  - ✓ To each other
  - ✓ To a D ring to which another snap hook or other connector is attached to a horizontal lifeline.
  - ✓ To any object that is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snap hook keeper and release itself.

The maximum free fall distance is not to exceed 6 feet. Consideration must be given to the total fall distance. The following factors can affect total fall distance:

- Length of connecting means (i.e. lanyard length, use of carabiners, snap hooks, etc.).
- Position and height of anchorage relative to work platform/area (always keep above head whenever possible).
- Position of attachment and D-ring slide on the full body harness.
- Deployment of shock absorber (max 42”).

- Movement of lifeline.
- Initial position of worker before free fall occurs (i.e., sitting, standing, etc.).

Calculating Fall Distance

It is the total length of the shock absorbing lanyard + height of the person + the location distance of the D-ring from the work surface or platform.

Always allow a minimum of 6 feet of clearance above the ground, equipment, etc. at the end of the fall from the fall arrest point.

Controlled Access Zones

Occasionally there is an area where a guardrail or other permanent fall protection system can not be installed and a personal arrest system is not feasible. For such situations a Fall Protection Plan must be developed by the persons responsible for that area. A fall protection plan, which involves controlled access zones, can be created and utilized only when workers are engaged in the leading edge work, pre-cast concrete erection work, residential construction work, or where it can be demonstrated that it is not feasible, or creates a greater hazard, to use conventional fall protection system.

Inspection of Fall Protection Systems:

The following criteria will be utilized to maintain all equipment in good working order.

Full Body Harness

Inspection before each use:

- Closely examine all of the nylon webbing to ensure there are no burn marks which could weaken the material.
- Verify there are no torn, frayed, broken fibers, pulled stitches, or frayed edges anywhere on the harness.
- Examine D-ring for excessive wear, pits, deterioration, or cracks.
- Verify that the buckles are not deformed, cracked, and will operate correctly.
- Check to see all grommets (if present) are secure and not deformed from abuse or a fall.
- Harness should never have additional punched holes.
- All rivets should be tight and not deformed.
- Check tongue/straps for excessive wear from repeated buckling.

Annual inspection of all harnesses will be completed by a competent person or inspection facility.

Storage will consist of hanging in an enclosed cabinet, to protect from damage.

All harnesses that are involved in a fall will be destroyed.

Lanyards/Shock Absorbing Lanyards:

Inspection before each use:

- Check lanyard material for cuts, burns, abrasions, kinks, knots, broken stitches, and excessive wear.
- Inspect the snaphooks for hook, locks, and eye distortion.
- Check carabiner for excessive wear, distortion, and lock operation.
- Ensure that all locking mechanisms seat and lock properly.
- Once locked, locking mechanism should prevent hook from opening.
- Visually inspect shock absorber for any signs of damage, paying close attention to where the shock absorber attaches to the lanyard.
- Verify that points where the lanyard attaches to the snaphooks are free of defects.

Annual inspection of all lanyards will be completed by a competent person or inspection facility.

Storage will consist of hanging in an enclosed cabinet, to protect from damage.

All lanyards that are involved in a fall will be destroyed.

Snaphooks:

Inspection before each use:

- Inspect snaphook for any hook and eye distortions.
- Verify there are no cracks, pitted surfaces, and eye distortions.
- The keeper latch should not be bent, distorted, or obstructed.
- Verify that the keeper latch seats into the nose without binding.
- Verify that the keeper spring securely closes the keeper latch.
- Test the locking mechanism to verify that the keeper latch locks properly.

Annual inspection of all snaphooks will be completed by a competent person or inspection facility.

All snaphooks that are involved in a fall will be destroyed.

Self-Retracting Lanyards:

Inspection before each use:

- Visually inspect the body to ensure there is no physical damage to the body.
- Make sure all back nuts or rivets are tight
- Make sure the entire length of the nylon strap is free of any cuts, burns, abrasions, kinks, knots, broken stitches, and excessive wear and retracts freely.
- Test the unit by pulling sharply on the lanyard to verify that the locking mechanism is operating correctly.
- If the manufacturer requires, make certain the retractable lanyard is returned to them for scheduled annual inspections.

Monthly inspection will be conducted by a competent person or inspection facility.

Inspect for proper function after every fall.

Tie-off Adaptors/Anchorages:

Inspect for Integrity and attachment to solid surface.

Annual inspection of all tie-offs and anchorages by a competent person or inspection facility.

All tie-offs and anchorages will be destroyed and replaced after a fall.

Articulating Man Lift:

Inspect before each use.

Service per manufacturers guidelines. Forklifts, scissor lifts, and safety nets will be inspected at the beginning of each shift in use. Structural integrity of forklift basket will be checked per same schedule.

Annual inspection of forklift basket will be completed by competent person or inspection facility.

Horizontal Lifelines

Inspect before each use for structural integrity of line and anchors.

Annual inspection by competent person.

Guardrails:

Temporary Systems- Daily visual inspection will be completed by competent person.
Permanent Systems- Annual structural inspection will be completed by competent person with future frequency of inspection defined based on conditions/controls present.

Storage and Maintenance of Fall Protection Equipment

Never store personal fall arrest equipment in the bottom of a tool box, on the ground, or outside exposed to the elements (i.e. sun, rain, snow, etc.).

Hang equipment in a cool dry location in a manner that retains its shape.

Always follow manufacturer's recommendations for inspection.

Clean with a mild, nonabrasive soap and hang to dry.

Never force dry or use strong detergents in cleaning.

Never store equipment near excessive heat, chemicals, moisture, or sunlight.

Never store in an area with exposures to fumes or corrosive elements.

Avoid dirt and buildup on equipment.

Never use this equipment for any purpose other than personal fall arrest.

Once exposed to a fall, remove equipment from service immediately.

TRAINING RECORD

The following employees have been trained to recognize fall hazards and to use appropriate fall-protection systems and methods to minimize exposure to hazards.

Name of Employee	Date of Training	Trainer's Signature

FALL HAZARD CHECKLIST

Use this checklist to identify fall-hazards at your worksite.

Check all boxes that apply. Check **"Yes"** if hazards exist at your worksite. Check **N/A** if not.

Hazard	YES	N/A
Hoist Areas		
Holes		
Formwork		
Rebar		
Runways		
Excavations		
Dangerous Equipment		
Overhead Work		
Floor Joists and Trussing		
Floor Sheathing		
Erection of Exterior Walls		
Roof Trussing		
Roof Sheathing		
Roofing		
Wall Openings		
Falling Objects		

XVI. Hearing Conservation Program

Policy

The primary goal of the Ernest D. Menold Inc. Hearing Conservation Plan is to reduce, and eventually eliminate hearing loss due to workplace noise exposures. That is why it is mandatory for all employees to wear hearing protection while working in the shop. The program includes the following elements:

- The work environment will be surveyed to identify potentially hazardous noise levels and employees at risk.
- Where engineering controls are not feasible, administrative controls and/or the use of hearing protective devices will be employed.
- Education is vital to the overall success of a hearing conservation program. Annual training is required for all employees who meet or exceed OSHA noise exposure requirements.

This Hearing Conservation Program is to protect our employees at Ernest D. Menold Inc. from the harmful effects of noise. The program shall consist of noise monitoring, employee training, audiometric testing with the appropriate medical surveillance, utilization of hearing protection and engineering controls, and record keeping. The program will include all employees exposed to noise levels over 85 dB (A) on an hour basis. The program shall be administered by Kevin Moore, Safety Coordinator. The program administrator has the full authority and responsibility to implement this program. A copy of 1910.95, Appendix A, will be posted for reference.

The following job categories in the list are or have been determined to have employee exposures to noise in excess of 85 db (A) on an 8 hour basis. These employees will be included in the hearing conservation program.

DEPARTMENT	JOB TITLE	EXPOSURE LEVEL

The following job categories listed have employee exposure to noise in excess of the OSHA permissible exposure level of 85 dB (A) on an 8 hour basis.

DEPARTMENT	JOB TITLE	EXPOSURE LEVEL

Hearing Protection

Hearing protection shall be provided to all employees at Ernest D. Menold Inc. regardless of the noise levels. The use of hearing protection is required for all employees especially if they are exposed to noise levels in excess of the permissible exposure level, have a documented Standard Threshold Shift, or have not had a baseline audiogram and employed for 6 months or more. The effectiveness of the hearing protection will be calculated by using the OSHA field attenuation formula in Appendix B. If the attenuation does not reduce employee exposure levels below the PEL for those who have had a Standard Threshold Shift, a higher form of protection will be utilized. The use of double protection, earplugs and muffs, can add an additional 5 dB (A) to the attenuation value of the highest rated (NRR) protector.

A variety of hearing protection is available at no cost to our employees. This consists of two types in any combination of foam plugs, inserts, or earmuffs.

Administrative and Engineering Controls
(If needed)

All locations where noise exposure levels are in excess of the permissible exposure level of 85 dB (A) shall have effective administrative or engineering controls to reduce employee exposure to noise. Engineering controls may include enclosures and barriers. Administrative controls may include rotation of employees to quiet areas during the shift. These controls shall be implemented with the assistance of an acoustical engineer or industrial hygienist. The controls shall be properly maintained to ensure their continued effectiveness. The following engineering controls have been instituted.

CONTROL	NOISE LEVEL	LOCATION

Noise Monitoring

An industrial hygienist will conduct noise monitoring. Noise monitoring will be performed whenever a condition exists resulting in an increase of employee noise exposure. Employees or their representatives will be given an opportunity to observe the monitoring. Any employee exposed to noise levels in excess of the action level shall be informed of their exposure level and provided training as described later.

Audiometric Testing

All employees exposed to noise levels in excess of the action level shall be included in an audiometric testing program. The audiometric testing is performed by Worknet Occupational Medicine in Lester Pennsylvania. (610) 521-6880.

All new employees in job categories exposed at the Action Level or higher are given a baseline audiogram. If this cannot be arranged, they must be given a baseline within six months unless a van service is used. Then it must be given within one year.

Audiometric testing will fulfill the following requirements:

1. Performed by a trained audiometric technician
2. Performed using properly calibrated audiometer (annual electronic and acoustic calibration, or biologic calibration prior to daily use).
3. Performed in a test booth meeting the background noise requirements of 29 CFR 1910.95, Appendix D.
4. Performed following fourteen hours of no occupational noise exposure (quiet time). Hearing protectors may be used to achieve this required time. Employees will be notified of this requirement and asked to avoid high noise levels during this period.
5. Evaluated and compared to any existing baseline.
6. Re-tested within thirty days by an audiologist or physician following any audiogram identified as a standard threshold shift.
7. Employees must be notified of audiogram results within twenty-one days if standard threshold shift is identified.
8. Done at no cost to employees.

A standard threshold shift is the loss of hearing relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear. If a standard threshold shift does occur, the employee will be immediately retested. The employee is now required to wear hearing protection. If they are already wearing hearing protection, they will be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering higher attenuation. They will be referred to a licensed physician for evaluation. **A standard threshold shift may be recorded as an occupational illness on the OSHA 300 log (see recordkeeping).**

Training

All employees and supervisors in areas where noise exposure levels exceed the action level shall be trained on an annual basis and shall be updated to be consistent with changes in protective equipment and work practices. The training shall include the following:

1. The effects of excess noise upon the ear. (Mandatory)

2. Types of hearing protectors available and their purpose, proper use, care, and fitting including advantages and disadvantages of each type. (Mandatory)

3. The purpose of audiometric testing and an explanation of test procedures. (Mandatory)

4. The current and future efforts of the company to reduce noise exposures by engineering and/or administrative controls. (Recommended)

5. Specific machinery that can cause excessive noise exposure. (Recommended)

6. The contents of the noise standard and its appendices (29 CFR 1910.95).

Recordkeeping

The program administrator is responsible for maintaining all records. Employees may access these at any time. Records are also available for review by the Assistant Secretary and the Director.

The following records will be maintained for the specified time period:

1. Audiograms- (Required for duration of employment, recommended for duration of employment plus thirty years).

   A. Name and job classification

   B. Date of audiogram

   C. Examiner name. (Recommend you include the qualifications also).

   D. Manufacturer and model number of equipment.

   E. Audiometer calibration

      i. Type of calibration
      ii. Date
      iii. Results (numerical)

   F. Employee's most recent noise exposure assessment

   G. Test booth background levels (octave band) and date.

2. Noise monitoring results (two years).

   A. Name.

   B. Job classification of employee measured and other employees represented by the measurement.

   C. Date, locations and results of each measurement.

   D. Equipment and calibration information.

3. Training documentation (recommended five years).

4. Notification letter to employee with a Standard Threshold Shift (recommended for length of employment plus thirty years).

5. If an employee's hearing test (audiogram) reveals that the employee has experienced a work-related Standard Threshold Shift (STS) in hearing in one or both ears, and the employee's total hearing level is 25 decibels (db) or more above audiometric zero (averaged at 2000, 3000, and 4000 Hz) in the same ear(s) as the STS, you must record the case on the OSHA 300 Log.

TRAINING RECORD

Date: _____

Employee Name: _____

Trainer Name: _____

TOPICS COVERED

1. The effects of excess noise upon the ear.

2. Types of hearing protectors available and their purpose, proper use, care, and fitting including advantages and disadvantages of each type.

3. The purpose of audiometric testing and an explanation of test procedures.

_____
Employee Signature

_____
Trainer Signature

EVALUATION OF THE EFFECTIVENESS OF HEARING PROTECTORS

Ear protection for employees is effective in substantially reducing noise exposure. Such protection may be provided as either ear plugs, ear muffs or both. Employers are required by the noise standard to evaluate the sound attenuation provided by ear protectors for the specific environment in which the protector will be used. Evaluation methods that must be used, according to 29 CFR 1910.95(l)(1), are described in Appendix B of the standard.

When utilizing the Noise Reduction Rating (NRR) for hearing protectors using a dosimeter that records A-weighted measurements, the following method is used:

1. Convert the A- weighted dose (%) to the TWA
2. Subtract 7 dB from the NRR
3. Subtract the remainder from the A-weighted TWA to obtain the A-weighted TWA under the hearing protector.

This method determines the laboratory based noise reduction for a given hearing protector. However, in an actual work environment laboratory based attenuation cannot be obtained. Therefore, a 50% safety factor is applied.

For example, an employee has an 8 hour TWA noise exposure of 96 dB (A). He used Zee Brand earplugs with an NRR=31. The field based attenuation is calculated as follows:

$$\text{Approximate Field Attenuation} = \frac{31\text{ dB} - 7\text{ dB}}{2\text{ (safety factor)}} = 12.0\text{ dB}$$

A-weighted TWA under the hearing protector
=96 dB(A) – 12 dB=84 dB(A)

When ear muffs (North, NRR=23) are utilized along with ear plugs, an additional 5 dB attenuation may be realized from the better rated hearing protector. In this case the Zee model plugs are better, so do the calculation as above and subtract 5 dB(A). Actual hearing protection under the muff and plugs would then be 79 dB(A).

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

XVII. ERNEST D. MENOLD, INC. HAZARD COMMUNICATION PROGRAM

Hazard Communication Program

Policy

The policy of Ernest D. Menold, Inc. is to perform work in the safest manner possible. Ernest D. Menold, Inc. will provide the safest possible working conditions for its employees' workplace. It is a condition of employment for employees of our company to acknowledge, in writing, that they have received a briefing on this program and that they agree to follow all directions, written, verbal, and visual pertaining to this program. This written Hazard Communication program will be available upon request to employees, their designated representative, Emergency Personnel, and interested members of the community.

Purpose

The purpose of the Hazard Communication Program is to inform its employees of the Occupational Safety and Health Administration (OSHA) Regulation which requires that employees be informed about hazards from chemicals that they may encounter at the workplaces and appropriate protective measures they can take. The objective of the Hazard Communication program is:

- To safeguard our employees' health be providing a management guide for safe compliance.
- To provide our employees' subcontractors and licensed vendors with the necessary information concerning health and physical hazards of the chemical materials in use at the workplace.

Program Elements

The major elements of the company Hazard Communications Program include the following:

- Listing of all chemical products used at the company workplaces or stored on company property.
- Hazard identification of all chemicals in use or stored at the company workplaces.
- Labeling of all containers of all chemicals used .
- Provide ready availability of Material Safety Data Sheets (MSDS) for hazardous chemicals used by the company.
- Identify operations or tasks in the employees' work area that use hazardous chemicals.
- Training of employees in the safe handling and use of chemicals.

Chemical Lists

A list of all chemicals used or stored at our company workplace will be assembled and maintained and will be updated in a timely fashion to show the chemicals actually in use or in storage. These lists will be maintained in a central file in the shop foreman office and will be available to the employees upon request.

Labels and Other Forms of Warning

Each container of hazardous chemicals regardless of size, shall be labeled, tagged, or otherwise marked to show the identity of hazardous chemicals and the appropriate hazard warnings. Employees shall be trained on how to read and interpret warning labels.

- The HCS Coordinator will be responsible for seeing that all containers delivered at company workplaces are properly labeled.
- All incoming labels shall be checked for identity, hazard warning, and name and address of manufacturer or supplier.
- Each supervisor shall be responsible for seeing that all portable containers used in their work area are labeled with identity and hazard warning.

Material Safety Data Sheets (MSDS)

This hazard communication program relies on Material Safety Data Sheets (MSDS) from suppliers for purposes of hazard determination. Employees will be trained in the use of Material Safety Data Sheets to include their location and availability, in order to avoid and / or lessen potential hazards

- The HCS Coordinator will be responsible for compiling the master MSDS file. It will be kept at their desk and the shop foreman office.
- Copies of MSDS's for all hazardous chemicals provided by the employer, to which employees may be exposed, will be kept at the workplace. MSDS's will be available for review to all employees.

Training

Employees shall be trained according to a written hazard communication training plan that is part of our company overall hazard communication program. Training shall extend to non-routine tasks, as necessary, and to foreseeable hazards.
Orientation training shall be provided to all newly hired employees who will be routinely exposed to hazardous material provided by the employer. When as employee is reassigned or transferred to a different workplace where the employee may be exposed to a different set of hazardous chemicals, provided by employer, reorientation training will be provided.
The training provided shall include the following items according to individual requirements:

- Explanation of the Hazard Communication Standard (Employee rights and responsibilities).
- Introduction to the written Hazard Communication Program.
- Dissemination of Hazard Information
- Availability and interpretation of MSDS's.
- Labeling procedures.
- Physical and health hazards of chemicals in workplaces.

- Flammable materials
- Corrosive materials
- Toxic materials
- Explosives
- Oxidizers
- Carcinogens
- Adhesives
- Lubricants
- Irritants
- Sensitizers
- Protective procedures
- Protective equipment
- Procedures for non-routine tasks.

After attending the training class each employee will sign a form stating that they received training in accordance with the Companies Hazard Communication Program.
Every trainings session for employees must be documented.

Hazardous Non–routine Tasks

Prior to starting work on a hazardous, non-routine task, each employee will be given information about hazards involved. This information will include:

- Specific chemical hazards
- Protective / safety measures the employee can take

Contracts

All contracts signed by Ernest D. Menold, Inc. shall be reviewed by the HCS Coordinator to determine what contractual requirements, if any, exist with regard to Hazard Communications. These requirements shall be communicated to the appropriate person in the organization and necessary action taken.

Multi-Employer Worksites

While each contractor is responsible for its own employees' training, Ernest D. Menold, Inc. will attempt to answer other contractor employees' questions about workplace hazards.

Community Right-To-Know Reporting Requirements under HCS

Ernest D. Menold, Inc. shall submit a list of hazards materials if requested which are present at company facilities to:

- The local emergency planning committee
- The state emergency response commission
- The local fire department

Administrative Responsibility

Administrative responsibilities for this program are hereby delegated to the HCS Coordinator. The HCS Coordinator will be responsible for the execution and continual audit of this program on a day-to-day basis and is hereby given the necessary authority to perform his responsibilities.
The HCS Coordinator of the Hazard Communication Standard Program is Kevin Moore who is also the companies Safety Coordinator. He can be reached at 610-521-4700 during normal office hours 8:00 A.M. to 5:00 P.M., Monday thru Friday.

FOOTNOTES:

1. Exceptions to this rule are made only for very small containers filled by the person using the material, which must then be used/emptied by that person during the same shift. Such containers need not be labeled.
2. The HCS Coordinator may delegate this duty to designed jobsite personnel.

Hazard Communication Training Program

A. Introduction

OSHA's Hazard Communications Standards of 1985 was initially designed to alert manufacturing employees about workplace chemicals by providing them better access to information on their health and physical hazards, emergency and first aid procedures, and safe handling precautions. In August 1987 OSHA expanded its standard to non-manufacturing employers as a result of evidence it had studied indicating that some employees in every SIC Code were being exposed to hazardous chemicals.

The expended OSHA Communication Standard requires:

1. Non-manufacturing employers to establish a hazard communication program to inform their employees by means of material safety data sheets, labels on containers and training programs about the hazards of chemicals they come in contact with on their jobs effective May 23, 1988.
2. Chemical manufactures, distributors, and importers to provide MSDS's to all non-manufacturing employers or distributors after September 23, 1987.

OSHA's expanded standard preempts state laws covering hazard communication in states that do not have OSHA state plans. It requires OSHA approval for state hazard communication laws in states operating their own OSHA programs. In states where employers are obligated under the Emergency Planning and Community Right to Know Act of 1986, those employers included under the Hazards Communication Standard will be required to submit chemical hazard information to state and local governments and the surrounding communities.

B. Employee Information and Training

1. All employees shall be informed that Ernest D. Menold, Inc. is required by law to have a chemical hazard communication program.
2. All employees shall be informed of the details of Ernest D. Menold, Inc. chemical hazard communication program. The detailed information shall include:
   a. The location and ready availability of a list of all hazardous chemicals used by the company.
   b. A list of all chemicals used or stored at our Ernest D. Menold, Inc. workplaces will be assembled and maintained and will be updated in a timely fashion to reflect the chemicals actually in use or stored. These lists will be maintained in a central file at the safety coordinators desk and the shop foreman's office and will be available to the employees upon request.
   c. Copies of MSDS's for all hazardous chemicals provided by the employer to which employees may be exposed will be kept in a binder on the workplace. MSDS's will be available for review to all employees.
   d. Specific questions or tasks in the employee's work areas that use hazardous chemicals.

3. Additionally, all employees shall receive the following training:
   a. Employees shall be trained in how to detect the presence of hazard chemicals
   b. Employees shall be trained in the specific physical and health hazards of hazardous chemicals in the employee's work areas.
   c. Employees shall be trained in protective measures including specific work procedures implemented by Ernest D. Menold, Inc. and the use of personal protective equipment.
   d. Employees shall be trained in understanding, interpreting, and using hazard information and data provided on chemical labels and MSDS's.

C. Training Assignment and Responsibility

1. The HCS Coordinator or his designated representative will train all new employees in the hazard communication program as specified above in item 2. This training will be a part of the new employee's general orientation and will take place before the new employee begins work.
2. Additionally, the HCS Coordinator or his designated representative will train existing employees whenever new hazardous chemicals are introduced into the workplace, or existing employees are reassigned to new positions where they may be working near new hazardous chemicals.
3. All employees will be trained in the issues identified above.

D. Material Safety Data Sheets

The material safety data sheets (MSDS) for each hazardous chemical in your workplace explains how to use, handle and store the chemical in a safe manner. Because MSDS's are written by manufactures each one may look different; however, they all contain the same basic information.

Most MSDS's have nine (9) basic sections. The following is an overview of the material safety data sheet information, by section.

Section I – Chemical Identification
This first section of the MSDS helps you identify the chemical by listing its name, any trade names and the chemical manufacturer's name and address. There is usually a section for an emergency phone number.

Section II – Hazardous Product Ingredients
This section identifies the ingredients in the chemical that can harm you. It also lists the concentration levels of the chemical to which you can be safely exposed. This is often identified as the permissible exposure level (PEL), or threshold limit value (TLV).

Section III – Physical Data
The chemical's appearance, odor and other physical characteristics are described in this section. A chemicals physical characteristics and limits may help identify what special personal protective equipment needs to be used to work safely with the chemical.

Section IV – Fire and Explosive Data
Listed here is the temperature at which the chemical ignites (flash point). If a chemical is flammable it ignites below 100 F. If it's combustible it ignites at 100 F or above. This section also lists items that will put the fire out safely (extinguishing media) and any special fire fighting procedures.

Section V – Reactivity Data
This section will tell you whether the chemical reacts with materials or conditions. "Incompatibility" lists the materials such as water or other chemicals that cause the chemical to burn explode or release dangerous gasses.

Section VI – Health Hazards
This section lists symptoms of overexposure such as headache, dizziness, skin rash or burn. It also details first aid and emergency procedures in case of overexposure.
This section may also tell you what medical conditions may be aggravated by exposure to the chemical and identify chronic health effects, if any.

Section VII – Precautions for Safe Handling and Use
This section tells you what to use to clean up an accidental spill or leak. Before cleaning up a chemical spill you may need to wear personal protective equipment.
This section may also include notes on how to dispose of the chemical safely (waste management).

Section VIII – Control Measures
In this section, you will find a listing of any personal protective equipment (respiratory protection, gloves, eye protection) you'll need to work safely with the chemical. If protective equipment is needed, this section may list specific types that are recommended.

E. Labels and Other Forms of Warning

Under the Hazard Communication regulations an employer is required to ensure that each container of hazardous materials is labeled or marked with information giving the identity of the hazardous chemical and appropriate warnings. Care will be exercised to ensure that all labels are intact and have not been defaced or removed. Labels will be provided in English. If necessary labels will be available in other languages. There are various types of labels. Most labels will contain information on basic warnings, first aid, fire, spills, handling and storage and disposal. Labels may also contain pictures, symbols, or a combination of the two.

Questions relating to a hazardous chemical not addressed in the label content should be referred to the Material Safety Data Sheet for that hazardous chemical.

Basic Warning – This section of the warning label identifies the chemical by name, its hazardous ingredients and the name and address of the manufacturer. It may also list basic hazard warnings such as avoid skin contact, etc.

First Aide – The label may explain what steps to take if the hazardous chemical is splashed in your eyes or on your skin.

Fire – This section will describe what action to take if an accidental fire involving the hazardous chemical is started. It should identify which of the four types of fire extinguishers (water spray, carbon dioxide, dry chemical, or Halon) to use in putting out the fire.

Spills – The label may indicate methods to handle spills including what protective equipment is needed to respond to a spill. Employees should be cautioned to contact their superior immediately in the event of a spill.

Handling and Storage – This section of the label may identify the personal protective equipment needed to handle the hazardous chemical safely (e.g. glass goggles or respirators). It also may contain the need to store the chemical away from other chemicals, which may react it, or identify specific ventilation requirements.

Disposal – The label may inform you on how to dispose of empty containers. Often empty containers hold the residues of the hazardous chemical and should be treated as if they are full.
Hazardous chemical containers that are not labeled or where the label is torn or not legible should not be handled. Supervisory or management personnel should be advised immediately of these conditions. When hazardous chemicals are moved from their primary container to a transfer container, that transfer container needs to be identified with a proper label or other form of warning. Exceptions to this rule are made only for very small containers need not be labeled.

F. Hazard Determination

It is the chemical manufactures and importers responsibility to evaluate chemicals produced or imported by them to determine if they are hazardous. This determination of a hazardous chemical is communicated to non-manufacturing firms by way of Material Safety Data Sheets and appropriate chemical container labeling. Under OSHA, employers are not required to evaluate chemicals unless they make a determination not to reply on the evaluation of the manufacturer or importer.

Some physical hazards pertain to chemicals and how they react under certain conditions. Physical hazards include chemicals that are combustible liquids, compressed gasses, explosives, flammable, organic peroxides, oxidizers, pyrophoriacs (ignite spontaneously), and water reactive.

Health hazards pertain to how a chemical hurts or can hurt your body. In some instances, your body reacts quickly when exposed to a hazardous chemical, and in other instances the reaction can take place over a long period of exposure.

G. Common Terms and Definitions

Corrosives: Corrosives are chemicals or materials that can burn or damage on contact with the body, or in close proximity with the eyes. Corrosives can also damage the lungs if inhaled. Common corrosives are some cleaners, acids and caustics.

Flammables: Most common flammables are liquids that emit vapors that can ignite and materials that burn. Flammables can also be gases or solids.

Reactives: Reactives are materials that when mixed with certain other materials can react explosively or violently. The reaction can cause fire or toxic vapors or gases.

Toxic: Toxic materials can poison the body and cause harmful effects under improper exposure. The effects can result from immediate or long-term overexposure.

Acute Exposure: Acute exposure to chemical pertains to a single exposure to a chemical over a short period of time.

Chronic Exposure: Chronic exposure pertains to repeated exposures to a chemical over a long period of time.

Inhalation: A chemical can enter a body through inhalation by breathing the substance into the body. Vapors and dusts can also be inhaled causing damage to the breathing passages and lungs.

Ingestion: Ingestion is the act of swallowing and is an infrequent route of toxic chemicals into the body.

Absorption: The entry of a chemical substance through the skin is known as absorption.

XVIII. LEAD SAFETY PROGRAM

I. Purpose

The purpose of the Ernest D. Menold Inc. Lead Safety Program is to minimize lead exposure to all employees and to help prevent building contamination during demolition, maintenance and renovation activities while working. It is the intent of this program to comply with the OSHA Lead Standard for Construction 29 CFR 1926.62.

II. Scope

This program applies to all Ernest D. Menold employees working in the main facility at 445 Powhatan Avenue Lester, PA., as well as any job sites. All employees are subject to the requirements of this program.

III. Occupational Exposure to Lead

A. Permissible Exposure Limit *(PEL)*

Ernest D. Menold Inc. shall assure that no employee is exposed to lead at concentrations greater than fifty (50) micrograms per cubic meter of air averaged over an 8 hour period. If an employee is exposed to lead for more than 8 hours in any work day, the permissible exposure limit, as time weighted average (TWA) for that day, shall be reduced according to the following formula:

Allowable employee exposure (in µg /m³) = 400 ÷ hours worked in a day

B. Exposure Assessment

Ernest D. Menold Inc. shall make an initial determination of whether any employee involved in construction activities may be exposed to lead at or above the OSHA action level of 30 µg /m³, 8-hr TWA without regards to respiratory protection.

Exposure assessments shall be done by the collection of personal air samples. These air samples shall:

- Be representative of a full shift
- Include at least one sample of each job classification in each work area
- Be done for each shift or for the shift with the highest exposure level
- Be representative of the monitored employee's regular daily exposure to lead

B.1 Protection of employees during assessment of exposure

The following interim protection shall be provided to employees:

- Appropriate respiratory protection
- Appropriate personal protective equipment
- Change areas

- Hand washing facilities
- Biological monitoring consisting of blood sampling and analysis for lead and zinc protpporphyrin levels
- Training

B.2 Basis of Initial Determination

Ernest D. Menold Inc. shall monitor employee exposures and shall base initial determinations on the employee
exposure monitoring results and any of the following relevant considerations:

- Any information, observations, or calculations which would indicate employee exposure to lead
- Any previous measurements of airborne lead
- Any employee complaints of symptoms which may be attributed to lead exposure

B.3 Frequency

If the initial determination shows that employee exposure is below the action level, then monitoring can be stopped. If the initial determination shows exposure above the action level but below the PEL, the monitoring shall be done every 6 months. This shall be done until at least two consecutive measurements are below the action level.

If the initial determination shows that the employee exposure is above the PEL, monitoring shall be done quarterly. This shall be done until at least two consecutive measurements are at or below the PEL. If the measurement remains above the action level, monitoring shall be done according to the paragraph above.

B.4 Additional Exposure Assessments

Whenever there has been a change of equipment, process, control, personnel or new task has been initiated that may result in additional employees being exposed to lead at or above the action level, or may result in employees already exposed at or above the action level being exposed above the PEL, additional monitoring shall be conducted according to **section B** of this program.

B.5 Employee Notification

Employees shall be notified in writing as soon as possible, but no later than 5 working days after the receipt of the results of any exposure monitoring, including any corrective actions being taken.

C. Compliance Program

A “site specific” written compliance program will be implemented to reduce exposures to or below The permissible exposure limit, and interim levels if applicable.

The written compliance program shall include:

- A description of each operation in which lead is emitted including machinery used, material processed, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices.

- A description of the specific means that will be employed to achieve compliance, including engineering plans and studies used to determine methods selected for controlling exposure.
- A report of the technology considered in meeting the permissible exposure limit.
- Air monitoring data which documents the source of lead emission.
- A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts etc.
- Written programs must be revised and updated at least annually to reflect the current status of the program.

D. Respiratory Protection

Respiratory protection is specified in Table I of CFR 1926.62 (f) (3) for exposure not in excess of 500 µg/m³ . must be worn by Ernest D. Menold Inc. employees performing any work tasks if exposure monitoring has not been done. Also required are appropriate personal protective clothing and equipment, change areas, had washing

facilities, biological monitoring, safety training and education which includes respirator training and hazard communication training.

Respiratory Protection must be worn:

- During periods necessary to install or implement engineering or work-practice controls.
- During work operations for which engineering and work-practice controls are not sufficient to reduce employee exposures to or below the permissible exposure limit.
- During periods when an employee requests a respirator.

E. Protective Clothing and Equipment

Protective work clothing and equipment shall be used prior to the completion of and during exposure assessment monitoring, where an employee is exposed to lead above the PEL, and where an employee is exposed to lead compounds that may cause skin and eye irritation. Ernest D. Menold Inc. shall provide these items at no cost to the employee to prevent lead contamination of the employee or employees clothing.

The following are acceptable PPE:

- Coveralls or similar full-body work clothing
- Gloves, hats and shoes or disposable shoe coverlets
- Face shields, vented goggles, or other appropriate protective equipment which complies with section 1910.133 of the OSHA regulations.

The protective clothing described above shall be provided in a clean and dry condition at least weekly. If exposure has been determined to be above 200 µg/m³ for a particular task, then the protective clothing shall be provided in a clean and dry condition each day that task is performed.

Ernest D. Menold Inc. shall provide for the cleaning, laundering, or disposal of any protective clothing. The company shall ensure that this protective clothing is removed only in a designated change area as described in Section F of this program and that this contaminated clothing is placed in a closed container in the change area to prevent dispersion of lead outside the container. This container shall be labeled:

Caution: Clothing contaminated with lead. Do not remove dust by blowing or shaking. Dispose of lead contaminated wash water in accordance with applicable local, state, or federal regulations.

F.Housekeeping

All surfaces shall be maintained as free as practicable from accumulations of lead. Floors and surfaces where lead accumulates shall wherever possible be cleaned by vacuuming or other methods that minimize the chance of the lead becoming airborne. The vacuum must be equipped with HEPA filters. Compressed air shall not be used to remove lead from any surfaces.

G. Hygiene Facilities and Practices

The following shall not be used or present in areas that employees are exposed to lead above PEL:

- Food and Beverages
- Tobacco Products

Change areas:

A clean change area shall be provided for employees whose airborne exposure to lead is above the PEL as well as before exposure assessments. The change area shall have separate storage available for protective work clothing and street clothes to prevent cross-contamination.

Employees shall not leave the work place wearing any protective clothing or equipment that is worn during the work shift which has been exposed to lead contamination.

Hand Washing Facilities:

Employees shall wash their hands and face prior to eating, drinking, smoking, or applying cosmetics as well as at the end of their work shift prior to leaving area of contamination.

H. Medical Surveillance

Medical surveillance shall be provided according to 29 CFR 1926.62 (j). For a detailed explanation see Appendix B of this program.

I. Methods of Compliance

Engineering and work practice controls:

These controls will be put in place to reduce lead exposure to below the PEL. If these controls are not sufficient to keep exposure below the PEL then respiratory protection will be implemented. Section D of this program summarizes general procedures to use with respect to protective clothing and equipment.

Compliance Program:

J. Medical Removal Protection

Medical removal protection shall be enacted according to 29 CFR 1926.62 (k). For a detailed explanation see Appendix C of this program.

K. Employee Information and Training

All employees subject to exposure to lead above the action level (30 µg/m³) on any day shall be included in lead training. Initial training shall be completed prior to job assignment. Refresher training for all company employees will be conducted annually.

General Training Guidelines:

- The OSHA lead standard
- Specific operations that could lead to lead exposure above action level
- The purpose, proper selection, fit, use and limitations of respirators
- The medical surveillance and medical removal program
- Information regarding adverse health effects associated with excessive lead exposure
- Engineering and work practice controls
- The contents of any lead compliance plan in effect
- The right to access medical records under 29 CFR 1910.1020

Warning Signs

Work areas where employees exposure to lead is above the PEL shall be posted with the following warning signs:

- Warning
- Lead Work Area
- Poison
- No Smoking or Eating

L. Recordkeeping

Records shall be kept regarding all monitoring as well as other data used in conducting employee exposure assessments. Exposure monitoring records shall include:

1. Dates, number, duration, location and results of all samples taken, including a description of the sampling procedure used to determine employee exposure.

2. A description of sampling and analytical methods used as well as evidence of their accuracy.

3. The type of respiratory devices used.

4. Name, Social Security, and Job Classification of all employees involved in monitoring and exposure.

5. Records will be kept on file for 40 years or for at least 20 years after termination of employment, whichever is longer.

Appendix A

With Respect to protective clothing, and equipment, where appropriate, the following procedures should be observed prior to beginning work:

1. Change into work clothing and shoe covers in the clean section of the designated changing areas.
2. Use appropriate protective work garments and gear, including respirators before entering the work area.
3. Store any clothing not worn under protective clothing in the designated changing area.

Workers should follow these procedures upon leaving the work area:

1. HEPA vacuum heavily contaminated protective work clothing while it is still donned. At no time may lead be removed from
   Protective clothing by any means which result in uncontrolled dispersal of lead into the air.
2. Remove shoe covers and leave them in the work area.
3. Remove protective clothing and gear in the dirty area of the designated changing area. Remove protective coveralls by carefully rolling down the garment to reduce exposure to dust.
4. Remove respirators last.
5. Wash hands and face.

Workers should follow these procedures upon finishing work for the day (in addition to procedures described above):

1. Where applicable, place disposable coveralls and shoe covers with the abatement waste.
2. Contaminated clothing which is to be cleaned, laundered or disposed of must be placed in closed containers in the change room.
3. Clean protective gear, including respirators, according to standard procedures.
4. Wash hands and face again. If showers are available, take a shower and wash hair. If shower facilities are not available at the work site, shower immediately at home and wash hair.

Appendix B

I. Medical Surveillance

The medical surveillance program is part of the comprehensive approach to the prevention of lead related disease. Its purpose is to supplement the lead program that is aimed at minimizing airborne concentrations of lead and Sources of ingestion. Only medical surveillance can determine if the provisions of the lead safety program have Effectively protected an employee. Periodic medical surveillance of individual employees will help detect those Failures in the lead program and engineering techniques.

II. Biological Monitoring

The initial phase of the medical surveillance program includes blood-lead and zinc level tests. Biological monitoring will be made available to all employees who are exposed in excess of the action level for more than thirty days a year:

1. At least every six months
2. If the blood sampling and analysis indicated a blood level at or above 40 ug/100g of whole blood, monitoring will continue every two months.
3. Monitoring will continue until two consecutive blood samples and analysis indicate a blood lead level below 40 ug/100g of whole blood.

Written Notification of test results will be given to employees within five (5) days indicating blood lead levels. Medical removal protection will be given when blood sampling and analysis indicate a blood level at or above 40 ug/100g of whole blood. (See Appendix C)

III. Medical Examinations and Consultations

The second phase of medical surveillance is medical examinations and consultations for employees who meet the following conditions:

1. Employees who are exposed in excess of the action level for more than thirty (30) days a year.
2. At least annually for each employee for whom a blood-sampling test conducted at any time during the preceding 12 months indicated a blood level at or above 40 ug/100g.
3. Prior to the assignment for the first time to an area in which airborne concentrations of lead are at or above the action level.
4. As soon as possible, upon notification by an employee, that he/she has developed signs and symptoms commonly associated with lead intoxication, or desire medical advise concerning the effects of current or past exposure to lead and the ability to procreate a healthy child, that the employee is pregnant, or employee

has demonstrated difficulty in breathing during a respirator fit test or during use.

5. As medically appropriate for each employee either removed from exposure to lead due to risk of sustaining material impairment to health, or otherwise limited pursuant to a final medical determination.

Appendix C

I. Medical Removal Protection

Excessive lead absorption subjects employees to increased risk of disease. Medical Removal Protection is a means of protecting employees when, for whatever reasons, such as engineering controls, work practices, and respirators, have failed to provide the needed protection. Medical Removal Protection involves the temporary removal of an employee from his or her regular job to a place of lower exposure without the loss of earnings, seniority, or benefits.

XIX. Hydrogen Sulfide Safety Program

Purpose

The purpose of the Ernest D. Menold Inc. hydrogen sulfide safety program is to protect our employees as well as reduce their exposures below the permissible exposure limits by means of engineering and work practice controls. This program meets the requirements of OSHA Standard 29CFR 1910.1000 Table Z-2.

Definitions

Acceptable ceiling concentration: airborne concentration that should not be exceeded at anytime during an 8 hour shift.

Acceptable maximum peak concentration: The maximum airborne concentration allowed over a short time period if there is no other measurable exposure over an 8 hour shift.

Container: Any barrel, bottle, can cylinder, drum, reaction vessel, storage tank, or similar apparatus, but does not include piping systems.

Emergency: Any occurrence such as equipment failure, rupture of containers, or failure of control equipment that may or does result in an unexpected significant release of hydrogen sulfide.

Employee exposure: exposure to airborne hydrogen sulfide that would occur if the employee were not using respiratory protective equipment.

Permissible Exposure Limit (PEL): The OSHA limit for exposure to airborne hazards. For benzene the limits are 10 ppm TWA, 15 ppm STEL20 ppm acceptable ceiling and 50 ppm acceptable maximum peak above ceiling once for 10 min if no other exposure occurs.

Route of exposure: The route by which air contaminants enter the body. Exposure routes include inhalation, ingestion or skin absorption.

Short Term Exposure Limit (STEL): Airborne concentration measured over any 15 minute time period.

Time Weighted Average (TWA): Airborne concentration averaged over an 8 hour time period.

Responsibilities

A. Program Administrator

- Responsible for issuing and implementing this program and ensuring that it meets all applicable requirements.
- Will issue and implement the Ernest D. Menold Confined Space Safety Program in accordance with OSHA CFR 29 1910.146.
- Provide Hazard Communication training for hydrogen sulfide.
- Will implement engineering and work practice controls to prevent exposure to hydrogen sulfide.
- Provide appropriate personnel protective equipment for exposed employees.
- Maintain exposure monitoring records according to the recordkeeping section outlined in this program.

B. Project Managers and Foremen

- Will know and understand the hazards of hydrogen sulfide exposure.
- Will be in strict compliance with the Ernest D. Menold Inc. Hydrogen Sulfide Safety Program.
- Will adhere to all engineering and work practice controls in place to prevent hydrogen sulfide exposure.
- Ensure the availability and use of the appropriate personal protective equipment for any and all exposed employees.

C. Employees

- Will comply with all aspects of the Ernest D. Menold Inc. Hydrogen Sulfide Safety Program.
- Comply with the Ernest D. Menold Confined Space Safety Program.
- Attend any scheduled Hazard Communication Training and Confined Space Entry training.
- Use engineering and work practice controls in place to prevent hydrogen sulfide exposure.
- Use personal protective equipment as necessary to prevent hydrogen sulfide exposure.
- Use personal protective equipment as necessary to prevent hydrogen sulfide exposure.
-

Program Activities

A. Hazard Recognition

Ernest D. Menold Inc. works to ensure that employees are not exposed to hydrogen sulfide above OSHA exposure limits at any time.

Hydrogen sulfide, or H2S, is a colorless, flammable gas that has a distinctive "rotten egg" odor. It is also referred to as dihydrogen sulfide, sulfur hydride, sewer gas and stink damp. The physical characteristics of hydrogen sulfide gas are as follows:

Hydrogen Sulfide Characteristics (H2S)	
Color	Colorless
Odor	"Rotten egg" (detectable at 10 ppb)
Toxicity	Highly Toxic
Flammability	Flammable
Solubility	0.4%
Incompatibilities	Strong oxidizers, strong nitric acid, metals

Hydrogen sulfide is produced naturally by decaying organic matter released from liquid manure and natural gas which is a byproduct of industrial processes including petroleum refining, mining, tanning, wood pulp processing. It is also used to produce elemental sulfur, sulfuric acid, and heavy water for nuclear reactors. Hydrogen sulfide exposure could occur as a result of the following processes:

1. Drilling operations
    - Recycling drilling mud
    - Contact with water from crude wells
    - Blowouts

2. Tank Gauging

3. Routine Maintenance at refining operations

4. Confined Space Entry (refer to Ernest D. Menold Confined Space Safety Program).

Exposure to hydrogen sulfide above published limits can result in adverse health effects including:

- Eye irritation
- Lung effects
- Central nervous system effects on parts of the brain that control breathing
- Shock, convulsions and death at high exposures

Symptoms of hydrogen sulfide exposure include:

- Eye irritation
- Nose and throat irritation
- Headache, dizziness
- Nausea
- Cough, breathing difficulty
-

Hazard Evaluation

A. Monitoring
   - Monitoring for airborne concentrations of hydrogen sulfide at Ernest D. Menold Inc. work sites will be conducted using a four gas meter and accomplished using the procedures outlined in the Ernest D. Menold Inc. Confined Space Program.
   - Area four gas monitors will be set to alarm when airborne hydrogen sulfide concentrations exceed the OSHA STEL limit of 20ppm for 1910 or 10ppm for 1926.

Hazard Control

- Ernest D. Menold employees will not work in areas with airborne concentrations above OSHA permissible exposure limits.
- If circumstances require an exception to the above, NIOSH approved self contained breathing apparatus or air supplied respirators will be used.
- In confined spaces, hydrogen sulfide hazards will be controlled in accordance with the Ernest D. Menold Inc. Confined Space Safety Program. Controls include but are not limited to dilution ventilation, forced air ventilation, and the use of NIOSH approved respiratory protection (SCBA and air supplied only).
- Whenever the four gas monitor alarms affected employees **must** leave the area immediately to a fresh air area and will not reenter until conditions are proven safe or appropriate respiratory protection is donned.
- Upon commencing operations at any worksite, obtain, know and understand the facility's contingency plan.

Training

- Ernest D. Menold Inc. employees will be trained in the hazards and safe control of hydrogen sulfide exposure.
- Training is documented according to the recordkeeping section of this program as well as the recordkeeping sections of the Ernest D. Menold Hazard Communication Program and the Confined Space Program.

- Ernest D. Menold Inc. employees will be trained for confined space entry under the Confined Space Safety Program.

Recordkeeping

- Training records included in this program are retained with and in accordance to the requirements outlined in the Ernest D. Menold Inc. Hazard Communication Program.
- Confined space entry training records are kept in accordance with the Confined Space Entry Program.
- Hydrogen sulfide monitoring results are documented in accordance with the Confined Space Entry Program.

XX. FIRST AID/CPR PROGRAM

Purpose

The purpose of the Ernest D. Menold Inc. First Aid/CPR Program is to set forth general guidelines and procedures for handling any and all incidents that may arise both on the premises as well as on additional job-sites possibly requiring the use of First Aid and/or CPR.

Training

First Aid/CPR Training will be offered to any and all employees of Ernest D. Menold Inc. by a certified trainer. Only employees who have a valid certificate in First Aid/CPR issued by the American Red Cross or the equivalent will be authorized to perform emergency First Aid/ CPR.

Job-Sites

Prior to the start of any job there will be a written program in place that will include an emergency plan in case of any injury requiring medical attention.

The Emergency Plan will include:

- Posting of contact numbers of medical personnel who are available for immediate advice and consultation regarding any matters on health.
- Posting of emergency contact numbers for rescue personnel if in an area where 911 is not available.
- Proper equipment for transportation of injured person(s) to a physician or hospital if rescue personnel are not readily available.
- Written location of all First Aid Kits.
- Written location of all facilities for quick drenching or flushing of eyes and body if job exposes employees to any injurious corrosive materials.

At least one employee will be readily available who is certified in First Aid/CPR if there is no infirmary, clinic, or hospital in near proximity to the work-site.

First Aid Kits

First Aid Kits will be readily available on all job-sites. They will be stocked with appropriate items pertaining to the scope of work and the hazards involved. All First Aid Kits will be stored in a weather proof container and the individual items will be sealed. Contents of the kits will be checked prior to deployment to a job-site. It is the responsibility of the Job Foreman to inspect all First Aid Kits on a weekly basis to determine if any items need replenishing and to make the necessary arrangements to acquire refills. If the scope of work changes it is the responsibility of the Job Foreman to order any additional items for all First Aid Kits.

Body/ Eye Flush Stations

In the event where employees of Ernest D. Menold Inc. have the potential of being exposed to injurious corrosive materials, suitable facilities will be made available within the work area.

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

EMERGENCY INFORMATION

COMPANY NAME: _____

JOB LOCATION: _____

SUPERVISOR: _____

To be posted in conspicuous location.

EMERGENCY CONTACT NUMBERS	LOCATION OF FIRST AID KITS	LOCATION OF EMERGENCY EYE/BODY STATION.

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

WEEKLY FIRST AID KIT CHECKLIST

JOB LOCATION: _____

DATE: _____

LOCATION OF FIRST AID KIT	MISSING ITEMS	REQUESTED ADDITIONAL ITEMS

XXI. BLOODBORNE PATHOGENS

Policy

Ernest D. Menold Inc. is committed to providing a safe and healthful working environment for all of our employees. This includes the goal to eliminate or minimize possible exposure to bloodborne pathogens which are outlined in the OSHA standard 29 CFR 1910.1030.

Exposure Control Plan-Overview

The Exposure Control Plan's is an essential way of assisting with the implementation and compliance with set standards, thereby protecting our employees. This program includes:

- Determination of employees exposure
- Implementing safe and effective methods of exposure control which include:
  Standard precautions
  Work practice controls
  Personal protective equipment
  Housekeeping
  The posting of any labels and/ or signs that warn of possible infectious materials
  Hepatitis B vaccinations
  Post-exposure monitoring and follow up
  Communication and training to all employees
  Recordkeeping
  Procedures for evaluation and corrective actions surrounding exposure incidents

Implementation of these procedures will be outlined in detail on subsequent pages.

PROGRAM ADMINISTRATION

The implementation of the Exposure Control Plan is the responsibility of Kevin Moore, Safety Coordinator. The Plan will be maintained reviewed and updated annually or whenever a change in regulation and/ or policy occurs.

All employees who have been determined to have occupational exposure to blood or other infectious materials must comply with the procedures and regulations outlined in the Exposure Control Plan.

Kevin Moore, Safety Coordinator will be responsible for the distribution and maintenance of any and all personal protective equipment, engineering controls, labels, and red bags as required by standard. Adequate supplies and appropriate sizes for necessary equipment will be available.

Kevin Moore, Safety Coordinator will make sure that all medical actions required are scheduled and performed. All employee health and OSHA records will be kept current and up to date.

Kevin Moore, Safety Coordinator will be responsible for training and the proper documentation of said training. Copies of the Exposure Control Plan are available to employees, OSHA, and NIOSH representatives at: Ernest D. Menold Inc. (610) 521-4700

EMPLOYEE EXPOSURE DETERMINATION

The following is a list of all job classifications in which employees have occupational exposure:

JOB TITLE *DEPARTMENT/ LOCATION*

_____

_____

_____

_____

The following is a list of all job classifications along with the corresponding tasks in which some employees have occupational exposure:

JOB TITLE *DEPARTMENT/ LOCATION* *TASK/PROCEDURE*

_____

_____

_____

_____

IMPLEMENTATION AND CONTROL

Universal Precautions

All employees will exercise universal precautions.

Exposure Control Plan

All employees that are covered by the bloodborne pathogens OSHA Standard shall receive an overview of the Company's Exposure Control Plan. There will also be annual refresher training. The plan is available for review at any time by contacting Kevin Moore, Safety Coordinator. If a written copy is requested it can be obtained free of charge within 15 days of the initial request.

The Exposure Control Plan will be reviewed annually or more frequently if any new or modified tasks and procedures become necessary.

Engineering Controls and Work Practices

Controls will be used to prevent or minimize employee exposure to bloodborne pathogens specific controls and work practice controls used are listed below:

- A Bloodborne Pathogen Kit will be available to protect workers from cleanup of any body fluids.
- If hand washing is not available anti-bacterial hand cleaner in conjunction with cloth/paper towels will be provided.

Ernest D. Menold Inc. recognizes and identifies the need to constantly keep up with changes in scope of work as well as any changes in OSHA regulations. As an ongoing effort to protect employees from blood or other possibly infectious materials vigilance is kept regarding review of OSHA records, any pertinent industry literature, employee feedback, and input received from the Company Workplace Cooperation Meetings.

Personal Protective Equipment (PPE)

Personal Protective Equipment is provided to all employees at no cost. Training in the proper use of any and all equipment is provided by Kevin Moore, Safety Coordinator, Site Foremen, and Shop Foreman.
The types of PPE available to employees are:

- Disposable Gown with full sleeves
- Disposable shoe covers
- Disposable Bonnet
- Exam Quality Gloves

- Eye Shield with ear loop mask

The appropriate PPE is located in the Ernest D. Menold shop area. Additional equipment and supplies will be available at any remote work sites where workers are employed.

All employees using PPE must observe the following precautions:

- Wash hands immediately or as soon as feasible after removing gloves or other PPE.
- Remove PPE after it becomes contaminated and before leaving the work area.
- Used PPE must be disposed of in appropriate "Bio Hazard Bags".
- Wear appropriate gloves when it is reasonably anticipated that there may be hand contact with blood or other potentially infectious materials. Replace gloves if torn punctured contaminated or compromised in any way.
- Never wash or decontaminate disposable gloves for reuse.
- Wear appropriate face, eye and body protection when exposed to splashes, sprays, spatters, pose a hazard.
- Remove any PPE as soon as feasible if it becomes contaminated by blood or other potentially infectious material. Make sure to avoid contact with the other surface when removing.

Housekeeping

Regulated waste is always placed in provided red bags clearly marked "BIO HAZARD". These bags will be properly closed after use to prevent spillage or protrusion of contents during handling.

Any equipment suspected of being contaminated will only be picked up using mechanical means such as a "Bio-Scoop".

Any equipment or surfaces suspected of being contaminated by bloodborne pathogens or other potentially infectious materials shall be cleaned and disinfected.

Labels

The following labeling methods are used:

- Any contaminated items will be placed in a red bag labeled "BIO HAZARD".

HEPATITIS B VACCINATION

Kevin Moore, Safety Coordinator will provide training to employees on hepatitis B vaccinations, addressing safety, benefits, efficacy, methods of administration, and availability.

The hepatitis B vaccination series is available at no cost after initial employee training and within 10 days of initial assignment to all employees identified in the exposure determination section of this plan. Vaccination is encouraged unless:

- Documentation exists that the employee has received the series in the past.
- Antibody testing reveals that the employee has an immunity
- Medical evaluation shows that vaccination is medically inadvisable.

If employee declines vaccination they must sign a declination form. Employees who decline can receive the vaccination at a later date at no cost. Documentation of refusal of the vaccination is kept with Kevin Moore, Safety Coordinator.

Vaccination will be provided by WORKNET at 100 Diplomat Drive, Lester Pa. (610) 521-6880. Additional Worknet Centers will be specified if worker is on Job-Site.

Subsequent to the medical evaluation, a copy of the health care provider's professional opinion will be obtained and provided to the employee(s) within 15 days of completion of evaluation. It will be limited to whether the employee requires the vaccine and whether the vaccine was administered.

POST EXPOSURE EVALUATION AND FOLLOW-UP

Should a suspected exposure incident occur, you must contact Kevin Moore, Safety Coordinator at (610) 521-4700.

An immediate confidential medical evaluation will be conducted by WORKNET located at 100 Diplomat Drive, Lester Pa. (610) 521-4700. Following initial first aid the following activities will be performed:

- Document the routes of exposure and how the exposure occurred.
- Identify and document the source individual.
- Obtain patient consent and make arrangements for person(s) to be tested to determine HIV, HCV, and HBV infectivity. Make sure that the results of these tests are conveyed to the employee's health care provider.

- If the source is already known to be HIV, HCV, and/ or HBV positive, new testing need not be performed.
- Assure that the exposed employee is provided with the source individuals testing results and with information regarding disclosure laws and regulations concerning the identity and infectious status of the source individual. (Confidentiality Laws)
- After obtaining consent, collect exposed employee's blood as soon as possible and test blood for HBV and HIV serological status.
- If employee refuses consent for HIV serological testing during collection of blood for baseline testing, preserve the baseline blood sample for at least 90 days; if the exposed employee elects to have the baseline sample tested during this waiting period, perform testing as soon as feasible.

ADMINISTRATION OF POST-EXPOSURE EVALUATION AND FOLLOW UP

Kevin Moore, Safety Coordinator, ensures that health care professionals responsible for employee's hepatitis B vaccination and post-exposure evaluation and follow-up are given a copy of OSHA's bloodborne pathogen's standard.

Kevin Moore, Safety Coordinator, ensures that the health care provider in charge of evaluating employee after an exposure incident receives the following:

- A description of the employees job duties relevant to the exposure incident.
- Route(s) of exposure.
- Circumstances surrounding the exposure.
- If possible results of the sources blood tests.
- Relevant employee medical records, including vaccination status.

Kevin Moore, Safety Coordinator, will provide the employee with a copy of the evaluating health care provider's written opinion within 15 days after completion of the evaluation.

PROCEDURES FOR EVALUATING THE CIRCUMSTANCES SURROUNDING AN EXPOSURE INCIDENT

Kevin Moore, Safety Coordinator, will review the circumstances of any and all exposure incidents to determine:

- Engineering controls in use at the time.
- Work practices.
- Description of any devices or equipment involved.
- Protective equipment being used at the time.
- Location of the incident.
- Detail of work being performed at the time of the incident.
- History of Employee training.

EMPLOYEE TRAINING

All employees who have possible exposure to bloodborne pathogens will receive initial and annual training conducted by Kevin Moore, Safety Coordinator.

This training will receive training on epidemiology, symptoms, and transmission of bloodborne diseases. In addition the training also covers:

- A copy and explanation of the OSHA bloodborne pathogen standard.
- An overview of the Company Exposure Control Plan
- Methods to recognize activities that may involve exposure to bloodborne diseases.
- Proper use and limitations of engineering controls, work practices, and PPE.
- Explanation of types of PPE.
- Basis for proper PPE selection
- Information regarding the Hepatitis B vaccine. Training will include efficacy, safety, and vaccination benefits. It will also be conveyed that the vaccination will be offered free of charge.
- Procedure involved when an employee is possibly exposed to bloodborne pathogen or other infectious materials.
- Information of the post-exposure evaluation and follow- up that the employer is required to provide for the employee following an exposure incident.

Training Records are completed for each employee when training is complete. These documents will be kept for at least three years.

The training records include:

- Dates of training.
- Contents of the summary of the training
- Names and qualifications of persons conducting the training
- Names and job titles of all persons attending the training sessions

Medical Records

Medical records will be maintained for each employee with occupational exposure in accordance with 29 CFR 1910.1020.

Kevin Moore, Safety Coordinator is responsible for all medical records. These confidential records will be kept in the personnel office located at 445 Powhatan Ave., Lester, Pa. 19029 for the duration of employment plus 30 years.
Employee medical records are provided upon request of the employee or to anyone having written consent of the employee within 15 working days. Such requests will be handled by Kevin Moore, Safety Coordinator located at 445 Powhatan Ave. Lester, Pa. 19029 (610) 521-4700.

OSHA RECORDKEEPING

Every exposure incident is evaluated to determine if the case meets OSHA's Recordkeeping requirements covered under 29 CFR 1904. This determination and documentation is handled by Kevin Moore, Safety Coordinator.

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

MEDICAL RECORDS INFORMATION RELEASE FORM

I _____ grant Ernest D. Menold Inc. the right to release any and
(Employee name)

all medical records obtained in accordance with OSHA CFR 1910.1020 to the all recipients listed hereafter.

Name	Address of Recipient	Phone Number

I understand my signature releases Ernest D. Menold Inc. from any further liabilities incurred once said medical records are released to designated recipients.

_____ _____
(Signature of Employee) (Signature of Company Representative)

HEPATITIS B VACCINE DECLINATION

I understand due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with the hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time; I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and want to be vaccinated with the hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Signed: _____ Date: _____
(Employee name)

XXII. Electrical Safety Program

Scope

The purpose of the Ernest D. Menold Inc. Electrical Safety Program is to provide a general procedure regarding work on or near electrical equipment in order to avoid any unfortunate accidents or mishaps. This is a general procedure only. Anytime that your scope of work brings you in either direct or close proximity to electrical equipment a more detailed procedure should be outlined and implemented.

Qualified Person

A qualified person is one familiar with the construction and operation of the equipment and hazards involved. There are various circumstances involved in determining whether an employee is qualified. For example an employee may be considered qualified in regards to certain tasks and equipment but unqualified for others. An employee who is undergoing on-the-job training and who in the course of such training, has demonstrated the ability to perform said duties at his or her level and who is under the direct supervision of a qualified person also posses the necessary credentials to perform as a qualified person.

Unqualified Person

Those who have little or no training in avoiding the electrical hazards of working on or near exposed energized parts.

Training

Training is mandatory for all employees who face the risk of electric shock that is not reduced to a safe level by the requirements outlined in 29 CFR 1910.303 through 29 CFR 1910.308. The following is a general guideline for occupations that face such risks and need training. There may also be a need for additional training for employees who are not on the list if such situations are present.

Occupation
Blue collar supervisors *
Electrical or electronic engineers *
Electrical and electronic equipment assemblers *
Electrical and electronic technicians *
Electricians
Industrial machine operators *
Material handling equipment operators *
Mechanics and repairers *
Painters *
Riggers and roustabouts *
Stationary engineers *
Welders

* Workers in the these groups do not need training if their work or the people they supervise does not bring them or their employees close enough to exposed parts of electric circuits operating at 50 volts or more to ground for a hazard to exist.

Work Practices

Safety work practices will be implemented to avoid electric shock and/or other injuries when work is performed near or on equipment or circuits that are or have a potential to be energized. The safety work practices shall be consistent with the nature and extent of the electrical hazards at hand.

De-energized Parts

Any live parts that an employee may be exposed to **must** be de-energized before an employee works on or near said equipment unless the employer can show proper evidence that de-energizing would create additional or increased hazards or is simply infeasible because of equipment design or other limitations. Energized parts that operate less than 50 volts to ground need not be de-energized if there is no increased exposure to electrical burns or explosion as a result of electrical arc.

If exposed live parts are not de-energized for reasons listed above, other safety related work practices will be implemented to protect employees who may become exposed to these electrical hazards. These work practices will protect employees from coming in contact with energized circuits whether directly or through a conductive

object. The work practices will be adequate for the conditions and voltage under which the employee(s) will be exposed. A list of procedures involved under these circumstances will be outlined in this program under the heading "Working on or near exposed energized parts".

Working on or near exposed de-energized parts

Conductors and parts of electric equipment that have been de-energized but not locked out and tagged out in accordance to the section in this program labeled " Lockout Tagout Procedures", must be treated as energized parts and must follow the procedures outlined later in this program found under " Working on or near exposed energized parts".

While any employee is exposed to contact with parts of fixed electric equipment or circuits that have been de-energized, the parts shall be locked out and tagged out in accordance with the procedures outlined in Ernest D. Menold Inc. Lock out Tag out Program. These procedures will be maintained in written form and are available for inspection by employees and by the Assistant Secretary of Labor.

De-energizing Equipment

The following safe procedures shall be implemented before equipment and circuits are de-energized:

1. The circuits and equipment that work is being performed on or near shall be disconnected from all electric energy sources. Push buttons, selector switches, and interlocks **may not be used as the sole source for de-energizing equipment. Interlocks may not be used as a substitute for Lock out Tag out procedures.**

2. Stored electrical energy shall be released. Capacitors shall be discharged and high capacitance elements shall be short circuited and grounded if the stored energy poses a danger. If the stored energy is not released as stated above then the equipment will be considered energized.

3. Stored non-electrical energy that could re-energize electrical circuit parts shall be blocked or relieved to the extent that the circuit parts could not be accidentally energized.

Lockout Tagout Procedures

A lock and tag will be placed on each disconnecting point used to de-energize circuits and equipment prior to performance of work. The lock shall be attached to prevent re-energizing unless resorting to undue force or use of tools.

Each tag shall contain a written statement prohibiting unauthorized operation and removal of tag.

If a lock can not be applied then a tag may be used without a lock. If this method is used, the tag will be followed up by at least one additional safety measure. Additional safety measures may include isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

A lock may be used without a tag if:

1. Only one circuit or piece of equipment is de-energized, and
2. The lockout period does not extend beyond the work shift, and
3. Employees exposed to the hazards associated with re-energizing are familiar with this procedure.

Verification of de-energized condition

Circuits and equipment are considered de-energized when:

1. A qualified person operates controls or verifies that the equipment can not be restarted.
2. A qualified person uses test equipment to test the circuit elements and electrical parts of the equipment to which employees will be working and shall verify through said testing that equipment and parts are de-energized. If the circuit tested is over 600 volts, the test equipment shall be checked for proper operation immediately following the test.

Re-energizing equipment

The following criteria must be met before re-energizing can take place (even temporarily).

1. A qualified person will conduct tests and visual inspections to verify that all tools, electrical jumpers, shorts, grounds, and other devices have been removed.
2. Employees directly and indirectly exposed to re-energizing of equipment shall be warned to stay clear.
3. Each lock and tag shall be removed by the employee who installed it or under their direct supervision. If the employee is absent from the workplace then the lock and/or tag may be removed by a qualified person designated to perform this task insofar as:

a. The employer verifies that the employee who installed the lock and/or tag is not present at the workplace and

b. The employer ensures that the employee who installed the lock and/or tag is aware that the lock and/or tag is removed prior to the employee returning to the workplace.

4. There shall be a visual inspection performed to ensure all employees are clear of all circuits and equipment.

Working on or near exposed energized parts

Only qualified persons may work on energized electric circuit parts or equipment. All qualified persons must be trained in the proper use of precautionary techniques, personal protective equipment, insulating and shielding material, and insulated tools.

Overhead Lines

If work is to be performed near overhead lines, the lines must be de-energized and grounded. If de-energizing is not an option other methods such as guarding, isolating, or insulating must be implemented to prevent employees from contacting lines directly or indirectly through conductivity. If the lines are to be de-energized, the appropriate contacts will be made with the person(s) who control said electrical circuits to arrange de-energizing.

A. Unqualified persons working near energized lines

I. When a unqualified person is working in an elevated position near overhead lines, the distance will be such that the person and the longest conductive object they may contact cannot come closer to any unguarded energized overhead line than the following distances:

a. For voltages to ground 50kV or below ---------- 10 feet (305 cm.)
b. For voltages to ground over 50kV ---------- 10 feet (305 cm.) + 4 inches (10 cm) for every 10kV over 50kv

II. When an unqualified person is working from the ground in the vicinity of overhead lines, they can not bring any conductive object closer to any unguarded, energized overhead line than the following distances:

a. For voltages to ground 50kV or below ---------- 10 feet (305 cm.)
b. For voltages to ground over 50kV ---------- 10 feet (305 cm.) + 4 inches (10 cm) for every 10kV over 50kV

B. Qualified persons working near energized lines

I. When a qualified is working in the vicinity of overhead lines they may not approach or take any conductive object without an approved insulated handle closer to exposed energized parts than the distances shown in the chart below

TABLE 1A

Voltage Range (phase to phase)	Minimum approach distance
300V and less	Avoid contact
Over 300V, not over 750V	1 ft. 0 in. (30.5 cm)
Over 750V, not over 2kV	1 ft. 6 in. (46 cm)
Over 2kV, not over 15kV	2 ft. 0 in. (61 cm)
Over 15kV, not over 37kV	3 ft. 0 in. (91 cm)
Over 37kV, not over 87.5kV	3 ft. 6 in. (107 cm)
Over 87.5kV, not over 121kV	4 ft. 0 in. (122 cm)
Over 121kV, not over 140kV	4 ft. 6 in. (137 cm)

II. The only instances where these minimum approach distances do not apply is when:

a. The employee is insulated from the energized part by means of gloves and sleeves rated at the appropriate voltage for job being performed; or
b. The energized part is insulated both from all other conductive objects at a different potential and from the person; or
c. The employee(s) are insulated from all conductive objects at a potential different from that of the energized part.

C. Equipment

I. Any equipment that has the potential of having its structure elevated near energized overhead lines shall adhere to the following clearances:

TABLE 2A

Voltage Range (phase to phase)	Minimum approach distance
50kV or less	10 ft. (305 cm)
Over 50kV	10 ft. (305 cm) + 4 in. (10 cm) for every 10kV over

II. The only instances where the minimum clearances do not apply is when :

a. A vehicle is in transit with its structure lowered in which the clearance may be reduced to 4 ft. if the voltage is under 50kV. The clearance shall be increased by 4 in. for every 10kV over 50kV.
b. Insulating barriers are installed to prevent contact. These barriers can not be a part of or attached to the vehicle or equipment in question.
c. If the equipment is an aerial lift insulated for the voltage involved, and the work is being done by a qualified person then the distance between the un-insulated portion of the lift and the power line may be reduced according to TABLE 1A.

III. Employees on the ground may not come in contact with any of the equipment or any of their attachments unless:

a. The employee is wearing protective equipment rated for the required voltage.
b. The equipment is located so that no un-insulated part of its structure can come closer to the line than stated in Section I and II of this plan.

IV. If any equipment or vehicle with the capability of having parts of its structure elevated near energized lines in intentionally grounded, employees on the ground are prohibited from standing at the grounding location. Additional barricades, or insulation, shall be implemented to protect employees from hazardous ground potentials.

Illumination

Employees are forbidden to enter any spaces that contain exposed energized parts if there is not adequate illumination that will enable the work to be performed safely.

Confined or Enclosed Spaces

When situations require an employee to enter any confined space with exposed energized parts, they will not be granted entry until the proper protective shields, protective barriers, or insulating materials are properly installed.

Conductive Materials and Equipment

Conductive materials that are in contact with the employee(s) body shall be handled in a manner which will prevent said material(s) from coming in contact with any energized parts. This will be achieved through insulation, guarding, and material handling techniques.

Portable Ladders

All portable ladders shall have non-conducting side rails if they are used near energized parts.

Conductive Apparel

Conductive articles of jewelry or clothing may not be worn if there is danger of coming in contact with energized parts.

Housekeeping

Where energized parts are present employees will not perform any housekeeping duties unless the proper barriers are in place.

XXIII. NFPA 70E Safety Program

I. Purpose

The purpose of the Ernest D. Menold Inc. NFPA 70E Safety Program is to set forth procedures for the safe use of electrical equipment, tools, and to comply with NFPA 70E requirements.

II. Scope

This program applies to all Ernest D. Menold Inc. employees. When work is performed on a non-owned or operated site, the property owners program may supersede this document; however, this document covers all employees and shall be used when applicable.

III. Responsibilities

The Ernest D. Menold Safety Coordinator will develop electrical safety programs and procedures in accordance with OSHA requirements and/or as indicated by events and circumstances.

Project Managers and Foremen are responsible for ensuring that only qualified employees and qualified contractors perform electrical repairs or installations. Unqualified persons shall not be permitted to enter spaces that are required to be accessible to qualified employees only, unless the electric conductors and equipment involved are in an electrically safe work condition.

Project Managers and Foremen are responsible for advising the host employer of any unique hazards in the workplace presented during the scope of work. This includes any unanticipated hazards and any measures taken to correct the hazards reported to them by the host employer.

Project Managers and Foremen shall ensure a documented job briefing is held before starting each job and will include all employees involved. The briefing will cover hazards associated with the job, work procedures, special precautions, energy source controls, and PPE requirements.

Project Managers and Foremen are responsible for ensuring all applicable electrical safety programs are implemented and maintained at their locations.

Employees are responsible to use electrical equipment, tools, and appliances according to this program, for attending required training sessions when directed and to report unsafe conditions to their supervisor immediately.
Only qualified employees may work on electric circuit parts or equipment that has not been de-energized. This includes testing, troubleshooting, and voltage measurement within the limited approach boundary. Those deemed qualified shall be trained with the use of special precautionary techniques, PPE, insulating and shielding materials and tools.

IV. Safe Work Practices

Prior to any work being performed within the Limited Approach Boundary a hazard risk analysis shall be performed. The analysis shall contain event severity, frequency, probability and avoidance to determine the level of safe practices employed.

Safe Work Practices for Working within the Limited Approach Boundary
The limited approach boundary is the distance from an exposed live part within which a shock hazard exists.

The restricted approach boundary is the closest distance to exposed live parts a qualified person can approach without proper PPE and tools. Inside this boundary, accidental movement can put a part of the body or conductive tools in contact with live parts. To cross the restricted approach boundary, the qualified person must:

- Have an energized work permit that is approved by the appropriate authority.
- Use PPE suitable for working near exposed live parts and rated for the voltage and energy level involved.
- Be certain that no part of the body enters the prohibited boundary.
- Minimize the risk from unintended movement by keeping as much of the body as possible out of the restricted space; body parts in the restricted space should be protected.

The prohibited approach boundary is the minimum approach distance to exposed live parts to prevent flashover or arcing. Approaching any closer is comparable to making direct contact with a live part. To cross the prohibited approach boundary, the qualified person must:

- Have specified training to work on exposed live parts.
- Have a permit with proper written work procedures and justifying the need to work that close.
- Perform a risk analysis.
- Have the written permit and risk analysis approved by the appropriate supervisor.
- Use the appropriate PPE for working near exposed live parts and rated for the voltage and energy level involved.

The Flash Protection Boundary is the distance from exposed live parts within which a person could receive a second degree burn if an electrical arc flash were to occur.

- Use PPE appropriate for working near exposed live parts and rated for the voltage and energy level involved.
- For systems of 600 volts and less, the flash protection boundary is 4 feet, based on the available bolted fault current of 50kA and the clearing time of 6 cycles for the circuit breaker to act, or any combination of fault currents and clearing time not exceeding 300kA cycles.
- When working on de-energized parts and inside the flash protection boundary for nearby live exposed parts, if the parts cannot be de-energized, use barriers such as insulated blankets to protect against accidental contact or wear proper PPE.

Arc Flash Hazard Analysis

An arc flash hazard analysis includes the following:

- Collect data on the facilities power distribution system.
  - Arrangement of components on a one-line drawing with nameplate specifications of every device.
  - Lengths and cross-section area of cables.
- Contact the electric utility for information including the minimum and maximum fault currents that can be expected at the entrance facility.
- Conduct a short circuit analysis followed by a coordination study.
- Feed the resultant data into the NFPA 70E equations.
  - These equations produce the necessary flash protection boundary distances and incident energy to determine the minimum PPE requirement.
  - The flash protection boundary is the distance at which PPE is needed to prevent incurable burns (2^{nd} degree or worse) if an arc flash occurs.
- For systems of 600 volts and less, the flash protection boundary is 4 feet, based on an available bolted fault current of 50kA (kilo amps) and a clearing time of 6 cycles (0.1 seconds) for the circuit breaker to act, or any combination of fault currents and clearing times not exceeding 300 kA cycles (5000 ampere seconds).

When working on de-energized parts, but still inside the flash protection boundary for nearby live exposed parts:

- If the parts cannot be de-energized, barriers such as insulated blankets must be used to protect against accidental contact or PPE must be worn.
- Employees shall not reach blindly into area that might contain exposed live parts.

- Employees shall not enter spaces containing live parts unless illumination is provided that allows the work to be performed safely.
- Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metal frame glasses etc.) shall not be worn where there is risk of electrical contact hazard with exposed live parts.
- Conductive materials, tools, and equipment that are in contact with any part of an employee's body shall be handled in a manner that prevents accidental contact with live parts. Examples of this include but are not limited to:
    - Ducts, pipes, tubes
    - Conductive hoses and rope.
    - Metal lined rules, steel tapes.
    - Pulling lines, and chains.
    - Metal scaffold parts.
- When an employee works in a confined space or enclosed space that contains exposed live parts, the employee shall use protective shields, barriers or insulating materials as necessary to avoid contact. Doors, hinged panels etc., shall be secured to prevent them from swinging into employees (refer to the Ernest D. Menold Confined Space Program).

Inspections

- Electrical equipment, tools, and appliances must be inspected prior to each use.
- The use of a hard fixed GFCI or a portable GFCI shall be used with all portable hand tools, electric extension cords, drop lights, and all 110 volt equipment.
- Faulty equipment, tools or appliances shall be tagged "Out of Service", dated and signed by the employee applying the tag, and removed from service immediately.

Equipment

Test instruments, equipment, and their accessories shall meet the requirements of ANSI/ISA-61010-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1 General Requirements, for rating and design requirements for voltage measurement and test instruments intended for use on electrical systems 1000 volts and below.

When test instruments are used for testing for the absence of voltage on conductors or circuit parts operating at 50 volts or more, the operation of the test instrument shall be verified before and after an absence of voltage test is performed.

Personal Protective Equipment

All insulating PPE must be inspected before each day's use and immediately following any incident that can reasonably be suspected of having caused damage. Insulating gloves shall be given an air test, along with the inspection.

Maximum test intervals for rubber insulating personal protective equipment shall include:

- Blankets – before first issue / every 12 months thereafter
- Gloves – before first issue / every 6 months thereafter
- Sleeves – before first issue / every 12 months thereafter
- Covers and line hose shall be tested if insulating value is suspected.

Energized Electrical Work Permit
Work on energized electrical conductors or circuit parts that are not placed in an electrically safe work condition shall be considered energized electrical work and shall be performed by written permit only.

Lighting
Employees shall not enter spaces containing electrical hazards unless illumination is provided that enables the employees to perform the work safely. Where lack of illumination or an obstruction precludes observation of the work to be performed,

employees shall not perform any task within the Limited Approach Boundary of energized electrical conductors or circuit parts operating at 50 volts or more, or where an electrical hazard exists.

Extension Cords

- Use only three-wire, grounded extension cords and cables that conform to a hard service rating of 14 amperes or higher, and grounding of the tools or equipment being supplied.
- Only commercial or industrial rated-grounded extension cords may be used inside and outdoors.
- Cords for use other than indoor appliances must have a rating of at least 14 amps.
- Cords must have suitable strain relief provisions at both plug and receptacle ends.
- Work lamps (drop lights) used to power electrical tools must have a 3 wire, grounded outlet, unless powering insulated tools.
- Adapters that allow three wire grounded prongs connected to two wire non-grounded outlets are strictly prohibited.
- Cords must have a service rating for hard or extra hard service and have S, AJ, ST, SO, SJO, SJT, STO, or SJTO printed on the cord.
- Cords may not run through doorways, under mats or carpets, across walkways or aisles, concealed behind walls ceilings or floors, run through holes in walls, or anywhere they can become a tripping hazard.
- High current equipment or appliances should be plugged directly into a wall outlet whenever possible.
- All extension cords must be plugged into the following:
    - A GFCI outlet
    - A GFCI built into the cord
    - A GFCI adapter used between the wall outlet and cord plug.
- All extension cords and/or electrical cords shall be inspected daily or before each use for breaks, plug condition and ground lugs, possible internal breaks, and any other damage. If damage is found the extension cord or electrical cord shall be removed from service immediately.

Outlets

- Outlets connected to circuits with different voltages must use a design such that the attachment plugs on the circuits are not interchangeable.

Multiple Outlet Boxes

- Multiple outlet boxes must be plugged into a wall receptacle.
- Multiple outlet boxes must not be used to provide power to microwave ovens, toasters, space heaters, hot plates, coffeepots, or other high current loads.

Double Insulated Tools

- Double insulated tools must have the factory label intact indicating the tool has been approved to be used without a three wire grounded supply cord connection.
- Double insulated tools must not be altered in any way which would negate the factory rating.

Switches, Circuit Breakers, and Disconnects

- All electrical equipment and tools must have an on / off switch and may not be turned on or off by plugging or unplugging the supply cord at the power outlet.
- Circuit breaker panel boxes and disconnects must be labeled with the voltage rating.
- Each breaker within the breaker panel must be labeled for the service it provides.
- Disconnect switches providing power for the individual equipment must be labeled accordingly.

Ladders

- Only approved, non-conductive ladders may be used when working near or with electrical equipment. This includes changing light bulbs.
- Ladders must either be constructed of wood, fiberglass, or have non-conductive side rails.
- Wood ladders should not be painted except with clear lacquer.
- When using ladders they shall be free from any moisture, oils, and greases.

Energized and Overhead High Voltage Power Lines & Equipment

- A minimum clearance of 10 feet from high voltage lines must be maintained when operating vehicular and mechanical equipment such as forklifts, cranes, winch trucks, and other similar equipment.
- When possible, power lines shall be de-energized and grounded or other protective measures shall be provided before work is started.
- Minimum approach distance to energized high power lines for unqualified employees is 10 feet.
- Minimum approach distance for qualified employees shall be followed as per 29 CFR 1910.333©(3)(i) Qualified – Table S5 Selection and Use of Work Practices – Approach Distances for Qualified Employees – Alternating Current.

Confined or Enclosed Work Spaces

- When an employee works in a confined or enclosed space that contains exposed energized parts, the employee shall isolate the energy source and turn off the source. The Ernest D. Menold Lockout / Tag Out procedures will then be followed. Only qualified electricians can work on an exposed energy source.
- Protective shields, protective barriers or insulating materials as necessary shall be provided.

Enclosures, Breaker Panels, and Distribution Rooms

- A clear working space must be maintained on all four sides of all electrical enclosures and around electrical equipment for safe operation and to permit access for maintenance and alteration.
- A minimum two foot working floor space in front of panels and enclosures shall be painted yellow.
- Employees may not enter spaces containing exposed energized parts unless illumination is provided that enables them to work safely.
- Housekeeping in distribution rooms must receive high priority to provide a safe working and walking area in front of panels and to keep combustible materials to a minimum required to perform maintenance operations.
- All enclosures and distribution rooms must have “Danger High Voltage – Authorized Personnel Only” posted on the front panel and entrance doors.
- Flammable materials are strictly prohibited inside distribution rooms.

Lock Out / Tag Out

- No work shall be performed on or near live parts and the hazards they present.

- If any employee has a potential of coming in contact with parts of fixed electric equipment or circuits which have been de-energized, the circuits energizing the parts shall be locked out and tagged.
- Conductors and parts of electrical equipment that have been de-energized but not locked and tagged out shall be treated as live parts.
- Per Ernest D. Menold Inc. policy all electrical work will be outsourced and performed by qualified and licensed electrical contractors only. These contractors will be familiar with the use of special precautionary techniques, PPE, insulating and shielding materials and insulated tools. Any equipment being made ready for maintenance will be locked out using the Ernest D. Menold Inc. Lockout / Tag Out Program.
- Only authorized personnel may perform lock out / tag out procedures on electrical equipment.

Contractors

- Only approved, certified, electrical contractors may perform construction and service work.
- It is the Project Managers responsibility to verify the electrical contractor's qualifications and certification status.

Fire Extinguishers

- Approved fire extinguishers must be provided near electrical breaker panels and distribution centers.
- Water type extinguishers shall not be located closer than 50 feet from electrical equipment.

Electric Shock – CPR

- If someone has received an electrical shock and is unconscious, first check to see if their body is in contact with an electrical circuit. Do not touch the person until you are sure there is no contact with the circuit.
- When it is safe to make contact with the victim, begin CPR if the persons heart has stopped or they are not breathing.
- Call 911 immediately

Electric Welders

- A disconnecting means shall be provided in the supply circuit for each motor – generator arc welder, and for each AC transformer and DC rectifier arc welder which is not equipped with a disconnect mounted as an integral part of the welder.
- A switch or circuit breaker shall be provided by which each resistance welder and its control equipment can be isolated from the supply circuit. The ampere rating of this disconnecting means may not be less than the supply conductor ampacity.

Equipment Grounding

- All gas compressors, air compressors, separators, vessels, etc., shall be grounded by means of using a lug and ground strap, nominal in size to a ½" bolt or larger, attached to a ground rod six feet or longer.
- Equipment bonding jumpers shall be of copper or other corrosion resistant metal.
- The transfer of hazardous or flammable material from a metal or plastic container with a flash point of 100° F or less shall have a ground strap from the container and attached to the skid or a ground rod placed in the ground.

V. Training

Employees are trained to understand the specific hazards associated with electrical energy. Employees shall be trained in safety – related work practices and procedural requirements as necessary to provide protection from the electrical hazards

associated with their respective jobs. Employees shall be trained to identify and understand the relationship between electrical hazards and possible injury.

Employees shall be trained in the skills and techniques to distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment, to determine the nominal voltage of exposed energized electrical conductors and circuit parts, the approach distances (specified in Table I below), and the decision making process necessary to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform all tasks safely.

Employees shall be trained in safety related work practices that pertain to their respective job assignments.

Safe work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contact when work is performed near or on equipment and circuits which may or may not be energized.

Retraining will be performed when an employee is not conforming with safe work practices or when workplace changes occur which make procedures different from those that the employee would normally use.

Training shall be documented and maintained for the duration of the employees employment. Documentation shall be made when the employee demonstrates proficiency. Documentation shall include employees name and date of training. Retraining shall be performed at intervals not to exceed 3 years.

TABLE I.

Limited Approach Boundary				
Nominal system voltage Range, phase to phase	**Exposed movable conductor**	**Exposed fixed Circuit part**	**Restricted approach boundary (allowing for accidental movement)**	**Prohibited approach boundary**
0 to 50 volts	Not Specified	Not Specified	Not Specified	Not Specified
51 to 300 volts	10 ft. 0 in.	3 ft. 6 in.	Avoid Contact	Avoid Contact
301 to 750 volts	10 ft. 0 in.	3 ft. 6 in.	1 ft. 0 in.	0 ft. 1 in.
751 kV to 15 kV	10 ft. 0 in.	5 ft. 0 in.	2 ft. 2 in.	0 ft. 7 in.
15.1 kV to 36kV	10 ft. 0 in.	6 ft. 0 in.	2 ft. 7 in.	0 ft. 10 in.
36.1 kV to 46 kV	10 ft. 0 in.	8 ft. 0 in.	2 ft. 9 in.	1 ft. 5 in.
46.1 kV to 72.5 kV	10 ft. 0 in.	8 ft. 0 in.	3 ft. 2 in.	2 ft. 1 in.
72.6 kV to 121 kV	10 ft. 8 in.	8 ft. 0 in.	3 ft. 3 in.	2 ft. 8 in.
138 kV to 145 kV	11 ft. 0 in.	10 ft. 0 in.	3 ft. 7 in.	3 ft. 1 in.
161 kV to 169 kV	11 ft. 8 in.	11 ft. 8 in.	4 ft. 0 in.	3 ft. 6 in.
230 kV to 242 kV	13 ft. 0 in.	13 ft. 0 in.	5 ft. 3 in.	4 ft. 9 in.
345 kV to 262 kV	15 ft. 4 in.	15 ft. 4 in.	8 ft. 6 in.	8 ft. 0 in.

XXIV. Grounding Conductor Program

Program Overview

All employees of Ernest D. Menold Inc. are required to use Ground Fault Circuit Interrupters. The uses of Ground Fault Circuit Interrupters are mandatory in all instances where 120v single phase 15 and 20 ampere receptacle outlets are not part of the permanent wiring of a building or structure.

Plan

The Grounding Conductor Program will:

- Be kept up to date a periodically reviewed by Kevin Moore, Safety Coordinator.
- Implemented on all job-sites by the Project Manager and/or Job Foreman.
- Be available in written form for review on all job-sites.

Visual Inspections

The following shall be visually inspected before each day's use for external defects (such as deformed or missing pins or insulation damage) and for indication of possible internal damage:

- Cord Sets.
- Attachment Caps.
- Plug and Receptacle of cord sets.
- Any equipment connected by cord and plug (except cord sets and receptacles that are fixed and not exposed to damage).

Continuity Testing

Equipment grounding conductors on the following shall be tested for continuity and shall be electrically continuous:

- All cord sets.
- Receptacles that are not part of the permanent wiring of the building or structure.
- All plug connected equipment required to be grounded.

Grounding Conductor Testing

Each receptacle and plug of the following shall be tested for correct attachment of the equipment-grounding conductor and the equipment-grounding conductor shall be connected to its proper terminal:

- All cord sets.
- Receptacles that are not a part of permanent wiring of a building or structure.
- All plug-connected equipment required to be grounded.

Test Frequency

All required tests shall be performed with the following frequency:

- Before the first use.
- Before equipment is returned to service following any repairs
- Before equipment is used after any incident that can be reasonably suspected to have caused damage (e.g. when a cord set is run over).
- At intervals not to exceed 3 months, except on cord sets and receptacles that are fixed and not exposed to damage. These will be tested at intervals not to exceed 6 months.

Removing Faulty Equipment

Equipment found to be damaged or fails any of the previous inspections or tests may not be used until repaired or replaced.

Recordkeeping

All inspections and tests shall be documented to identify each receptacle, cord set, and cord-and-plug connected equipment that passed the inspection or test, the date of inspection or test, and the individual response for the inspection test.

XXV. Hand and Power Tools

Overview

All hand and power tools whether furnished by Ernest D. Menold Inc. or owned by the employee shall be maintained in a safe and workable condition. The use of guards is essential and will be in place and free from defects at all times. The guards are not to be manipulated in such a way that compromise its intended integrity or compromise the protection in which it was intended. All guarding will meet ANSI B15.1 requirements. When using hand or power tools the proper personal protective equipment must be worn. Any hand or power tools that do not meet the requirements of Ernest D. Menold Inc. will be removed from the premises.

XXVI. Waste Management Plan

Purpose: This plan is designed to standardize a site specific procedure for waste removal. Some locations provide their own procedures for handling and disposing of debris. These plans supersede this program.

Procedure:

I. Before the commencement of any job, a pre-assessment form will be completed by the project manager and foreman to determine the types and quantities of wastes, trash, and scrap materials that will be generated during the scope of work. This assessment will be able to determine the need for containers and waste removal procedures.(See Page 2 of this program)
II. In determining the requirements for waste removal, attention shall be given to proper storage in order to minimize the potential for spills and impact to the environment.
III. If any waste or recycling containers reside outdoors, receptacles will be covered to prevent dispersion of waste materials and to control the potential for run-off. Spill containments kits shall also be readily available in case of emergency.
IV. Attention shall be given to proper segregation of waste materials to take full advantage of reuse and recycling.

Employee Training:

I. After the pre-assessment is completed all employees shall be trained on the proper disposal methods for all wastes. This includes general instruction of disposal of hazardous and non-hazardous wastes, trash and scrap materials as well as recyclable items. If materials are deemed hazardous proper instruction must be given to ensure proper disposal. Employees will also be given instruction in the use of spill containment kits in order to segregate spills in case of emergency.

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

WASTE MANAGEMENT PRE-ASSESMENT FORM

Job Location: _____

Project Manager: _____

Date of Assessment: _____

Non-Recyclable Waste	Recyclable Waste	Spill Kits	Disposal Plan

XXVII. Ladder Safety Program

Overview

The purpose of this program is to provide training for the proper and safe use of ladders for all employees at Ernest D. Menold Inc.
This program contains requirements for the safe and proper use of fixed ladders as well as portable ladders including wooden, metal, reinforced plastic and/or fiberglass.

Scope

This program covers the minimum requirements for the care and use of portable ladders in order to ensure safety under normal conditions of usage. The common types of portable ladders are: wooden, metal, fiberglass or reinforced plastic ladders. The scope is to provide information on the most common types of ladders. Detailed requirements are provided in the ANSI A14.1-1994, ANSI A14.2-1990, et al.

Care and Use of Ladders

To insure the safety and serviceability, the following precautions on the care of ladders shall be observed:

- Ladders shall be maintained in good condition at all times, the joint between the steps and side rails shall be tight, all hardware and fittings securely attached, and the moveable parts shall operate freely without binding or undue play.
- Metal bearings of locks, wheels, pulleys, etc., shall be lubricated frequently.
- Frayed or badly worn rope shall be replaced immediately.
- Safety feet and other auxiliary equipment shall be kept in good condition to ensure proper performance.
- Ladders shall be inspected frequently, and those which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked “Dangerous Do Not Use”.
- Rungs should be kept free of grease or oil.
- If a ladder is involved in any of the following, immediate inspection is necessary:
  - ✓ If ladders tip over, inspect ladder for side rail dents or bends or excessively dented rungs.
  - ✓ If ladders are exposed to oil and grease, equipment should be cleaned of oil, grease or slippery materials. This can easily be done with a solvent or steam cleaning.
  - ✓ Ladders having defects are to be marked (as indicated above) and taken out of service until they are repaired by a qualified repair person.

The rule for setting up a ladder at the proper angle is to place the base a distance from the vertical wall equal to (1/4) the working length of the ladder. The following safety precautions shall be observed in connection with the use of ladders:

- Portable ladders shall, where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter (1/4) of the working length of the ladder (the length along the ladder between the foot and the top support). The ladder shall be placed as to prevent slipping, or it shall be lashed or held in position. Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds.
- Ladders designed for one (1) person shall not be used by more than one person at a time nor with ladder jacks and scaffold planks. In such cases, specially designed ladders with larger dimensions shall be used.
- Portable ladders will be placed so that side rails have a secure footing. The top rest for portable ladders shall be reasonably rigid and shall have ample strength to support any applied load.
- Ladders shall not be loaded beyond their maximum load rating.
- Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked open, locked, and/or guarded.
- Ladders shall not be placed on boxes, barrels or other unstable bases to obtain additional height.
- Ladders with broken or missing steps, rungs or cleats, broken side rails, or other faulty equipment shall not be used. Improvised repairs are not allowed.
- Short ladders shall not be spliced together to provide longer sections.
- Ladders made by fastening cleats across a single rail shall not be used.
- Ladders shall not be used as guys, braces or skids, or for other than their intended purpose.
- The top two rungs of any stepladders shall not be used as steps.
- Portable ladders with reinforced rails shall be used only with the metal reinforcement on the underside.
- No ladder should be used to gain access to a roof unless the top of the ladder extends at least three (3) feet above the point of support, at eave, gutter of roofline.
- The user should equip all portable ladders with non-slip bases when there is a hazard of slipping. Non-slip bases are not intended as a substitute for care in safely placing, lashing or holding a ladder that is being used upon oily, metal, concrete or slippery surfaces
- On two section extension ladders the minimum overlap for the two (2) sections in use shall be as follows.

Size of ladder (feet)	Overlap (feet)
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

- The bracing on the back legs of step ladders is designed solely for the increasing of stability and not for climbing.
- Portable ladders are designed as a one-man working ladder based on a 200 pound load.
- The ladder base section must be placed with a secure footing.
- The top of the ladder must be placed with the two (2) rails supported unless equipped with a single support attachment.
- When ascending or descending, the climber must face the ladder.
- Ladders must not be tied or fastened together to provide longer sections. They must be equipped with the hardware fitting necessary, if the manufacturer endorses extended uses.
- Ladders should not be used as a brace, skid, guy or gin pole, gangway or for uses other than for which they were intended, unless specifically recommended for use by the manufacturer.
- Always observe the three points of contact rule. Never carry anything in your hands that could cause injury during a fall.

Wooden Ladders

- Wooden ladders shall not be painted so that the wood can be inspected for cracks, damage and/or deterioration. All wood parts shall be free from sharp edges and splinters, and sound and free from accepted visual inspection from shake, wane, compression failures, decay or other irregularities. Low density wood shall not be used.
- Wood stepladders shall be no longer than 20 feet. Stepladders as hereinafter specified shall be of three types:
  - ✓ Type I Industrial Stepladder- 3 to 20 feet for heavy duty work, such as utilities, contractors, and industrial use.
  - ✓ Type II Commercial Stepladder- 3 to 12 feet for medium duty work, such as painters, offices, and light industrial use.
  - ✓ Type III Household Stepladder- 3 to 6 feet for light duty work, such as light household use.

- The use of wooden ladders is prohibited around any areas where the risk of electrical shock exists.
- General requirements for wood stepladders are:
  - ✓ A uniform step spacing shall be employed which shall be not more than 12 inches. Steps shall be parallel and level when the ladder is in position for use.
  - ✓ The minimum width between side rails at the top, inside to inside, shall be not less than eleven and a half inches. From top to bottom, the side rails shall spread at least one (1) inch for each foot of length of stepladder.
  - ✓ A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open positions shall be a component of each stepladder. The spreader shall have all sharp points covered or removed to protect the user. For Type III ladders, the pail shelf and spreader may be combined in one unit (i.e., the shelf-lock ladder).

- Single ladders shall be no longer than 30 feet.
- Two- section extension ladders shall be no longer than 60 feet. All ladders of this type shall consist of two (2) sections. One to fit within the side rails of the other and arranged in such a manner that the upper section can be raised and lowered.

Portable Metal Ladders

- The use of metal ladders is prohibited around any areas where the risk of electrical shock exists.
- The spacing of rungs or steps shall be on 12 inch centers.
- Rungs and steps shall be corrugated, knurled, dimple coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping.
- The minimum width between side rails of a straight ladder or any section of an extension ladder shall be 12 inches.
- The length of single ladders or individual sections of ladders shall not exceed 30 feet. Two section ladders shall not exceed 48 feet in length and over two section ladders shall not exceed 60 feet in length.
- Based on nominal length of the ladder, each section of multi-section ladder shall overlap the adjacent section by at least the number of feet stated below:

Normal Length of Ladder (feet)	Overlap (feet)
Up to and including 36	3
Over 36, up to and including 48	4
Over 48, up to 60	5

- Extension ladders shall be equipped with positive stops which will ensure the overlap specified in the table above.

General Specifications for Step Ladders

The length of a stepladder is measured by the length of the front rail. To be classified as a standard length ladder, the measured length shall be within the plus or minus one-half inch of the specified length.

- The length of a step ladder shall not exceed 20 feet in length.
- The bottoms of the four rails are to be equipped with insulating non-slip material for the safety of the user.
- A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position shall be a component of each stepladder. The spreader shall have all sharp points or edges covered or removed to protect the user.

Fixed Ladders

- The minimum design live load shall be a single concentrated load of 200 pounds.
- The number and position of additional concentrated live load units of 200 pounds each as determined from anticipated usage of the ladder shall be considered in the design.
- The live loads imposed by persons occupying the ladder shall be considered to be concentrated at such points as will cause the maximum stress in the structural member being considered.
- The weight of the ladder and attached appurtenances together with the live load shall be considered in the design of rails and fastenings.
- For fixed ladders consisting of wood side rails and wood rung cleats, used at a pitch in the range of 75 degrees to 90 degrees, and intended for use by no more than one (1) person per section, single ladders of less than 30 feet are acceptable.
- All rungs shall have a minimum diameter of three fourths inch for metal ladders and a minimum diameter of eleven eighths inches for wood ladders.
- The distance between rungs, cleats, and steps shall not exceed 12 inches, and shall be uniform throughout the length of the ladder.
- The minimum clear length of rungs or cleats shall be 16 inches.
- Rungs, cleats and steps shall be free of splinters, sharp edges, burrs or projections which may be a hazard.
- The rungs of an individual rung ladder shall be designed so the foot cannot slide off the end.

- Side rails which might be used as a climbing aid shall be of such cross-sections as to afford adequate gripping surface without sharp edges, splinters or burrs.
- Fastenings shall be an integral part of fixed ladder design.
- All splices made by whatever means shall meet the design requirements as noted in OSHA 29 CFR 1910.27(a). All splices and connections shall have smooth transition with original members and no sharp or extensive projections.
- No welding shall be allowed on any metal ladders.
- The preferred pitch of fixed ladders shall be considered to come in the range of 75° and 90º with the horizontal.
- Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of 60º and 75º with the horizontal. Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation. This substandard pitch range shall be considered as a critical range to be avoided, if possible.
- This section covers only fixed ladders within the pitch range of 60º and 90º with the horizontal. Ladders having a pitch in excess of 90º with the horizontal are prohibited.
- All ladders shall be maintained in a safe condition. All ladders shall be inspected regularly, with the intervals between inspections being determined by use and exposure.

Portable Reinforced Plastic Ladders

Plastic, reinforced plastic ladders are a newer type of ladders on the market that follow the same requirements as the wooden and metal ladders. Specific design and construction requirements are minimized in the Ladder Safety Program because of the wide variety of materials and design possibilities.

These ladders shall have sufficient strength and stiffness to meet the performance requirements of ANSI Standard A14.5-1992, and shall be free of structural defects and accident hazards such as sharp edges, burrs, and the like.

Safe Use of Ladders on or Around Electrical Equipment

Safety related work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contact when work is performed near or on equipment or circuits which are or may be energized. The specific safety related work practices shall be consistent with the nature and extent of the associated electrical hazards and comply with information contained in OSHA 29 CFR 1910.333.

- Metallic or metal type ladders and wooden ladders shall NOT be used around electrical energy, components and sources.
- Portable ladders shall have nonconductive side rails if they are used where the employee or the ladder could contact exposed energized parts.

Clearance and the Climbing of Ladders

- Fixed Ladders: The perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be 36 inches for a pitch of 76º, and 30 inches for a pitch of 90º, with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope.
- Ladders without Cages or Wells: A clear width of at least 15 inches shall be provided each way from the centerline of the ladder in the climbing space, except when cages and wells are necessary.
- Clearance in Back of Ladder: The distance from the centerline of rungs, cleats or steps to the nearest permanent object in back of the ladder shall be no less than seven inches, except when unavoidable obstructions are encountered.
- Clearance in Back of Grab Bar: The distance from the centerline of the grab bar to the nearest permanent object in back of the grab bars shall be no less than four inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder which they serve.
- Step-Across Distance: The step-across distance from the nearest edge of the ladder to the nearest edge of equipment or structure shall not be more than 12 inches or less than 2½ inches.
- Hatch Cover: Counterweighted hatch covers shall open a minimum of 60º from the horizontal. The distance from the centerline of the rungs or cleats to the edge of the hatch opening on the climbing side shall be no less than 24 inches for offset wells or 30 inches for straight wells.

Special Requirements for Cages and Wells

- Cages and wells shall be built in compliance with applicable specifications shown in detail OSHA 29 CFR 1910.27(d)(1).
- Cages or wells conforming to the dimensions of OSHA 29 CFR 1910(d)(1)(ii) shall be provided on ladders of 20 feet to a maximum unbroken length of 30 feet.
- Cages shall extend a minimum of 42 inches above the top of landing, unless other acceptable protection is provided.
- Cages shall extend down the ladder to a point not less than seven feet nor more than eight feet above the base of the ladder, with the bottom flared not less than four inches, or portion of cage opposite ladder shall be carried to the base.
- Cages shall not extend less than 27 inches nor more than 28 inches from the centerline of the rungs of the ladder. Cages shall not be less than 27 inches in width. The inside shall be clear of projections. Vertical bars shall be located at a maximum spacing of 40º around the circumference of the cage; this will give a maximum spacing of approximately 9½ inches, center to center.
- Ladder wells shall have a clear width of at least 15 inches measured each way from the centerline of the ladder. Smooth walled wells shall be a minimum of 27 inches from the centerline of rungs to the well wall on the climbing side of the ladder. Where other obstructions on the climbing side of the ladder exist, there shall be a minimum of 30 inches from the center line of the rungs.

Special Requirements for Landing Platforms

- When ladders are used to ascend heights exceeding 20 feet (except chimneys), landing platforms shall be provided for each 30 feet of height or fraction thereof, except that, where no cage, well or ladder safety device is provided, landing platforms shall be provided for each 20 feet of height or fraction thereof. Each ladder section shall be offset from adjacent sections. Where installation conditions (even for a short, unbroken length) require that adjacent sections be offset, landing platforms shall be provided at each offset.
- Where a person has to step a distance greater than 12 inches from the center line of the rung of a ladder to the nearest edge of structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be 2½ inches.
- All landing platforms shall be equipped with standard railings and toeboards, so arranged as to give safe access to the ladder. Platforms shall be not less than 24 inches in width and 30 inches in length.
- One rung of any section of ladder shall be located at the level of the landing laterally served by the ladder. Where access to the landing is through the ladder, the same rung spacing as used on the ladder shall be used from the landing platform to the first rung below the landing.

Ladder Extensions

- The side rails of through or side step ladder extensions shall extend 3½ feet above parapets and landings. For through ladder extensions, the rungs shall be omitted from the extension and shall have no less than 18 inches or more than 24 inches clearance between rails.
- For side step or offset fixed ladder sections, at landings the side rails and rungs shall be carried to the next regular rung beyond or above the 3½ feet minimum.

Grab Bars

- Grab Bars shall be spaced by a continuation of the rung spacing when they are located in the horizontal position. Vertical grab bars shall have the same spacing as the ladder side rails. Grab bar diameters shall be the equivalent of the round rung diameters.

Ladder Safety Devices

- Ladder safety devices may be used on tower, water tank and chimney ladders over 20 feet in unbroken length in lieu of cage protection. No landing platform is required in these cases.
- All ladder safety devices, such as those that incorporate life belts, friction brakes and sliding attachments, shall meet the design requirements of the ladders which they serve.

XXVIII. Scaffold Safety Program

Purpose: The purpose of the Ernest D. Menold Inc. Scaffold Safety Program is to ensure that falls and accidents do not occur and to reduce injuries to workers. This program can be used as a guideline for protecting employees using scaffolding, it is not intended as a substitute for professional engineering expertise in erection of scaffolding if the situation warrants.

It is mandatory that all employers read and understand the OSHA standards relating to scaffolding found in OSHA 29 CFR 1926.450. A competent person will be assigned to oversee scaffolding implementation and safety. This competent person will have the authority to take actions and correct safety problems on the worksite.

General Scaffolding Safety Guidelines:

- When leasing or purchasing scaffolding, all safety instructions will be included with the equipment.
- Scaffolding components should never be interchanged with components from a different manufacturer.
- A qualified person will supervise the construction of all scaffolding as well as participate in before and after shift daily inspections.
- Inspect, maintain, and replace all parts of the scaffold and accessories that are in poor condition.
- Scaffolds should support at least four times the anticipated weight of workers and materials.
- Keep scaffolds, platforms, runways, and floors free of ice, snow, grease, mud, or any other materials that could cause slipping.
- Place scaffolding on a firm, smooth foundation that prevents sideways movement.
- Employees must not work on scaffolds during storms or high winds.
- Overhead protection must be provided for persons on a scaffold exposed to overhead hazards.
- Toe boards should be used to protect workers from tools and equipment falling from the platform.
- Do not use scaffolding if the working platform is not planked all the way across.

- All planking or platforms must be overlapped a minimum of 12 inches or secured from movement.
- Tools, materials, and debris must not be allowed to accumulate in quantities to cause a hazard.
- Wire of fiber rope used for suspension must be capable of supporting at least six times the intended load.
- Do not use a scaffold if the planks are not scaffold grade, bearing the proper stamp.
- Hard hats must be worn.
- Do not use rolling towers unless the wheels are locked and never allow workers to ride on rolling towers while they are being moved.
- Do not bridge between two scaffolds unless designed by a qualified person.
- Do not use a scaffold taller than four times the minimum base unless it is tied, guyed, or braced to prevent tipping.
- Provide a safe convenient means for gaining access to the working platform.
- Workers should not carry materials as they climb. Keep both hands on the side rails of the ladder.
- Do not use heat producing activities such as welding or insulation removal without taking precautions as outlined in the Ernest D. Menold “Welding, Cutting, Hotwork Program”.
- Spacing between the platform and the uprights should be no more than 1 inch, unless it is demonstrated that the wider space is necessary.
- Scaffold planks should extend over their end supports not less than six (6) inches and not more than 18 inches.
- Only qualified personnel who have received the proper training should erect and dismantle scaffolding.
- All platforms must be at least 18” (two boards) wide.
- Planks and platforms should be fastened to the scaffold as necessary to prevent uplift or displacement.
- Platforms and planks must not be painted, this will hide defects.

- Loads on the plank should be evenly distributed when possible.
- Post scaffolding rules in easy to see place so employees see and follow them.

Inspections and Testing:

Wood scaffolds should not be proof tested. This may result in concealed or unrecognized damage that may cause failure later. Wood planks bear a mark, stamp, seal, or other indication of the referenced standard on usage.

- Examine the plank for large knots, excessive grain slopes, shakes, decay, and other defects that may render it unfit.
- Do not use scaffold if the planks are bowing more than 1/60 of their span.
- Discard the plank upon visible or audible evidence of failure, or if it has an obvious defection.
- Determine the safe load for a plank on its size and species.
- Do not use rusty or corroded scaffold equipment, it's strength is unknown.
- Check for cracks around welds, joints, and circumference.
- Check castors for damaged brakes, axles, or stems.
- Check manufactured planking for missing hooks, locks, missing rivets, bent side rails, and damaged walking surfaces. If the surface is plywood, check for rotten areas.

Note: If defects or unsafe conditions are found, the equipment in question must be tagged out by a competent person. All employees must comply with the tags.

Fall Protection:

- Each employee on a scaffold more than 10 feet above a lower level must be protected from falling.
- Guardrail systems shall be installed along the sides and ends of platforms over 10 feet high.

- Scaffolds made after January 1, 2000 must have a top guardrail height of between 38 inches and 45 inches above the platform surface.

- Scaffolds made before January 1, 2000 must have a top guardrail height of between 36 and 45 inches above the platform surface.

- Each guardrail must be able to withstand a force applied in any downward or horizontal direction of at least 200 pounds.

Electrical Power Lines:

- The minimum clearances must be maintained between scaffolds and exposed energized lines (see Electrical Safety Plan):

    - 2 feet for insulated power lines of less than 300 volts; and
    - 10 feet for insulated power lines of 300volts or more and all non-insulated power lines.

- Evaluate each job site before any work is done to determine if there is a danger of overhead power lines coming in contact with workers or equipment.

- The utility company should be notified when scaffolds must be erected or moved in areas with overhead power lines where the required clearances cannot be maintained. Utility companies can de-energize the power lines or cover them with insulation before any work is initiated.

Training:

The following is a brief outline of the training requirements for all workers who will be required to erect or work on scaffolding.

1. All employees that work on scaffolds must be trained by a qualified person in the hazards associated with the type of scaffold that is being used and how to control the hazards.

2. The training will include the following:

    I. Electrical hazards, fall hazards, and falling object hazards.

II. Correct procedures for dealing with electrical hazards, using fall protection, and falling object protection systems.

III. Proper use of scaffolds, and proper handling of materials on scaffolds.

IV. Maximum intended load and load-carrying capacities of the scaffold used.

V. The correct procedures for erecting, disassembling, moving, operating, repairing, maintaining, and inspecting scaffolds.

VI. Re-training must be done if new hazards appear on the worksite or if an employee(s) exposes their lack of proper knowledge pertaining to scaffold instruction.

XXIX. Rigging and Material Handling

Purpose:

Many types of cranes hoists and rigging devices are used at Ernest D. Menold Inc. for lifting and moving materials. The companies policy is to maintain a safe workplace for all of it's employees, therefore it can not be overemphasized that only qualified and licensed individuals shall operate these devices. The safety rules and guidance in this chapter apply to all operations at Ernest D. Menold Inc. and their jobsites, that involve the use of cranes and hoists installed in or attached to buildings.

Responsibilities:

I. Supervisors are responsible for:

- Ensuring that employees under their supervision receive the required training and are certified and licensed to operate the cranes and hoists in their areas.
- Ensuring the hoisting equipment is inspected and tested monthly by a qualified individual and that rigging equipment is inspected daily.

II. Crane and Hoist Operators are responsible for:

- Operating hoisting equipment safely.
- Conducting functional tests prior to using the equipment.
- Selecting and using rigging equipment appropriately.
- Having a valid operator's license on their person while operating cranes and hoists.

Crane and Hoist Safety Design Requirements:

Following are the design requirements for cranes and hoists and their components:

- The design of all commercial cranes and hoists shall comply with the requirements of ASME/ANSI B30 standards and Crane Manufacturer's Association of America standards (CMAA-70 and CMAA-74).

- All crane and hoist hooks shall have safety latches.
- Hooks shall not be painted (or re-painted) if the paint previously applied by the manufacturer is worn.
- Crane pendants shall have an electrical disconnect switch or button to open the main line control circuit.
- Cranes and hoists shall have a main electrical disconnect switch. This switch shall be in a separate box that is labeled with lockout capability.
- Crane bridges and hoist monorails shall be labeled on both sides with the maximum capacity.
- Each hoist hook block shall be labeled with the maximum hook capacity.
- Directional signs indicating N-W-S-E shall be displayed on the bridge underside, and a corresponding directional label shall be placed on the pendant.
- A device such as upper- limit switch or slip clutch shall be installed on all building cranes and hoists. A lower-limit switch may be required when there is insufficient hoist rope on the drum to reach the lowest point.
- All cab and remotely operated bridge cranes shall have a motion alarm to signal bridge movement.
- All newly installed cranes and hoists, or those that have been extensively repaired or rebuilt structurally, shall be load tested at 125% capacity prior to being placed into service.
- If an overload device is installed, a load test to the adjusted setting is required.
- Personnel baskets and platforms suspended from any crane shall be designed in accordance with the specifications in OSHA 29 CFR 1926.550(g).

General Safety Rules:

Operators shall comply with the following rules while operating the cranes and hoists:

- Do not engage in any practice that will divert your attention while operating the crane.

- Respond to signals only from the person who is directing, or any appointed signal person. Obey a stop signal at all times, no matter who gives it.

- Do not swing a load over anyone. Employees will not be placed in jeopardy by being under a suspended load.

- Ensure that the rated load capacity of a crane's bridge, individual hoist, or any sling or fitting is not exceeded. Know the weight of the object(s) being lifted or use a dynamometer or load cell to determine weight.

- Check that all controls are in the OFF position before closing the main line disconnect switch.

- If spring loaded reels are provided to lift pendants clear off the work area, ease the pendant up into the stop to prevent damaging the wire.

- Avoid side pulls. These can cause the hoist rope to slip out of the drum groove, damaging the rope or destabilizing the crane or hoist.

- To prevent shock loading, avoid sudden starts or stops. Shock loading can occur when a suspended load is accelerated or decelerated, and can overload the crane hoist. When completing an upward or downward motion, ease the load slowly to a stop.

- Hooks on overhead ball assemblies, lower load blocks or other attachment assemblies shall be of a type that can be closed and locked, eliminating the hook opening.

Moving a Load:

- Center the hook over the load to keep the cables from slipping out of the drum grooves and overlapping, and to prevent the load from swinging when it is lifted. Inspect the drum to verify that the cable is in the grooves.

- Use a tag line when loads must be controlled unless the use would create a safety hazard.

- Plan and check the travel path to avoid personnel and obstructions.

- Lift the load only high enough to clear the tallest obstruction in the travel path.

- Start and stop slowly.

- Land the load when the move is finished. Chose a safe landing.

- ***Never*** leave a suspended load unattended.

- ***Never*** swing a load over any personnel.

Rigging:

Only select rigging equipment that is in good condition. All rigging equipment shall be inspected prior to use before each shift and as necessary during its use. Defective equipment is to be removed from service and destroyed to prevent re-use. Rigging equipment shall not be loaded beyond its recommended safe work load. The load capacity limits shall be stamped or affixed to all rigging components. When rigging equipment is not in use it shall be removed from the immediate work area. The following types of slings shall be rejected or destroyed:

I. Nylon slings with:

- Abnormal Wear.
- Torn stitching.
- Broken or cut fibers.
- Discoloration or deterioration.

II. Wire-Rope slings with:

- Kinking, crushing, bird-caging, or other distortions.
- Evidence of heat damage.
- Cracks, deformation, or worn end attachments.
- Six randomly broken wires in a single rope lay.
- Three broken wires in one strand of rope.
- Hooks opened more than 15% at the throat.

- Hooks twisted sideways more than 10 ° from the plane of the unbent hook.

III. Alloy Steel Chain Slings with:

- Cracked, bent, or elongated links or components.
- Cracked hooks.

Shackles, eye bolts, turnbuckles, or other components that are damaged or deformed.

Rigging a Load:

Do the following when rigging a load:

- Determine the weight of the load. Do not guess.
- Determine the proper size for slings and components.
- Make sure that shackle pins and shouldered eye bolts are installed in accordance with the manufacturers recommendations.
- Use safety hoist rings (swivel eyes) as a preferred substitute for eye bolts whenever possible.
- Pad sharp edges to protect slings.
- Do not use slings, eye bolts, shackles, or hooks that have been cut, welded, or brazed.
- Determine the center of gravity and balance the load before moving it.
- Initially lift the load only a few inches to test the balance.

XXX. Welding, Cutting, Hot Work Program

Scope:

This program is designed to prevent injury and loss of property from fire or explosion as a result of hot work on all Ernest D. Menold Inc. work areas. This document also contains standards safe operations for welding and cutting.

It covers: welding, brazing, soldering, heat treating, grinding, power-actuated tools, hot riveting and all other similar applications producing a spark, flame, or heat.

Hot work operations in confined spaces are briefly covered here but for more information regarding official procedures under such circumstances reference Ernest D. Menold Inc. Confined Space Program.

Definitions:

Competent Hot Work Supervisor (CHWS): For Ernest D. Menold Inc. employees the CHWS shall have successfully completed competent person training and examination to be considered competent. For outside contractors the hot work supervisor shall be identified and the name provided to the project manager. The CHWS cannot be the hot work operator.

Designated Area: Permanent location designed for or approved by a CHWS for hot work operations to be performed regularly.

Hot Work: Any work involving welding, brazing, soldering, heat treating, grinding, powder-actuated tools, hot riveting, and all other similar applications producing spark, flame, or heat, or similar operations that are capable of initiating fires or explosion.

Hot Work Permit: A document issued by the CHWS for the purpose of authorizing a specified activity.

Hot Work Operator: An individual designated by Ernest D. Menold Inc. to perform hot work under the authorization of a CHWS. These individual(s) must be properly instructed and qualified to operate relevant equipment and who are familiar with OSHA 29 CFR 1910.254, OSHA 29 CFR 1910.252 (a)(b)(c) and the American Welding Society Standard A6-1-1966.

Welding and Allied Processes: Those processes such as arc welding, oxy-fuel gas welding, open flame soldering, brazing, thermal spraying, oxygen cutting, and arc cutting.

Specific Responsibilities:

Competent Hot Work Supervisor (CHWS)

The CHWS is responsible for the safe operations of hot work activity under their supervision. These duties include:

- Establish permissible areas for hot work.
- Ensure that only approved apparatus, such as torches, manifolds, regulators, and pressure reducing valves, are used.
- Ensure that all individuals involved in the hot work operations are familiar with the Ernest D. Menold Inc. Hot Work requirements.
- Ensure that all individuals involved in the hot work operations are trained in the safe operation of their equipment and the safe use of the process. These individuals must have an awareness of the risks involved and understand the emergency procedures in the event of a fire.
- Determine site-specific flammable materials, hazardous processes, or other potential fire hazards present or likely to be present in the work location.
- Ensure combustibles are protected from ignition by the following means:
    - Move the work to a location free from combustibles
    - If the work can not be moved, ensure the combustibles are moved to a safe distance or have the combustibles properly shielded against ignition.
    - Ensure hot work is scheduled such that operations that could expose flammables or combustibles to ignition during hot work operations.
    - **If any of these conditions can not be met, then hot work must not be performed.**
- Determine that fire protection and extinguishing equipment are properly located and readily available.
- Make sure a First Aid Kit is available at all times.
- Ensure sufficient local exhaust ventilation is provided to prevent accumulation of any smoke and fume.
    - Hot work is performed in a location where other than a minor fire might develop, or where the following conditions exist:
        - ❖ Combustible materials in building construction or contents are closer than 35 ft. to the point of work
        - ❖ Combustible materials are more than 35 ft. away but are easily ignited by sparks.
        - ❖ Wall or floor openings are within 35 ft. and expose combustible materials in adjacent areas. This includes combustible materials concealed in walls or floors.

- ❖ Combustible materials are adjacent to the opposite side of partitions, walls, ceilings, or roofs and are likely to be ignited.

Where a fire watch is not required, the CHWS shall make a final inspection ½ hour after the completion of hot work operations to detect and extinguish possible smoldering fires.

Hot Work Operator (HWO)

The hot work operator shall handle the equipment safely and perform work so as not to endanger lives and property. Specific duties include:

- No hot work shall be conducted without specific written authorization from the CHWS via completion of the Hot Work Permit.
- The operator must cease hot work operations if unsafe conditions develop.
- The operator must notify the CHWS for reassessment of the situation in the event of suspected unsafe conditions or concerns expressed by affected persons.

Fire Watch

The fire watch is an individual posted in specific circumstances, as described above. The function of the fire watch is to observe the hot work and monitor conditions to ensure that a fire or explosion does not occur as a result of the work performed. The fire watch is authorized to stop any unsafe operation or activity. Specific duties and responsibilities include:

- Watch for fires, smoldering material or other signs of combustion.
- Be a ware of inherent hazards of the work site and of the hot work.
- Ensure that safe conditions are maintained during hot work operations and stop the hot work operations if unsafe conditions develop.
- Have fire-extinguishing equipment readily available and be trained in its use.
- Extinguish fires when the fires are obviously within the capacity of the equipment available. If the fire is beyond the capacity of the equipment, sound the alarm immediately.
- Be familiar with the facilities and procedures for sounding an alarm in the event of a fire.
- A fire watch shall be maintained for at least ½ hour after completion of hot work operations in order to detect and extinguish smoldering fires.
- More than one fire watch shall be required if combustible materials that could be ignited by the hot work operation cannot be directly observed by a single fire watch (e.g. in adjacent rooms where hot work is done on a common wall).

Hot Work Operational Requirements:

Hot work is allowed only in areas that are or have been made fire-safe. Hot work may only be performed in either designated areas or permit-required areas.

A designated area is a specific area designed or approved for such work, such as a maintenance shop or a detached outside location that is of noncombustible or fire resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas.

A permit required area is an area made fire-safe by removing or protecting combustibles from ignition sources.

Hot work is not allowed:

- In sprinkler system buildings if the fire protection system is impaired.
- In the presence of explosive atmospheres or potentially explosive atmospheres (e.g. on drums previously containing solvents)
- In explosive atmospheres that can develop in areas with an accumulation of combustible dusts (e.g. grain silos).

Hot Work Permit

Before hot work operations begin in a non-designated location, a completed hot work permit prepared by the CHWS is required (See Appendix A). Based on local conditions, the CHWS must determine the length of the period, not to exceed 24 hours, for which the hot work permit is valid.

The following conditions must be confirmed by the CHWS before permitting the hot work to commence:

- Equipment to be used (e.g. welding equipment, shields, personal protective equipment, fire extinguishers) must be in satisfactory operating condition and in good repair.
- The floor must be swept clean for a radius of 35 ft. if combustible materials, such as paper or wood shavings are on the floor,
- Combustible floors (except wood on concrete) must be:
    - Kept wet or covered with damp sand (note: where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock)., or
    - Be protected by noncombustible or fire-retardant shields.

- All combustible materials must be moved at least 35 ft. away from the hot work operation. If relocation is impractical, combustibles must be protected with fire-retardant covers, shields or curtains. Edges of covers at the floor must be tight to prevent sparks from going under them, including where several covers overlap when protecting a large pile.

- Openings or cracks in walls, floors, or ducts within 35 ft. of the site must be tightly covered with fire retardant or noncombustible material to prevent the passage of sparks to adjacent areas.

- If hot work is done near walls, partitions, ceilings, or roofs of combustible construction, fire retardant shields or guards must be provided to prevent ignition.

- If hot work is to be done on a wall, partition, ceiling, or roof, precautions shall be taken to prevent ignition of combustibles on the other side by relocating combustibles. If it is impractical to relocate combustibles, a fire watch on the opposite side from the work must be posted.

- Hot work must not be attempted on a partition, wall, ceiling, or roof that has a combustible covering or insulation, or on walls or partitions of combustible sandwich-type panel construction.

- Hot work that is performed on pipes or other metal that is in contact with combustible walls, partitions, ceilings, roofs, or other combustibles must not be undertaken if the work is close enough to cause ignition by conduction.

- Fully charged and operable fire extinguishers that are appropriate for the type of possible fire shall be available immediately at the work area. These extinguishers should be supplied by the group performing the hot work. The fire extinguishers normally located in a building are not considered to fulfill this requirement.

- If hot work is done in proximity to a sprinkler head, a wet rag shall be laid over the head and then removed at the conclusion of the welding or cutting operation. During hot work, special precautions shall be taken to avoid accidental operation of automatic fire detection or suppression systems (for example, special extinguishing systems or sprinklers).

- Nearby personnel must be suitably protected against heat, sparks, and slag.

Work Closeout

- A fire watch shall be maintained for at least 30 minutes after completion of hot work operations in order to detect and extinguish smoldering fires.
- The CHWS shall inspect the job site 30 minutes following completion of hot work and close out the permit with the time and date of the final check.
- The completed Hot Work Permit shall be retained for 6 months following completion of the project.

Warning Signs

In order to control traffic, barriers and proper signs must be posted to ensure traffic is prevented from exposure to hot work areas. Shields must be used to prevent exposure to sparks and flashes. A clear path to an exit of at least forty-four (44) inches must be maintained at all times. Whenever possible, vehicular traffic should be kept out of the hot work areas while work is in progress.

Personal Protective Equipment

Suitable eye protection is required during all welding and cutting operations. Helmets are required for arc welding and arc cutting. Suitable goggles or other eye protection is required for gas welding and oxygen cutting operations. All helmets and eye protection must be approved, and the filter lenses should be appropriately rated for the welding/cutting activity being performed.

Appropriate protective clothing will be provided to all workers exposed to welding or cutting hazards. The appropriate protective clothing will vary according to the size, nature, and location of the work performed. Flame-resistant gloves must be worn to protect the hands during work activities.

Compressed Gas Cylinders (CGC's)

Compressed gas cylinders have inherent dangers aside from using them in hot work activities. The handling and storage of compressed gas cylinders must be undertaken with great care. Workers in charge of oxygen or fuel gas supply equipment must be instructed and judged competent for such work.

Handling- The following guidelines should be followed when working with CGC's:

- Cylinders should be secured in the upright position to prevent tipping.
- Regulators must be compatible with the cylinder and its content. Many regulators are similar in design and construction, so it is necessary to check the regulators model number and compare it with the cylinders requirements to ensure compatibility.
- Cylinder carts equipped with cylinder restraints such as a chain or strap should be used for transporting and while using CGC's. Never drop cylinders or let items fall on them.
- Do not accept delivery of acetylene CGC's that arrive in the horizontal position. Transporting cylinders in this manner makes them much more susceptible to explosion.
- CGC's should be inspected before using to check for leaking, corrosion, cracking, burn marks, contaminated valves, worn hoses and faulty connectors, or broken gauges. If any defective condition is discovered, the CGC's should not be used.
- Never open valves until regulators are drained of gas and pressure adjusting devices are released. When opening CGC's point outlets away from people and sources of ignition and open valves slowly. On valves without handle wheels, use only supplier recommended wrenches. On valves with handle wheels, never use wrenches. Never use a hammer to turn a handle wheel open or closed.
- When cylinders are empty, close and return them. Empty CGC's must be marked "MT" or "Empty".

Storage- The following guidelines should be followed when storing CGC's:

- Oxygen and fuel gas cylinders must be stored separately with protective valves in place.
- Oxygen and acetylene must be stored at least twenty (20) feet apart, and separated by a non-combustible wall at least five (5) feet in height.
- Regulators must be compatible with the CGC and designed for the appropriate cylinder.
- Check the manufacturer's model number and compare it with the gas supplier's requirements and with the gas cylinder.

- Cylinder carts must be used to transport cylinders from location to location.
- Cylinders must be secured from tipping and secured in an upright position while in use. The cylinder must be braced from tipping over by placing a strap or chain around the top third of the cylinder.
- Empty or unused gas cylinders must be promptly returned to the supplier.
- Gas cylinders and welding equipment must be left outside the work space where the work was performed. Examples of such locations include boilers, tanks, or pressure vessels.
- Heavy portable equipment mounted on wheels must be securely blocked to prevent movement.
- Protective valve caps should be in place on the CGC when it is placed in storage. This will reduce the likelihood that a blow to the valve will result in leakage.
- When stored, CGC's should be arranged in such a way that old stock will be used before new stock.

Arc Welding and Cutting

- Workmen assigned to operate and maintain arc welding equipment must be properly trained and qualified to operate the equipment. They should be familiar with OSHA 29 CFR 1910.254, OSHA 29 CFR 1910.252 (a) (b) (c), and the American Welding Society Standard A6-1-1966.
- Welding equipment must be chosen for safe application to the work being performed. All equipment should be used, inspected and maintained according to the manufacturer's instruction.
- For all types of arc welding machines, the control apparatus must be enclosed except for operating wheel, levers or handles. Input power terminals, tap change devices and live metal parts connected to input circuits should be completely enclosed and only accessible by means of tools.
- Terminals for welding leads should be protected from accidental electrical contact by personnel or by metal objects. The frame or case of the welding machine must be properly grounded.
- Before starting operations, all connections to the machine must be checked to make sure they are properly made.

- Cables with splices within 10 feet of the holder must not be used.
- Cables with damage insulation or exposed bare conductors must be replaced.
- Any equipment defects or safety hazards detected on the equipment should be reported immediately and the equipment in question should not be used until the proper repairs are made. Repairs are only to be made by competent, qualified repair personnel.

Confined Spaces

When performing hot work in confined spaces, employees must comply with the Ernest D. Menold Inc. "Confined Space Entry" procedures. In addition, employees must adhere to the following guidelines:

- Keep all gas cylinders and welding machines outside of confined spaces. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement.
- Lifelines must be provided to all employees entering a confined space. These requirements and procedures are outlined in "Confined Space Entry Program". An attendant with a pre-planned rescue plan must be stationed outside to observe the welder at all times.
- When arc welding is suspended for a substantial amount of time, such as lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine disconnected from the power source.
- In order to eliminate the possibility of gas escaping through leaks of improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the fuel-gas and oxygen supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. When practical the torch and hose shall be removed from the confined space.
- After welding operations are completed, the welder shall mark the hot metal or provide some other means of warning other workers.
- First Aid Equipment will be available at all times.

1. Ventilation-

Ventilation shall be adequate, depending on the volume and configuration of space, number and type of operations that are generating contaminants, natural air flow rate where operations are taking place, location of the welding breathing zone, and whether ventilation can be obtained mechanically or naturally.

A. Ventilation and Atmospheric Testing- Ventilation techniques for welding operations vary depending on size and type. For basic operations, fans will provide enough ventilation. However, ventilation should never be relied on as the only method of protecting employees when it is suspected that air contaminants are present. When ventilation is poor or questionable, respirator protection should be implemented before hot work activities begin (see Ernest D Menold Inc., "Respiratory Protection Program"). Ventilation of the space where hot work is going to occur should be evaluated based on the "general" guidelines below:

I. Hot work should not be conducted in the presence of explosive mixtures of flammable gases, vapors, liquids, or dusts or where explosive mixtures could develop inside improperly prepared tanks or equipment.
II. Atmospheric testing and monitoring for combustible gases and vapors must always be conducted inside a confined space before work commences and at regular and predetermined intervals thereafter.
III. Any welding, cutting, or burning of base metals, zinc, cadmium, mercury, beryllium, or exotic metals and paints not listed here shall have proper ventilation and/ or respiratory protection.

Appendix A

Hot Work Permit

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

Ernest D. Menold Inc. Hot Work Permit

This Hot Work Permit is required for any operation involving open flames or producing heat and/or sparks and must be completed by a Competent Hot Work Supervisor (CHWS) and posted at the site. Hot Work includes, but is not limited to: Brazing, Torch Cutting, Grinding, Soldering, and Welding. **If the required precautions cannot be met, Hot Work is not permitted.**

Date:

Building:

Location:

Description of Hot Work:

Name of Hot Work Operator:

Is a Fire Watch required?

_____ Yes

_____ No

A Fire Watch should be posted if:

- Combustible materials within a 35 foot radius of hot work Cannot be removed.
- Wall or floor openings within the 35 foot radius of hot work expose combustible materials in adjacent areas, including concealed spaces in walls or floors.
- Combustible materials are adjacent to the opposite side of Partitions, walls, ceilings or roofs and are likely to be ignited.
- It is deemed necessary by the Permit Authorizing Individual

Permit Checklist

___ Flammable and combustible materials within a 35 foot radius of hot work have been removed or covered with fire retardant tarps or metal shields.

___ All floors and surfaces within a 35 foot radius of the hot work area have been swept free of combustible dust or debris.

___ Any openings or cracks in the walls, floors, or ducts that are potential travel passages for sparks, heat and flames have been covered.

___ An operable fire extinguisher is nearby and accessible.

___ Sprinkler heads that could be activated by hot work have been covered with a wet rag.

___ Smoke detectors in the area of hot work have been covered to prevent false alarms.

___ A Fire Watch has been posted, if it is required, during hot Work operations and for 30 minutes after work has been completed.

Authorization: The information on this permit has been evaluated, the site has been examined and all safety measures are in place.

Signed: _____
Permit Authorizing Individual

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

WARNING!

HOT WORK IN PROGRESS
WATCH FOR FIRE!

This permit valid until: _____

If you have questions about these hot work activities:

CALL: _____

AT: _____

_____

WARNING!

Fatigue Management Program

1. OVERVIEW

The focus of this document is the health and safety of workers relating to fatigue. Fatigue related impairment is considered an identifiable workplace hazard. Like any hazard, the controls employed to manage the risks posed by fatigue are based on sound principles. The most effective means to manage fatigue is through restorative sleep.

Work rosters are the primary means used to establish working hours of employees. The first order of control to manage fatigue is derived by assessing the opportunity that particular work patterns provide for restorative sleep. The duration of breaks or limits of planned rosters promoted in this procedure are based on the opportunity for restorative sleep provided by rostered work patterns.

This procedure is designed to manage the health and safety risks resulting from fatigue related impairment.

2. SCOPE

This procedure applies to all Ernest D. Menold Employees, and Visitors whilst at the workplace or carrying out activities on behalf of (or when representing) Ernest D. Menold Inc.

3. PURPOSE AND OBJECTIVE

Ernest D. Menold Inc. has an obligation to minimize risk due to fatigue on Employees, Contractors, Visitors and the public whilst at the workplace or whilst carrying out activities on behalf of (or when representing) Ernest D. Menold Inc.. This is underpinned by the organization's Fatigue Management Program.

Where the effects of fatigue and/or the nature of the work being performed induces fatigue causing impairment to a person's health and safety, Ernest D. Menold Inc. will ensure that appropriate and reasonable management action, consistent with this procedure, is taken.

The objective of this procedure is to provide appropriate knowledge, skills and tools for the safe management of fatigue to:

- Maintain a safe and healthy work environment
- Minimize the risk to Employees, Contractors, Visitors and the public.
- Act as a minimum standard.
- Encourage persons affected by work and non-work related fatigue to seek assistance.
- Enable the appropriate people to perform their role and responsibilities whilst maintaining the privacy and confidentiality of people participating in fatigue management.
- Educate and provide a greater understanding of the effects of fatigue to Employees, Contractors and Visitors.

4. OBLIGATIONS

All Employees shall comply with this common policy for fatigue management.

All Supervisors have an obligation to ensure that this policy is in place to promote, support, monitor and review the workplace practices and outcomes.

All Employees have an obligation to ensure they turn up to work in a state that enables them to conduct their business activities in a safe manner.

All Supervisors have an obligation to ensure that as far as reasonably practical that those workers unfit to drive due to the effects of fatigue are transported to their home or alternative suitable place for sleep.

Where a fatigue risk is identified the situation must be managed to remove or minimize the risk.

5. RESPONSIBILITIES

Everyone at the workplace has a responsibility to ensure that fatigue does not affect their own or others' health and safety.

5.1 Shared Responsibility

The management of fatigue is considered a shared responsibility between an organization and its Personnel as illustrated in Figure 1. CS Energy is responsible for providing a safe system of work which includes the development, implementation and management of working

time schedules, work schedules and the establishment of a safe work environment and work practices.

Personnel are responsible for ensuring they are fit for duty by taking into account their lifestyle and medical factors that could influence fatigue, and managing these appropriately.

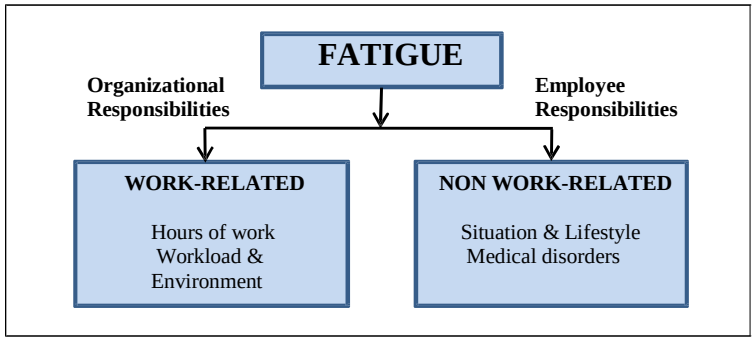


Fig. 1. Shared Responsibility Model

5.2 Ernest D. Menold Inc.

Ernest D. Menold Inc. will:

- Educate its Employees about the impacts of fatigue.
- Offer rehabilitation assistance to any Employee taking into account the person's right to privacy and confidentiality.
- Provide leadership and commitment through the allocation of resources and personnel for the establishment, implementation, evaluation and review of the fatigue management program.
- Review, monitor and track all aspects of the fatigue management program to ensure compliance across whole of site and Personnel as well as identifying areas for improvement;
- Ensure that the fatigue assessment process is utilized and documented.
- Provide appropriate fatigue management training.

- Develop and implement agreed working rosters to ensure adequate opportunity for restorative sleep is provided.
- Ensure that if a person's capacity to work safely is reduced by fatigue they can notify their supervisor without fear of adverse repercussions.
- Ensure that privacy and confidentiality is maintained.
- Provide suitable accommodation for Employees when required to travel for work.
- Provide an Employee Assistance Program (EAP) that places emphasis on the recognition and management of fatigue.
- Report quarterly to Employees on the number and location of evaluations carried out.

5.2 Responsibilities of Safety Coordinator

The management and safety coordinator will:

- Ensure that information and education regarding this procedure are provided in employee and workplace instruction.
- Offer to arrange support and medical advice for employees.
- Provide advice on establishing suitable alternate duties (where possible).
- Maintain records and reporting fatigue matters and statistical data.
- Ensure privacy and confidentiality.
- Audit and continually improve all aspects of the fatigue management program.
- Provide initial and annual training on how to recognize fatigue, how to control fatigue through appropriate work and personal habits, and reporting of fatigue to supervision.

5.4 Responsibilities of Project Manager / Foreman

The project manager and foreman will:

- Implement and enforce this procedure at the workplace.

- Investigate apparent breaches of the provisions of this procedure.
- Taking appropriate actions where breaches of the procedure have occurred.
- Ensuring that privacy and confidentiality is maintained.
- Ensuring that investigations of incidents assess the effects of fatigue.
- Monitoring the application of this procedure and regularly assessing the suitability and adequacy of this procedure. Identifying any aspects that can be improved and report accordingly.
- Ensuring that privacy and confidentiality is maintained.
- Periodically analyze and evaluate work tasks to control fatigue.
- Recognizing and assessing the signs, symptoms and management of fatigue (see **Appendix 1**).
- Ensuring that, to the extent possible, fatigue is considered in planning working rosters, work allocation and scheduling, taking into account the range of matters set out in **Appendix 2.**

5.5 Employees

All employees and subcontractors must:

- Not willfully place their own or others health and safety at risk.
- Make every effort to be fit and adequately rested for work.
- Participate in fatigue assessments if asked.
- Notify their supervisor if their work performance is likely to be affected by fatigue.

- Notify their supervisor immediately if they suspect others in the workplace are behaving in a manner that suggests fatigue related impairment exists (see **Appendix 1**).
- Must not chronically use over-the-counter or prescription drugs to increase mental alertness.

- Must not take any substance known to increase fatigue, including fatigue that sets in after the effects of the drug wear off.

6. Privacy and Confidentiality

The use of information gained as a result of a fatigue assessment will be strictly limited to purposes consistent with this program.

Ernest D. Menold Inc. will ensure that all information is kept confidential and secure. All documentation and requests for disclosure will be handled according to relevant legislation. Information will only be used for the purpose of determining fitness for duty, assignment of appropriate duties, treatment and/or support purposes.

7. Education and Training

Ernest D. Menold Inc. will provide all employees with an education program on fatigue management including their responsibilities under this procedure.

This education will be ongoing and flexible. It will respond to fatigue related trends identified through policy and procedure reviews and audits.

All employees will participate in training to recognize symptoms and behaviors associated with the effects of fatigue including support mechanisms and the application of the procedure.

8. Fatigue Management System and Procedures

8.1 Fatigue Risk Management Framework

Fatigue risk management is about managing sleep, the duration of sustained wakefulness and type of work performed. The level of control will reflect the level of fatigue risk. It is a shared responsibility between Ernest D. Menold Inc. and its personnel.

Work related risk factors shall be addressed because they reduce physical performance, impact on psychological factors such as judgment, concentration, vision and decision making processes. The process for undertaking risk assessments and fatigue assessments to identify the proper control measures is outlined in this section.

8.2 Risk Assessment

A recognized risk methodology shall be utilized to assist in the evaluation and management of fatigue risks.

When performing a risk assessment use Form S1878 (see **Appendix 5)** to document the activity, tasks, risk analysis, and control measures to be applied.

When undertaking risk assessments and identifying control measures refer to the risk factors that contribute to fatigue and typical control measures outlined in **Appendix 2**.

To support the risk assessment the following tools may be applied:

- Fatigue assessment tool (form S1878).
- Work schedule/ roster /shift pattern assessment tool (refer to Section 15).

Risk assessments will provide a graded/graduated process for the determination of fatigue cut off levels such as low, moderate, and high risk categories with subsequent actions such as breaks, task rotation, refreshments and others outlined in **Appendix 2**.

8.3 Identification of Fatigue

Identification of persons who may be affected by fatigue can occur as a result of:

- Self-assessment and voluntary disclosure by the person affected.
- Direct observation of the affected person's behavior consistent with **Appendix 1**.

- A workplace incident investigation.
- Completing a fatigue risk assessment.
- Conducting a relevant site risk assessment process.

8.4 Assessing Fatigue Impairment

A fatigue assessment toll assists in understanding a person's level of fatigue. All Employees of Ernest D. Menold Inc. can be assessed at any time.

The fatigue assessment will be conducted by a suitably trained person. The assessment shall be documented on Form S1886.

Any person who is requested to undergo a fatigue assessment and refuses such a request will not be allowed entry to or remain in the workplace. They will also be subject to reprisals according to the Ernest D. Menold Safety Disciplinary Program.

The following are several fatigue assessment methods:

- Sleep Opportunity.
- Signs and Symptoms (use the fatigue table detailed in **Appendix 1**)
- Prior sleep wake model (see **Appendix 3**)
- Hazard control methods (refer to **Appendix 2 and 4** and Risk Assessment Section 10.2).
- Sleepiness Scales
- Hours of wakefulness
- Incident Reporting.
- Self-Reporting.

This criteria is used in the assessment tool (Form S1886) to document, and provide appropriate action to safely manage fatigue. This Form is used for the following assessments:

- Self
- Random
- With cause (post-incident)
- Reasonable suspicion.

The assessment will indicate the persons level of fatigue giving a score and corresponding risk category with pre-determined responses and actions (see **Appendix 4**).

Self-Assessment

Employees are encouraged to recognize when they may be impaired due to the effects of fatigue. Self-assessment is generally performed using the prior sleep wake model (see **Appendix 3**) and by identifying signs and symptoms (see **Appendix 1**). This is a voluntary assessment process.

An employee who identifies that they are impaired by fatigue as the result of a voluntary self-assessment must cease work immediately and contact their supervisor. A formal risk assessment will be conducted to identify appropriate controls and the supervisor will take immediate steps to prevent loss and rectify the situation.

Random Assessment

Random assessments may be initiated where there is concern that a high level of risk may exist.

With Cause (Post Incident)

If an incident occurs in the workplace that a supervisor believes caused or could have

caused serious injury to people all persons involved will be assessed for fatigue using form S1886. This Assessment will form part of the incident investigation packet.

Reasonable Suspicion Assessment

Reasonable suspicion is ascertained from observation of signs and symptoms that may Be displayed by a person impaired by fatigue (see **Appendix 1**).

If a supervisor has a reasonable suspicion that a person is impaired by fatigue, they should direct the employee to stop performing any duties that may present a risk of injury. The supervisor should initiate an assessment using form S1886.

In the event that it is not possible or practical for the person in question to undertake an assessment, the immediate supervisor will stop them from performing any further work. The employee will remain in an area where they present no safety risk until assessment can be performed.

Assessment Results

When an employee has been identified as a fatigue risk, control measures shall be put in place consistent with the actions and responses detailed in **Table 1 and Appendix 4**.

The assessment will also utilize the Risk Score Chart (Form S1886 Section 6) to determine the particular action to be taken.

9. Management of a Person Impaired by Fatigue

When a person has been identified with a level of fatigue that will present a risk to the health and safety of the workplace, the supervisor will discuss the appropriate control measures based upon the risk score chart (see **Appendix 4**).

Where practical, suitable alternative duties and control measures are to be selected (see **Appendix 2**).

When it is not possible to provide alternative duties and the person is requested to leave work, the supervisor shall arrange transport for that person.

10. Rules for Managing Fatigue

Table 1 describes the rules for managing fatigue for planned or pre-agreed rosters.

Situation	Basis	Value
Limit number of actual work hours in any 7 day period.	6 attendances consisting of a maximum of 12 hours each.	72 hours.
Handover for continuous shifts for Personnel in roles such as: Operators, Supervisor, PTW Officer, OIC, Inspector etc.	In addition to 12 hour shift, maximum 30 minutes per shift.	3 hours (6 attendances x 30 mins).
Planned maximum hours of work (not inclusive of handovers).	12 hours.	12 hours.
Long break frequency.	Minimum 24 hours with no financial disadvantage.	1 Break in every 7 Days.
If Personnel are required to work continuously for 4 or more nights the person will have a rest period after change from night work/shift before returning to normal roster.	4 or more night shifts consecutively.	48 hours (to support 2 night sleeps) *See Note 1.
Rest period after change from night work/shift before changing to a different roster – where night work/shift has been worked continuously for 3 or more weeks.	Minimum 48 hours *See Note 1.	48 hours (to support 2 night sleeps) *See Note 1.

Table 1 – Rules for planned or pre-agreed rosters

*Note 1: The 48 hour rest period may occur at any time during a roster period. Breaks which fall on normal projected roster working shifts will be paid as if at work.

Prior Sleep and Wakefulness

The Prior Sleep Wake Model, detailed in **Appendix 3**, shall be used as part of the fatigue assessment tool. It is based upon a person's level of risk from fatigue when that person had:

- less than 5 hours sleep in the previous 24 hours; and
- less than 12 hours sleep in the previous 48 hours.

The duration of their wake period is not to exceed the amount of prior sleep they have had in the previous 48 hours. This is illustrated in **Appendix 3** and supporting examples.

Control measures shall be initiated consistent with **Appendix 4** where a person reports they have had inadequate time for sleep or poor sleep.

Scheduling

Planning of work tasks shall comply with this fatigue management procedure.

In all scheduling the following matters shall be considered, but are not limited to:

- Time of day.
- Nature of work and the level of risk inherent in the work.
- Number of people.
- Circadian rhythm.
- Sleep inertia.
- Sleep debt.
- Start and finish times.
- Duration of work.
- Frequency of breaks.
- Opportunity to recover from fatigue.
- Redesign work practices or rescheduling high risk/complex tasks.
- The need to conduct a formal risk assessment.

Job rescheduling may be necessary when there is a risk to a person's health & safety, if performing hazardous/critical work during high fatigue periods (e.g. between 2:00am to 6:00am).

Review and Recording
A review of this procedure will be conducted within 12 months of implementation.
The review shall determine effectiveness, functionality, compliance to the requirements within and other internally related documents/materials/practices using an auditing approach.

The audit will incorporate:

- Interviews with Personnel.
- A desktop audit of documentation and practices.
- Examination of internal systems (databases, safety records, investigations etc.).

Following the initial review, each subsequent review of this procedure will be undertaken no less frequently than once every 2 years or at other times as required by unforeseen changes.

Records

Fatigue Assessments and all other documentation pertaining to this program will be on file with the Ernest D. Menold Inc. Safety Coordinator for review.

Appendix 1 – Sign and Symptoms of Fatigue

PHYSICAL
Yawning
Heavy Eyelids
Eye-rubbing
Head drooping
Micro sleeps

MENTAL
Difficulty concentrating on a task
Lapses in attention
Difficulty remembering what you are doing
Failure to communicate important information
Failure to anticipate events or actions
Accidentally doing the wrong thing (error)
Accidentally not doing the right thing (omission)

EMOTIONAL
More quiet than usual
Lacking energy
Mood changes, decrease tolerance
Emotional outburst, aggressive, rage

Use these signs and symptoms for Fatigue when completing a Fatigue Assessment.

Appendix 2 – Risk Factors and Control Measures

Project Managers / Foremen (e.g. when preparing JSEAs in consultation with workers) should address the following issues.

Risk factors that contribute to fatigue:

- Prior sleep and wakefulness – the amount of sleep they have had prior to work and the duration of their work period.
- Working without a rest break to meet critical deadlines/milestones.
- Sleep patterns affected by frequent call outs over a limited period and extended hours of work.
- Work tasks/activities requiring concentration or high levels of muscular exertion for extended periods of time.
- Tedious and monotonous work.
- Heavy or exhausting physical activity.
- Working in high risk situations.
- Inadequate recovery from interrupted or poor quality sleep.
- Working successive shifts, frequently on call out, and regular emergency work outside standard work hours.
- Working in high heat or cold temperatures or humid conditions.
- Driving vehicles while tired.
- Accepting work which results in exceeding working hour limits.
- External factors that affect a person's fatigue risk level while at work.
    - Excess hours/Overtime.
    - Extended Shiftwork and with early starts or late finishes over successive days.
    - Rest Breaks and Rotation of Tasks.
    - Contractors and Outages.
- Emergency Works/Time of day – incidents are more likely to happen in circadian low points (such as night time, especially between the hours of 2am to 6am).

- Length of shifts worked – the effects of fatigue are cumulative, workers are more likely to feel fatigued in the final hours of a shift, than in the first few hours of a shift.
- Lack of opportunity to recover from fatigue – incidents are more likely to occur if workers are not given a sufficient opportunity to recover from fatigue.
- How often the situation occurs – generally, the more often a worker is fatigued, the greater the likelihood is that an incident will occur.
- How many people are fatigued – generally, the greater the number of people who are fatigued, the more likely an incident is to occur.
- The skills and experience of persons fatigued – consider training and competency both to perform work related tasks and manage fatigue.
- Any special characteristics of the people involved – for example if a worker is on medication for a medical condition that is affected by circadian rhythms and night shift work (such as asthma, depression or diabetes).
- The duration of exposure to fatigue - generally, the longer a person is fatigued, the more likely an incident will occur.
- The level of risk inherent in the work – incidents are more likely to occur in work that is generally hazardous, such as when operating heavy machinery or plant.
- Number of consecutive night shifts worked.
- Commuting – time spent travelling reduces time available for recovery.
- Shift rotation – relevant shift changes and start/finish times.
- Sleep inertia – drowsiness after being woken.
- Rest breaks – the number and duration of breaks taken.
- Occupational exposure levels – extended exposure on longer shifts to noise, dusts, chemicals.
- Manual tasks – forces used to push, pull, lift, carry, reach or dexterity required for work and ergonomics – body position and location – confined or cramped work spaces.
- Proximity of workers residence or accommodation – method of travel to and from work and the risk of commuting incidents.
- Ability to access food and refreshments for a balanced diet.

Control Measures

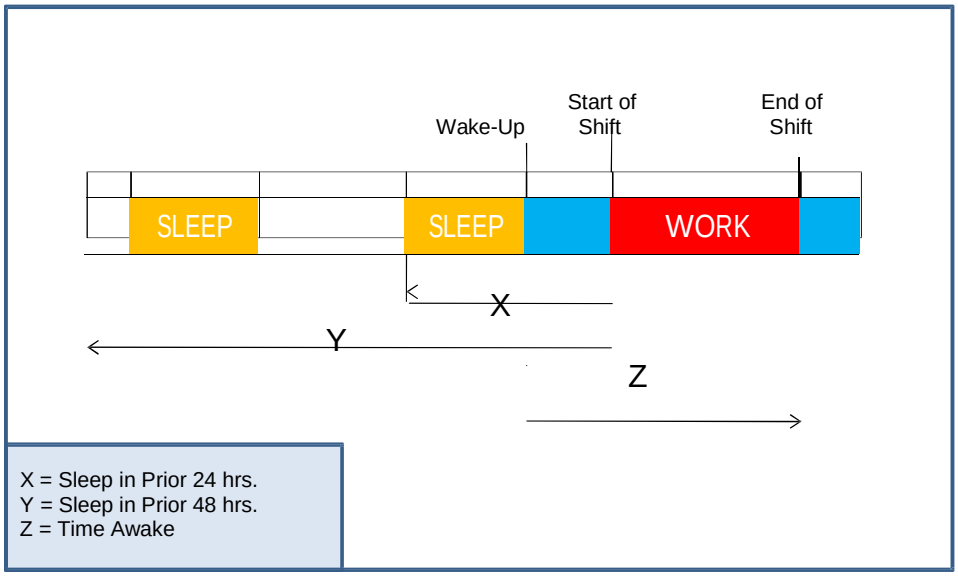
- The setting of work hour limitations and controlling of job rotation schedules to control fatigue, allow for sufficient sleep, and increase mental fitness in order to help control employee turnover and absenteeism.
- Redesigning work practices so that routine administrative tasks are minimized for night shift workers, allowing them to focus on core duties during night work.
- Scheduling later start times so that maximum night sleep can be obtained before starting work (however this can affect those on night shift).
- Scheduling low risk work during periods of high fatigue, such as night time, especially during the hours of 2am to 6am) and/or in the latter half of shifts.
- Scheduling complex tasks to be performed only during the day.
- Sufficient supervision, particularly during periods of high fatigue (such as night time, or in the latter half of shifts) and especially for hazardous work.
- Contingency plans if workers become fatigued – this would involve removing fatigued workers from work activities where there is a considerable risk to health and/or safety (eg operating heavy machinery or plant).
- Effective emergency responses.
- Strict controls and procedures if performing hazardous work during high fatigue periods (especially during 2am to 6am).
- Job rotation for repetitive or monotonous work, or work that involves heavy physical demands.
- Provide chairs for workers to sit periodically.
- Ergonomic Equipment will be used wherever possible to improve workstation conditions (anti-fatigue mats, lift assist devices, proper lighting, and temperature control).

Appendix 3 – Prior Sleep Wake Model

This tool is used for qualifying a person's fatigue risk level/s based on the amount of sleep obtained in the prior 24 and 48 hour period.

The basis of the model is minimum sleep of:

- 5 hours in the previous 24 hour period and
- 12 hours in the previous 48 hour period.



As prior sleep decreases and prior wake increases the likelihood of fatigue also increases.

In general; **X** should be greater than threshold of **5** hours

Y should be greater than threshold of **12** hours

Z should be less than

A point system is used to determine what course of action a person and/or the organization may take.

Step 1

X: Sleep in previous 24 hours: ..... hrs. [add 2 points for every hour below 5] ..... pts.

Step 2

Y: Sleep in previous 48 hours: ..... hrs. [add 2 points for every hour below 12] ..... pts.

Step 3

Z: Time awake: Start of Work ..... hrs. End of Work ..... hrs.

[add 1 point for every hour of work beyond **Y**] ..... pts.

(Sum all of the points – Steps 1 to 3)

Total Score (Prior Sleep Wake Score)**:** ..... pts.

Example – Low Fatigue

If a person has slept 6 hours in the prior 24 hours and 10 hours in the prior 48 hours and has been awake for 2 hours, that person's score would be -

X=**6** (sleep in prior 24 hours) Y=**10** (sleep in prior 48 hours) Z=**2** (hours awake) Points System

Step 1 + Step 2 + Step 3 = Fatigue Risk Score

0 + 4 + 0 = **4**

Refer to **Appendix 4** - Risk control measures for a score of **4** may include:

Self-monitoring, task rotation and team monitoring of colleague but this range will be determined by internal organizational decisions regarding responses designed to reduce the identified fatigue risk.

Example – Higher Fatigue

If a person has slept 3 hours in the last 24 hours and 6 hours in the prior 48 hours and has been awake for 10 hours, that person's score would be -

X=**3** (sleep in prior 24 hours) Y=**6** (sleep in prior 48 hours) Z=**10** (hours awake) Points System

Step 1 + Step 2 + Step 3 = Fatigue Risk Score

4 + 12 + 4 = **20**

Refer to **Appendix 4** - Risk control measures for a score of **20** may include:

Document externally, do not engage in any hazardous activities, do not commence work.

Appendix 4 – Risk Score Chart

Score	Risk	Response/Actions
0	n/a	Remain with working existing arrangements unless higher level hazards are present.
1 - 4	Low	Report to the supervisor and document. Undertake approved individual control measures. Self-monitor for symptoms, team monitoring by colleagues and task rotation.
5 - 8	Moderate	Report to supervisor and document. Organize supervisory checks. Complete symptom checklist and task re-assignment.
9 or more	High	Document externally, do not engage in any safety critical work and do not recommence until fit for work.

Score: The higher number from the fatigue assessment determined from either:

(i) the prior sleep wake model; or

(ii) signs and symptoms chart (Appendix 1)

Risk: The level designated for the risk to identify severity to priority to address.

Response/action: The appropriate course of action to address the level of risk.

Appendix 5 – Form S1886, Observation Record and Fatigue Assessment

This form is a record of the fatigue assessment for a person under CS Energy's Fitness For Duty Policy. The privacy and confidentially of that person will be maintained with respect to the information gained as a result of the fatigue assessment.

Section 1 - Assessment Type

Tick ✓ appropriate boxes

Assessment Type: ☐ Self ☐ Random ☐ Reasonable Suspicion ☐ With Cause

Work Type: ☐ Ops/Maint/Adm ☐ Overhaul ☐ Forced Outage ☐ Projects

Section 2 - Particulars of Person (being assessed) and Work Schedule

Tick ✓ appropriate boxes

Engagement Type: ☐ Employee ☐ Contractor ☐ Visitor

If Contractor or Visitor what Organisation: .....

Surname: ..... **First Name:** .....

Job Role: .....

Site: ..... **Department:** .....

Nature of Duties: .....

.....

Date: ..... / ..... / ..... **Time:** ..... : ..... hrs **Attendance Start Time:** ..... : ..... hrs

Work Schedule: ☐ Planned Roster ☐ Call Out ☐ Extended Hours

This assessment was undertaken ..... hrs into the attendance.

Section 3 - Questions

Tick ✓ appropriate boxes

Have you completed your designated compulsory break from previous work period?	☐ Yes	☐ No
Will this work keep you within 72 hours worked within 7 days?	☐ Yes	☐ No
Have you had a continuous 24 hr break since you last worked greater than 12 hrs?	☐ Yes	☐ No
Have you had a 10 hour break since your last call out ended?	☐ Yes	☐ No
Do you think you are fit for duty?	☐ Yes	☐ No

Where 'no', the risks from Fatigue are increased. Refer to 'Rules for Managing Fatigue' Doc. CS-OHS-12 and record in Section 6.

Other Comments: .....

.....

.....

Section 4 - Observation, Signs and Symptoms

Tick ✓ appropriate boxes

Physical: ☐ Yawning ☐ Heavy eyelids ☐ Eye rubbing ☐ Head drooping ☐ Micro sleeps

Emotional: ☐ More quiet than usual ☐ Mood changes, decrease in tolerance
☐ Lacking energy ☐ Emotional outburst, aggressive, rage

Mental: ☐ Difficulty concentrating on the task ☐ Difficulty remembering what you are doing
☐ Lapses in attention ☐ Failure to communicate important information
☐ Failure to anticipate events/actions ☐ Accidentally doing the wrong thing (error)
☐ Accidentally not doing the right thing (omission)

Total number of marked boxes: ..... (Signs & Symptoms Score)

Transfer score to Section 6

Section 5 - Prior Sleep Wake History

Use the Prior Sleep Wake Model

X: Sleep in previous 24 hours: ..... hrs [5 or more hrs = 0; add 2 pts for every hour below 5] ..... pts

Y: Sleep in previous 48 hours: ..... hrs [12 or more hrs = 0; add 2 pts for every hour below 12] ..... pts

Z: Time awake: Time from waking to present time: ..... hrs

[Y or less hrs = 0; add 1 point for every hour of wake beyond Y hrs] ..... pts

Total Score (Prior Sleep Wake Score): ..... pts

Transfer total score to Section 6.

Section 6 - Assessment and Decision Response

Signs & Symptoms Score: ..... **Prior Sleep Wake Score:** .....

Chose the higher score to determine the Fatigue Assessment Score.

Fatigue Assessment Score: ..... *from table below* **Risk:** .....

Score	Risk	Response/Actions
0	n/a	Remain with working arrangements unless higher level hazards are present.
1 - 4	Low	Report to the supervisor and document. Undertake approved individual control measures. Self-monitor for symptoms, team monitoring by colleagues and task rotation.
5 - 8	Moderate	Report to supervisor and document. Organise supervisory checks. Complete symptom checklist and task re-assignment.
9 or more	High	Document externally, do not engage in any safety critical work and do not recommence until fit for work.

Relating the Fatigue Assessment Score to the table plus responses from Section 3 has identified the person is:

☐ **Fit for current duties** ☐ **Not fit for current duties**

Action Taken: .....

.....

.....

☐ Employee Assistance Program recommended ☐ Alternate transport offered

☐ Alternate transport accepted

Section 7 - Completion Details

Observation Sheet completed by:

Name: .....

Position: .....

Signature: ..... Date : ..... / ..... / .....

Acknowledgement of person assessed:

Signature: ..... Date : ..... / ..... / .....

→ Forward to the Superintendent/Manager

Superintendent/Manager:

Name: .....

Position: .....

Signature: ..... Date : ..... / ..... / .....

→ Forward completed form to the Site Health and Safety Specialist

Manual Lifting Policy

1. PURPOSE

The purpose of this policy is to eliminate the possibilities of injuries on the job due to improper lifting techniques and overexertion during lifting.

2. SCOPE

This program applies to all employees that perform manual handling tasks as part of their job responsibility. This program is intended to minimize the potential for soft tissue injury caused by lifting or manipulating heavy or awkward objects. Employees whose work requires heavy lifting shall be properly trained, and physically qualified.

3. RESPONSIBILITIES

Supervisors and Foremen are responsible for the following:

- Identifying lifting or material handling operations that have potential for injury
- Conducting a hazard assessment
- Instituting engineering controls when applicable
- Ensuring all employees are properly trained
- Ensure employees use proper lifting techniques
- Making assistance available to employees who manually handle or lift 50 lbs. or greater
- Periodically evaluating work areas and employees work techniques especially if operations or conditions change.
- Making sure of the availability of manual lifting equipment.
- Timely investigation of any injuries caused by improper lifting techniques so findings can be incorporated into work procedures to avoid future incidents.

Employees are responsible for:

- Attending required training
- Using proper lifting and material handling techniques
- Limiting manual lifting and handling tasks to objects less than 50 lbs.
- Getting assistance when manually lifting or handling objects over 50 lbs.
- Reporting injures immediately upon occurrence.

4. Pre Lifting Procedures:

Before any type of manual lifting is attempted a hazard assessment must be filled out. The hazard assessment must take into consideration the following areas:

- Size, bulk, and weight of the object(s).
- If mechanical lifting equipment is required.
- If two-man lift is required.
- Whether there is an obstruction in vision and/or the walking surface and path where the object(s) are to be carried.

5. Corrective Actions:

Once a job hazard assessment has been completed the proper controls should be put in place as follows:

- Always use lifting equipment whenever possible when size, bulk, and weight are in question.
- Manual lifting equipment such as dollies, hand trucks, lift-assist devices, jacks, carts etc. (when required) must be provided for employees and enforced.
- Where use of lifting equipment is found to be impractical, two man lifts must be utilized.
- Other engineering controls should be considered such as conveyors, lift tables, and work station design.

6. Training:

All employees shall be trained on proper lifting procedures. Training includes the following areas:

- General principles of ergonomics
- Recognition of hazards and possible injuries.
- Procedures for reporting hazardous conditions.
- Methods and procedures for early reporting of injuries.

Additionally, there may be a need for job specific training which should include:

- Safe lifting and work practices.
- Hazards.
- Controls

Further information regarding training can be found in the General Lifting Techniques section of this program.

General Lifting Techniques

Whether it is during leisure activities or as a part of work, everyone lifts, holds, carries, pushes and pulls on a daily basis. Manual material handling involves lifting light, heavy, and awkward objects. Safe lifting is a critical aspect of daily activities and should be the focus of any manual material handling. Before you lift, remember the following:

- Wear supportive shoes.
- Use lift assist devices (hand dollies, carts, lift tables, forklifts).
- Carry all movements out horizontally (e.g. push and pull rather than lift and lower).
- Always use your body weight and not your feet when pushing.
- Try to have objects at waist height.
- Always keep objects in the comfort zone (between hip and shoulder height).
- Keep all loads close to and in front of body.
- Keep the back aligned while lifting.
- Maintain a good center of balance.
- Let the legs do the actual lifting.
- Reduce the size of the material whenever possible to keep it light, compact, and safe to grasp.

Plan your Lift prior to lifting as follows:

- Size up the load, its weight, shape and position.
- Determine if the load is too large, too heavy, or too awkward to move alone.
- Get help from a coworker or use mechanical aid device to help with the lift when necessary.
- Decide on the route to take.
- Check for any problems or obstacles such as slippery or cluttered floors and remedy any issues before lifting.
- Investigate the location where the load is going to be placed in order to anticipate any difficulties.
- Always exercise or warm up the back prior to lifting.

Squat Lifting should be done for the majority of lifts. Squat lifting should be performed as follows:

- Stand as close to the load as possible.

- Move your feet shoulder length apart.
- Tighten your stomach muscles so you can tuck in your pelvis.
- Bend at the knees, keeping your back straight and stomach tucked.
- Get a good firm grip on the load.
- Hug the load close to the center of the body.
- Lift smoothly with your legs, gradually straightening the knees and hips into a standing position.
- Avoid twisting your body as you lift.

Carrying Loads should be done as follows:

- Keep the load close to the center of your body to take full advantage of the mechanical leverage of your body.
- Do not change your grip on the load unless it is weight supported.
- Avoid twisting your body without pivoting your feet at the same time.
- If you must change direction, move your feet in that direction instead of twisting your trunk in that direction.
- Make sure you can see over the load.
- Move carefully toward your destination.
- If a heavier load is carried for some distance, consider storing it closer.

Unloading Objects should be done the same way as lifting objects but in the reverse order as follows:

- Slowly bend your knees to lower the load.
- Keep your back straight and the weight close to the center of your body.
- Allow enough room for fingers and toes when the load is set down.
- Place the load on a bench or table by resting it on the edge and pushing it forward with your arms and body.
- Secure the load to ensure that it will not fall, tip over, roll or obstruct someone's movement.

One-Arm Loads are used when carrying items such as pails or buckets. Lifting and carrying one-arm loads should be performed as follows:

- Bend the knees at the waist keeping your back straight.
- Reach for the load.
- Grasp the handle of the load firmly.
- Lift with your legs (not your shoulders) and upper back.
- Keep shoulders level while switching hand regularly to reduce overexertion on one side of the body while carrying the load.

Team Lifts are used when objects are too heavy, too large or too awkward for one person to lift. Team lifts should be performed as follows:

- Work with someone of similar build and height if possible.
- Choose one person to direct the lift (e.g. “lift on the count of three”)
- Lift with your legs and raise the load to the same level while carrying.
- Move smoothly and in unison
- Set the load down together.

Overhead Lifts should be conducted as follows:

- When lifting or lowering objects from above the shoulders, lighten the load whenever possible.
- Stand on something sturdy such as a step stool or platform rated for the proper weight to decrease vertical distance.
- When you are lowering objects from above the shoulders, slide the load close to your body, grasp the object firmly, slide it down your body and proceed with your move.

MECHANICAL AIDS

Alternative material handling techniques for carrying or moving loads are to be used whenever possible to minimize lifting and bending requirements. These alternate techniques include the use of: hand trucks, carts, dollies, forklifts, hoists, and wheelbarrows. Even though mechanical aids are used, safe lifting procedures should still be followed by maintaining the natural curvature of the back, using the legs for any lifting that is encountered and avoid twisting the back.

Fire Protection Program

1. PURPOSE

The purpose of the Fire Prevention Plan is to make every Ernest D. Menold Inc. employee aware of the need to properly plan and observe conditions in the workplace for the prevention of fires that could threaten the safety of the employees.

A Fire Prevention Plan is designed to reduce the risk of workplace fires through active participation and proper training of all employees. Each employee should feel free to report any condition that they feel could be a fire hazard to their supervisor immediately.

2. POLICY

The purpose of this policy is to provide guidelines and overall general procedures company wide. All company offices and worksites are required to develop fire prevention plans addressing specific hazards found in their work areas and convey them to all who work there.

All fire plans will have the following components at a minimum:

- A list of the major workplace fire hazards and their proper handling and storage procedures.
- Potential ignition sources (such as welding) and their control procedures.
- The type of fire protection equipment or systems which can control an ignition if one occurs.
- Names and/or job titles of those personnel responsible for maintenance of equipment and systems installed to prevent or control ignition fires.

All site specific plans should be brought to the Ernest D. Menold Inc. incident commander.

Plans should be maintained in a conspicuous place within the work area.

3. GENERAL FIRE PREVENTION RULES

Emergency numbers shall be placed in a clearly visible and accessible area (i.e. on phones, bulletin boards).

Supervisors will ensure all employees are familiar with escape routes, evacuation locations, and fire extinguisher locations.

Exit doors, exit signs, passageways, and means of emergency exit shall be inspected periodically to ensure proper working condition and unobstructed access.

4. HOUSEKEEPING

All flammable materials will be properly stored and discarded on a timely basis in the interest of preventing fires.

All trash consisting of paper products will be removed from inside containers and placed in exterior receptacles on a daily basis.

All oil soaked rags or other materials containing oil or other flammable materials will be stored in metal containers with covers and identified until they can be disposed of properly.

Flammable materials will not be stored near open flames or ignition sources. If applicable they will be stored in metal fireproof cabinets.

5. CONTROL PROCEDURES

Any jobsite welding or burning requires a hot work permit as well as a full time fire watch. For more information reference the Ernest D. Menold Welding Cutting and Hotwork Program.

Strict enforcement of “NO SMOKING” policy regarding all indoor areas as well as any other posted areas.

All paper trash will be removed from office wastebaskets daily.

6. EMPLOYEE TRAINING

Employees will be instructed on the use of portable fire extinguishers. This training will be provided prior to initial assignment and will be followed up at least annually. The training will cover:

- The Fire Triangle

- Classification of Fuels
- Types of Fire Extinguishers
- Rules for Fighting Fires
- How Properly Use a Fire Extinguisher

This training is required to familiarize all employees with the general principles of fire extinguisher use and the hazards involved.

7. MAINTENANCE OF EQUIPMENT

All fire extinguishers will be visually inspected monthly and inspected by a professional company yearly.

Emergency lighting will be inspected and tested for serviceability at least semi-annually.

Emergency Response Program

I. Overview: The work environment can bring about many challenges to employee safety. These challenges come in many forms. Whether in the performance of everyday work tasks or in rare instances of natural disaster, pandemic outbreak or violence, companies are faced with an ever increasing responsibility to provide safeguards in the event of such occurrences. The following program is an outline on what steps to follow in the event of such emergencies.

II. Preparation for Emergencies and Crises: The first step in the development of an effective emergency response program is to compile an emergency response team. Once assembled the team can then designate responsibilities for primary leadership roles in the overall plan.

A. Crisis Management Team Responsibilities.
1) Development of the overall Emergency Response Program.
2) Appointing of lead positions in the program.
3) Meeting annually to discuss any changes necessary to the program.
4) Offering any assistance necessary during an actual emergency situation. These duties would be assigned by the incident commander who will be the person in charge of the overall operations.
5) Becoming familiar with any and all evacuation plans.

B. Off -Hours Emergency Response Team or Person (OHERT) Responsibilities.
1) Names and contact numbers of all OHERT members will be clearly posted on the company bulletin board located in the entrance area to the shop.
2) OHERT members are responsible for handling any emergency situations that occur after normal business hours.
3) OHERT member(s) shall have a list of information that includes:
    a) A list of emergency contact numbers for all employees.
    b) A list of contact numbers for local police and fire.
    c) Any pertinent company insurance contact information.

C. Incident Commander Responsibilities.
1) Coordinate with the emergency responders and provide them with all necessary information regarding emergency.
2) Secure the scene to prevent anyone from re-entering evacuated facilities.
3) Update and make available the “go kit”. The “go kit will include:
    a) A copy of the Emergency Response Program
    b) MSDS for all inventory in the building(s).
    c) Copies of employee emergency contact list.

d) Map of building(s) and property (10 copies).
e) Keys to all pertinent doors, locks, gates etc.
f) Flashlight
g) Legal Pads
h) Pens and Marker

4) Accounting for all employees, visitors and vendors at all times during the day.
5) Providing ongoing information regarding emergency to the Communications Representative.
6) When emergency has been abated, coordinating with Emergency personnel to determine safety of returning to work facilities.

D. Communications Representative Responsibilities.
1) Oversee the coordination and smooth operation of the Crisis Command Post. (see Section III)
2) Handle all pertinent communications necessary to deal with emergency including:
a) Open communication with the incident commander
b) Contacting family members to make them aware of current status of events.

III. Crisis Command Post

A. The crisis command center location for main office emergency staging purposes will be located at 500 S. Governor Printz Blvd. This is formally known as the Conference Center. It will also be utilized as a designated meeting place in the event of inclement weather or other such factors. The facility will have necessary equipment necessary for handling of any emergency situations. This shall include:
1) A copy of the Emergency Response Program.
2) A computer with internet connection.
3) A working phone for emergency communications.
4) Keys to all pertinent doors, locks, gates etc.
5) A first aid kit.
6) Printed copies of any emergency contact numbers.
7) Any other crucial business documentation needed in order to resume normal operations.
8) Phone number(s) for loss control representative from insurance company.
9) Phone number for Ernest D. Menold Inc. Bank Relationship Manager.
10) Phone numbers of local utilities such as electrical, telephone etc.

IV. General Evacuation Procedure

A. In the event of an evacuation procedure, all occupants of the main office and shop, as well as the CAD house will assemble in the employee parking lot on the end closest to the Conference Center. Once assembled the incident commander as well as a representative from the CAD house will verify that all persons are accounted for. This information will be relayed by the Incident Commander to Emergency Response personnel.

Types of Crises/Emergencies Identified

I. Medical Emergency

A. General Procedure:
1) Call 911.
2) If a heart attack is suspected use company defibrillator on patient.
3) If there is excessive bleeding use blood clotting agent in first aid kit.
4) Wait for Emergency personnel to arrive and give a brief synopsis of what you have done so far.
5) Alert the company safety coordinator.

II. Pandemics

A. General Procedure: Please see Ernest D. Menold Inc. Pandemic Preparedness Program.

III. Fire or Explosion

A. General Procedure:
1) Evacuate Building and convene at the designated meeting place.
2) Call 911.
3) Alert Incident Commander.
4) Incident Commander Alerts Crisis Management Team.

IV. Hazardous Material Spill

A. General Procedure:
1) Evacuate the building and/or area to the designated meeting place.
2) Call 911.
3) Alert the Incident Commander.
4) Incident Commander alerts Crisis Management Team.

V. Bomb Threat

A. General Procedure:
1) Take all threats seriously.
2) Take steps necessary to evacuate the building and meet at the designated meeting place.
3) Call 911 once safely evacuated.
4) Alert the Incident Commander.
5) Incident Commander alerts the Crisis Management Team.

VI. Violent Crime or Behavior

A. General Procedure:
1) Stay Calm.
2) Try to be calm and unthreatening in your responses and actions. Palms open stance.
3) If possible evacuate to designated meeting area.
4) Call 911.
5) Alert the Incident Commander.
6) Incident Commander alerts the Crisis Management Team.

VII. Discovery of a Violent Crime

A. General Procedure:
1) Call 911
2) If possible do not leave the scene and do not allow other witnesses to leave.
3) Do not contaminate the scene.
4) Co-operate with Emergency Responders when they arrive.

Training

All employees of Ernest D. Menold Inc. will be required to fill out an Emergency Contact Form every quarter so information can be kept current. Training on the Emergency Response Program will be given twice a year by the Safety Coordinator. The program will be reviewed at least annually by the Crisis Management Team and any changes thus made will be relayed to all employees immediately via training.

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

Pandemic Preparedness Program

I. Objective:

Safety is the number one objective of Ernest D. Menold Inc. As a result of this it is essential that a procedure be put in place not only for emergency response in case of any unforeseen emergencies or disasters, but also given the current environment, for dealing with any pandemics that may occur. The Ernest D. Menold Inc. Pandemic Preparedness Program along with the Emergency Response Program addresses actions and remediation procedures in case of such occurrences.

II. Administration:

The Ernest D. Menold Inc. Pandemic Response Program will be developed and a coordinator will be appointed to track the proper implementation, tracking and compliance of the program. The program will be administered by the company safety coordinator.

1. Administrators Duties include:
    - Development and revision of the overall plan.
    - Dealing with disease issues and their potential impact on the workplace.
    - Coordinating the contact of local health department and health care providers in advance.
    - Develop and implement protocols for response to ill employees.
    - Testing the plan in a table-top exercise (at least annually) to ensure the plan is effective and workable.

III. Hygienic Protocols:

A. Hand Washing – hand washing facilities with antiseptic soap as well as hand sanitizers are readily available to all employees and their continued use is encouraged. The facility also includes no touch trash cans and disposable towels.

B. Cleaning and Disinfecting – cleaning and disinfecting of all frequently contacted surfaces will be addressed daily by cleaning personnel. Areas such as restrooms, doorknobs, and faucets will undergo disinfecting procedures.

C. Immunizations – All employees of Ernest D. Menold Inc. are actively encouraged through toolbox talks and newsletters to obtain appropriate annual immunizations. Certain vaccines for job specific duties are available during normal work hours.

IV. General Company Policies:

- Employees are advised to stay at home if they or any of their family members are ill free from any disciplinary action or reprisals. Depending on specific duties, work from home can be accommodated (see Section VI. Continuity Plans).
- All large gatherings are discouraged during times of outbreak or increased level of disease.
- All precautions will be implemented in the workplace to reduce or eliminate the possible spread of disease. This includes the possibility of social distancing as well as increasing the space between employees and their work areas.

V. Plan Overview:

A. Internal Communication

I. Key contacts will be communicated with at all times. This includes the Emergency Response Team.
II. Contact numbers of employees and their emergency contacts will be readily available.
III. The chain of communications will be followed as outlined in the company Emergency Response Program.

B. External Communication

I. The Emergency response coordinator will be responsible for notifying customers and suppliers in the event of a severe outbreak that would interfere with Ernest D. Menold Inc. performing business in a normal manner and notifying said parties when normal operations resume.
II. The coordinator is also responsible for keeping the contact list of customers and suppliers up to date.

VI. Continuity Plans:

A. If there is a significant absentee ratio business operations will be continued by implementation of the following:

- Office Personnel – For office personnel any significant absenteeism will be addressed with the ability to work from home using appropriate remote desktop software.

- Shop Personnel – All necessary arrangements will be made between Ernest D. Menold and the local Sheet metal Workers Union to alleviate or eliminate problems during any pandemics which will create any severe absenteeism.

VII. Training:

A. Initial training shall be given to all employees. Training shall include:

I. All health issues pertinent to the disease in question. This includes the steps for prevention, symptoms, spread prevention, and appropriate time frame for returning to work.
II. Disease containment plans as well as all other policies and procedures contained in this plan will be revisited in employee annual training.
III. Provisions for training will be implemented for any employees who are non – English speaking as well as for those with disabilities.

Hazard Identification and Risk Assessment Plan

1. Purpose, Applicability, and Scope

Ernest D. Menold Inc. has established this written safety policy and implemented procedures to ensure that hazard identification and risk assessment will be part of routine safety procedures in the workplace. This includes all field operations as well as all subcontractors.

This program outlines methods for the identification of hazards and the assessment and control of health and safety risks during the course of a workday.

This policy applies to management, supervisors, and employees.

2. Definitions

Hazard – the potential to cause harm to a person or environment.

Risk – a combination of the severity and likelihood of harm arising from a hazard.

Risk Assessment – the process of evaluating the severity and likelihood of harm arising from a hazard.

Risk Control – the implementation of measures to reduce the risk associated with a hazard. The process must follow the control hierarchy as determined by company safety procedures and in accordance with OSHA requirements. It is important that the measures do not introduce new hazards, and that ongoing effectiveness of the controls is monitored.

Risk Control Hierarchy – ranks control measures in decreasing order of effectiveness:

(1) Elimination of hazard
(2) Substitution of hazardous processes or materials with safer ones
(3) Engineering controls
(4) Administrative controls
(5) Personal protective equipment

The risk control measures implemented for the hazards identified should always aim to be as high on the list as practicable.

Project Manager and Foreman – any employee who plans, organizes, or supervises activities of other workers in the course of company business.

New – company work situations, tasks, or assignments that have not previously been undertaken. This includes chemical products that have not previously been used. The term also applies to changing work conditions.

Workplace – the location where employees, machinery, equipment and/or resources are being utilized in The course of a company project.

Substance – covers all chemicals and materials used in the course of work.

3. Process for Identifying Hazards

Consult with the company safety coordinator and ensure that a written Job Hazard Analysis is conducted Prior to beginning work.

Compile a chemical list prior to beginning work. This is to ensure that chemical products used onsite are managed and controlled in accordance to their properties.

Conduct follow up or additional evaluation whenever change is introduced in workplace activities.

Job Hazard Analysis results will be conveyed to everyone involved in working on jobsite or project.

Employees and contractor personnel as well as any subcontractors will utilize and be actively involved in processes for identifying workplace hazards and evaluating risk in accordance with this program and the procedures specified herein.

4. Classification and Prioritizing of Hazards

All identified hazards will be corrected or mitigated in a timely, appropriate manner. Those that are most severe and have the highest likelihood of occurrence will be given priority.

Before any corrective action is implemented it will be reviewed by the company safety coordinator as well as the project manager and/or foreman.

Corrective actions will be tracked, confirmed, and documented by the project manager and/or foreman.

5. Documentation and Recordkeeping

All written documentation accumulated during Hazard Identification will be kept on file by the safety coordinator.

6. Training

The company safety coordinator with assistance from project managers and foreman will be responsible for site specific training on how to implement this program.

Training will include instruction on the proper selection and use of personal protective equipment.

Individual training will be documented in writing.

Injury / Illness Recordkeeping

1. Purpose

The purpose of this program is to define the requirements for recording job related injuries, illnesses, and fatalities for Ernest D. Menold Inc.

2. Key Responsibilities

Safety Manager

- Written records shall be kept for all related injuries and illnesses and recorded properly in accordance with OSHA requirements.
- Shall ensure all required posting s are conducted in accordance with recordkeeping guidelines.
- Shall maintain all required records.
- Shall determine the proper classification of job related injuries or illnesses based on OSHA recordkeeping guidelines.

Project Managers / Foremen

- Shall ensure that all job related injuries and illnesses are reported promptly to the Ernest D> Menold Inc. Safety Coordinator.

Employees

- Shall promptly report any actual or suspected job related injury or illness.

Procedure

- Ernest D. Menold Inc. must enter each recordable injury or illness on the OSHA 300 log within seven (7) calendar days of receiving the information that a recordable injury or illness has occurred.
- An Ernest D. Menold Inc. executive must sign the OSHA 300A log.

Posting

- Ernest D. Menold Inc. must post a copy of the OSHA 300A summary in each establishment in a conspicuous place where notices to employees are customarily posted. Ernest D. Menold Inc. must ensure that the posted summary is not altered, defaced, or covered by other material.

- The annual summary must be posted no later than February 1st of the following year covered by the records and must be kept in place until April 30th.
- Ernest D. Menold Inc. must have the OSHA 300 and 300A log on record for five (5) years.

Job Competency

1. Purpose

The purpose of this program is to establish general job competency requirements for all employees of Ernest D. Menold Inc.

2. Responsibilities

Safety Coordinator

- Identifies, updates, and monitors minimum qualification requirements, job titles, and training documentation.
- Supplies training reports to clients and Ernest D. Menold Inc. management.

Project Managers / Foremen

- Ensure all employees assigned to their project meet job competency requirements and complete training when needed.
- Ensure that any work that may endanger an employee is completed by someone who is competent to perform the work.
- Ensure that all employees have sufficient experience to safely perform work without supervision or with only a minimal degree of supervision.

Employees

- Attend and follow requirements of safety and health management training.

3. General

Competence is a combination of knowledge, understanding, and skill. The appropriate level of competence cannot be acquired by simply attending a training session. Understanding and skill are acquired by experience. For individuals involved in exposure to workplace hazards experience and training are essential. The following components are to be considered for each worksite for competency assurance:

Experience **Level of Knowledge** **Capability to Perform**

At Ernest D. Menold Inc. our view of competency assurance involves the continuous assessment of training and development needs against an employee's responsibilities, abilities, and critical activities. This process enables the continuous improvement loop that feeds back into training and development activities that ensure competency assurance is an ongoing career cycle process.

Competency is verified before employees are permitted to perform tasks independently. A competent person must verify that an employee is competent to perform their roles and responsibilities before being allowed to work independently.

Identification and Documentation

Documentation is obtained from employees to demonstrate they meet the qualifications of their job. Based on the job description requirements documentation may include educational, certifications, licenses, prior acceptable training course completion, etc. Documentation is reviewed and confirmed by the company Safety Coordinator.

Identification of Positions

A company organizational chart and list of job titles has been established by Ernest D. Menold Inc. Required training is entered for each employee based on their job and exposure to risk. Job descriptions are prepared for each job title.

Identification of Qualifications

Minimum qualification requirements for each job title have been established by Ernest D. Menold Inc. Qualifications may include a combination of education, certifications, and work experience. Safety training completion for the indicated job title is required before full qualifications are met to allow an employee to begin work.

Identification of Training and Competency Needs

Employees are provided job specific training related to their roles and responsibilities and trained on the tasks they perform on a regular basis. Training is identified in the company training matrix which lists training needs. The matrix is updated based on change of risk.

Training Records

All training records are maintained by the Ernest D. Menold Inc. Safety Coordinator.

XXXI. MISCELLANEOUS FORMS

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

NOTICE OF NONCOMPLIANCE

Name: _____ Craft: _____

Date: _____ Time: _____

Project: _____ Location: _____

Violation: _____

_____

_____

_____

_____

_____

_____

Disciplinary Action Taken:

____ First Warning

____ Second Warning

____ Termination

Issued by: _____ Date: _____

Title: _____

Employee Name (Print): _____ Date: _____

Employee Signature: _____ Date: _____

Distribution: Employee; Safety Coordinator; Personnel Office

GUIDE for IDENTIFYING CAUSAL FACTORS and CORRECTIVE ACTIONS

Answer questions by placing an X in the "Y" circle or box for YES or in the "N" circle or box for NO.
Reminder: An X in a circle identifies a causal factor. An X in a box indicates that the item is not a causal factor.

CASE NUMBER

PART 1-EQUIPMENT					
Y ○	N ☐	**1.0 WAS A HAZARDOUS CONDITION(S) A CONTRIBUTING FACTOR?** If yes, answer the following. If no, proceed to Part 2.			
		CAUSAL FACTORS	**COMMENT**	**POSSIBLE CORRECTIVE ACTIONS**	**RECOMMENDED CORRECTIVE ACTIONS**
Y ○	N ☐	1.1 Did any defect(s) in equipment/tool(s)/material contribute to hazardous condition(s)?		Review procedure for inspecting, reporting, maintaining, repairing, replacing, or recalling defective equipment/tool(s)/material used.	
Y ☐	N ○	1.2 Was the hazardous condition(s) recognized? If yes, answer A and B. If no, proceed to 1.3.		Perform job safety analysis. Improve employee ability to recognize existing or potential hazardous conditions. Provide test equipment, as required, to detect hazard. Review any change or modification or equipment/tool(s)/material.	
Y ☐	N ○	A. Was the hazardous condition(s) reported?		Train employees in reporting procedures. Stress individual acceptance of responsibility.	
Y ☐	N ○	B. Was employee(s) informed of the hazardous condition(s) and the job procedures for dealing with it as an interim measure?		Review job procedures for hazard avoidance. Review supervisory responsibility. Improve supervisor-employee communications. Take action to remove or minimize hazard.	
Y ☐	N ○	1.3 Was there an equipment inspection procedure(s) to detect the hazardous condition(s)?		Develop and adopt procedures (for example, an inspection system) to detect hazardous conditions. Conduct test.	
Y ☐	N ○	1.4 Did the existing equipment inspection procedure(s) detect the hazardous condition(s)?		Review procedures. Change frequency or comprehensiveness. Provide test equipment as required. Improve employee ability to defects and hazardous conditions. Change job procedures as required.	

		CAUSAL FACTORS	COMMENT	POSSIBLE CORRECTIVE ACTIONS	RECOMMENDED CORRECTIVE ACTIONS
Y ☐	N ○	1.5 Was the correct equipment/tool(s)/material used?		Specify correct equipment/tool(s)/material in job procedures.	
Y ☐	N ○	1.6 Was the correct equipment/tool(s)/material readily available?		Provide correct equipment/tool(s)/material. Review purchasing specifications and procedures. Anticipate future requirements.	
Y ☐	N ○	1.7 Did employee(s) know where to obtain equipment/tool(s)/material required for the job?		Review procedures for storage, access, delivery, or distribution. Review job procedures for obtaining equipment/tool(s)/material.	
Y ○	N ☐	1.8 Was substitute equipment/tool(s)/material used in place of correct one?		Provide correct equipment/tool(s)/material. Warn against use of substitutes in job procedures and in job instruction.	
Y ○	N ☐	1.9 Did the design of the equipment/tool(s) create operator stress or encourage operator error?		Review human factors engineering principles. Alter equipment/tool(s) to make it more compatible with human capability and limitations. Review purchasing procedures and specification. Check out new equipment and job procedures involving new equipment before putting into service. Encourage employees to report potential hazardous conditions created by equipment design.	
Y ○	N ☐	1.10 Did the general design or quality of the equipment/tool(s) contribute to a hazardous condition?		Review criteria in codes, standards, specification, and regulations. Establish new criteria as required.	
○		1.11 List other causal factors in "Comment" column.			

PART 2-ENVIRONMENT					
Y ○	N ❐	**2.0 WAS THE LOCATION/POSITION OF EQUIPMENT/MATERIALS/EMPLOYEE(S) A CONTRIBUTING FACTOR?** If yes, answer the following. If no, proceed to Part 3.			
		CAUSAL FACTORS	**COMMENT**	**POSSIBLE CORRECTIVE ACTIONS**	**RECOMMENDED CORRECTIVE ACTIONS**
Y ○	N ❐	2.1 Did the location/position of equipment/material/employee(s) contribute to a hazardous condition?		Perform job safety analysis. Review job procedures. Change the location, position, or layout of the equipment. Change position of employee(s). Provide guardrails, barricades, barriers, warning lights, signs, or signals.	
Y ❐	N ○	2.2 Was the hazardous condition recognized? If yes, answer A and B. If no, proceed to 2.3.		Perform job safety analysis. Improve employee ability to recognize existing or potential hazardous conditions. Provide test equipment, as required, to detect hazard. Review any change or modification of equipment/tools/materials.	
Y ❐	N ○	A. Was the hazardous condition reported?		Train employees in reporting procedures. Stress individual acceptance of responsibility.	
Y ❐	N ○	B. Was employee(s) informed of the job procedure for dealing with the hazardous condition as an interim action?		Review job procedures for hazard avoidance. Review supervisory responsibility. Improve employee-supervisor communications. Take action to remove or minimize hazard.	
Y ❐	N ○	2.3 Was employee(s) supposed to be in the vicinity of the equipment/material?		Review job procedures and instruction. Provide guardrails, barricades, barriers, warning lights, signs, or signals.	
Y ❐	N ○	2.4 Was the hazardous condition created by the location/position of equipment/material visible to employee(s)?		Change lighting or layout to increase visibility of equipment. Provide guardrails, barricades, barriers, warning lights, signs or signals, floor stripes, etc.	
Y ❐	N ○	2.5 Was there sufficient workspace?		Review workspace requirements and modify as required.	

		CAUSAL FACTORS	COMMENT	POSSIBLE CORRECTIVE ACTIONS	RECOMMENDED CORRECTIVE ACTIONS
Y ○	N ☐	2.6 Were environmental conditions a contributing factor (for example, illumination, noise levels, air contaminant, temperature extremes, ventilation, vibration, radiation)?		Monitor, or periodically check, environmental conditions as required. Check results against acceptable levels. Initiate action for those found unacceptable.	
○		2.7 List other causal factors in "Comment" column.			
PART3-PEOPLE					
Y ○	N ☐	**3.0 WAS THE JOB PROCEDURES(S) USED A CONTRIBUTING FACTOR?** If yes, answer the following. If no, proceed to Part 3.6.			
		CAUSAL FACTORS	**COMMENT**	**POSSIBLE CORRECTIVE ACTIONS**	**RECOMMENDED CORRECTIVE ACTIONS**
Y ☐	N ○	3.1 Was there a written or known procedure (rules) for this job? If yes, answer A,B, and C. If no, proceed to 3.2.		Perform job safety analysis and develop safe job procedures.	
Y ☐	N ○	A. Did job procedures anticipate the factors that contributed to the accident?		Perform job safety analysis and change job procedures.	
Y ☐	N ○	B. Did employee(s) know the job procedure?		Improve job instruction. Train employees in correct job procedures.	
Y ○	N ☐	C. Did employee(s) deviate from the known job procedure?		Determine why. Encourage all employees to report problems with an established procedure to supervision. Review job procedure and modify if necessary. Counsel or discipline employee. Provide closer supervision.	
Y ☐	N ○	3.2 Was employee(s) mentally and physically capable of performing the job?		Review employee requirements for the job. Improve employee selection. Remove or transfer employees who are temporarily, either mentally or physically, incapable of performing the job.	

		CAUSAL FACTORS	COMMENT	POSSIBLE CORRECTIVE ACTIONS	RECOMMENDED CORRECTIVE ACTIONS
Y ○	N ☐	3.3 Were any tasks in the job procedure too difficult to perform (for example, excessive concentration or physical demands)?		Change job design and procedures.	
Y ○	N ☐	3.4 Is the job structured to encourage or require deviation from job procedures (for example, incentive, piecework, work pace)?		Change job design and procedures.	
○		3.5 List other causal factors in "Comment" column.			
Y ○	N ☐	**3.6 WAS LACK OF PERSONAL PROTECTIVE EQUIPMENT OR EMERGENCY EQUIPMENT A CONTRIBUTING FACTOR IN THE INJURY?** If yes, answer the following. If no, proceed to Part 4. NOTE: The following causal factors relate to the *injury*.			
		CAUSAL FACTORS	**COMMENT**	**POSSIBLE CORRECTIVE ACTIONS**	**RECOMMENDED CORRECTIVE ACTIONS**
Y ☐	N ○	3.7 Was appropriate personal protective equipment (PPE) specified for the task or job? If yes, answer A, B, and C. If no, proceed to 3.8.		Review methods to specify PPE requirements.	
Y ☐	N ○	A. Was appropriate PPE available?		Provide appropriate PPE. Review purchasing and distribution procedures.	
Y ☐	N ○	B. Did employee(s) know that wearing specified PPE was required?		Review job procedures. Improve job instruction.	
Y ☐	N ○	C. Did employee(s) know how to use and maintain the PPE?		Improve job instruction.	
Y ☐	N ○	3.8 Was the PPE used properly when the injury occurred?		Determine why and take appropriate action. Implement procedures to monitor and enforce use of PPE.	
Y ☐	N ○	3.9 Was the PPE adequate?		Review PPE requirements. Check standards, specification, and certification of the PPE.	

		CAUSAL FACTORS	COMMENT	POSSIBLE CORRECTIVE ACTIONS	RECOMMENDED CORRECTIVE ACTIONS
Y ☐	N ○	3.10 Was emergency equipment specified for this job (for example, emergency showers, eyewash fountains)? If yes, answer the following. If no, proceed to Part 4.		Provide emergency equipment as required.	
Y ☐	N ○	A. Was emergency equipment readily available?		Install emergency equipment at appropriate locations.	
Y ☐	N ○	B. Was emergency equipment properly used?		Incorporate use of emergency equipment in job procedures.	
Y ☐	N ○	C. Did emergency equipment function properly?		Establish inspection/monitoring system for emergency/equipment. Provide for immediate repair of defects.	
	○	3.11 List other causal factors in "Comment" column.			

PART 4-MANAGEMENT

Y ○	N ☐	**4.0 WAS A MANAGEMENT SYSTEM DEFECT A CONTRIBUTING FACTOR?** If yes, answer the following. If no, STOP. Your causal factor identification exercise is complete.

		CAUSAL FACTORS	COMMENT	POSSIBLE CORRECTIVE ACTIONS	RECOMMENDED CORRECTIVE ACTIONS
Y ○	N ☐	4.1 Was there a failure by supervision to detect, anticipate, or report a hazardous condition?		Improve supervisor capability in hazard recognition and reporting procedures.	
Y ○	N ☐	4.2 Was there a failure by supervision to detect or correct deviations from job procedure?		Review job safety analysis and job procedures. Increase supervisor monitoring. Correct deviations.	
Y ☐	N ○	4.3 Was there a supervisor/employee review of hazards and job procedures for tasks performed infrequently? (Not applicable to all accidents.)		Establish a procedure that requires a review of hazards and job procedures (preventive actions) for tasks performed infrequently.	
Y ☐	N ○	4.4 Was supervisor responsibility and accountability adequately defined and understood?		Define and communicate supervisor responsibility and accountability. Test for understandability and acceptance.	

		CAUSAL FACTORS	COMMENT	POSSIBLE CORRECTIVE ACTIONS	RECOMMENDED CORRECTIVE ACTIONS
Y ☐	N ○	4.5 Was supervisor adequately trained to fulfill assigned responsibility in accident prevention?		Train supervisors in accident prevention fundamentals.	
Y ○	N ☐	4.6 Was there a failure to initiate corrective action for a known hazardous condition that contributed to this accident?		Review management safety policy and level of risk acceptance. Establish priorities based on potential severity and probability of recurrence. Review procedure and responsibility to initiate and carry out corrective actions. Monitor progress.	
○		4.7 List other causal factors in "Comment" column.			

INCIDENT INVESTIGATION REPORT

Case Number:

Company:

Address:

Department:

Location (if different from mailing address):

1. Name of injured:

2. Social Security Number:

3. Sex:

☐ M ☐ F

4. Age:

5. Date of incident:

6. Home Address:

7. Employee's usual occupation:

8. Occupation at time of incident:

9. Employment category:

☐ Regular, full-time ☐ Regular, part-time

☐ Non-employee ☐ Temporary ☐ Seasonal

10. Length of employment:

☐ Less than 1 mo. ☐ 6 mo. - 5 yrs.

☐ 1-5 months ☐ Over 5 yrs.

11. Time in occupation at time of incident:

☐ Less than 1 mo. ☐ 6 mo. - 5 yrs.

☐ 1-5 months ☐ Over 5 yrs.

12. Nature of injury and part of body:

13. Case numbers/names of others injured in same incident:

14. Name and address of physician:

15. Name and address of hospital:

16. Time of injury:

A. a.m. / p.m.

B. Time within shift:

C. Type of shift:

17. Severity of injury:

☐ Fatality

☐ Lost workdays -days away from work

☐ Lost workdays -days of restricted activity

☐ Medical treatment needed

☐ First aid needed

☐ Other, specify _____

18. Specific location of incident:

19. On employer's premises?

☐ Yes

☐ No

20. Phase of employee's workday at time of injury:

☐ During rest period ☐ Entering or leaving facility

☐ During meal period ☐ Performing work duties

☐ Working overtime ☐ Other _____

21. Describe how incident occurred:

22. Incident sequence: Describe, in reverse order of occurrence, events preceding the injury and incident. Starting with the injury and moving backward in time, reconstruct the sequence of events that led to the injury.

A. Injury event:	
B. Incident event:	
C. Preceding event #1:	
D. Preceding event #2, #3,etc.	

23. Task and activity at time of incident:

General type of task:

Specific activity:

24. Posture of employee:

Employee was working:

☐ Alone ☐ With crew or fellow worker ☐ Other, specify

25. Supervision at time of incident:

☐ Directly supervised ☐ Indirectly supervised

☐ Not supervised ☐ Supervision not feasible

26. Causal Factors (Events and conditions that contributed to the incident. Include actions identified using the *Guide for Identifying Causal Factors and Corrective Actions.*):

27. Corrective actions (Those that have been or will be taken to prevent recurrence. Include actions identified using the *Guide for Identifying Causal Factors and Corrective Actions.*):

Prepared by:	Approved:	
Title:	Title:	Date:
Department:	Approved:	Date:
Date:	Title:	

INCIDENT INVESTIGATION REPORT

Page: **of**

Case Number:

Date:

Investigation Team:

Introduction:

Summary of Event(s):

INCIDENT INVESTIGATION REPORT

Page: **of**

Case Number:

Date:

Witness Statements: (attach additional pages if needed)

INCIDENT INVESTIGATION REPORT

Page: **of**

Case Number:

Date:

List all other documentation and physical evidence contained in this incident investigation:

INCIDENT INVESTIGATION REPORT

Page: **of**

Case Number:

Date:

Findings and Recommendations:

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

CONFINED SPACE ENTRY PERMIT

Location & Description of Confined Space: _____

Purpose of Entry: _____

Scheduled Start _____ a.m. p.m. Day / Date / Time	Scheduled Finish _____ a.m. p.m. Day / Date / Time

Authorized By:

_____

_____

Attendants:

_____

_____

Entrants:

_____

_____

_____

_____

_____

_____

{Check those items below that are applicable to your confined space permit.}

TYPES OF HAZARDS

- ❑ Oxygen-Deficient Atmosphere
- ❑ Oxygen-Enriched Atmosphere
- ❑ Welding/Cutting
- ❑ Engulfment
- ❑ Toxic Atmosphere
- ❑ Flammable Atmosphere
- ❑ Energized Electrical Equipment
- ❑ Entrapment
- ❑ Hazardous Chemical

SAFETY PRECAUTIONS

- ❑ Self-Contained Breathing Apparatus
- ❑ Air-Line Respirator
- ❑ Ventilation
- ❑ Respirators
- ❒ Head / Eye / Hearing Protection (Circle type(s))
- ❑ Protective Clothing
- ❑ Protective Gloves
- ❒ Full Body Harness
- ❑ Lifelines
- ❑ Lockout/Tag-out
- ❑ Clearances Secured
- ❑ Remarks _____
- ❑ Barricade Job Area
- ❑ Ground Fault Interrupter
- ❑ Lighting
- ❒ Fire Extinguishers
- ❑ Signs Posted

ENVIRONMENTAL CONDITIONS

Test(s) to be performed	Permissible Entry Level	Test #	1	2	3	4	5	6	7
		Date							
		Time							
Percent of Oxygen	19.5% to 23.5%								
Combustible Gas	Under 10% LEL								
Carbon Monoxide	0-25 PPM								
Hydrogen Sulfide	0-10 PPM								

TESTER(S) NAME _____ _____ _____

INSTRUMENT MODEL/TYPE _____ _____ _____

SERIAL OR IDENT. NO. _____ _____ _____

Any questions pertaining to test requirements should be directed to our Safety Coordinator, Kevin Moore at (610) 521-4700

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

ENTRY AUTHORIZATION

All actions and/or conditions for safe entry have been performed. Person in Charge of Entry _____

PLEASE PRINT

EMERGENCY PHONE NUMBERS

Emergency: _____ Fire: _____ Ambulance: _____

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

Shop Inspection Report

Company Name: **Location:**

Inspection Date: **Inspected by:**

445 Powhatan Avenue ● P.O. Box 427 ● Lester, PA 19029-0427

Phone: 610-521-4700 ● Fax: 610-521-0722 ● E-mail: menold@menold.com

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

Shop Inspection Checklist

Check Protective Clothing

	Yes	No	N/A
Are hard Hats provided and worn where required?	☐	☐	☐
Are protective goggles or glasses provided and worn where there is any possible danger of eye injury?	☐	☐	☐
Are protective gloves, aprons, shields or other means provided for protection from sharp, hot or corrosive materials when required?	☐	☐	☐
Is ear protection provided and worn when required?	☐	☐	☐
Are proper work shoes worn by employees where required?	☐	☐	☐
Are respirators available for use when necessary?	☐	☐	☐

Action Needed:

Check Equipment:

	Yes	No	N/A
Are appropriate warning signs posted on or near all power equipment?	☐	☐	☐
Is there any system for inspecting small hand tools for ragged ends, cracked handles, etc.?	☐	☐	☐
Are hand tools and other equipment regularly inspected for safe condition?	☐	☐	☐
Are portable ladders adequate for their purpose, in good condition and provided with secure footing?	☐	☐	☐
If you have fixed ladders, are they adequate, and are they in good condition and equipped with side rails, cages or special safety climbing devices if required?	☐	☐	☐
Are all machines or operations that expose operators or other employees to rotating parts, pinch points, flying chips, particles, etc. adequately guarded?	☐	☐	☐
Are mechanical power transmission belts and pinch points guarded?	☐	☐	☐
Are power saws and similar equipment provided with safety guards?	☐	☐	☐
Are grinding wheel tool rests set to within ¼ inch or less of the wheel?	☐	☐	☐

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

	Yes	No	N/A
Are only trained personnel allowed to operate forklift trucks, power brakes? power shears and other power equipment?	☐	☐	☐
Are dock plates kept in serviceable condition and secured to prevent slipping?	☐	☐	☐
Do you have means to prevent car or truck movement when dock plates are in place?	☐	☐	☐
Is compressed air used for cleaning reduced to less than 30 psi?	☐	☐	☐
Are all employees trained and familiar with the company's Lockout/ tagout policy?	☐	☐	☐

Action Needed:

Check Arc and Flame Welding and Cutting Operations

	Yes	No	N/A
Are only authorized, trained personnel permitted to use such equipment?	☐	☐	☐
Have combustible materials and flammable liquids and gases been removed from welding areas?	☐	☐	☐
Are arc welding and cutting cables completely insulated and in good repair?	☐	☐	☐
Are fuel gas and oxygen hoses easily distinguishable and in good condition?	☐	☐	☐
Is mechanical ventilation provided at welding, cutting or heating locations when required?	☐	☐	☐
Is proper eye protective equipment provided and used?	☐	☐	☐
Are painting operations and the application of adhesives remote from welding and cutting operations?	☐	☐	☐
Are arc welding and cutting operations shielded by noncombustible or flameproof shields to protect employees from direct arc rays?	☐	☐	☐

Action Needed:

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

Check Protective Devices and Warning Signs

	Yes	No	N/A
Are stand mats, platforms or similar protection from wet floors in wet processes provided to employees?	☐	☐	☐
Are areas with limited occupancy posted and is access controlled to persons specifically authorized to be in those areas?	☐	☐	☐
Are floor load capacities posted on second floors, lofts, storage area's etc.?	☐	☐	☐
Is exposed power shafting less than 7 feet from the floor guarded?	☐	☐	☐
Are all upper floors and any openings properly guarded to prevent falls?	☐	☐	☐
Are stairways in good condition with standard railings provided for every flight having four or more risers?	☐	☐	☐
Are floor openings provided with toe boards and railings or a floor hole cover?	☐	☐	☐

Action Needed:

Check Cylinders

	Yes	No	N/A
Are compressed gas cylinders separated – flammable from non-flammable?	☐	☐	☐
Are compressed gas cylinders examined regularly for obvious signs of defects, deep rusting or leakage?	☐	☐	☐
Is care used in handling and storing cylinders and valves to prevent damage?	☐	☐	☐
Are all air receivers periodically examined, including the safety valves?	☐	☐	☐
Are safety valves tested regularly and frequently?	☐	☐	☐
Are all such cylinders properly secured to prevent falling?	☐	☐	☐

Action Needed:

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

Check for Cleanliness

	Yes	No	N/A
Are waste receptacles provided, and are they emptied regularly?	☐	☐	☐
Do your toilet facilities meet the requirements of applicable sanitary codes?	☐	☐	☐
Are washing facilities provided?	☐	☐	☐
Are aisles and workshops kept clear of obstructions?	☐	☐	☐
Are all areas of your business adequately illuminated?	☐	☐	☐

Action Needed:

Check for Toxic Substances

	Yes	No	N/A
Is ventilation equipment provided for removal of air contaminants from operations such as production grinding, buffing, spray painting and / or vapor degreasing, and is it operating properly?	☐	☐	☐
Are there quick water flush facilities available where employees are exposed to corrosive materials?	☐	☐	☐
When lunches are eaten on the premises are they eaten in areas where there is no exposure to toxic materials, and not in toilet facility areas?	☐	☐	☐
Are all materials used checked for toxic qualities?	☐	☐	☐
Are Material Safety Data Sheets readily available to employees?	☐	☐	☐
Are paint spray booths, dip tanks and their exhaust ducts cleaned regularly?	☐	☐	☐

Action Needed:

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

Check for Electrical Hazards

	Yes	No	N/A
Is there evidence of fraying on any electrical cords?	☐	☐	☐
Are all electrical cords strung so they do not hang on pipes, nails hooks, etc.?	☐	☐	☐
Are rubber cords kept free of grease, oil and chemicals?	☐	☐	☐
Are portable electric tools and appliances grounded or double insulated?	☐	☐	☐
Are all ground connections clean and tight?	☐	☐	☐
Are all fuses free of "jumping" and pennies or metal strips? Do switches show evidence of overheating?	☐	☐	☐
Are all electrical switches marked to show their purpose?	☐	☐	☐
Are motors clean and kept free of excessive grease and oil?	☐	☐	☐
Are motors properly maintained and provided with adequate over current protection?	☐	☐	☐
Are portable lights equipped with proper guards?	☐	☐	☐
Are all lamps kept free of combustible material?	☐	☐	☐
Is your electrical system checked periodically by someone competent in the NEC?	☐	☐	☐

Action Needed:

Check for Fire Hazards

	Yes	No	N/A
Are all exits visible and unobstructed?	☐	☐	☐
Are all exits marked with a readily visible sign that is properly illuminated?	☐	☐	☐
Are there sufficient exits to ensure prompt escape in case of emergency?	☐	☐	☐
Is there sufficient clearance from stoves, furnaces, etc., for stock, woodwork, or other combustible materials?	☐	☐	☐
Is there clearance of at least 4 feet in front of heating equipment involving open flames, such as gas radiant heaters, and fronts of firing doors of stoves, furnaces, etc.?	☐	☐	☐

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

	Yes	No	N/A
Are all oil- and gas-fired devices equipped with flame failure controls that will prevent flow of fuel if pilots or main burners are not working?	☐	☐	☐
Is there at least a 2-inch clearance between chimney brickwork and all woodwork or other combustible materials?	☐	☐	☐
Is smoking permitted in designated :safe areas" only?	☐	☐	☐
Do you have an enforced "no smoking" rule in areas for storage and use of hazardous materials?	☐	☐	☐
Are "no smoking" signs prominently posted in areas containing combustibles and flammables?	☐	☐	☐
Are covered metal waste cans used for oily and paint-soaked waste?	☐	☐	☐
Are they emptied at least daily?	☐	☐	☐
Are approved safety cans or other acceptable containers used for handling and dispensing flammable liquids?	☐	☐	☐
Are all flammable liquids that are kept inside buildings stored in proper storage containers or cabinets?	☐	☐	☐

Action Needed:

Check for Fire-Fighting Equipment

	Yes	No	N/A
Are portable fire extinguishers provided in adequate number and type?	☐	☐	☐
Are air extinguishers inspected monthly for general condition and operability, and is the inspection noted on the inspection tag?	☐	☐	☐
Are fire extinguishers recharged regularly and properly noted on the inspection tag?	☐	☐	☐
Are fire extinguishers mounted in readily accessible locations?	☐	☐	☐
Are employees periodically instructed in the use of extinguishers and fire protection procedures?	☐	☐	☐
If you have outside private fire hydrants, were they flushed within the last year and placed on a regular maintenance schedule?	☐	☐	☐
Are fire doors and shutters in good operating condition?	☐	☐	☐

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

	Yes	No	N/A
Are fire doors unobstructed and protected against obstruction?	☐	☐	☐
Are fusible links in place?	☐	☐	☐
Is your local fire department well acquainted with your plant, location and specific hazards?	☐	☐	☐
Are water control valves, as well as air and water pressures, checked weekly?	☐	☐	☐
Are control valves locked open?	☐	☐	☐
Is maintenance of the system assigned to a responsible person?	☐	☐	☐
Are sprinkler heads protected by metal guards where exposed to possible mechanical damage?	☐	☐	☐
Is proper minimum clearance maintained around sprinkler heads?	☐	☐	☐
If you have a fire alarm system, is it tested at least annually?	☐	☐	☐

Action Needed:

First Aid

	Yes	No	N/A
Is there a hospital, clinic or infirmary for medical care near your worksite?	☐	☐	☐
If medical and first aid facilities are not nearby, do you have one or more employees trained in first aid?	☐	☐	☐
Are your first aid supplies adequate for the type of potential injuries in your workplace? Are they checked and replenished regularly?	☐	☐	☐
Are approved respirators provided for regular or emergency use where needed?	☐	☐	☐

Action Needed:

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

Check for Compliance with OSHA Requirements

	Yes	No	N/A
Is the required OSHA workplace poster displayed in your place of business as required where all employees are likely to see it?	☐	☐	☐
Do you report all workplace fatalities and any serious accidents (if necessary) to a federal OSHA office within the required time limits? (This is a law.)	☐	☐	☐
Are workplace injury and illness records being kept as required by OSHA?	☐	☐	☐
Do you post the OSHA annual summary of workplace injuries and illnesses by February 1 and leave it posted until March 1?	☐	☐	☐
Do you maintain a written hazard communication plan?	☐	☐	☐
Is protection against the effects of occupational noise exposure provided when the sound levels exceed permissible levels?	☐	☐	☐

Action Needed:

Teaching Employees about Safety

	Yes	No	N/A
Are safety meetings held regularly?	☐	☐	☐
Do you provide safety training for all employees requiring such training, and is it documented?	☐	☐	☐
Do you have a safety coordinator in charge of safety activities?	☐	☐	☐
Do all employees know what to do in emergencies?	☐	☐	☐
Are emergency telephone numbers posted?	☐	☐	☐
Do you have a procedure for handling employee complaints regarding safety and health?	☐	☐	☐

Action Needed:

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

HVAC Industrial Architectural Metal EXPERTISE PERFORMANCE • TRAINING • STANDARDS

MONTHLY INSPECTION REPORT

Company Name: _____ Inspection Date: _____

Project: _____ Inspected By: _____

Item (Description of Condition Found): _____

_____

Area (location): _____

Recommendations and Action Taken: _____

_____

Target Date for Correction: _____ Date Corrected: _____

Item (Description of Condition Found): _____

_____

Area (location): _____

Recommendations and Action Taken: _____

_____

Target Date for Correction: _____ Date Corrected: _____

Item (Description of Condition Found): _____

_____

Area (location): _____

Recommendations and Action Taken: _____

_____

Target Date for Correction: _____ Date Corrected: _____

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

WEEKLY INSPECTION REPORT

Company Name: _____ Inspection Date: _____

Project: _____ Inspected By: _____

Item (Description of Condition Found): _____

_____

Area (location): _____

Recommendations and Action Taken: _____

_____

Target Date for Correction: _____ Date Corrected: _____

Item (Description of Condition Found): _____

_____

Area (location): _____

Recommendations and Action Taken: _____

_____

Target Date for Correction: _____ Date Corrected: _____

Item (Description of Condition Found): _____

_____

Area (location): _____

Recommendations and Action Taken: _____

_____

Target Date for Correction: _____ Date Corrected: _____

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

SAFETY MEETING LOG

CUSTOMER: _____ LOCATION: _____

PROJECT: _____

DATE OF MEETING: _____ CONDUCTED BY: _____

A safety meeting was conducted on the above date by our/your supervisor named above. The purpose of this meeting was to instruct Ernest D. Menold, Inc. employees with regard to operational and construction hazards and the performance of their work in a safe manner. Areas of discussion covered at this time are listed on the reverse side. Specific emphasis was placed on those items, which are checked off.

The following employees were in attendance:

NAME	NAME

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

HVAC Industrial Architectural Metal EXPERTISE PERFORMANCE • TRAINING • STANDARDS

SAFETY MEETING LOG – CHECK LIST

1. Personal Clothing & Equipment _____
2. Behavior / Horseplay _____
3. Smoking / Eating _____
4. Housekeeping _____
5. Natural Hazards _____
6. Machinery & Equipment Hazards _____
7. Fire Protection _____
8. Chemical Protection _____
9. Scaffold & Ladders Flagging & Tagging _____
10. Motor Vehicles _____
11. Floor & Ground Openings _____
12. Compressed Gas Use _____
13. Welding/Burning/Grinding _____
14. Lockout Procedure _____
15. Vessel Entry _____
16. Storage / Laydown _____
17. Eye Protection _____
18. Hearing Protection _____
19. Head Protection _____
20. Electric Cords/Welding Cables/Gas & Air Hoses _____
21. Ventilation/Breathing Protection _____
22. Protection of Work Area _____
23. Climbing _____
24. Rigging _____
25. Crane Usage _____
26. Alcohol/Drugs/Weapons _____
27. Hazard Communication Program _____
28. First Aid Locations _____
29. Reporting Injuries _____
30. What To Do In An Emergency _____
31. Specific Customer Policies _____

Other Topics

32. ---------- _____
33. ---------- _____
34. ---------- _____
35. ---------- _____
36. ---------- _____
37. ---------- _____
38. ---------- _____
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40. ---------- _____

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Respirator Selection Criteria

The 3M™ Respirator Selection Guide includes a list of chemicals for which 3M respirators can be recommended. This information can be used to supplement general industrial hygiene knowledge. Once workplace contaminants and their concentrations have been identified, the guide can be used to help select an appropriate 3M™ Respirator for nearly 700 chemicals with Threshold Limit Values (TLVs®) or other recommended exposure limits.

Because actual conditions vary from one worksite to another, this information is intended only as a guide. Selection of the most appropriate respirator will depend on the particular situation and should be made only by a person familiar with the working conditions and with the benefits and limitations of respiratory protection products. If you have any questions related to proper selection and use of 3M respirators, or the use of this guide, contact your local 3M OH&ESD representative or call our 3M OH&ESD Technical Service Line at 1-800-243-4630.

Respirator Program Management

Where respirators are in use in the workplace, a formal respiratory protection program must be established covering the basic requirements outlined in the OSHA Respiratory Protection Standard (29 CFR 1910.134). Education and training must be properly emphasized and conducted periodically. Maintenance, cleaning, and storage programs must be established and routinely followed for reusable respirators.

Respirator Fit

The OSHA Respiratory Protection Standard (29 CFR 1910.134) requires fit testing for all tight-fitting respirators. Whether you select a maintenance-free or a reusable respirator, the wearer must obtain a satisfactory fit as indicated by a qualitative or quantitative fit test. Worker comfort must also be considered. Removal of the respirator, even for short periods of time, dramatically reduces the protection afforded by the respirator.

Protection Factors

The respirator selected must have an assigned protection factor adequate for the particular workplace exposure. Divide the air contaminant concentration by the occupational exposure limit (OEL) to obtain a hazard ratio. Then select a respirator with an assigned protection factor greater than or equal to that hazard ratio.

Hazard Ratio

$$= \frac{\text{Airborne Contaminant Concentration}}{\text{OEL}}$$

Assigned protection factors* currently recommended by 3M are as follows:

Air Purifying Respirators
- Half facepiece (maintenance-free and dual cartridge).....10
- Full facepiece 50

Powered Air Purifying Respirators
- Loose-fitting facepiece (e.g., L-501, Airstream™) 25
- Half facepiece 50
- Full facepiece, helmet, or hood.....1000

Supplied Air Respirators (airline)
- Continuous Flow
  - –Loose-fitting facepiece (e.g., L-501) 25
  - –Half facepiece.....50
  - –Full facepiece, helmet, or hood 1000
- Pressure Demand with Full facepiece 1000

Pressure Demand Airline with Escape SCBA .....10,000, unknown and IDLH atmospheres

Pressure Demand SCBA.....10,000, unknown and IDLH atmospheres

Effects From Skin or Eye Contact

If a chemical can be absorbed through the skin, skin protection may be required in addition to respiratory protection. Eye protection may also be necessary if not provided by the respirator. Failure to provide adequate skin or eye protection can invalidate established exposure limits and make respirator use ineffective for protection against certain workplace contaminants.

Human Factors

Consider the entire package of safety equipment required for the job. The respirator selected must be compatible with hard hats, goggles, glasses, welding hoods, faceshields, etc. In addition, the worker must be able to communicate and perform required job duties without removing the respirator. If strenuous work is to be performed, or if the respirator is to be worn for an extended period of time, it may be desirable to select a lightweight respirator with low breathing resistance. If a respirator does not have good worker acceptance and does not stay on the worker's face, it will not provide the protection needed.

*Assigned protection factors may vary for specific standards as promulgated by OSHA (e.g., continuous flow supplied air respirators are assigned a protection factor of 100 in the OSHA Asbestos Standards, 29 CFR 1910.1001 and 29 CFR 1926.1101). Where assigned protection factors in local, state, or federal standards are lower than those listed here, they should be used instead. For additional limitations of 3M respiratory protection products, refer to 3M respirator packaging and use instructions and limitations.

Location Of Hazardous Area

When specifying supplied air respirators, consider the distance the worker must travel to get to an uncontaminated work area, as well as obstacles or equipment present in the area. If ladders or scaffolds must be climbed, an air purifying respirator or a combination air purifying/airline respirator may be appropriate.

Respirator Characteristics, Capabilities, and Limitations

A respirator may not be able to help protect against all of the contaminants present in a particular work environment. Specific limitations are stated on the approval labels and are included with use instructions and limitations. These must be carefully reviewed for each respirator before use. General precautionary information is given below. Refer to respirator packaging or operating manuals for specific information.

Use these respirators only for those specific chemical compounds for which they have been approved or recommended.

General Use Instructions

- Failure to follow all instructions and limitations on the use of these respirators and/or failure to wear them during all times of exposure can reduce respirator effectiveness and may result in sickness or death.
- Many of the contaminants that can be dangerous to a person's health include the ones that are so small they cannot be seen or smelled at dangerous levels.
- Before use of any respirator, the wearer must first be trained by the employer in proper respirator use in accordance with applicable safety and health standards.
- The OSHA Respiratory Protection Standard [29 CFR 1910.134(f)(1)] requires that the wearer of any tight-fitting respirator be fit tested.

⚠WARNING

These respirators help protect against airborne particles or gases and vapors only. Many of these substances can cause serious health effects, including sickness or death. Misuse of a respirator may result in sickness or death. For proper use, see a supervisor, refer to the respirator package, or call 3M OH&ESD Technical Service at 1-800-243-4630.

Format Explanation

Chemical Name

Chemical names listed in this guide are generally those used in the Threshold Limit Values and Biological Exposure Indices for 2008 published by the American Conference of Governmental Industrial Hygienists (ACGIH). Pesticides and chemicals without established occupational exposure limits are not included. Call 3M OH&ESD Technical Service for assistance in selecting respirators for these chemicals.

⚠WARNING

No respirator is capable of preventing all airborne contaminants from entering the wearer's breathing zone. Respirators help protect against certain airborne contaminants by reducing airborne contaminant concentrations in the breathing zone to below the TLV or other recommended exposure level. Misuse of respirators may result in overexposure to the contaminant and cause sickness or death. For this reason, proper respirator selection, training, use, and maintenance are mandatory in order for the wearer to be properly protected.

- Leave the contaminated area immediately if dizziness or other distress occurs, if the respirator becomes damaged or breathing becomes difficult, if contaminants can be smelled or tasted, or if irritation occurs.

General Use Limitations

- These respirators do not supply oxygen.
- Do not use when concentrations of contaminants are immediately dangerous to life or health, when concentrations are unknown, or in atmospheres containing less than 19.5% oxygen, unless using an SCBA or combination airline/SCBA.
- Do not abuse or misuse any respirator.
- Do not use tight-fitting respirators or loose-fitting facepieces with beards or other facial hair or conditions that prevent direct contact between the face and the edge of the respirator.
- Do not use when concentrations exceed maximum use concentrations established by regulatory agencies.

IDLH Level

This is the concentration considered Immediately Dangerous to Life or Health (IDLH), as published by the National Institute for Occupational Safety and Health (NIOSH) (DHHS [NIOSH] Publication No. 90-117). It specifically refers to the acute respiratory exposure that poses an immediate threat of loss of life, immediate or delayed irreversible adverse effects on health, or acute eye exposure that would prevent escape from a hazardous atmosphere. The reasons NIOSH established an IDLH at a particular level for a specific chemical are described in Documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs), NTIS Publication No. PB-94-195047,

May 1994. The 1994 IDLH values established by NIOSH used interim criteria, and OSHA stated in a May 21, 1996 memorandum that OSHA will use the older IDLH values while NIOSH conducts further study regarding the 1994 values. The 1990 IDLH values are used in this guide since OSHA uses these values for enforcement. For those substances with no IDLH listed, the manufacturer or supplier may have additional chemical information. The Chemical Referral Center operated by the Chemical Manufacturers Association can assist in providing telephone numbers for obtaining information from manufacturers. The lower explosive level (LEL) and the concentration that would result in an oxygen deficient atmosphere should also be considered to be IDLH.

Odor Threshold*

Odor thresholds can no longer be used as the primary indicator for changing gas and vapor cartridges as a result of the revised OSHA standard, 29 CFR 1910.134. The respirator program administrator, using objective data and information, must now establish chemical cartridge change schedules. The established change schedule should result in replacing the cartridges with new ones before their service life is depleted under the conditions of that workplace. Reported odor thresholds will continue to be listed in the guide because odor can be useful as a secondary or backup indicator for cartridge change-out. The primary references for odor thresholds were VOCBASE and an American Industrial Hygiene Association (AIHA) publication. When an odor threshold value was not published in either of these two sources, the other references were used.

A few odor thresholds published in other documents were used when not listed in the references below (e.g., AIHA WEEL documentation). The method of defining and determining odor thresholds varies widely, thereby giving rise to a significant range of reported odor thresholds for many substances. Individuals may also respond differently to the same odor. At a given concentration, one person may smell and recognize the odor, while another person may barely notice it. The odor thresholds reported in the literature are typically determined for a single constituent, with no other chemicals present in the air. The single constituent situation rarely occurs in the workplace. Therefore, caution must be exercised in using these numbers. They may not be representative of odor detection capabilities of individual workers in your facilities. On the other hand, experience may indicate better warning properties than what is indicated by the reported value.

OEL

- The occupational exposure limits listed are 2008 ACGIH Threshold Limit Values (TLVs), unless otherwise stated. The concentrations are expressed in ppm — parts per million (parts of contaminant per million parts of air) — unless specifically stated as mg/m^3 (milligrams of contaminant per cubic meter of air) or some other unit.
- An asterisk(*) indicates that the TLV is lower than the PEL.
- The OSHA **Permissible Exposure Limit** (PEL) is listed when it is more stringent than the current TLV.
- The 2008 Workplace Environmental Exposure Levels (WEEL) from the American Industrial Hygiene Association is listed when it is the most stringent value or there is no TLV or PEL.
- The occupational exposure limits refer to **Time Weighted Average** (TWA) concentrations for a normal eight (8) hour workday and a forty (40) hour workweek, unless referenced as a ceiling or STEL.
- **Ceiling** OELs refer to concentrations that should not be exceeded during any part of the working exposure.
- **Short-Term Exposure Limit (STEL)** is a 15-minute time weighted average exposure which should not be exceeded at any time during a workday.
- **Skin** notations indicate the substance can be absorbed through the skin. In these cases, appropriate measures must be taken to prevent skin and eye contact to avoid invalidating the OEL.
- For a more detailed explanation of TLVs and their proper application, refer to the TLV booklet available for a nominal fee from ACGIH, 1330 Kemper Meadow Drive, Cincinnati, OH 45240.

Synonyms

Several common synonyms are listed in this column.

Respirator Recommendations

(to 10X OEL)

This column lists the 3M recommended respirator for exposure levels not exceeding ten times (10X) the OEL. **Do not exceed maximum use concentrations established by regulatory agencies. When a chemical cartridge respirator is recommended (e.g., OV) it can only be used if a cartridge change schedule is established as described in 29 CFR 1910.134 (d)(3)(iii) (B)(2). If a**

***Odor Threshold References**

1. Jensen, B., and P. Wolkoff. VOCBASE: Odor Thresholds, Mucous Membrane Irritation Thresholds and Physio-Chemical Parameters of Volatile Organic Compounds. [Computer Software]. National Institute of Occupational Health, Denmark, 1996.
2. Odor Thresholds for Chemicals with Established Occupational Health Standards. American Industrial Hygiene Association (1989).
3. Amoore, J.E. and E. Hautula. Odor as an Aid to Chemical Safety. J. Appl. Toxicol. 3(6):272-290 (1983).
4. Fazzuluri, F.A. Compilation of Odor and Taste Threshold Values Data. American Society for Testing and Materials (1978).
5. Verschueren, K. Handbook of Environmental Data on Organic Chemicals. pp. 12-21. Van Nostrand Reinhold, NY (1977).
6. Warning Properties of Industrial Chemicals—Occupational Health Resource Center, Oregon Lung Association.
7. Electrical Safety Practices, ISA Monograph #113 (1972).
8. Documentation of TLVs and BEIs. American Conference of Governmental Industrial Hygienists. 7th edition (2008).
9. Gemert, L.J. Van and A.H. Nettenbreijer. Compilation of Odor Threshold Values in Air and Water. CIVO-TNO, Netherlands (1977).
10. Gemert, L.J. Van. Compilation of Odor Threshold Values in Air, Supplement IV, CIVO-TNO, Zeist, Netherlands (1982).
11. Workplace Environmental Exposure Levels, American Industrial Hygiene Association (2008).
12. Ruth, J.H. Odor Thresholds and Irritation Levels of Several Chemical Substances: A Review. Am. Ind. Hyg. Assoc. J. 47(3):A-142-A-151 (1986).

change schedule is not established, an airline respirator must be used. The **SA** code indicates that chemical cartridge respirators should not be used. Generally this is because of one of the three reasons described in the Comments column. These recommendations are valid only if the respirator selection process outlined on pages 11-14 is followed. The abbreviations used are explained in the Respirator Identification Key in the back pocket insert. All of these respirators have not been **specifically** tested against each compound listed. A review of chemical and physical properties of the materials, as well as adsorption or filtration characteristics of the respirators, forms the basis for the recommendations. The recommendations are for single substances. When two or more substances are present, a combination respirator may be appropriate. For example, with a spray paint that contains organic solvents and titanium dioxide, a respirator consisting of an organic vapor cartridge and a filter may be appropriate.

In cases where an air purifying respirator is not available for all of the substances of concern in a mixture, a supplied air respirator may be required. **In some cases, the respirator is preceded by an "(F)" designation. The Identification Key lists these respirators as full facepiece air purifying respirators. For concentrations not exceeding ten times (10X) the OEL, half facepiece respirators (maintenance-free or reusable) with equivalent filters or cartridges may be suitable if appropriate eye protection is provided.**

For concentrations greater than ten times (10X) the OEL, follow the protection fact or guidelines in specific OSHA standards, or refer to the instructions in the **Respirator Selection Criteria** and **How To Use This Guide** sections of this guide.

Comments

Other information may be listed in this column:

A. **Short service life** means predicted cartridge life of less than 30 minutes at concentrations of ten times (10X) the OEL. Actual service life will vary considerably, depending on concentration levels, temperature, humidity, work rate, etc. See the following literature references for specific details on the conditions and limitations of these estimates:

1. 3M Company. 3M Respirator Service Life. [Computer Software] 3M OH&ESD, www.3M.com/OccSafety.
2. Smoot, D.M. Organic Vapor Respirator Service Life Prediction. Prepared Under NIOSH Contract No. 210-76-0108. Published October 1977.
3. Nelson, G.O. and C.A. Harder. Respirator Cartridge Efficiency Studies: V. Effect of Solvent Vapor. Am. Ind. Hyg. Assoc. J. 35(7): 391-410 (1974).

Typically, an airline respirator is recommended because the service life may be so short that the frequency required for changing the cartridges may not be practical.

References to **Ineffective sorbents** or **Unknown sorbent effectiveness** indicate 3M does not make chemical cartridge respirators appropriate for these substances at this time or it is not known how effective the sorbents would be for these materials. 3M does not recommend using a chemical cartridge respirator or attempting to establish a change schedule for these chemicals.

B. References to a **respirator not** being **specifically approved** refer to approvals for that particular substance only. All respirators listed in this guide are NIOSH approved for specific substances and/or conditions.

C. References to **warning** refer to odor or irritation warning properties of the substances. Where listed as unknown, no literature reference was located. Where listed as questionable, a wide range of reported odor thresholds exists. Air purifying respirators may be acceptable for these substances if you follow the requirements for establishing a change schedule acceptable to OSHA.

D. These compounds have been identified as possibly existing in both particulate and vapor phase by a method published by Perez and Soderholm. For these compounds, 3M recommends that a gas/vapor cartridge be used in addition to the traditionally accepted particulate filter. It is the user's responsibility to determine whether both forms coexist. Both chemical properties and use conditions/processes can affect the physical form in the workplace. Users should consider specific exposure data and workplace conditions before making their final selection. If a chemical cartridge is used, a change schedule must be established to replace the cartridges before the end of their service life.*

E. These compounds have been identified as possibly existing in both vapor and particulate phase in the workplace by Perez and Soderholm. Even though these chemicals would be expected to be in the vapor phase, when other aerosols are present or there is high humidity, it is possible that the vapor may be adsorbed onto these coexisting particles or dissolved in available water droplets; therefore, 3M recommends a filter for the particulate phase be used in addition to the traditionally accepted chemical cartridge. It is the user's responsibility to determine whether both forms coexist. Both chemical properties and use conditions/processes can affect the physical form in the workplace. Users

* See Perez, C. and S. C. Soderholm: Some Chemicals Requiring Special Consideration When Deciding Whether to Sample the Particle, Vapor, or Both Phases of an Atmosphere. Appl. Occup. Hyg. 6(10): 859-864 (1991).

should consider specific exposure data and workplace conditions before making their final selection.*

F. It is believed that an N-series filter is sufficient since these materials will not coat the filter fibers, but since this material may contain oil aerosols, an R- or P-series filter is recommended until further research or a regulatory agency takes a specific position.

G. R- or P-series filters have been recommended pending more research as to how these materials affect the filter fibers.

H. Listing of 3M **3510, 3530, 3550,** or **3720** refers to a 3M™ Personal Air Monitor which may be used to measure the amount of contaminant in the air. Monitors may also be used to sample for other materials with analysis performed by a private laboratory. You should check with the laboratory to determine what other chemicals can be measured with the monitors.

An estimate of the airborne concentration is needed for making appropriate respirator selection and establishing a cartridge change schedule.

Contact the toll free 3M OH&ESD Technical Service Line at **1-800-243-4630** if you have questions about the use of this guide or the proper selection and use and limitations of any 3M respirators.

Respirator Filter Definitions

3M 42 CFR 84 Filters

N-Series Filters: These filters are restricted to use in those atmospheres free of oil aerosols. They may be used for any solid or liquid airborne particulate hazard that does not contain oil. Generally these filters should be used and reused subject only to considerations of hygiene, damage, and increased breathing resistance.

N95 Particulate Filter -At least 95% filter efficient when tested with ~0.3 µm NaCl aerosol. 3M has replaceable filters and filtering facepiece respirators in this category.

N100 Particulate Filter -At least 99.97% filter efficient when tested with ~0.3 µm NaCl aerosol. 3M has a filtering facepiece respirator in this category.

R-Series Filters: A filter intended for removal of any particle including oil-based liquid aerosol. They may be used for any solid or liquid airborne particulate hazard. If the atmosphere contains oil, the R-series filter should be used only for a single shift (or for 8 hours of continuous or intermittent use).

R95 Particulate Filter -At least 95% filter efficient when tested with ~0.3 µm DOP (Dioctyl Phthalate) aerosol. 3M makes filtering facepiece respirators in this category.

P-Series Filters: A filter intended for removal of any particle including oil-based liquid aerosols. They may be used for any solid or liquid particulate airborne hazard. NIOSH requires that respirator manufacturers establish time-use limitations for all P-series filters. 3M recommends that P-series filters should be used and reused for no more than 40 hours of use or 30 days, whichever occurs first, in atmospheres that contain only oil aerosols, unless the filter needs to be changed for hygiene reasons, is damaged, or becomes difficult to breathe through before the time limit is reached. When used in atmospheres containing non-oil aerosol, 3M P-series filters should be used and reused subject to conditions of hygiene, damage and increased breathing resistance.

P95 Particulate Filter -At least 95% filter efficient when tested with ~0.3 µm DOP (Dioctyl Phthalate) aerosol. 3M makes replaceable filters and filtering facepiece respirators in this category.

P100 Particulate Filter -At least 99.97% filter efficient when tested with ~0.3 µm DOP (Dioctyl Phthalate) aerosol. 3M makes replaceable filters and filtering facepieces in this category.

Oil: Any of numerous mineral, vegetable and synthetic substances and animal and vegetable fats that are generally slippery, combustible, viscous, liquid or liquefiable at room temperatures, soluble in various organic solvents such as ether but not in water.

* See Perez, C. and S. C. Soderholm: Some Chemicals Requiring Special Consideration When Deciding Whether to Sample the Particle, Vapor, or Both Phases of an Atmosphere. Appl. Occup. Hyg. 6(10): 859-864 (1991).

How to Use This Guide

If a respirator is being selected for a single compound listed in this guide with an air concentration not exceeding 10 times the value in the **TLV** column, then the respirator identified in the **Respirator Recommended** column may be selected. If a particulate filter respirator is recommended (any respirator code with N95, N100, R95, P95 or P100 in it) and a mineral, vegetable or synthetic oil or other oily material is also present in the air, you must select a respirator that provides the same efficiency but is acceptable for oil aerosols (see Oil definition). For example, if a respirator is being selected for beryllium dust at a concentration 2 times the exposure limit, the guide lists **N95**. This code indicates a half facepiece respirator with an N95 particulate filter. If an oil mist is present (air concentration greater than 0.1 mg/m^3, but less than the occupational exposure limit) either an R- or P-series filter must be selected, even though respiratory protection is not needed for the oil mist. Therefore, the minimum recommended respirator would be **R95** or **P95**. These codes indicate a half facepiece respirator with an R95 or P95 particulate filter. These codes can be found in the **Respirator Codes and Descriptions** section located in the fold-out back cover of this guide.

If respiratory protection is desired for an atmosphere with more than one chemical or for an air concentration that exceeds either the IDLH value or 10 times the value in the TLV column, you must follow the directions below for proper respirator selection. If you need help, call 3M Technical Service at 1-800-243-4630.

Oil: Any of numerous mineral, vegetable and synthetic substances and animal and vegetable fats that are generally slippery, combustible, viscous, liquid or liquefiable at room temperatures, soluble in various organic solvents such as ether but not in water.

1. Identify the air contaminants present in the workplace. Include chemical name and form. Classify particulate contaminants as oil or non-oil material. If the chemical is listed in this guide, it is classified. For help, see definition of oil. The material safety data sheet (MSDS) can be helpful with this step. Consider particulate contaminants oil if unknown or not sure. List the contaminants on the form contained in this guide or on your own form. Go to Step 2.
2. Determine the air concentration of the contaminant. Air sampling is recommended. Consideration should be given to TWA, short term and peak (ceiling) exposures, while keeping in mind seasonal and worker variability and the specific process being used. If air sampling data are not available and sampling is not practical, historical information from similar processes or analogous operations may be helpful for calculating maximum exposures and evaluating potential health effects. Record the airborne concentration(s) on the form provided or your own form. Go to Step 3.
3. Is the airborne concentration unknown?
   a) If **yes**, go to Step 16.
   b) If **no**, go to Step 4.
4. Is the oxygen concentration less than 19.5% or does the potential exist for the oxygen concentration to fall below 19.5%?
   a) If **yes**, go to Step 16.
   b) If **no**, go to Step 5.
5. Is the chemical listed in the guide?
   a) If **yes**, go to Step 6.
   b) If **no**, go to Step 15.
6. Record the IDLH value and the value from the TLV column on the form provided or on one you created. Determine the hazard ratio (see page 2) and record. Using this information, determine which condition describes your situation:
   a) Does the airborne concentration exceed the IDLH value? If **yes**, go to Step 16.
   b) Does the hazard ratio exceed (>) 1000? If **yes**, go to Step 16.
   c) Does the hazard ratio exceed (>) 50? If **yes**, go to Step 7.
   d) Does the hazard ratio exceed (>) 10? If **yes**, go to Step 8.
   e) Is the hazard ratio less than or equal to (≤) 10? If **yes**, go to Step 9.
7. Select one of the following respirators: (1) a full facepiece, helmet or hood supplied air respirator or (2) a powered air purifying respirator (PAPR) with the same cartridge type as listed in the guide under the Respirator Recommended column. To determine what type of PAPRs are available, check the Respirator Identification Key. If a PAPR is selected, use a HEPA filter if an N, R, or P-series filter is listed. If the guide lists SA or SA(F) even though the hazard ratio is less than or equal to 10, an SA(F) must be used. A PAPR cannot be used. For example: For an exposure to vinyl toluene with a hazard ratio of 90, an SA(F) or (F)PAPR/OV must be selected. The (F)PAPR/OV is acceptable because the OV cartridge is listed in the Respirator Recommended column. The service life of the OV cartridge must be considered to determine if the (F)PAPR or SA(F) is the better selection given the high exposure concentrations. If the exposure was to 4-vinylcyclohexene, an SA(F) must be selected. A PAPR could not be selected. Record the respirator you selected in the last column of the form for that chemical. Go to Step 10.
8. Select either a supplied air respirator or a full facepiece respirator with filters and/or chemical cartridges listed in the guide under the Respirator Recommended column. If the guide lists SA or SA(F), you must select the respirator recommended. Do not use air purifying respirators. For example: For an exposure to benzene with a hazard ratio of 30 (15 ppm), an (F)OV could be selected. For the same exposure conditions to benzyl acetate, an SA must be selected. Record the respirator you selected in the last column of the form for that chemical. Go to Step 10.
9. Select the respirator listed in the Respirator Recommended column. Record the respirator you selected in the last column of the form for that chemical. Go to Step 10.
10. Are any other air contaminants present at the same time?
    a) If **yes**, go to Step 2 and repeat the procedure, recording the appropriate information for the next chemical. When two or more contaminants that act upon the same organ system are present, consideration should be given to the combined effect rather than individual effects. Consult the current edition of Exposure Indices published by the American Conference of Governmental Industrial Hygienists for

more information and the appropriate formula. If combined effects are considered, calculate the hazard ratio for the mixture.

b) If **no**, go to Step 11.

11. Are any of the respirators listed in the last column a particulate filter respirator (i.e., does it have an N, R or P filter?)?
    a) If **yes**, go to Step 12.
    b) If **no**, go to Step 14.
12. Are only N-series particulate filter respirator(s) listed?
    a) If **yes**, go to Step 13.
    b) If **no**, go to Step 14.
13. Is airborne oil mist present that has not been considered as a result of one of the following conditions: (1) was not listed as a contaminant or (2) is the oil mist concentration greater than 0.1 mg/m³ but less than the value in the TLV column of the guide? A respirator is not required for the oil. If a respirator is not being selected for the oil, the presence of the oil must still be considered when choosing the appropriate filter.

    a) If **yes**, a respirator with either an R- or P-series filter must be selected. R-series filters must be changed after 8 hours use or after the respirator is loaded with or exposed to 200 mg of aerosol. The manufacturer's service time recommendation must be followed for P-series filters. To choose a respirator that provides the same degree of protection as originally identified, but with an R- or P-series filter, consult the Respirator Identification Key. Record the respirator with the R- or P-series filter that is being selected. Go to Step14.

    b) If **no**, record the respirator listed in the last column as the final respirator selected (bottom line). A respirator meeting this description can be found by locating the code on the Respirator Identification Key. Go to Step 17.

14. Was more than one respirator type required for the specific exposure situation (i.e., is there more than one respirator code included in the list made in the last column of the form?)? A respirator must be selected that satisfies all of the requirements listed in the last column.
    a) If **yes**, note all respirators recommended. If your list contains more than one respirator and all are air-purifying respirators, select from the Identification Key the one with the highest assigned protection factor (see page 2) and one that removes all of the contaminants, if available. If **SA** or **SA(F)** is one of the respirators listed in the last column, this respirator must be selected over all others. If any of the respirator codes contain the **(F)** designation, respirators with half facepieces cannot be used. If no air-purifying respirator will provide the protection required, select **SA** or **SA(F)** from the Respirator Identification Key. Go to Step 17.

    b) If **no**, go to Step 14.

15. If the chemical is not listed in the guide, an occupational exposure limit either does not exist or was not located. Since it is not known what an acceptable exposure level is, a respirator cannot be recommended. If you have an exposure level for the material and would like help, go to Step 17. If no exposure limit is known, go to Step 16.
16. These conditions (unknown, <19.5% O_2, >IDLH) are generally considered as IDLH or the hazard ratio exceeds 1000. Select either a positive pressure self-contained breathing apparatus (SCBA) or combination respirator consisting of a positive pressure supplied air respirator with an auxiliary SCBA. The rated duration of the auxiliary SCBA should be sufficient to allow adequate time for escape. If 5 minutes is sufficient escape time, the 3M™ Air-Mate™ Combination Escape SCBA is acceptable (see Respirator Identification Key: Code SCBA). Record the respirator selected in the final row of the form. This is the minimum acceptable level of respiratory protection; the selection process is finished. If you need help, go to Step 17.

Note: If a chemical cartridge respirator is selected, you must establish a change schedule based on objective information and data. The information relied upon and the basis for the cartridge change schedule and the basis for reliance on the data must be described in the respiratory protection program.

17. Do you need help?
    a) If **yes**, call 3M for assistance at 1-800-243-4630. Follow the recommendations given.
    b) If **no**, order the selected respirator(s) from the local 3M Sales Representative or Distributor.

Respirator Selection Form

Chemical Name	Air Concentration	IDLH	TLV/PEL /WEEL	Hazard Ratio	Respirator Recommended
Respirator Selected:					

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Acetaldehyde	10,000	0.186	**25* (ceiling)**	Ethanal, Acetic aldehyde	**(F)OV (F)Form**	Short OV service life
Acetic acid	1000	0.016	**10**	Glacial acetic acid, Methane carboxylic acid, Ethanoic acid, Vinegar acid	**(F)OV**	
Acetic anhydride	1000	0.029	**5**	Ethanoic anhydride, Acetic acid anhydride, Acetyl oxide	**(F)OV**	
Acetone	20,000	4.58	**500***	2-Propanone, Dimethyl ketone, Ketone propane	**OV**	3M 3530 Monitor
Acetone cyanohydrin		3	**2 -skin- (AIHAWEEL)**	a-Hydroxy isobutyronitrile, 2-Propane cyanohydrin, 2-Cyano-2-propanol, 2-Methyllactonitrile, 2-Hydroxy-2-methyl propanenitrile	**OV**	Poor warning. 4.7 ppm TLV-C.
Acetonitrile	4000	97.7	**20 -skin-**	Cyanomethane; Ethane nitrile; Ethyl nitrile; Methanecarbonitrile; Methyl cyanide	**OV**	Poor warning. 3M 3530 Monitor.
Acetophenone		0.363	**10**	Methyl phenyl ketone, Acetyl benzene, Benzoyl methide, Hypnone, 1-Phenylethanone	**OV**	See Comment E, page 8
Acetylene dichloride				(See 1,2-Dichloroethylene)		
Acetylsalicylic acid			**5 mg/m³**	Aspirin	**N95**	
Acrolein	5	0.174	**0.1 (ceiling) -skin-**	Acrylic aldehyde, Acrylaldehyde, Propenal, Allylaldehyde	**(F)OV**	Poor warning
Acrylamide			**0.03 mg/m³* -skin-**	Propenamide, Acrylamide monomer, Acrylic amide	**OV/N95**	See Comment D, page 7
Acrylic acid		0.4	**2* -skin-**	Acroleic acid, Propenoic acid	**(F)OV**	
Acrylonitrile	500	16.6	**2 -skin-**	Propenenitrile, AN, Vinyl cyanide	**OV**	Poor warning. SA if cartridge not disposed of after shift, per 29 CFR 1910.1045. 3M 3510 Monitor.
Adipic acid			**5 mg/m³**	Hexanedioic acid; 1,6-Hexanedioic acid; 1,4-butanedicarboxylic acid Adipinic Acid	**(F)N95**	
Adiponitrile			**2 -skin-**	Addipic acid dinitrile; Hexanedinitrile; 1,4-dicyanobutane; Tetramethylene cyanide	**OV**	Warning unknown
Allyl alcohol	150	0.47	**0.5* -skin-**	2-Propenol, 2-Propen-1-ol, Vinyl carbinol	**(F)OV**	3M 3510 Monitor

* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Allyl chloride	300	0.489	**1**	3-Chloropropene, 1-Chloro-2-propene	**OV**	
Allyl glycidyl ether	270		**1**	AGE; 1-Allyloxy-2, 3-epoxy-propane	**(F)OV**	Warning unknown. PEL-10 ppm ceiling.
Allyl isothiocyanate		0.035	**1 (AIHAWEEL)**	Oil of mustard, AITC, Allyl thiocarbanimide, 3-Isothiocyanate-1-propene, Allyl isosulfocyanate	**OV**	15 minute TWA. SA if used with acids.
Allyl propyl disulfide			**0.5**	Onion oil, Propyl allyl disulfide, 2-Propenyl propyl disulfide	**(F)OV**	Warning unknown
Aluminum Metal and Insoluble Compounds –Respirable Particulate Matter				**1 mg/m³**		**N95**
p-Aminobenzoic acid			**5 mg/m³ (AIHAWEEL)**	Aminobenzoic acid, 4-Aminobenzoic acid, PABA	**(F)N95**	
2-Aminoethanol				(See Ethanolamine)		
2-Aminopyridine	5		**0.5**	a-Aminopyridine	**OV**	Warning unknown
Aminotri (methylenephosphonic Acid)			**10 mg/m³ (AIHAWEEL)**	ATMP; Aminotris (methylenephosphonic acid), Briquest 302-500; Briquest 301-32S; Dequest 2000; Dequest 2001; Nitrilotrimethanephosphonic acid; NTMP; NTPA, NTF	**AG/N95**	If heated, AG cartridge may be needed
Ammonia	500	5.75	**25***	Anhydrous ammonia	**(F)AM**	Irritation also provides warning
Ammonium chloride -Solids -Liquids			**10 mg/m³ 10 mg/m³**		**N95 AM/N95**	
Ammonium perfluorooctanoate			**0.01 mg/m³ -skin-**		**OV/N95**	See Comment D, page 7
n-Amyl acetate				(See Pentyl acetate)		
sec-Amyl acetate				(See Pentyl acetate)		
n-Amyl alcohol		0.1-0.3	**100 (AIHAWEEL)**	Amyl alcohol, 1-Pentanol, Pentyl alcohol, Pentanol, n-Pentanol	**F(OV)**	
tert-Amyl methyl acetate			**20**	TAME	**OV**	
Aniline	100	0.676	**2* -skin-**	Aminobenzene, Phenylamine, Aniline oil	**OV**	
Anisidine (o-, p- isomers) –ortho-Anisidine –para-Anisidine	10		**0.1* -skin-**	o-Methoxyaniline (oil), p-Methoxyaniline (solid)	**OV/P95 OV/N95**	

* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Antimony and compounds (as Sb)	80 mg/m³		**0.5 mg/m³**		**N95**	
Arsenic, elemental and inorganic compounds (except arsine) (as As)	100 mg/m³		**0.01 mg/m³ (PEL)**		**N100**	
Arsine	6	<1.0	**0.05 ppm**	Hydrogen arsenide, Arsenic trihydride, Arseniuretted hydrogen, Arsenous hydride	**SA(F)**	Poor warning. Unknown sorbent effectiveness.
Asbestos			**0.1 fiber/cc (PEL)**	Chrysotile, Amosite, Crocidolite, Tremolite, Anthophyllite, Actinolite	**N100**	Dual cartridge as per 29 CFR 1910. 1001, 1915.1001 and 1926.1101
Asphalt (petroleum; bitumen) fumes (as benzene-soluble aerosol)			**0.5 mg/m³ inhalable**	Asphaltum, Bitumen, Hot mix asphalt, Mineral pitch, Petroleum asphalt	**OV/P95**	R or P95 alone may be suitable for some applications. See Comment F, page 9.
Barium soluble compounds (as Ba)	1100 mg/m³		**0.5 mg/m³**		**N95**	
Barium sulfate			**10 mg/m³***		**N95**	
Benzaldehyde		0.042	**2 (AIHAWEEL)**	Benzoic aldehyde, Oil of bitter almond, Benzenecarbonal	**F(OV)**	
Benzene	3000	8.65	**0.5***	Benzol, Coal tar naphtha	**OV**	Poor warning. SA if cartridges are not replaced at the start of each shift, per 29 CFR 1910.1028. 3M 3510 Monitor.
Benzophenone			**0.5 mg/m³ (AIHAWEEL)**	Benzoyl benzene, Diphenyl ketone, Diphenyl methanone, Phenyl ketone	**OV/N95**	See Comment D, page 7
p-Benzoquinone				(See Quinone)		
Benzotrichloride			**0.1 (ceiling) -skin-**	Toluene trichloride, Benzenyl trichloride, Benzoic trichloride, Phenyl chloroform, Trichloromethylbenzene	**(F)OV**	Warning unknown
Benzoyl chloride		0.007	**0.5 (ceiling)**	a-Chlorobenzaldehyde, Benzene carbonyl chloride, Benzoic acid chloride	**(F)OV/AG (F)MG**	
Benzoyl peroxide	7000 mg/m³		**5 mg/m³**	Dibenzoyl peroxide	**OV/N95**	See Comment D, page 7
Benzyl acetate		0.145	**10**	Acetic acid benzyl ester, Acetic acid phenylmethyl ester, Phenylmethyl acetate	**OV/N95**	
Benzyl alcohol		5.55	**10 (AIHAWEEL)**	a-Hydroxytoluene, Phenylmethanol, Phenylcarbinol	**(F)OV**	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Benzyl chloride	10	0.034	**1**	a-Chlorotoluene	**(F)OV/AG**	See Comment E, page 8. 3M 3510 Monitor.
Beryllium and compounds (as Be)	10 mg/m³		**0.002 mg/m³**		**N95**	
Biphenyl	47.6	0.0093	**0.2**	Diphenyl, Phenylbenzene	**OV/N95**	
Bis(2-dimethylamino-ethyl) ether			**0.05 ppm -skin-**	DMAEE; Ethylamine, 2,2'-Oxybis (N.N-dimethyl)-; Niax [R] Catalyst A-99	**(FOV)**	
Bismuth telluride			**10 mg/m³***	Bismuth sesquitelluride	**N95**	
Bismuth telluride (Se-doped)			**5 mg/m³**		**N95**	
Borate compounds, inorganic						
- Boric acid			**2 mg/m³**	Borofax; Boron trihydroxide; Hydrogen orthoborate; Kill-off; Kjel-sorb; Orthoboric acid; Three elephant; Trihydroxyborane	**N95**	
- Sodium borate, anhydrous			**2 mg/m³**	Borates, tetrasodium salts, anhydrous; Borax fused; Boric acid, disodium salt; Disodium tetraborate; Sodium tetraborate, anhydrous	**N95**	
- Sodium borate, decahydrate			**2 mg/m³**	Borates, tetrasodium salts, decahydrate; Borax; Borascu; Borocin; Disodium diborate decahydrate; Disodium tetraborate decahydrate; Sodium pyroborate decahydrate; Sodium tetraborate, decahydrate	**N95**	
- Sodium borate, pentahydrate			**2 mg/m³**	Borates, tetrasodium salts, pentahydrate; Boric acid pentahydrate; Mule team borascu; Boron sodium oxide, pentahydrate; Sodium tetraborate, pentahydrate	**N95**	
Boron oxide			**10 mg/m³***	Anhydrous boric acid, Boric anhydride, Boric oxide	**N95**	
Boron tribromide			**1 (ceiling)**	Boron bromide	**(F)AG**	Warning unknown
Boron trifluoride	100	1.5	**1 (ceiling)**		**(F)AG**	Poor warning

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Bromine	10	0.066	**0.1**		**(F)OV/AG**	0.2 ppm TLV-STEL. Irritation also provides warning.
Bromine pentafluoride			**0.1**		**AG**	Warning unknown
Bromochloromethane				(See Chlorobromomethane)		
Bromoform		0.447	**0.5 -skin-**	Tribromomethane	**(F)OV**	3M 3510 Monitor
1-Bromopropane			**10**	n-Propylbromide, Propylbromide	**OV**	
1,3-Butadiene	20,000	0.455	**1 (PEL)**	Butadiene, Divinyl, Biethylene, Erythrene	**OV**	Cartridges must be replaced, per 29 CFR 1910.1051
Butane		204	**1000**	n-Butane, Methylethyl methane	**SA**	Short OV service life
n-Butanethiol				(See Butyl mercaptan)		
2-Butanone				(See Methyl ethyl ketone)		
1-Butene			250	a-Butene, But-1-ene, a-Butylene, 1-Butylene, Ethylethylene	**OV**	
2-Butene			250	B-Butene, B-Butylene, Dimethylethylene, Pseudobutylene	**OV**	
cis-2-Butene			250	cis-Butene, cis-Butene-2, B-cis-Butylene, cis-1,2-Dimethylethylene	**OV**	
trans-2-Butene			250	trans-Butene, 2-trans-Butene, B-trans-Butylene, trans-1,2-Dimethylethylene	**OV**	
2-Butoxyethanol	700	0.001	**20***	Butyl Cellosolve®, Ethylene glycol monobutylether	**(F)OV**	See Comment E, page 8
2-Butoxyethyl acetate			**20**	Acetic acid 2-butoxyethyl ester; 2-Butoxyethanol acetate; Butyl Cellusolve acetate; Butylglycol acetate; Ektasolve EB acetate; Ethylene glycol monobutyl ether acetate; EGBA; Glycol monbutyl ether acetate	**OV**	
n-Butyl acetate	10,000	0.007	**150**	Butyl acetate, Butyl ethanoate, Acetic acid butyl ester	**(F)OV**	See Comment E, page 8. 3M 3510 Monitor.
sec-Butyl acetate	10,000	3-7	**200**	1-Methylpropylacetate	**(F)OV**	See Comment E, page 8. 3M 3510 Monitor.
tert-Butyl acetate	10,000	4-47	**200**	Acetic acid tert-butyl ester	**(F)OV**	3M 3510 Monitor
Butyl acrylate		0.003	**2**	2-Propenoic acid butyl ester, Butyl-2-propenoate	**OV**	3M 3510 Monitor
n-Butyl alcohol	8000	0.03	**20***	1-Butanol, Butyl alcohol; Butyl hydroxide; Butyric alcohol; 1-Hydroxybutane; Methylolpropane; n-Propyl carbinol, n-Butanol	**(F)OV**	25 ppm TLV-ceiling proposed. 3M 3510 Monitor.

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
sec-Butyl alcohol	10,000	1	**100**	2-Butanol, Methyl ethyl carbinol	**(F)OV**	3M 3510 Monitor
tert-Butyl alcohol	8000	21.5	**100**	2-Methyl-2-propanol, TBA, Trimethyl-carbinol	**(F)OV**	3M 3510 Monitor
Butylamine	2000	0.053	**5 (ceiling) -skin-**	n-Butylamine, 1-Aminobutane	**AM**	Not specifically approved, but better service life than OV
Butylated hydroxytoluene (as inhalable aerosol and/or vapor)			**2 mg/m³**	BHT; DBPD; 2,6-Di-tert-butyl-p-cresol 2,6-bis(1,1-Dimethylethyl)-4-methylphenol	**F(OV)/N95**	
4-tert-Butylcatechol			**2 mg/m³ -skin- (AIHAWEEL)**	p-tert-Butylcatechol; 4-(1,1-Dimethylethyl)-1,2-benzenediol; 4-tert-Butyl pyrocatechol; 4-tert-Butyl 1-1,2-dihydroxy benzene	**(F)N95**	
tert-Butyl chromate (as CrO_3)	30 mg/m³		**0.1 mg/m³ (ceiling) -skin-**	Chromic acid, di-tert-Butyl ester	**N95**	
Butylene oxide		0.06	**2 (AIHAWEEL)**	1,2-Epoxybutane; 1-Butene oxide; 1,2-Butene oxide; 1,2-Butylene oxide; Epoxy-butane; BO	**OV**	
n-Butyl glycidyl ether	3500		**3* -skin-**	BGE; 1,2-Epoxy-3-butoxy-propane	**OV**	Warning unknown 3M 3510 Monitor
n-Butyl lactate		7.06	**5**	Lactic acid butylester	**OV**	Irritation also provides warning
Butyl mercaptan	2500	0.001	**0.5***	n-Butanethiol, 1-Mercaptobutane	**OV**	
o-sec-Butylphenol			**5 -skin-**	2-sec-Butylphenol	**OV/P95**	
p-tert-Butyltoluene	1000	5.02	**1***	1-Methyl-4-tert-butylbenzene	**OV**	Poor warning. 3M 3510 Monitor.
Butyraldehyde		0.009	**25 (AIHAWEEL)**	Butal, Butaldehyde, Butalyde, Butanol, Butanaldehyde, Butyl aldehyde, Butyral butyric aldehyde	**(F)FORM**	Not specifically approved, but better service life than OV
Cadmium, elemental and compounds (as Cd)	50 mg/m³ dust 9 mg/m³ fume		**0.005 mg/m³ (PEL)**		**N100**	0.002 mg/m³ TLV-TWA for respirable dust
Calcium arsenate (as As)	100 mg/m³		**0.01 mg/m³ (PEL)**	Tricalcium arsenate, Tricalcium o-arsenate, Cucumber dust	**N100**	
Calcium carbonate			**15 mg/m³ (PEL)**	Marble, Limestone	**N95**	
Calcium chromate			**0.001 mg/m³**	Calcium chrome yellow	**N95**	
Calcium cyanamide			**0.5 mg/m³**	Lime nitrogen, Calcium carbimide	**N95**	
Calcium fluoride (as F)			**2.5 mg/m³**	Fluorite, Fluorspar	**N95**	
Calcium hydroxide			**5 mg/m³***	Calcium hydrate, Hydrated lime, Caustic lime	**N95**	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Calcium oxide			**2 mg/m³***	Quicklime, Pebble lime	**N95**	
Calcium silicate (as inhalable particulate mass)			**10 mg/m³***	Calcium metasilicate, Portland cement, Wallastonite	**N95**	
Calcium sulfate			**10 mg/m³**	Gypsum, Plaster of Paris	**N95**	
Camphor	33	0.051	**2**	2-Camphonone, Synthetic camphor, Gum camphor, Laurel camphor	**(F)OV/N95**	3M 3510 Monitor
Caprolactam (Inhalable aerosol and vapor)		0.064	**5 mg/m³**	Aminocaproic lactam, 2-Oxohexamethyleneimine	**OV/N95**	
Captan inhalable fraction			**5 mg/m³**	N-(Trichloromethylthio)-4-cyclohexene-1,2-dicarboximide	**N95**	
Carbon black			**3.5 mg/m³**	Channel black, Lamp black, Furnace black, Thermal black, Acetylene black	**N95**	
Carbon dioxide	50,000	74,000	**5,000**	Carbonic acid gas, Dry ice	**SA**	Poor warning. Ineffective sorbents.
Carbon disulfide	500	0.096	**1 -skin-**	Carbon bisulfide, Carbon disulphide Carbon bisulphide, Carbon bisulfur, Dithiocarbonic anhydride, Carbon sulfide, Sulphocarbonic anhydride, Weevitox	**OV**	
Carbon monoxide	1500	100,000	**25***	Monoxide	**SA**	Poor warning. Ineffective sorbents.
Carbon tetrabromide			**0.1**	Tetrabromomethane	**(F)OV**	Warning unknown
Carbon tetrachloride	300	40.7	**5* -skin-**	Tetrachloromethane	**(F)OV**	Poor warning. 3M 3510 Monitor.
Carbonyl chloride				(See Phosgene)		
Carbonyl fluoride			**2**	Fluoroformyl fluoride, Carbon oxyfluoride	**(F)MG**	Warning unknown
Catechol			**5 -skin-**	Pyrocatechol	**OV/N95**	
Cellulose			**10 mg/m³***	Paper fiber	**N95**	
Cesium fluoride			**2.5 mg/m³**		**N95**	
Cesium hydroxide			**2 mg/m³**	Cesium hydrate	**N95**	
Chloramphenicol			**0.5 mg/m³ (AIHAWEEL)**	Chloromycetin; Levomycetin; [R-(R*,R*)]-2,2-dichloro-N-[2-hydroxy-1-(hydroxy methyl)-2-(4-nitrophenyl)ethyl] acetamide	**N95**	
Chlorinated diphenyl oxide			**0.5 mg/m³**	Hexachlorodiphenyl oxide	**OV/P95**	Warning unknown
Chlorine	30	0.05	**0.5**		**(F)AG**	Irritation also provides warning. PEL-1 ppm ceiling.
Chlorine dioxide	10	9.24	**0.1**	Chlorine oxide, Chlorine peroxide	**AG**	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Chlorine trifluoride	20		**0.1 (ceiling)**	Chlorine fluoride	**MG**	Warning unknown
Chloroacetaldehyde	100	0.917	**0.05* -skin-**	2-Chloroethanal, Chloroacetaldehyde (40% aqueous)	**(F)OV**	Poor warning
Chloroacetone			**1 (ceiling) -skin-**	Monochloroacetone, 1-Chloro-2-propanone, Chloracetone	**(F)OV**	Warning unknown
a-Chloroacetophenone	16	0.026	**0.05**	Phenacyl chloride, Chloromethyl phenyl ketone, Phenyl chloromethyl ketone (tear gas)	**(F)OV/N95**	Irritation also provides warning
Chloroacetyl chloride			**0.05 -skin-**	Chloracetyl chloride	**(F)OV/AG**	Warning unknown
Chlorobenzene	2400	0.741	**10***	Monochlorobenzene, Chlorobenzol, Phenyl chloride, MCB	**OV**	3M 3510 Monitor
o-Chlorobenzylidene malononitrile	0.25		**0.05 (ceiling) -skin-**	OCBM, CS	**OV/N95**	5X OEL maximum. Low IDLH.
Chlorobromomethane	5000	399	**200**	Bromochloromethane, Methylene chlorobromide, CBM, Halon™ 1011	**OV**	Poor warning. Short OV service life.
1-Chloro-1,1-difluoro-ethane			**1000 (AIHAWEEL)**	HCFC-142b, Dymel® 142b, Genetron™ 142b, Chlorodifluoro-ethane, a-chloroethylidene fluoride	**SA**	Short OV service life
2-Chloro-1,3-butadine				(See B-Chloroprene)		
Chlorodifluoromethane			**1,000**	Freon® 22	**SA**	Warning unknown. Ineffective sorbents.
Chlorodiphenyl (42% chlorine)	10 mg/m³		**1 mg/m³ -skin-**	Polychlorinated biphenyl, PCB	**(F)OV/P95**	See Comment D, page 7
Chlorodiphenyl (54% chlorine)	5 mg/m³		**0.5 mg/m³ -skin-**	Polychlorinated biphenyl, PCB	**(F)OV/P95**	See Comment D, page 7
1-Chloro,2,3-epoxy-propane				(See Epichlorohydrin)		
2-Chloroethanol				(See Ethylene chlorohydrin)		
Chloroethylene				(See Vinyl chloride)		
Chloroform	1000	11.7	**10***	Trichloromethane	**OV**	Poor warning. 3M 3510 Monitor.
bis-(2-Chloroisopropyl) ether			**3 (AIHAWEEL)**	DCIPE, Dichloroisopropyl ether	**(F)OV**	Warning unknown
bis-Chloromethyl ether			**0.001**	Dichloromethylether, BCME, Chloro (chloromethoxy) methane, Chloromethyl ether	**(F)OV**	Warning unknown
Chloropentafluoro-ethane			**1000**	FC-115, Monochloropentafluoroethane	**SA**	Warning unknown. Short service life.
Chloropicrin	4	1.08	**0.1**	Nitrotrichloromethane, Trichloronitromethane, Nitrochloroform	**(F)OV**	Irritation also provides warning
B-Chloroprene	400	14.9	**10* -skin-**	2-Chloro-1,3-Butadiene; Chlorobutadiene; beta-Chloroprene	**(F)OV**	Poor warning

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
1-Chloro-2-propanol			**1 -skin-**	1-Chloro-2-hydroxypropane; 1-Chloroisopropyl alcohol; sec-Propylene chlorohydrin	**OV**	
2-Chloro-1-propanol			**1 -skin-**	2-Chloropropanol; 2-Chloropropyl alcohol; 1-Hydroxy-2-chloropropane; Propylene chlorohydrin	**OV**	
2-Chloropropionic			**50 (AIHAWEEL)**	Isopropyl chloride; 2-Propyl chloride, isoprid, 2-CP	**OV**	Short OV service life
2-Chloropropionic acid			**0.1 -skin-**	a-Chloropropionic acid	**OV/AG**	Warning unknown
o-Chlorostyrene			**50**	1-Chloro-2-ethenylbenzene, 2-Chlorostyrene	**OV**	Warning unknown. 3M 3510 Monitor.
Chlorosulfonic acid			**0.1 (ceiling)**	CSA, Chlorosulfuric acid	**(F)AG/N95**	HCl, SO_3 hydrolysis products
2-Chloro-1,1,1,2-tetra-fluoroethane			**1000 (AIHAWEEL)**	Chlorotetrafluoroethane, HCFC124, HFA124, Fluorocarbon 124	**SA**	Short OV service life
o-Chlorotoluene		0.219	**50**	2-Chloro-1-methylbenzene	**OV**	3M 3510 Monitor
Chlorotrifluoroethylene			**5 (AIHAWEEL)**	CFE, CTFE, Trifluorovinylchloride, Trifluorochloroethylene	**SA**	Short OV service life
Chromates of lead and zinc (as Cr)				(See Lead, Zinc chromate)		
Chromium, metal and inorganic compounds (as Cr)						
–Metal and Cr III compounds			**0.5 mg/m³**		**N95**	
–Water-soluble Cr VI compounds, NOC (includes Chromic acid)	30 mg/m³		**0.005 mg/m³**		**N95**	
–Insoluble Cr VI compounds, NOC			**0.01 mg/m³**		**N95**	
Chromyl chloride			**0.025**	Chromium oxychloride, Chlorochromic anhydride	**AG**	Warning unknown
Coal dust						
-Bituminous or lignite			**0.9 mg/m³* (respirable)**		**N95**	≥5% quartz 0.1 mg/m³ TLV
-Anthracite			**0.4 mg/m³* (respirable)**		**N95**	≥5% quartz 0.1 mg/m³ TLV
Coal tar pitch volatiles (as Benzene solubles)	700 mg/m³		**0.2 mg/m³**		**R or P95**	8247, 8577 or respirators with 2076HF, 2078, 2096, 2097 or 7093C filters specifically recommended. See Comment F, page 9.
Cobalt, elemental and inorganic compounds (as Co)	20 mg/m³		**0.02 mg/m³***		**N95**	
Cobalt carbonyl (as Co)			**0.1 mg/m³**		**SA**	Ineffective sorbents

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Cobalt hydrocarbonyl (as Co)			**0.1 mg/m³**		**SA**	Ineffective sorbents
Coke oven emissions			**0.15 mg/m³**		**R or P95**	8247, 8577 or respirators with 2076HF, 2078, 2096 or 2097 filters specifically recommended. See Comment F, page 9.
Copper (as Cu) **–Dust and mist** **–Fume**			 **1 mg/m³** **0.1 mg/m³ (PEL)**		 **N95** **N95**	
Cotton dust (raw)			**0.2 mg/m³***		**N95**	5X PEL maximum for disposables, per OSHA cotton dust standard. If oil aerosol present, use R or P95.
Cresol (all isomers)	250	0.00005-0.0079	**5 -skin-**	Cresylic acid	**OV/P95**	
Cristobalite				(See Silica, crystalline)		
Crotonaldehyde	400	0.135	**0.3 (ceiling)**	B-Methylacrolein, Propylene aldehyde, Crotontonic aldehyde	**(F)OV**	
Cryolite (as F)			**2.5 mg/m³**	Greenland spar, Icetone	**N95**	
Cumene	8000	0.024	**50**	Isopropyl benzene, 2-Phenyl propane, Cumol	**OV**	3M 3510 Monitor
Cumene hydroperoxide		0.005	**1 -skin- (AIHAWEEL)**	Isopropylbenzene hydroperoxide; CHP; a,a'-Dimethylbenzyl hydroperoxide; Cumyl hydroperoxide	**(F)OV**	
Cyanamide			**2 mg/m³**	Cyanogenamide, Carbodiimide	**N95**	
Cyanides (as CN)	50 mg/m³		**5 mg/m³ (ceiling) -skin-**		**SA**	Poor warning
Cyanogen		231	**10**	Dicyan, Oxalonitrile	**SA**	Poor warning. Unknown sorbent effectiveness.
Cyanogen chloride		0.976	**0.3 (ceiling)**	CNCl	**SA(F)**	Poor warning. Short service life.
Cyclohexane	10,000	83.8	**100**	Hexahydrobenzene, Hexamethylene	**(F)OV**	Irritation also provides warning. 3M 3510 Monitor.
Cyclohexanol	3500	0.068	**50 -skin-**	Hexalin, Hydralin, Hydroxycyclohexane, Anol, Hexahydrophenol, Cyclohexyl alcohol	**OV**	See Comment E, page 8. 3M 3510 Monitor.

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Cyclohexanone	5000	0.019	**20 -skin-**	Pimelic ketone, Cyclohexyl ketone	**OV**	3M 3510 Monitor
Cyclohexene	10,000	0.363	**300**	Benzene tetrahydride	**OV**	3M 3510 Monitor
Cyclohexylamine		2.66	**10**	Hexahydroaniline, Aminocyclohexane	**(F)OV**	
Cyclonite			**0.5 mg/m³ -skin-**	RDX; sym-Trimethylene trinitramine; Hexahydro-1,3,5-trinitro-sym-triazine	**N95**	
Cyclopentadiene	2000	3.8	**75**	1,3-Cyclopentadiene	**OV**	
Cyclopentane			**600**	Pentamethylene	**SA**	Warning unknown. Short OV service life.
Decaborane	20	0.06	**0.05 -skin-**		**SA**	Poor warning. Unknown sorbent effectiveness.
Decabromodiphenyl oxide			**5 mg/m³ (AIHAWEEL)**	DBDPO, Decabromodiphenyl ether, bis-(pentabromophenyl) ether	**N95**	
1-Decene		7	**100 (AIHAWEEL)**	Decylene, alpha-decene	**OV**	
Dehydrolinalool			**2 (AIHAWEEL)**		**OV**	
Diacetone alcohol	2100	0.891	**50**	Diacetone, 4-Hydroxy-4-methyl-2-pentanone, 2-Methyl-2-pentanol -4-one	**(F)OV**	3M 3510 Monitor
Diallylamine		2-9	**1 -skin- (AIHAWEEL)**	N-2-propenyl-2-propen-1-amine, Di-2-propenylamine	**OV**	Poor warning
1,2-Diaminoethane				(See Ethylenediamine)		
Diatomaceous earth (uncalcined)				(See Silica)		
Diazomethane	2		**0.2**	Azimethylene, Diazirine	**SA**	Warning unknown. Unknown sorbent effectiveness.
Diborane	40	1.8-3.5	**0.1**	Boroethane	**SA**	Poor warning. Unknown sorbent effectiveness.
Dibromochloropropane			**1 ppb (PEL)**	1-Chloro-2,3-dibromopropane; DBCP; 1,2-Dibromo-3-chloropropane	**SA(F)**	Warning unknown. OSHA requires SA(F); no change schedule allowed.
1,2-Dibromoethane				(See Ethylene dibromide)		
Dibutylamine		0.1	**5 (ceiling) -skin- (AIHAWEEL)**	1-Butanamine, n-Butyl, Di-n-butylamine, DNBA	**F(OV)**	See Comment E, page 8
2-N-Dibutylaminoethanol			**0.5 -skin-**	Dibutylaminoethanol; N,N-dibutyl-N-(2-hydroxyethyl) amine	**(F)OV**	Warning unknown
Dibutyl phenyl phosphate			**0.3 -skin-**	DBPP	**R or P95**	OV/P95 may be preferable if heat involved

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Dibutyl phosphate	125		**1**	Dibutyl acid-o-phosphate, Di-n-butyl hydrogen phosphate, Dibutyl phosphoric acid		**OV/P95**
Dibutyl phthalate	9300 mg/m³		**5 mg/m³**	DBP; Dibutyl; 1,2-Benzene-dicarboxylate	**OV/P95**	See Comment D, page 7
Dichloroacetic acid			**0.5 - skin -**	Acetic acid, dichloro-; 2,2-Dichloroacetic acid; Dichloroehanoic acid; Urmer's liquid	**F(OV/AG)**	
Dichloroacetylene			**0.1 (ceiling)**	Dichloroethyne	**SA(F)**	Warning unknown. Short OV service life.
o-Dichlorobenzene	1000	0.072	**25**	1,2-Dichlorobenzene; o-Dichloro-benzol	**(F)OV**	See Comment E, page 8. PEL-50 ppm ceiling. 3M 3510 Monitor.
p-Dichlorobenzene	1000	0.048	**10***	1,4-Dichlorobenzene; Dichloricide; PDCB	**(F)OV/N95**	3M 3510 Monitor
1,4-Dichloro-2-butene			**0.005 -skin-**	2-Butylenedichloride; DCB; 1,4-DCB; Dichlorobutene	**(F)OV**	Warning unknown
Dichlorodifluoromethane	50,000		**1000**	Refrigerant 12, Freon® 12	**SA**	Warning unknown. Short OV service life.
1,3-Dichloro-5,5-dimethylhydantoin		0.01	**0.2 mg/m³**	Halane, Dactin	**OV/N95**	
1,1-Dichloroethane	4000	255	**100**	Ethylidene chloride	**OV**	Poor warning
1,2-Dichloroethane				(See Ethylene dichloride)		
1,1-Dichloroethylene				(See Vinylidene chloride)		
1,2-Dichloroethylene	4000	19.1	**200**	Acetylene dichloride, Dioform	**OV**	
Dichloroethyl ether	250	0.049	**5 -skin-**	bis-(2-Chloroethyl) ether; 2,2'-Dichlorodiethyl ether	**(F)OV**	PEL-15 ppm ceiling
Dichlorofluoro-methane	50,000		**10***	Refrigerant 21, Freon® 21, Dichloromonofluoromethane	**SA**	Warning unknown. Short OV service life.
1,1-Dichloro-1-fluoro-ethane			**500 (AIHAWEEL)**	HCFC141b, HFA141b, Fluorocarbon 141b	**SA**	Short OV service life
Dichloromethane				(See Methylene chloride)		
1,1-Dichloro-1-nitroethane	150		**2**		**OV**	Warning unknown. PEL-10 ppm ceiling.
2,4-Dichlorophenol		0.21	**1 -skin- (AIHAWEEL)**	2,4-DCP; DCP; Phenol: 2,4-Dichloro	**OV**	R or P95 may also be needed if material is molten
1,2-Dichloropropane				(See Propylene dichloride)		
1,3-Dichloropropene			**1 -skin-**	1,3-Dichloropropylene	**(F)OV**	Warning unknown

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
2,2-Dichloropropionic acid			**5 mg/m³**	Dalapon™	**(F)OV/N95**	Warning unknown
Dichlorotetra-fluoroethane	50,000		**1000**	Freon® 114, Refrigerant 114, Halon™ 242, FC-114	**SA**	Warning unknown. Short OV service life.
Dicyclopentadiene		0.03	**5**		**OV/N95**	
Dicyclopentadienyl iron			**10 mg/m³***	bis-Cyclopentadienyl iron	**N95**	
Diesel Fuel (total hydrocarbons, vapor and aerosol)			**100 mg/m³ -skin-**	Astral oil, Gas oil, Coal oil, Fuel oil, Home heating oil, Marine diesel fuel	**OV/P95**	
Diethanolamine		0.025	**0.46 -skin-**	DEA, di-(2-Hydroxyethyl) amine	**OV**	See Comment E, page 8
Diethylamine	2000	0.186	**5* -skin-**		**(F)AM (F)OV**	AM not specifically approved
Diethylaminoethanol	500	0.034	**10 -skin-**	2-Diethylaminoethyl alcohol; N,N-Diethylethanolamine	**OV**	
Diethylbenzenes, mixed		**12**	**5**	DEB; Dowtherm J; 1,2-Diethylbenzene; 1,3-Diethylbenzene; 1,4-Diethylbenzene	**OV**	
Diethylene glycol			**10 mg/m³ (AIHAWEEL)**	DEG; Diglycol; 2,2'-Dihydroxy-diethyl ether	**R or P95**	See Comments D and G, pages 7 & 9
Diethylene glycol monoethyl ether		0.708	**25 (AIHAWEEL)**	2-(2-Ethoxyethoxy) ethanol, DiGGE, Diethylene glycol ethyl ether, Glycol ether DE, Carbitol, Dioxitol	**OV**	
Diethylene triamine		9.3	**1 -skin-**		**(F)OV**	Poor warning
Diethyl ether				(See Ethyl ether)		
Di-2-ethylhexyl phthalate				(See Di-sec-octyl phthalate)		
Diethyl ketone		0.316	**200**	Metacetone, Propione, 3-Pentanone, Ethyl propionyl	**OV**	
Diethyl phthalate			**5 mg/m³**	Ethylphthalate, DEP	**R or P95**	
Difluorodibromo-methane	2500		**100**	Dibromodifluoromethane, Freon® 12B2, DFBM	**OV**	Warning unknown
1,1-Difluoroethane			**1000 (AIHAWEEL)**	HFC-152a, Freon® 152a, Dymel® 152a, Genetron™ 152a, Ethylidene fluoride	**SA**	Ineffective sorbents
Difluoromethane			**1000 (AIHAWEEL)**	Refrigerant 32; R32; Hydrofluoro-carbon 32	**SA**	Warning unknown. Ineffective sorbents.
Diglycidyl ether	25	4.61	**0.01**	di-(Epoxypropyl) ether; bis-(2,3-Epoxypropyl)-ether; 2-Epoxypropyl ether; Diallyl ether dioxide; DGE	**(F)OV**	Poor warning
Dihydroxybenzene				(See Hydroquinone)		
Diisobutylene			**75 (AIHAWEEL)**	Diisobutene	**OV**	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Diisobutyl ketone	2000	0.339	**25***	2,6-Dimethyl-4-heptanone; sym-Diisopropylacetone; Isovalerone; Valerone	**(F)OV**	See Comment E, page 8. 3M 3510 Monitor.
Diisopropylamine	1000	0.398	**5 -skin-**		**(F)OV**	
Dimethoxymethane				(See Methylal)		
Dimethyl acetamide	400	47.9	**10 -skin-**	N,N-Dimethyl acetamide; DMAC	**OV**	Poor warning
Dimethylamine	2000	0.081	**5***	Anhydrous dimethylamine	**AM**	AM not specifically approved. Short OV service life.
Dimethylaminobenzene				(See Xylidine)		
Dimethylaniline	100	0.219	**5 -skin-**	N,N-Dimethylaniline	**OV**	
Dimethyl carbamoyl chloride			**0.005**	Chloroformic acid dimethylamide; Dimethyl carbamic chloride; Dimethylcarbamyl chloride; DMCC	**(F)MG**	
Dimethyldichlorosilane			**2 (ceiling) (AIHAWEEL)**	Dichlorodimethylsilane	**OV/AG**	Warning unknown
Dimethyl disulfide			**0.5**	Dimethyldisulfide; Dimethyl disulphide; 2,3-Dithiabutane; DMDS	**OV/AG**	
Dimethylethoxysilane			**0.5**	Ethoxydimethyl silane	**SA(F)**	Unknown sorbent effectiveness
Dimethylbenzene				(See Xylene)		
Dimethyl ether		0.3-9.0	**1000 (AIHAWEEL)**	Methyl ether, Wood ether	**SA**	Very short OV service life
Dimethyl formamide	3500	100	**10 -skin-**	N,N-Dimethyl formamide; DMF	**OV**	Poor warning
2,6-Dimethyl-4-heptanone				(See Diisobutyl ketone)		
1,1-Dimethylhydrazine	50	8.79	**0.01 -skin-**	unsym-Dimethylhydrazine, UDMH	**SA(F)**	Poor warning. Unknown sorbent effectiveness.
Dimethylphthalate	9300 mg/m^3		**5 mg/m^3**	DMP	**OV/P95**	See Comment D, page 7
1,1-Dimethylpropyl acetate				(See Pentyl acetate)		
Dimethyl sulfide		0.0025	**10**	DMS, Thiobis (methane)	**OV/AG**	AG recommended since H_2S may also be present
Dimethyl sulfoxide			**250 -skin-**	DMSO, Methylsulfoxide	**OV**	
Dimethylsulfate	10		**0.1* -skin-**	Methyl sulfate	**(F)OV**	Poor warning

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Dimethyl terephthalate			**5 mg/m³ (total dust) (AIHAWEEL)**		**OV/N95**	
Dinitrobenzene	29		**0.15* -skin-**	o-Dinitrobenzene, 1,2-Dinitrobenzene; m-Dinitrobenzene; 1,3-Dinitrobenzene; p-Dinitrobenzene, 1,4-Dinitrobenzene	**OV/N95**	
3,5-Dinitro-o-toluamide			**1 mg/m³**	Dinitolmide ; 2-Methyl-3, 5-dinitrobenzamide; Zoalene; Coccidin; Salcostat	**N95**	
Dinitrotoluene	200 mg/m³		**0.2 mg/m³ -skin-**	DNT	**OV/N95**	See Comment D, page 7
Dioxane	2000	7.78	**20* -skin-**	Diethylene dioxide; Diethylene ether; p-Dioxane; 1,4-Dioxane	**OV**	3M 3510 Monitor
1,3-Dioxalane			**20**	1,3-Dioxacyclopentane; 1,3-Dioxolan; Dioxolane; 1,3-Dioxole, dihydroethylene glycol formal; Formal glycol; Glycolformal; Glycol methylene ether	**OV**	
Diphenyl				(See Biphenyl)		
Diphenylamine		0.022	**10 mg/m³**	DPA, N-phenylaniline	**N95**	OV/N95 may be preferable when odor is a problem
4,4-Diphenylmethane diisocyanate				(See Methylenebisphenyl isocyanate)		
Dipropylene glycol methyl ether		1000	**100 -skin-**	Dipropylene glycol monomethyl ether, Dowanol™ 50B	**OV**	Poor warning
Dipropyl ketone			**50**	Butyrane, 4-Heptanone	**OV**	Warning unknown
Di-sec-octyl phthalate			**5 mg/m³**	DOP, bis-(2-Ethylhexyl)phthalate, Di-2-ethylhexyl phthalate, DEHP	**R or P95**	
Divinyl benzene			**10**	DVB, Vinylstyrene	**(F)OV**	Warning unknown
Dodecyl mercaptan			**0.1**	1-Dodecanethiol, n-Dodecyl mercaptan, n-Lauryl mercaptan, 1-Mercaptododecane	**OV**	R or P filter may be needed with oily aerosols
Dowtherm™ Q (as inhalable aerosol and/or vapor			**1 (AIHAWEEL)**	1,1-Dipheylethane with ethylated benzenes	**OV/P95**	
Emery			**10 mg/m³***	Corundum	**N95**	
Enflurane			**75**	2-Chloro-1,1,2-trifluoroethyl-difluoromethyl ether; Ethrane	**SA**	Warning unknown. Short OV service life. 3M 3510 Monitor.
Epichlorohydrin	250	0.934	**0.5* -skin-**	1-Chloro-2,3-epoxy-propane; 2-Chloropropylene oxide; g-Chloropropylene oxide	**(F)OV**	Poor warning. 3M 3510 Monitor.

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
1,2-Epoxypropane				(See Propylene oxide)		
2,3-Epoxy-1-propanol				(See Glycidol)		
Erythromycin			**3 mg/m³ (AIHAWEEL)**	Dotycin, Erycin, Ericynum, E-Mycin™, Pentadecanoic acid	**N95**	
Ethane			**1000**	Dimethyl ethane, Methylmethane	**SA**	Short OV service life
Ethanolamine	1000	2.59	**3**	Ethylolamine, Monoethanolamine, B-Aminoethyl alcohol, 2-Aminoethanol, 2-Hydroxyethylamine	**OV**	
2-Ethoxyethanol	6000	1.22	**5* -skin-**	Ethylene glycol monoethyl ether, Glycol monoethyl ether, Cellosolve® solvent	**OV**	3M 3510 Monitor
2-Ethoxyethyl acetate	2500	0.182	**5* -skin-**	Cellosolve® acetate, Ethylene glycol monoethyl ether acetate	**OV**	3M 3510 Monitor
Ethyl acetate	10,000	0.61	**400**	Acetic ester, Acetic ether, Ethyl enthanoate	**(F)OV**	3M 3510 Monitor
Ethyl acrylate	2000	0.0009	**5* -skin-**	Acrylic acid ethyl ester	**(F)OV**	3M 3510 Monitor
Ethyl alcohol	15,000	0.136	**1000**	Ethanol	**OV**	Short OV service life at 10X OEL
Ethylamine	4000	0.324	**5* -skin-**	Anhydrous ethylamine, Aminoethane, Monoethylamine	**(F)AM**	AM not specifically approved. Short OV service life.
Ethyl amyl ketone	3000	6	**10**	EAK, 5-Methyl-3-heptanone	**(F)OV**	
Ethyl benzene	2000	2.3	**100**	Phenylethane, Ethylbenzol	**OV**	See Comment E, page 8. 3M 3510 Monitor.
Ethyl bromide	3500	3.09	**5* -skin-**	Bromoethane	**SA**	Short OV service life
Ethyl butyl ketone	3000	0.1-10	**50**	3-Heptanone	**OV**	See Comment E, page 8
Ethyl chloride	20,000	4.07	**100 -skin-**	Chloroethane, Monochloroethane, Hydrochloric ether	**SA**	Very short OV service life
Ethyl cyanoacrylate			**0.2**	2-Cyanoacrylic acid, ethyl ester; 2-Cyano-2 propenoic acid, ethyl ester; ECA; Ethyl alpha-cyanoacrylate; Ethyl 2-cyanoacrylate; Ethyl 2-cyano-2-propenoate	**OV**	Warning unknown
Ethyl tert-butyl ether			**5**	tert-Butyl ethyl ether; 1.1-Dimethyl-ehtyl ether; ETBE; 2-Ethoxy-2-methylpropane; Ethyl tert-butyl oxide; Ethyl 1,1-dimethylethyl ether	**OV**	
Ethylene			**200**	Acetene, Bicarburetted hydrogen, Elayl, Ethene, Olefiant gas	**SA(F)**	
Ethylene chlorohydrin	10	0.402	**1* (ceiling) -skin-**	2-Chloroethanol, 2-Chloroethyl alcohol	**OV**	3M 3510 Monitor

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Ethylenediamine	2000	4.27	**10**	1,2-Diaminoethane; 1,2-Ethanediamine	**(F)OV**	
Ethylene dibromide	400	9.84	**20 (PEL) -skin-**	1,2-Dibromoethane	**(F)OV**	
Ethylene dichloride	1000	11.2	**10***	Ethylene chloride; 1,2-Dichloroethane	**OV**	Poor warning. 3M 3510 Monitor.
Ethylene glycol, aerosol		60.3 mg/m^3	**100 mg/m^3 (ceiling)**	Ethylene alcohol; Glycol; 1,2-Ethanediol	**OV/P95**	See Comments D and G, pages 7 & 9
Ethylene glycol dinitrate	82		**0.05* -skin-**	Glycol dinitrate, Nitroglycol	**OV**	Warning unknown. PEL-0.2 ppm ceiling.
Ethylene glycol methyl ether acetate				(See 2-Methoxyethyl acetate)		
Ethyleneimine	100	1.5	**0.5 -skin-**	Ethyleimine, Dimethylenimine, Dihydroazirine, Azirane, Aziridine, Aminoethylene	**SA(F)**	Poor warning. OSHA requires SA(F); see 29 CFR 1910.1003.
Ethylene oxide	800	851	**1**	Dimethylene oxide; 1,2-Epoxy ethane; Oxirane	**SA(F)**	Poor warning. OSHA requires SA(F); no change schedule allowed. 3M 3550 Monitor.
Ethyl ether	19,000	2.29	**400**	Diethyl ether, Ethyl oxide, Ether	**OV**	Short service life. 3M 3530 Monitor.
Ethyl formate	8000	18.6	**100**	Ethyl methanoate, Formic acid ethyl ester	**(F)OV**	Short service life
2-Ethylhexanoic acid (as inhalable aerosol and vapor)			**5 mg/m^3**	Butylethylacetic acid; 2-Butylbutanoic acid; 2-Ethylcaproic acid; 2-Ethylhexoic acid; Ethylhexoic acid	**OV/N95**	
Ethylidene chloride				(See 1,1-Dichloroethane)		
Ethylidene norbornene		0.074	**5 (ceiling)**	ENB	**(F)OV**	
Ethyl mercaptan	2500	0.001	**0.5***	Ethanethiol, Ethyl sulfhydrate	**OV**	
N-Ethylmorpholine	2000	0.275	**5* -skin-**	4-Ethylmorpholine	**(F)OV**	
Ethyl silicate	1000	3.6	**10***	Tetraethyl silicate, Ethyl orthosilicate, Tetraethoxysilane	**OV**	
Ferric/Ferrous salts, soluble				(See Iron salts)		
Ferrovanadium, dust			**1 mg/m^3**		**N95**	
Fibrous glass, dust				(See Synthetic vitreous fibers - Continuous filament glass fibers)		
Flour dust (as inhalable particles)			**0.5 mg/m^3**		**N95**	

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Fluorides (as F)	500 mg/m³		**2.5 mg/m³**	Synonyms vary depending upon specific compound	**N95**	
Fluorine	25	0.126	**0.1 (PEL)**		**SA(F)**	Poor warning. Unknown reaction products with sorbent.
Fluorotrichloromethane				(See Trichlorofluoromethane)		
Formaldehyde	30	0.871	**0.3* (ceiling)**	Methylene oxide, Formalin	**(F)FORM**	Irritation also provides warning. 3M 3720 Monitor.
Formamide		80	**10* -skin-**	Methanamide	**OV**	Poor warning
Formic acid	30	28.2	**5**	Hydrogencarboxylic acid, Methanoic acid	**(F)OV**	Poor warning. 6X OEL maximum. Low IDLH.
Furfural	250	0.058	**2* -skin-**	2-Furaldehyde, Furfuraldehyde, Fural, 2-Furancarboxaldehyde	**(F)OV**	3M 3510 Monitor
Furfuryl alcohol	250	7.83	**10* -skin-**	2-Hydroxymethylfuran, 2-Furyl-methanol	**(F)OV**	See Comment E, page 8
Gallium arsenide			**0.3 µg/m³**	Gallium monoarsenide	**N100**	
Gasoline		0.3	**300**	Petrol	**(F)OV**	
Germanium tetrahydride			**0.2**	Germane, Germanium hydride	**SA(F)**	Warning unknown. Unknown sorbent effectiveness.
Glass, fibrous or dust				(See Synthetic vitreous fibers)		
Glutaraldehyde		0.038	**0.05 (ceiling)**	1,5-Pentanedial	**(F)OV**	See Comment E, page 8
Glycerin, mist			**10 mg/m³***	Glycerol	**R or P95**	
Glycidol	500		**2***	2-Hydroxymethyloxiran; Hydroxymethyl ethylene oxide; Epoxypropyl alcohol; 3-Hydroxy-propylene oxide; 2,3-Epoxy-1-propanol	**OV**	Warning unknown
Glycidyl methacrylate			**0.5 (AIHAWEEL) -skin-**	GMA	**OV**	
Glycol monoethyl ether				(See 2-Ethoxyethanol)		
Glyoxal (as inhalable aerosol and/or vapor)			**0.1 mg/m³**	Ethanedial, Biformyl, Diformyl, Oxaldehyde, 1,2-Ethanedione	**(F)OV/N95**	Short OV service for vapor at 10X OEL
Grain dust (oat, wheat, barley)			**4 mg/m³* (respirable)**		**N95**	
Graphite (natural)			**2.5 mg/m³* (respirable)**	Plumbago, Potelot, Corbo minerals, Black lead, Silver lead	**N95**	
Graphite (synthetic)			**2 mg/m³* (respirable)**		**N95**	

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Gypsum				(See Calcium sulfate)		
Hafnium and compounds (as Hf)			**0.5 mg/m³**		**N95**	
Halothane		33	**50**	2-Bromo-2-chloro-1,1,1-trifluoroethane	**OV**	3M 3510 Monitor
Heptane	5000	9.77	**400***	Normal heptane, n-Heptane	**OV**	3M 3510 Monitor
2-Heptanone				(See Methyl n-amyl ketone)		
3-Heptanone				(See Ethyl butyl ketone)		
Hexachlorobenzene		0.463 mg/m³	**0.002 mg/m³ -skin-**	Perchlorobenzene	**N95**	
Hexachlorobutadiene			**0.02 -skin-**	Hexachloro-1,3-butadiene; perchlorobutadiene	**(F)OV**	Warning unknown
Hexachlorocyclopentadiene		0.03	**0.01**		**(F)OV**	Poor warning
Hexachloroethane	300	0.15	**1 -skin-**	Perchloroethane	**OV/N95**	
Hexachloronaphthalene	2 mg/m³		**0.2 mg/m³ -skin-**	Halowax™ 1014	**OV/N95**	See Comment D, page 7
1,4-Hexadiene			**10 (AIHAWEEL)**		**OV**	Warning unknown
Hexafluoroacetone			**0.1 -skin-**	1,1,1,3,3,3-Hexafluoro-2-propanone	**SA**	Warning unknown. Short OV service life.
1,1,1,3,3,3-Hexafluoropropane			**1000 (AIHAWEEL)**	HFC-236 fa; FC-236 fa; hydrofluorocarbon 236 fa; FE-13	**SA**	Ineffective sorbents
Hexafluoropropylene			**0.1**	1,1,2,3,3,3-Hexafluoro-1-propene; 1,1,2,3,3,3-Hexafluoropropylene**;** Hexafluoropropene; Perfluoro-1-propene; Perfluoropropylene; Perfluoropropene; Fluorocarbon 1216; HFP	**SA**	Short OV service life.
Hexahydrophthalic anhydride all isomers (as inhalable vapor and aerosol)			**0.005 mg/m³ (ceiling)**	1,2-Cyclohexanedicarboxylic acid anhydride; Cyclohexane-1, 2-dicarboxylic anhydride, cis and trans mixture; 1,2-Cyclohexanedicarboxylic anhydride; Hexahydrophthalic acid anhydride; Hexahydro-1, 3-isobenzofurandione; HHPA; HHPAA; 1,3-Isobenzofurandione, hexahdro	**OV/N95**	
Hexamethylene diisocyanate		0.01	**0.005**	HDI	**OV/N95**	Poor warning
Hexane (n-Hexane)	5000	21.9	**50* -skin-**	Hexyl hydride, Normal hexane	**OV**	3M 3510 Monitor
Hexane (other isomers)		65-248	**500**		**OV**	3M 3510 Monitor

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
1,6-Hexanediamine			**1 (AIHAWEEL)**	Hexamethylenediamine; 1,6-diaminohexane; HMDA; HMD	**OV/N95**	
Hexanediol diacrylate			**1 mg/m³ (AIHAWEEL)**	HDODA; Propenoic acid, 1,6-hexanediol ester	**OV/P95**	See Comment D, page 7
2-Hexanone				(See Methyl n-butyl ketone)		
1-Hexene			**50**	Butyl ethylene; Hexene; Hex-1-ene; Hexene-n-1; Hexylene	**OV**	Warning unknown
Hexone				(See Methyl isobutyl ketone)		
sec-Hexyl acetate	4000	0.219	**50**	1,3-Dimethylbutyl acetate; Methylamyl acetate; Methylisoamyl acetate; Methylisobutyl carbinol	**(F)OV**	See Comment E, page 8
Hexylene glycol		49.9	**25 (ceiling)**	4-Methyl-2,4-pentanediol	**(F)OV**	Irritation also provides warning
HFE-7100			**750 (AIHAWEEL)**	Mixture of 1-Methoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane (40%) and 1-Methoxy-2-Trifluoromethyl-1,1,2,3,3,3-hexafluoropropane (60%); Mixture of 1-Methoxyperfluorobutane (40%) and 1-Methyoxyperfluoroisobutane (60%)	**OV**	Warning unknown
Hydrazine	80	3.6	**0.01* -skin-**	Anhydrous hydrazine	**SA(F)**	Poor warning
Hydrogenated terphenyls			**0.5**		**R or P95**	
Hydrogen bromide		2	**2 (ceiling)**	Hydrobromic acid, HBr	**AG**	Not specifically approved for HBr
Hydrogen chloride	100	0.77	**2 (ceiling)**	Hydrochloric acid, HCl, Muriatic acid	**AG**	Irritation also provides warning
Hydrogen cyanide	50	0.603	**4.7* (ceiling) -skin-**	Hydrocyanic acid, Prussic acid	**SA(F)**	10X OEL maximum. Low IDLH.
Hydrogen fluoride	30	0.042	**0.5 -skin-**	Anhydrofluoric acid, HF, Etching acid, Fluorohydric acid, Fluoric acid	**(F)HF**	
Hydrogen peroxide	75		**1**	Peroxide, Hydrogen dioxide	**SA(F)**	Warning unknown. Unknown sorbent effectiveness.
Hydrogen selenide (as Se)	2	0.3	**0.05**	Selenium hydride	**(F)MG**	Poor warning
Hydrogen sulfide	300	0.0005	**10***	Sulfuretted hydrogen, H_2S, Hydrosulfuric acid, Hepatic gas	**SA AG-escape only**	Poor warning (olfactory fatigue)
Hydroquinone			**1 mg/m³**	Quinol; Dihydroxybenzene; 1,4-Benzenediol	**(F)OV/N95**	See Comment D, page 7
Hydrotreated kerosene		0.1	**200 mg/m³ -skin-**		**OV/P95**	When aerosols present, add a particulate prefilter.

* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
4-Hydroxy-4-methyl-2-pentanone				(See Diacetone alcohol)		
2-Hydroxypropyl acrylate			**0.5 -skin-**	HPA	**OV**	Warning unknown
Indene		0.009	**5**	Indonaphthene	**OV**	
Indium and compounds (as In)			**0.1 mg/m³**		**N95**	
Iodine and Iodides (inhalable fraction and vapor)	10		**0.01 (ceiling)**		**(F)MG**	Warning unknown
Iodoform		0.000019-1.1	**0.6**	Triiodomethane	**(F)OV**	Questionable warning
Iron oxide (as respirable particulate mass)			**5 mg/m³***	Ferric oxide, Hematite, Burnt sienna, Burnt umber, Jeweler's rouge, Rouge	**N95**	
Iron pentacarbonyl (as Fe)			**0.1**	Iron carbonyl	**SA**	Warning unknown. Unknown sorbent effectiveness.
Iron salts, soluble (as Fe)			**1 mg/m³**	Ferrous sulfate and chloride; Ferric chloride, nitrate and sulfate	**N95**	
Isoamyl acetate		0.004		(See Pentyl acetate)		
Isoamyl alcohol	10,000	0.045	**100**	3-Methyl-1-butanol, Isobutyl carbinol, Isopentyl alcohol, Fusel oil	**(F)OV**	See Comment E, page 8
Isobutene			250	1,1-Dimethylethene, 1,1-Dimethylethylene, Isobutylene, 2-Methylpropene, 2-Methylpropylene	**OV**	
Isobutyl acetate	7500	0.479	**150**	2-Methylpropyl acetate	**(F)OV**	
Isobutyl alcohol	8000	0.832	**50***	Isobutanol, IBA, 2-Methyl-1-propanol, Isopropylcarbinol	**(F)OV**	3M 3510 Monitor
Isobutane			**1000**	Methylpropane; 2-methylpropane	**SA**	Short OV service life.
Isobutyl nitrate (Inhalable aerosol and vapor)			**1 (ceiling)**	IBN; Nitrous acid, isobutyl ester; Nitrous acid, 2-methylpropyl ester	**F(OV)N95**	See Comment E
Isobutyraldehyde			**25**	Isobutanal, 2-Methylpropanal, Isobutyric aldehyde, Isobutyl aldehyde, 2-Methylpropionaldehyde, 2-Methyl-1-propanal, Valine aldehyde	**OV**	Short OV service life.
Isocyanuric acid			**10 mg/m³ (total) (AIHAWEEL) 5 mg/m³ (respirable) (AIHAWEEL)**	Cyanuric acid, s-Triazinetriol, s-Triazine-2,4,6(1H,3H,5H)-trione	**N95**	AM/N95 may be preferable, if wet
Isooctyl alcohol			**50 -skin-**	Isooctanol	**OV**	Warning unknown

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Isophorone	800	0.631	**5* (ceiling)**	3,5,5-Trimethyl-2-cyclohexene-1-one	**OV**	See Comment E, page 8. 3M 3510 Monitor.
Isophorone diisocyanate			**0.005**	IPDI	**OV/N95**	Warning unknown
Isophthalic acid			**5 mg/m³ (respirable) (AIHAWEEL)**	1,3-Dicarboxylic acid; m-Phthalic acid; IA; IPA	**N95**	
Isoprene			**2 (AIHAWEEL)**	2-Methyl-1,3-butadiene	**OV**	Warning unknown
Isopropoxyethanol		0.738	**25 -skin-**	IPE, Isopropyl glycol, Ethylene glycol monoisopropyl ether, Isopropyl Cellosolve®	**OV**	
Isopropyl acetate	16,000	0.05-4.1	**100**	Isopropyl ester of acetic acid, sec-Propyl acetate	**(F)OV**	3M 3510 Monitor
Isopropylamine	4000	0.6	**5**	Monoisopropylamine, 2-Aminopropane	**(F)AM (F)OV**	AM not specifically approved
N-Isopropylaniline			**2 -skin-**	o-Isopropylaniline, o-Amino-isopropylbenzene	**OV**	Warning unknown
Isopropyl ether	10,000	0.055	**250***	Diisopropyl ether	**OV**	
Isopropyl glycidyl ether	1000	297	**50**	Isopropoxymethyl-oxiran; 1,2-Epoxy-3-isopropoxy-propane; Isopropyl epoxypropyl ether; IGE	**(F)OV**	Poor warning
Kaolin			**2 mg/m³* (respirable)**	China clay, Aluminum silicate	**N95**	
Ketene			**0.5**	Carbomethene, Ethenone	**SA(F)**	Warning unknown. Ineffective sorbents.
Kerosene (Total hydrocarbon vapor)			**200 mg/m³ -skin-**	Deobase, Kerosine, Diesel No. 1	**OV/P95**	When aerosols present, add a particulate prefilter.
Lacquer thinner				(See specific ingredients)		
Lead, elemental and inorganic compounds (as Pb)	700 mg/m³		**0.05 mg/m³**		**N100**	
Lead arsenate (as As)			**0.01 mg/m³ (PEL)**		**N100**	
Lead chromate (as Cr)			**0.012 mg/m³***	Chrome orange, Red lead chromate	**N100**	
Limestone				(See Calcium carbonate)		
d-Limonene		0.437	**30 (AIHAWEEL)**	1-methyl-4(1-methylethenyl) cyclohexene; 4-isopropyl-1-methylcyclohexene; p-mentha-1,8-diene; Cinene; Cajeputene	**OV**	
Lithium fluoride (as F)			**2.5 mg/m³**		**N95**	
Lithium hydride	55 mg/m³		**0.025 mg/m³**		**N95**	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Lithium hydroxide			**1 mg/m³ (ceiling) (AIHAWEEL)**	Lithium hydroxide monohydrate	**N95**	
Lithium oxide			**1 mg/m³ (ceiling) (AIHAWEEL)**	Dilithium oxide, Lithium monoxide	**N95**	
LPG	19,000		**1000**	Liquefied petroleum gas, Bottled gas	**SA**	Warning unknown. Mixture with compounds with short OV service life.
Magnesite				Magnesium carbonate	**N95**	
-Total dust			**15 mg/m³ (PEL)**			
-Respirable fraction			**15 mg/m³ (PEL)**			
Magnesium oxide fume			**10 mg/m³***	Magnesia fume	**N95**	
Maleic anhydride		0.318	**0.1**		**(F)OV/N95**	Poor warning
Manganese, elemental and inorganic compounds (as Mn)			**0.2 mg/m³***		**N95**	
Manganese cyclopentadienyl tricarbonyl			**0.1 mg/m³ -skin-**	MCT	**SA**	Properties of vapor unknown
Marble				(See Calcium carbonate)		
Melamine			**10 mg/m³ (inhalable) (AIHAWEEL)**	1,3,5-Triazine-2,4,6-triamine; 2,4,6-Triamino-1,3,5-Triazine, Cyanuramide	**N95**	
			5 mg/m³ (respirable) (AIHAWEEL)		**N95**	
2-Mercaptobenzothiazole		12 mg/m³	**5 mg/m³ -skin- (AIHAWEEL)**	Mercaptobenzothiazole; 2(3H)-Benzothiazolyl mercaptan; Benzothiazole-2-thione	**N95**	
Mercaptoethanol		0.12-0.64	**0.2 -skin- (AIHAWEEL)**	2-Mercaptoethanol, 2ME, 1-Hydroxy-2-mercaptoethane, 2-Hydroxy-1-ethanethiol, 2-Hydroxyethylmercaptan, 2-Thioethanol, Thioethyleneglycol, Thioglycol	**OV**	Poor warning
Mercury (as Hg)						
–Vapor	28 mg/m³		**0.025 mg/m³* -skin-**	Quicksilver, Hg	**Hg**	
–Alkyl compounds	10 mg/m³		**0.01 mg/m³ -skin-**		**SA**	
–Aryl compounds	28 mg/m³		**0.1 mg/m³ (PEL) (ceiling) -skin-**		**N95**	Dust with essentially no vapor pressure only

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
–Inorganic compounds	28 mg/m³		**0.025 mg/m³***		**N95**	Dust with essentially no vapor pressure only. Hg/N95 for volatile liquids.
Mesityl oxide	5000	0.056	**15***	Isobutenyl methyl ketone, Methyl isobutenyl ketone, Isopropylidene acetone	**(F)OV**	3M 3510 Monitor
Methacrylic acid			**20 -skin-**	a-Methacrylic acid	**(F)OV**	Warning unknown
Methane			**1000**	Biogas; Fire damp; Marsh gas; Methylhydride; Natural gas; R 50 (refrigerant)	**SA**	Short OV service life.
Methanethiol				(See Methyl mercaptan)		
2-Methoxyethanol	2000	0.11	**0.1 -skin-**	Ethylene glycol monomethyl ether, Methyl Cellosolve®	**OV**	3M 3510 Monitor
2-Methoxyethyl acetate	4000	1.07	**0.1 -skin-**	Ethylene glycol methyl ether acetate, Ethylene glycol monomethyl ether acetate, Methyl Cellosolve® acetate	**OV**	3M 3510 Monitor
4-Methoxyphenol			**5 mg/m³**	p-Methoxyphenol, Hydroquinone monomethyl ether	**N95**	
3-Methoxypropyl amine		2.7	**5 (AIHAWEEL)**	1-Propanimine, 3-Methoxy	**(F)OV (F)AM**	Irritation also provides warning. AM not specifically approved.
Methyl acetate	10,000	6.17	**200**	Acetic acid, methyl ester; Methyl acetic ester; Methyl ethanoate	**OV**	
Methyl acetylene	15,000		**1000**	Propyne, Allylene	**SA**	Warning unknown. Very short OV service life.
Methyl acetylene propadiene mixture	15,000	100	**1000**	MAPP gas, Methyl acetylene-allene mixture, Propyne-allene mixture	**SA**	Very short OV service life
Methyl acrylate	1000	0.263	**2 -skin-**	Methyl propenoate	**(F)OV**	3M 3510 Monitor
Methylacrylonitrile		6.8	**1 -skin-**	2-Methyl-2-propenenitrile, Isoprene cyanide	**SA**	Poor warning
Methylal	15,000		**1000**	Dimethyoxymethane, Methyl formal, Formal, Dimethylacetal formaldehyde	**SA**	Warning unknown
Methyl alcohol	25,000	141	**200 -skin-**	Methanol, Wood alcohol, Carbinol	**SA**	Very short OV service life
Methylamine	100	0.019	**5***	Monomethylamine	**(F)AM**	
Methyl amyl alcohol	2000	1.1	**25 -skin-**	Methyl isobutyl carbinol	**OV**	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Methyl n-amyl ketone	4000	0.141	**50***	n-Amyl methyl ketone, 2-Heptanone	**OV**	See Comment E, page 8
Methylaniline	100	1.74	**0.5* -skin-**	Monomethyl aniline, MA, N-Methyl aniline	**OV**	Poor warning
Methyl bromide	2000		**1* -skin-**	Bromomethane	**SA(F)**	Short OV service life. Use of 60928 Cartridge/ Filter recommended by 3M; not specifically approved for methyl bromide.
2-Methylbutyl acetate				(See Pentyl acetate)		
Methyl n-butyl ketone	5000	0.166	**5* -skin-**	2-Hexanone, MBK	**OV**	3M 3510 Monitor
Methyl Cellosolve®				(See 2-Methoxyethanol)		
Methyl Cellosolve® acetate				(See 2-Methoxyethyl acetate)		
Methyl chloride	10,000	10.2	**50* -skin-**	Chloromethane	**SA**	Very short OV service life
Methyl chloroform	1000	22.4	**350**	1,1,1-Trichloroethane	**OV**	3M 3510 Monitor
Methyl 2-cyanoacrylate		2.16	**0.2**	Mecrylate	**(F)OV**	Poor warning
Methylcyclohexane	10,000	500-630	**400***	Cyclohexylmethane, Hexahydrotoluene	**OV**	Poor warning
Methylcyclohexanol	10,000	490	**50***	Hexahydrocresols	**OV**	Poor warning
o-Methylcyclohexanone	2500		**50* -skin-**	2-Methylcyclohexanone	**(F)OV**	Irritation also provides warning
2-Methylcyclopentadienyl manganese tricarbonyl (as Mn)			**0.2 mg/m³ -skin-**		**OV/N95**	SA preferable if heat involved
Methylenebisphenyl isocyanate	9.7	0.384	**0.005***	MDI; 4,4'-Diphenylmethane diisocyanate; Methylene-bis-(4-phenyl isocyanate)	**OV/N95**	Poor warning
Methylene chloride	5000	0.912	**25 (PEL)**	Dichloromethane, Methylene dichloride	**SA(F)**	OSHA requires SA(F); no change schedule allowed. Short OV service life. 3M 3530 Monitor.
4,4'-Methylene-bis-(2-chloroaniline)			**0.01 -skin-**	MOCA; DACPM; 4,4'-Methylene -bis-(2-chlorobenzamine)	**OV**	Warning unknown
Methylene-bis-(4-cyclohexylisocyanate)			**0.005**		**OV/N95**	Warning unknown
4,4'-Methylene dianiline			**0.01 (PEL) -skin-**	4,4'-Diaminodiphenylmethane; MDA	**N100**	Warning unknown. Use OV/N100 if heat is involved. See 29 CFR 1910.1050.
Methyl ethyl ketone	3000	0.27	**200**	MEK, 2-Butanone	**(F)OV**	3M 3510 Monitor

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Methyl ethyl ketone peroxide			**0.2 (ceiling)**	MEKP	**(F)OV**	Warning unknown
Methyl ethyl ketoxime			**10 (AIHAWEEL)**	2-Butanone oxime, MEKO	**OV**	Warning unknown
Methyl formate	5000	93.3	**100**	Methyl methanoate, Formic acid, Methyl ester	**SA**	Short OV service life
5-Methyl-3-heptanone				(See Ethyl amyl ketone)		
Methyl hydrazine	50	1.71	**0.01 -skin-**	Monomethyl hydrazine	**SA(F)**	Poor warning. Unknown sorbent effectiveness.
Methyl iodide	800		**2 -skin-**	Iodomethane	**SA(F)**	Warning unknown. Short OV service life.
Methyl isoamyl ketone		0.042	**50***	5-Methyl-2-hexanone, 2-Methyl-5-hexanone, MIAK	**(F)OV**	
Methyl isobutyl carbinol				(See Methyl amyl alcohol)		
Methyl isobutyl ketone	3000	0.121	**50***	MIBK, Hexone	**(F)OV**	3M 3510 Monitor
Methyl isocyanate	20	2.1	**0.02 -skin-**	Isocyanic acid, methyl ester	**SA**	Poor warning. Unknown sorbent effectiveness.
Methyl isopropyl ketone		4.47	**200**	MIPK, 3-Methyl-2-butanone	**(F)OV**	
Methyl mercaptan		0.001	**0.5***	Mercaptomethane; Methanediol; Methyl sulfhydrate; Thiomethyl alcohol	**OV**	Very short OV service life
Methyl methacrylate	4000	0.085	**50**	Methacrylic acid, methyl ester	**OV**	3M 3510 Monitor
1-Methylnaphthalene			**0.5 -skin-**	a-Methylnaphthalene; a-Methyl naphthalene	**OV/R or P95**	
2-Methylnaphthalene			**0.5 -skin-**	B-Methylnaphthalene; B-Methyl naphthalene	**OV/R or P95**	
Methyl propyl ketone	5000	1.55	**150**	MPK, 2-Pentanone, Ethyl acetone	**(F)OV**	3M 3510 Monitor
n-Methyl-2-pyrrolidone			**10 -skin- (AIHAWEEL)**	NMP; 1-Methyl-2-pyrrolidone; m-Pyrol**;** n-Methyl pyrrolidone	**OV**	Warning unknown
Methyl silicate			**1**	Tetramethoxy silane	**(F)OV**	Warning unknown
a-Methyl styrene	5000	0.003	**50**	1-Methyl-1-phenyl-ethylene, AMS	**OV**	See Comment E, page 8. PEL-100 ppm ceiling.
Methyl tert-butyl ether		0.053	**50**	2-Methoxy-2-methyl-propane; tert-Butyl methyl ether; MTBE; 2,2-MMOP	**OV**	3M 3510 Monitor
Methyltrichlorosilane			**1 (ceiling) (AIHAWEEL)**	Trichloromethylsilane	**(F)AG/N95**	Irritation provides warning

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Methyl vinyl ketone		0.2	**0.2 (ceiling) -skin-**	Acetyl ethylene; 3-Buten-2-one; 3-Butene-2-one; Butenone; d(3)-2-Butenone; Methylene acetone; Methyl vinyl acetone; g-Oxo-a-Butylene	**OV**	
Mica (less than 1% quartz)			**3 mg/m³* (respirable)**		**N95**	
Mineral spirits				(See Stoddard solvent)		
Mineral (rock), wool fiber				(See Synthetic vitreous fibers–Glass, Rock or Slag wool fibers)		
Molybdenum (as Mo)						
–Soluble compounds (as respirable particulate)			**0.5 mg/m³**		**N95**	
–Insoluble compounds						
(as inhalable particulate)			**10 mg/m³**		**N95**	
(as respirable particulate)			**3 mg/m³**		**N95**	
Monochloroacetic acid (as inhalable fraction and vapor)		0.045	**0.5 -skin-**	MCAA, Chloroethanoic acid	**(F)OV/N95**	
Monochlorobenzene				(See Chlorobenzene)		
Monomethyl aniline				(See Methyl aniline)		
Monomethyl hydrazine				(See Methyl hydrazine)		
Morpholine	8000	0.036	**20 -skin-**	Tetrahydro-1,4-oxazine; Diethylenimide oxide	**(F)OV**	
Naphtha (coal tar)	10,000		**100 (PEL)**	Naphtha, Crude solvent coal tar naphtha, High solvent naphtha, Rubber solvent	**(F)OV**	Odor variable. Irritation also provides warning.
Naphthalene	500	0.015	**10**	White tar, Naphthalin	**OV**	3M 3510 Monitor. See Comment E, page 8.
Natural rubber latex (as inhalable total proteins)			**0.0001 mg/m³ -skin-**	Caoutchouc; India rubber; Natural latex; Natural rubber; NRL; Polyisoprene; Rubber	**N95**	
Nickel (as Ni)						
–Elemental/metal			**1.5 mg/m³ (inhalable)**		**N95**	
–Insoluble compounds			**0.2 mg/m³ (inhalable)**		**N95**	
–Soluble compounds			**0.1 mg/m³ (inhalable)**		**N95**	
Nickel carbonyl	7	0.5-3.0	**0.001 (PEL)**	Nickel tetracarbonyl	**SA(F)**	0.05 ppm TLV-TWA. Unknown sorbent effectiveness.
Nickel subsulfide			**0.1 mg/m³ (inhalable)**		**N95**	
Nicotine	35 mg/m³		**0.5 mg/m³ -skin-**	3-(1-Methyl-2-pyrrolidyl) pyridine	**OV/P95**	See Comment D, page 7
Nitric acid	100	0.267	**2**	Aqua fortis, White fuming nitric acid (WFNA), Red fuming nitric acid (RFNA), Hydrogen nitrate	**SA(F)**	Ineffective sorbents

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Nitric oxide	100		**25**	Nitrogen monoxide, NO	**SA**	Ineffective sorbents
p-Nitroaniline	300 mg/m³		**3 mg/m³* -skin-**	Azoic diazo component 37, p-Aminonitro-benzene, Fast red GG base, 4-Nitroaniline, PNA	**OV/N95**	See Comment D, page 7
Nitrobenzene	200	0.044	**1 -skin-**	Nitrobenzol, Oil of mirbane	**OV**	
p-Nitrochlorobenzene	344		**0.1* -skin-**	PNCB, PCNB, 4-Chloronitrobenzene, p-Chloronitrobenzene, 1-Chloro-4-nitrobenzene	**OV**	Warning unknown
Nitroethane	1000	2.11	**100**		**(F)OV**	
Nitrogen dioxide	50	0.186	**3**	Nitrogen tetroxide, NTO, Dinitrogen tetroxide, Nitrogen peroxide	**SA**	Ineffective sorbents. PEL-5 ppm ceiling.
Nitrogen trifluoride	2000		**10**	Nitrogen fluoride	**SA**	Warning unknown. Unknown sorbent effectiveness.
Nitroglycerin (NG)	53		**0.05* -skin-**	Glyceryl trinitrate, Trinitroglycerin	**OV**	Warning unknown
Nitromethane	1000	3.5	**20**	Nitrocarbol	**OV**	
1-Nitropropane	2300	7.09	**25**		**OV**	
2-Nitropropane	2300	4.85	**10***	sec-Nitropropane	**OV**	
Nitrotoluene	200	0.017	**2* -skin-**	Nitrotoluol	**OV/N95**	See Comment D, page 7
5-Nitro-o-toluidine (Inhalable particulate matter)			**1 mg/m³**	2-Methyl-5-nitrobenzenamine; 5-Nitro-2-toluidine; Azoic Diazo Compound 12	**OV/R or P95**	
Nitrotrichloromethane				(See Chloropicrin)		
Nitrous oxide			**50**	Dinitrogen monoxide	**SA**	Warning unknown. ineffective sorbents.
Nonane		1.26	**200**	n-Nonane	**OV**	
Octachloronaphthalene			**0.1 mg/m³ -skin-**	Halowax™ 1051	**OV/N95**	See Comment D, page 7
Octane (all isomers)	5000	5.75	**300***	Normal octane; Isooctane	**OV**	3M 3510 Monitor
1-Octanol		0.006	**50 (AIHAWEEL)**	Alcohol C-8, Capryl alcohol, Heptyl carbinol, n-Octanol, 1-Hydroxyoctane, N-Octyl alcohol	**OV**	
1-Octene		2	**75 (AIHAWEEL)**	a-Octylene, a-Octene	**OV**	
Oil mist (mineral)			**5 mg/m³**	White mineral oil, Cutting oil, Heat-treating oil, Hydraulic oil, Cable oil, Lubricating oil	**R or P95**	As sampled by method that does not collect vapor. 0.005 mg/m³ TLV-TWA proposed for oils that contain PNAs.

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Osmium tetroxide (as Os)	0.1	0.002	**0.0002***	Osmic acid	**SA(F)**	Poor warning. Unknown sorbent effectiveness.
Oxalic acid	500 mg/m³		**1 mg/m³**	Oxalic acid dihydrate, Ethane dioic acid	**OV/N95**	See Comment D, page 7
p,p'-Oxybis (Benzene-sulfonyl hydrazide)			**0.1 mg/m³**	Benzenesulfonic acid, 4,4'-Oxybis-dihydrazide; OBSH; Diphenyl ether 4,4'-disulfohydrazide	**N95**	
Oxygen difluoride	0.5	0.098	**0.05 (ceiling)**	Difluorine monoxide, Fluorine monoxide	**SA**	Poor warning. Unknown sorbent effectiveness.
Ozone	10	0.051		Triatomic oxygen		6000 with 2078 or 2097 filters recommended by 3M for 10X OEL. Not NIOSH approved for ozone.
–Heavy work			**0.05**		**OZ**	
–Moderate work			**0.08**		**OZ**	
–Light work			**0.1**		**OZ**	
Paraffin wax fume			**2 mg/m³**		**N95**	
Particulate polycyclic aromatic hydrocarbons (PPAH)				(See Coal tar pitch volatiles)		
Particulates Not Otherwise Regulated				Nuisance particulates	**N95**	This category includes many materials. For oils, and R or P95 filter/ respirator is recommended.
-Total dust			**15 mg/m³**			
-Respirable fraction			**5 mg/m³ (PEL)**			
(PPAH)						
PCBs				(See Chlorodiphenyl)		
Pentaborane	3	0.97	**0.005**	Stable pentaborane, Pentaboron nonahydride	**SA**	Poor warning. Unknown sorbent effectiveness.
Pentachloronaphthalene			**0.5 mg/m³**	Halowax™ 1013	**OV/N95**	See Comment D, page 7
Pentaerythritol			**10 mg/m³***	Tetramethylolmethane	**N95**	
Pentaerythritol triacrylate			**1 mg/m³ (AIHAWEEL)**	PETA; 2-Propenoic acid, 2-(hydroxymethyl)-2-[[(1-oxo-2 propenyl) oxy] methyl]-1,3-propanediylester	**OV/P95**	See Comment D, page 7
1,1,1,2,2-Pentafluoro-ethane			**1000 (AIHAWEEL)**	Pentafluoroethane; HFC-125; Fluorocarbon 125	**SA**	Ineffective sorbents
Pentane, all isomers	15,000	31.6	**600***	Normal pentane	**OV**	
2-Pentanone				(See Methyl propyl ketone)		
1,1,1,3,3-Pentafluoro-propane			**300 (AIHAWEEL)**	HFC-245fa, R-245fa, Genetron 245fa	**SA**	

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Pentyl acetate (all isomers)	3000-9000 (depending on compound)		**50**	Isoamyl acetate, 1-pentanol acetate, 2-pentanol acetate, 3-Pentyl acetate, 2-Methylbutyl acetate, 1,1-Dimethyl-propyl acetate	**OV**	See Comment E, page 8. 3M 3510 Monitor.
Perchloroethylene	500	6.17	**25***	Tetrachloroethylene, Perk	**(F)OV**	
Perchloromethyl mercaptan	10	0.097	**0.1**	PMM, Trichloromethyl sulfur chloride	**OV**	
Perchloryl fluoride	385	11	**3**	Chlorine oxyfluoride	**SA**	Poor warning. Unknown sorbent effectiveness.
Perfluorobutyl ethylene			**100**	1-Hexane, 3,3,4,4,5,5,6,6, 6-nonafluoro; 1H, 1H, 2H-Perflourohexene; PFBE	**OV**	Short OV service life
Perfluoroisobutylene			**0.01 (ceiling)**	Octafluoroisobutylene, Octafluoro-sec-butene, PFIB	**SA**	Warning unknown. Short OV service life.
Persulfates						
-Ammonium			**0.1 mg/m³**		**N95**	
-Potassium			**0.1 mg/m³**		**(F)N95**	
-Sodium			**0.1 mg/m³**		**(F)N95**	
Pesticides				(Call 3M at 1-800-243-4630)		
Petroleum distillates (naphtha)	10,000		**500 (PEL)**	Petroleum naphtha, Aliphatic petroleum naphtha, Petroleum ether (95 to 115°C), Naphtha (See Gasoline, Stoddard solvent and VM&P Naphtha)	**OV**	Odor variable
Phenacyl chloride				(See a-Chloroacetophenone)		
Phenol	250	0.011	**5 -skin-**	Carbolic acid, Monohydroxy benzene	**OV/N95**	
m-Phenylenediamine			**0.1 mg/m³**	1,3-Benzenediamine; m-Diaminobenzene	**OV/N95**	SA preferable if heat involved
o-Phenylenediamine			**0.1 mg/m³**	1,2-Benzenediamine; o-Diaminobenzene; Orthamine	**OV/N95**	SA preferable if heat involved
p-Phenylenediamine			**0.1 mg/m³ -skin-**	p-Diaminobenzene; 1,4-Diamino-benzene	**OV/N95**	SA preferable if heat involved
Phenyl ether, vapor		0.03	**1**	Diphenyl ether, Diphenyl oxide	**OV**	See Comment E, page 8. 3M 3510 Monitor.
Phenyl ether-biphenyl mixture, vapor		0.001-0.01	**1 (PEL)**	Dowtherm™ A, Diphenyl oxide-diphenyl mixture	**OV**	See Comment E, page 8
Phenylethylene				(See Stryrene)		
Phenyl glycidyl ether			**0.1* -skin-**	Glycidyl phenyl ether; Phenyl epoxypropyl ether; 1,2-Epoxy-3-phenoxy propane; PGE	**OV**	Warning unknown
Phenylhydrazine	295		**0.1* -skin-**	Hydrazinobenzene	**(F)OV**	Warning unknown
Phenyl mercaptan		0.00094	**0.1 -skin-**	Benzenethiol, Thiophenol	**OV**	

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Phenylphosphine			**0.05 (ceiling)**		**OV**	Warning unknown
Phosgene	2	0.55	**0.1**	Carbonyl chloride, Carbon oxychloride, Chloroformyl chloride	**MG**	Poor warning
Phosphine	200	0.14	**0.3**	Hydrogen phosphide, Phosphorus hydride, Phosphorated hydrogen	**SA**	Unknown sorbent effectiveness. Fumigant.
Phosphoric acid	10,000 mg/m³		**1 mg/m³**	White phosphoric acid, o-phosphoric acid, m-phosporic acid	**(F)N95**	N95 with appropriate eye and face protection also acceptable
2-Phosphono-1,2,4-butanetricarboxylic acid			**10**	PBTC	**N95**	
Phosphorus (yellow)			**0.1 mg/m³**	White phosphorus, WP	**SA**	If no phosphorus vapor or phosphine gas present, N95
Phosphorus oxychloride			**0.1**	Phosphoryl chloride	**(F)AG**	Warning unknown
Phosphorus pentachloride	200 mg/m³		**0.1***	Phosphoric chloride	**AG**	Warning unknown
Phosphorus pentasulfide	750 mg/m³		**1 mg/m³**	Phosphoric sulfide	**N95**	
Phosphorus trichloride	50		**0.2**	Phosphorus chloride	**(F)AG**	Warning unknown
Phthalic anhydride	1650	0.052	**1***	PAN; 1,3-Isobenzofurandione	**OV/N95**	
m-Phthalodinitrile			**5 mg/m³**	Isophthalodinitrile, IPN, m-Dicyanobenzene	**N95**	
2-Picoline		0.003	**2 -skin- (AIHAWEEL)**	a-Picoline, 2-Methyl-pyridine	**OV**	
3-Picoline			**2 -skin- (AIHAWEEL)**	b-Picoline, 3-Methyl-pyridine	**OV**	Warning unknown
4-Picoline			**2 -skin- (AIHAWEEL)**	g-Picoline, 4-Methyl-pyridine	**OV**	Warning unknown
Picric acid		0.0005 mg/m³	**0.1 mg/m³ -skin-**	2,4,6-Trinitrophenol, Lyddite, Pertite, Shimose, Melinite	**N95**	
Piperazine dihydrochloride			**5 mg/m³**	Dihydrochloride salt of diethylenediamine	**N95**	
Piperidine		0.372	**1 (AIHAWEEL)**	Hexahydropyridine	**(F)OV**	
Plaster of Paris				(See Calcium sulfate)		
Platinum (as Pt)						
–Metal			**1 mg/m³**		**N95**	
–Soluble salts			**0.002 mg/m³**		**(F)N95**	
Polychlorinated biphenyls				(See Chlorodiphenyls)		
Polyethylene glycols			**10 mg/m³ (AIHAWEEL)**	PEG, Polyoxyethylene, PGE	**R or P95**	See Comment G, page 9

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Polypropylene glycols			**10 mg/m³ (AIHAWEEL)**	PPG	**R or P95**	See Comment G, page 9
Polyvinyl chloride			**1 mg/m³**	Cloroethylene homopolymer, Cloroethylene polymer, Cloroethene polymer, Polychloroethylene, Vinyl Chloride homoploymer, Vinyl chloride polymer, PVC	**N95**	
Portland cement (less than 1% quartz)			**10 mg/m³***	Hydraulic cement, Cement, Portland cement silicate	**N95**	
Potassium bromate			**0.1 mg/m³ (AIHAWEEL)**	Bromic acid, Potassium salt	**N95**	
Potassium hydroxide			**2 mg/m³ (ceiling)**	Caustic potash, Lye, Potassium hydrate	**N95**	
Propane		2690	**1,000**	Dimethyl methane n-Propane; Propane, various grades	**SA**	Ineffective sorbents
n-Propanol	4,000	2.6	**100 -skin-**	Alcohol, n-Propyl alcohol, 1-Propanol, Ethylcarbinol	**F(OV)**	See comment E, page 8
2-Propanol	12,000	0.44	**200 -skin-**	Isopropanol, IPA, Isopropyl alcohol, sec-Propyl alcohol	**F(OV)**	Irritation also provides warning. 3M 3530 Monitor
Propargyl alcohol		0.015	**1 -skin-**	2-Propyn-1-ol	**OV**	
Propargyl bromide		<2	**0.1 -skin- (AIHAWEEL)**	Bromopropyne; Propyne, 3-bromo; 1-Bromo-2-propyne; 3-Bromopropyne, gamma-Bromoallylene	**OV**	Questionable warning properties
2-Propenoic Acid, Isooctyl ester		<1	**5 (AIHAWEEL)**	Isooctyl acrylate; IOA	**OV**	
B-Propiolactone			**0.5**	Hydroacrylic acid, beta-lactone; 3-Hydroxypropionic acid; Propiolactone; 3-Hydroxy-beta-lactone; beta-Proprolactone; BPL	**(F)OV**	Warning unknown
Propionaldehyde		0.145	**20**	1-Propanal, Methylacetaldehyde, Propylaldehyde	**SA**	Very short OV service life.
Propionic acid		0.037	**10**	Methylacetic acid, Ethylformic acid	**(F)OV**	
n-Propyl acetate	8000	0.575	**200**	Propylacetate; Acetic acid, n-propyl ester	**(F)OV**	3M 3510 Monitor
Propylene		17	**500**	Propene, Methylethene, Methylethylene, 1-Propane, 1-Propylene	**SA**	
Propylene dichloride	2000	0.851	**10**	1,2-Dichloropropane	**OV**	3M 3510 Monitor
Propylene glycol –Vapor and aerosol			**50 (AIHAWEEL)**	1,2-Propanediol; 1,2-Dihydroxy-propane; Methyl glycol	**OV/P95**	See Comment G, page 9
–Aerosol only			**10 mg/m³ (AIHAWEEL)**		**R or P95**	See Comment G, page 9
Propylene glycol dinitrate		0.231	**0.05 -skin-**	1,2-Propylene glycol dinitrate; 1,2-Propanediol dinitrate	**(F)OV**	Poor warning

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Propylene glycol monomethyl ether		0.003	**100**	1-Methoxy-2-propanol	**OV**	3M 3510 Monitor
Propylene glycol monomethyl ether acetate			**50 (AIHAWEEL)**	Glycol ether PM acetate; PGMEA; 1-Methyoxy-2-propanol acetate; 2-Methoxy-1-methylethyl acetate; 1-Methoxy-2-acetoxypropane	**OV**	Warning unknown. 3M 3510 Monitor.
Propylene imine	500		**2* -skin-**	2-Methylaziridine	**(F)OV**	Warning unknown
Propylene oxide	2000	33.1	**2**	1,2-Epoxypropane; Propene oxide; Methyloxirane; 2,3-Epoxypropane; 1,2-Propylene oxide	**OV**	Poor warning. 3M 3550 Monitor.
n-Propyl nitrate	2000	50	**25**	Nitric acid n-propylester	**OV**	Poor warning
Propyne				(See Methyl acetylene)		
Pyridine		0.17	**1**	Azabenzene, Azine	**OV**	
Pyrocatechol				(See Catechol)		
Quartz				(See Silica, crystalline)		
Quinoline		0.015	**0.001 (AIHAWEEL)**	Chinoline, Leukoline, 1-Benzazine, 1-Azana-phthalene, Lencol	**(F)OV**	
Quinone	66	0.012	**0.1**	p-Benzoquinone	**(F)OV/N95**	
RDX				(See Cyclonite)		
Resorcinol			**10**	m-Dihydroxybenzene; 1,3-Benzenediol	**N95**	OV/N95 may be preferable if heat is involved
Rhodium (as Rh)						
–Metal			**0.1 mg/m³ (PEL)**		**N95**	
–Insoluble compounds			**0.1 mg/m³ (PEL)**		**N95**	
–Soluble compounds			**0.001 mg/m³ (PEL)**		**N95**	
Rubber solvent				(See Naphtha [coal tar])		
Selenium and compounds (as Se)			**0.2 mg/m³**		**N95**	
Selenium hexafluoride	5		**0.05**		**SA**	Warning unknown. Unknown sorbent effectiveness.
Silane				(See Silicon tetrahydride)		
Silica, amorphous						
–Diatomateous earth			**0.80 mg/m³ (PEL)**	Diatomite, Silicon dioxide	**N95**	Assuming 100% SiO_2 (80 mg/m³ divided by %SiO_2)
Silica, crystalline						
–Cristobalite			**0.025 mg/m³ (respirable)**		**N95**	
–Quartz			**0.025 mg/m³* (respirable)**		**N95**	
–Tripoli			**0.1 mg/m³ (respirable)**		**N95**	

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Silicon					**N95**	
-Total dust			**15 mg/m³ (PEL)**			
-Respirable fraction			**5 mg/m³ (PEL)**			
Silicon carbide					**N95**	
- Nonfibrous particles (containing no asbestos and <1% cystalline silica)						
Inhalable particulate mass			**10 mg/m³**		**N95**	
Respirable particulate mass			**3 mg/m³**		**N95**	
- Fibrous forms (including whiskers)						
Respirable fibers			**0.1 f/cc**		**N95**	
Silicon tetrahydride			**5**	Silane	**SA**	Warning unknown
Silver, metal and soluble compounds (as Ag)			**0.01 mg/m³ (PEL)**		**N95**	
Soapstone			**3 mg/m³ (respirable)**	Massive talc, Steatite, Soapstone silicate	**N95**	
Sodium azide				Hydrazoic acid		
–as Sodium azide			**0.29 mg/m³ (ceiling)**		**N95**	
–as Hydrazoic acid vapor			**0.11 (ceiling)**		**SA**	Warning unknown. Unknown sorbent effectiveness.
Sodium bisulfite			**5 mg/m³**	Sodium hydrogen sulfite	**AG/N95**	N95 alone suitable if irritation eliminated
Sodium chloroacetate			**2.5 mg/m³ (AIHAWEEL)**	Monoxone, Sodium monofluoroacetate, Chloroacetic acid, Sodium salt	**N95**	
Sodium fluoroacetate	5 mg/m³		**0.05 mg/m³ -skin-**	1080, Sodium monofluoroacetate, SFA	**N95**	
Sodium hydroxide	250 mg/m³		**2 mg/m³ (ceiling)**	Caustic soda, Soda lye, Lye	**N95**	
Sodium hypochlorite			**2 mg/m³ (AIHAWEEL)**	Hypochlorous acid, sodium salt; Sodium oxychloride	**N95**	15 minute TWA
Sodium metabisulfite			**5 mg/m³**	Sodium pyrosulfite	**AG/N95**	N95 alone suitable if irritation eliminated
Starch			**10 mg/m³***	Corn starch	**N95**	
Stearates			**10 mg/m³**	Aluminum stearate, Calcium stearate, Glyceryl stearate, Lithium stearate, Potassium stearate, Zinc stearate	**N95**	
Stibine	40		**0.1**	Hydrogen antimonide, Antimony trihydride	**SA**	Warning unknown. Unknown sorbent effectiveness.
Stoddard solvent	5150	1-30	**100***	Dry cleaning safety solvent, Mineral spirits	**OV**	3M 3510 Monitor
Strontium chromate (as Cr)			**0.0005 mg/m³**	Strontium yellow, C.I. pigment yellow 32	**N95**	

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Strychnine	3 mg/m³		**0.15 mg/m³**		**N95**	
Styrene	5000	3.44	**20***	Phenylethylene, Vinyl benzene, Cinnamene, Styrene monomer	**OV**	3M 3510 Monitor
Subtilisins			**0.00006 mg/m³ (ceiling)**	Proteolytic enzymes as 100% crystalline enzyme	**SA**	Difficult to measure 10X OEL. N95 acceptable with suitable air sampling data.
Sucrose			**10 mg/m³***	Table sugar, Saccharose	**N95**	
Sulfur dioxide	100	0.708	**2***	SO_2	**AG**	Irritation and taste also provide warning
Sulfur hexafluoride			**1000**	SF_6	**SA**	Warning unknown. Unknown sorbent effectiveness.
Sulfuric acid (Thoracic particulate mass)			**0.2 mg/m³**	Hydrogen sulfate; Matting acid; Oil of vitriol; Sulphuric acid; Vitriol brown oil	**(F)N95**	N95 with appropriate eye protection acceptable if irritation prevented
Sulfur monochloride	10	0.001	**1 (ceiling)**	Sulfur chloride, Sulfur subchloride	**(F)AG**	
Sulfur pentafluoride	1		**0.01 (ceiling)**	Disulfur decafluoride	**AG**	Warning unknown
Sulfur tetrafluoride			**0.1 (ceiling)**		**AG**	Warning unknown
Sulfuryl fluoride	1000		**5**		**SA**	Warning unknown. Unknown sorbent effectiveness.
Synthetic vitreous fibers						
–Continuous filament glass fibers			**1 f/cc**		**N95**	
–Glass wool fibers			**1 f/cc**		**N95**	
–Refractory ceramic fibers			**0.2 f/cc**		**N95**	
–Rock wool fibers			**1 f/cc**		**N95**	
–Slag wool fibers			**1 f/cc**		**N95**	
–Special purpose glass fibers			**1 f/cc**		**N95**	
Talc (containing no asbestos)			**2 mg/m³* (respirable)**	Hydrous magnesium silicate, Steatite talc, Non-fibrous talc, Non-asbestiform talc	**N95**	
Talc (containing asbestos)				(See Asbestos)		
Tantalum, metal and oxide dusts (as Ta)			**5 mg/m³**		**N95**	
Tellurium and compounds (as Te)			**0.1 mg/m³**		**N95**	
Tellurium hexafluoride (as Te)	1		**0.02**		**SA**	Warning unknown. Unknown sorbent effectiveness.

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Terephthalic acid			**10 mg/m³**	p-Phthalic acid; TPA; Benzene-p-dicarboxylic acid; 1,4 Benzenedicarboxylic acids, Tephthol	**N95**	
Terphenyls			**0.5* (ceiling)**	o-Terphenyl, m-Terphenyl, p-Terphenyl, Mixed terphenyls, Diphenyl benzenes	**N95**	OV/N95 may be preferable if heat involved
1,1,2,2-Tetrabromoethane (as inhalable fraction and vapor)		1	**0.1**	Acetylene tetrabromide, Muthmann's liquid, Tetrabromoethane, Tetrabromoethylene	**OV**	
1,1,1,2-Tetrachloro-2,2-difluoroethane	15,000		**100**	Refrigerant 112a; Halocarbon 112a; 2,2-Difluoro-1, 1,1,2-tetrachloroethane; Freon® 112a	**OV**	Warning unknown
1,1,2,2-Tetrachloro-1,2-difluoroethane	15,000		**50**	Refrigerant 112, Halocarbon 112, Freon® 112	**OV**	Warning unknown
1,1,2,2-Tetrachloro-ethane	150	0.21	**1* -skin-**	Acetylene tetrachloride	**OV**	3M 3510 Monitor
Tetrachloroethylene				(See Perchloroethylene)		
Tetrachloromethane				(See Carbon tetrachloride)		
Tetrachloronaphthalene			**2 mg/m³**	Halowax™, Seekay wax, Nibren wax	**OV/N95**	See Comment D, page 7
2,3,5,6-Tetrachloropyridine			**5 mg/m³ (AIHAWEEL)**	Pyridine, 2,3,5,6-tetrachloro	**OV/N95**	See Coment D, page 7
Tetrachlorosilane			**1 (ceiling) (AIHAWEEL)**	Silicon tetrachloride, Silicon chloride	**AG/N95**	Warning unknown. Reacts rapidly with moisture yielding HCl and silica.
Tetraethylene glycol diacrylate			**1 mg/m³ (AIHAWEEL)**	TTEGDA; 2-Propionic acid, oxy-bis-(2,1-ethane-diyoxy-2,1-ethanediol) ester	**OV/P95**	See Comment D, page 7
Tetraethylene pentamine (aerosol)			**5 mg/m³ -skin- (AIHAWEEL)**	1,2-Ethandiamine, N-(2-aminoethyl) -N'-(2-((2-amino)ethyl); Tetran 1,4,7, 10,13-Pentaazatridecane; DEH 26; TEPA; Tetraethyl pentamine	**F(OV)**	
Tetraethyl lead (as Pb)	40 mg/m³		**0.075 mg/m³ (PEL) -skin-**	TEL, Lead tetraethyl, Motor fuel anti-knock compound	**OV**	Warning unknown
1,1,1,2-Tetrafluoroethane			**1000 (AIHAWEEL)**	Tetrafluoroethane, HFC134a, HFA134a, Fluorocarbon 134a	**SA**	Ineffective sorbents
Tetrafluoroethylene			**2**	Perfluoroethene; Perfluoroethylene; TFE Tetrafluoroethene; 1,1,2,2-Tetrafluoroethylene	**SA**	
Tetrahydrofuran		3.8	**50 -skin-**	Diethylene oxide, Tetramethylene oxide, THF	**OV**	3M 3510 Monitor
Tetrahydrofurfuryl alcohol			**0.05 (AIHAWEEL)**	Tetrahydro-2-furanmethanol; Tetrahydro-2-furancarbinol; Tetrahydro-2 furylmethanol; THFA	**OV**	Warning unknown

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Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Tetrakis (hydroxymethyl) phosphonium chloride			**2mg/m³**	Proban CC; Pyroset TKC; Retardol C; THPC; Tetrahydroxymethyl phosphonium chloride	**N95**	
Tetrakis (hydroxymethyl) phosphonium sulfate			**2mg/m³**	Octakis (hydroxymethyl) phosphonium sulfate; Pyroset TKO; Retardol S; THPS; bis tetrakis-(hydroxymethyl) phosphonium sulfate	**N95**	
Tetramethyl lead (as Pb)	40 mg/m³		**0.075 mg/m³ (PEL) -skin-**	TML, Lead tetramethyl, Motor fuel anti-knock compound	**OV**	Warning unknown
Tetramethyl succinonitrile, vapor	5		**0.5 -skin-**	TMSN	**OV**	Warning unknown
Tetranitromethane	5		**0.005***	Tetan	**OV**	Warning unknown
Tetryl			**1.5 mg/m³**	2,4,6-Trinitrophenyl-methylnitramine; N-Methyl-N-2,4,6-tetranitroaniline; Nitramine; Tetralite	**N95**	
Thallium –Elemental and soluble compounds (as Tl)	20 mg/m³		**0.1 mg/m³ -skin-**	Thallium acetate, Thallium carbonate, Thallium hydroxide, etc.	**N95**	
4,4'-Thiobis(6-tert-butyl-m-cresol)			**10 mg/m³***	4,4'-Thiobis(3-methyl-6-tert-butyl phenol)	**N95**	
Thioglycolic acid			**1 -skin-**	Mercaptoacetic acid, Thioranic acid	**(F)OV**	Warning unknown
Thionyl chloride			**1 (ceiling)**	Sulfurous oxychloride, Sulfur oxychloride	**(F)AG**	Warning unknown
Thiram (inhalable fraction and vapor)			**0.05 mg/m³**	TMT, TMTD,TMTDS, Tetramethylthioram disulfide	**OV/N95**	
Tin (as Sn)						
–Metal and inorganic compounds (except SnH_4)	400 mg/m³		**2 mg/m³**		**N95**	
–Organic compounds			**0.1 mg/m³ -skin-**		**OV/N95**	See Comment D, page 7
Titanium dioxide			**10 mg/m³***	Rutile, Anatase, Brookite	**N95**	
Titanium tetrachloride			**0.5 mg/m³ (AIHAWEEL)**	Titanium chloride	**AG/N95**	
Toluene	2000	0.16	**20* -skin-**	Aantisal 1a; Methacide; Methylbenzol; Methyl benzene; Monomethyl benzene; Tol, Tolu-sol; Toluol; Phenyl methane; Methyl benzene	**OV**	3M 3510 Monitor

* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Toluene diamine			**0.005 -skin- (AIHAWEEL)**	Diaminotoluene; TDA; Tolyenediamine	**N95**	
Toluene-2,4 or 2,6-diisocyanate (or as a mixture)		0.17	**0.005***	2,4 or 2,6-Toluene diisocyanate 2,4- or 2,6-TDI	**OV/N95**	Poor warning
p-Toluenesulfonyl chloride			**5 mg/m³ (ceiling) (AIHAWEEL)**	4-Methyl-benzenesulfonyl chloride, Tosyl chloride	**(F)OV/AG/N95**	See Comment D, page 7. HCl and p-toluene sulfuric acid produced by hydrololysis.
m-Toluidine		0.46-5.9	**2 -skin-**	m-Aminotoluene	**(F)OV**	Questionable warning
o-Toluidine	100	0.025-6.6	**2* -skin-**	o-Aminotoluene; o-Methylaniline; 1-Methyl-1,2-amino-benzene; 2-Methylaniline	**(F)OV**	Questionable warning
p-Toluidine		0.027-3.2	**2 -skin-**	p-Aminotoluene	**(F)OV**	Questionable warning
Tributyl phosphate	125		**0.2***	Tri-n-butyl phosphate, TBP	**OV/P95**	
Trichloroacetic acid		0.295	**1**	TCA	**OV/AG**	Irritation also provides warning
1,2,4-Trichlorobenzene		2.91	**5 (ceiling)**		**OV**	
1,1,1-Trichloroethane				(See Methyl chloroform)		
1,1,2-Trichloroethane	500		**10 -skin-**	Vinyl trichloride, b-Trichloroethane	**(F)OV**	Warning unknown. 3M 3510 Monitor.
Trichloroethylene	1000	1.36	**10**	1-Chloro-2,2-dichloroethylene Ethylene trichloride, Triclene™, TCE, 1,1,2-TCE	**OV**	3M 3510 Monitor
Trichlorofluoromethane	10,000	16.3	**1000 (ceiling)**	FC-11, Freon® 11, Fluorotrichloromethane, Trichloromonofluoromethane	**SA**	Short OV service life
Trichloronaphthalene			**5 mg/m³ -skin-**	Halowax™, Seekay wax, Nibren wax	**OV/N95**	See Comment D, page 7
Trichloronitromethane				(See Chloropicrin)		
1,2,3-Trichloropropane	1000	100	**10* -skin-**	Allyl trichloride, Glycerol trichlorohydrin, Glycerin trichlorohydrin, Trichlorohydrin	**(F)OV**	Poor warning
Trichlorosilane			**0.5 (ceiling)**	Silicochloroform	**(F)AG**	Warning unknown
1,1,2-Trichloro-1,2,2-trifluoroethane	4500	487	**1000**	Halocarbon 113, Refrigerant 113, TTE, Freon® 113, FC-113	**SA**	Short OV service life. 3M 3530 Monitor.

* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Tridymite				(See Silica, crystalline)		
Triethanolamine			**5 mg/m³**	Daltogen; 2,2',2"-Nitrilo-triethanol; Sterolamide; TEA; Trihydroxytriethylamine	**OV/P95**	Warning unknown. See Comment D, page 7.
Triethoxysilane			**0.05 (AIHAWEEL)**	Silane, triethoxy	**SA(F)**	Unknown sorbent effectiveness
Triethylamine		0.001	**1 (AIHAWEEL)**	N-Trimethylamine; N, N-Dimethylmethanamine; TMA	**F(OV)**	AIHA WEEL is lower than TLV of 5 ppm. AM suggested, not specifically approved
Triethylene glycol diacrylate			**1 mg/m³ (AIHAWEEL)**	TREGDA; 2-Propenoic acid, 2-ethanediyl-bis-(oxy-2,1-ethanediyl) ester	**OV/P95**	
Triethylenetetramine			**1 -skin-**	N,N'-bis(2-aminoethyl)-1,2,ethane diamine; 1,4,7,10-Tetraazadecane; 1,8-diamino-3,6-diazaoctane; 3,6-diazaoctane-1,8-diamine; Trientine; TETA; TECZA	**OV**	See Comment E, page 8. R or P filter, if filter is required.
Trifluorobromomethane	50,000	16.3	**1000**	Halon™ 1301, Halocarbon 13B1, Refrigerant 13B1, Bromotrifluoromethane, Freon® 13B1	**SA**	Short OV service life
1,1,1-Trifluoro-2,2-dichloroethane			**50**	HCFC-123; FC-123; Hydrofluorocarbon 123	**SA**	Short OV service life
1,1,1-Trifluoroethane			**1000 (AIHAWEEL)**	HFC-143a; FC-143a; Hydrofluorocarbon 143a	**SA**	Ineffective sorbents
2,2,2-Trifluoroethanol			**0.3 (AIHAWEEL)**	Ethanol, 2,2,2-Trifluoro; 2,2,2-Trifluoroethyl alcohol; TFE	**SA**	Warning unknown. Ineffective sorbent.
1,3,5-Triglycidyl-s-triazinetrione			**0.05 mg/m³**	Araldite PT-810; TEPIC; 1,3,5-Triazine-2,4,6-(1H,3H,5H)-trione	**N95**	
Trimellitic anhydride			**0.0005 mg/m³ (ceiling)**	TMA , TMAN, Anhydrotrimellitic acid, Trimellitic acid anhydride	**OV/N95**	Chemical manufacturer's recommendation. See Comment D, page 7.
Trimethoxysilane			**0.05 (AIHAWEEL)**		**(F)OV**	Warning unknown
Trimethylamine		0.001	**1 (AIHAWEEL)**	N-Trimethylamine; N,N-Dimethylmethanamine; TMA	**(F)AM**	AIHAWEEL is lower than TLV of 5 ppm. AM not specifically approved.
Trimethyl benzene		2.4	**25**	Mesitylene, Pseudocumene, Hemimellitene	**OV**	3M 3510 Monitor
Trimethylchlorosilane			**5 (ceiling) (AIHAWEEL)**	Chlorotrimethylsilane; trimethylchloro silicane; monochlorotrimethylsilicon	**(F)OV/AG**	

* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Trimethyl phosphite		0.001	**2**	Phosphorus acid trimethylester, Methyl phosphite	**(F)OV**	
Trimethylolpropane triacrylate			**1 mg/m³ (AIHAWEEL)**	2-Propenoic acid, 2-ethyl-2(((1-oxo-2-propenyl) oxy) methyl)-1,3-propanediyl ester	**OV/P95**	
Trimethylolpropane trimethacrylate			**1 mg/m³ (AIHAWEEL)**	Acrylic acid, triester w/2-ethyl 2 (hydroxymethyl) 1,3 propanediol	**OV/P95**	
2,4,6-Trinitrophenol				(See Picric acid)		
2,4,6-Trinitrotoluene (TNT)	1000 mg/m³		**0.1 mg/m³* -skin-**	TNT, Trinitrotoluol, Trinitrotoluene, sym-Trinitrotoluene	**OV/N95**	See Comment D, page 7
Triorthocresyl phosphate	40 mg/m³		**0.1 mg/m³ -skin-**	o-Tritolyl phosphate, TCP, TOCP tricresylphosphate	**R or P95**	
Triphenyl amine			**5 mg/m³**		**N95**	
Triphenyl phosphate	1000 mg/m³		**3 mg/m³**	Phenyl phosphate, TPP	**N95**	OV/N95 preferable if heat involved
Tripoli				(See Silica, crystalline)		
Trisodium phosphate			**5 mg/m³ (AIHAWEEL)**	TSP, Sodium o-phosphate	**(F)N95**	N95 acceptable with appropriate eye/face protection. 15 min TWA.
Tungsten (as W)						
–Insoluble compounds			**5 mg/m³**		**N95**	
–Soluble compounds			**1 mg/m³**		**N95**	
Turpentine (wood)	1500	100-200	**20**	Gumspirits, Turps, Wood turpentine, Gum turpentine	**(F)OV**	See Comment E, page 8
Uranium (as U)						
–Insoluble compounds	30 mg/m³		**0.05 mg/m³ (PEL)**		**N95**	See 10 CFR 20 Subpart H
–Soluble compounds	20 mg/m³		**0.05 mg/m³ (PEL)**		**AG/N95**	Halides
					N95	Other
Urea			**10 mg/m³ (AIHAWEEL)**	Carbamide, Carbonyldiamide, Carbonyldiamine, isourea	**N95**	AM/N95 may be preferable if heat is involved
n-Valeraldehyde		0.006	**50**	Pentanal, Valeric aldehyde	**(F)OV**	
Vanadium pentoxide, respirable dust or fume (as V_2O_5)	70 mg/m³		**0.05 mg/m³* (respirable)**	Vanadic anhydride, Vanadium oxide	**N95**	
Vegetable oil, mists					**R or P95**	
-Total dust			**15 mg/m³ (PEL)**			
-Respirable fraction			**5 mg/m³ (PEL)**			
Vinyl acetate		0.603	**10**	1-Acetoxyethylene, Ethenyl acetate	**(F)OV**	3M 3510 Monitor
Vinyl benzene				(See Styrene)		

* TLV is lower than PEL.

NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
Vinyl bromide			**0.5**	Bromoethylene	**SA(F)**	Warning unknown. Short OV service life.
Vinyl chloride		0.253	**1 (PEL)**	Chloroethylene, Chloroethene, Monochloroethylene, VC, Vinyl chloride monomer, VCM	**SA**	OSHA allows OV for very short use periods. See 29 CFR 1910.1017.
Vinyl cyanide				(See Acrylonitrile)		
4-Vinylcyclohexene			**0.1**	4-Vinyl-1-cyclohexene; 4-Vinylcyclohexene-1-butadiene dimer; 4-Ethenyl-1-1-cyclohexene; 1-Vinylcyclohexene-3,4-vinyl-cyclohex-1-ene; VCH	**OV**	Warning unknown
Vinyl cyclohexene dioxide			**0.1 -skin-**	Vinylcyclohexane dioxide, Vinylhexane dioxide	**(F)OV**	Warning unknown
Vinyl fluoride			**1**	Fluoroethene, Fluoroethylene, Monofluoroethylene	**SA**	Warning unknown. Short service life.
Vinylidene chloride		35.5	**1 (PEL)**	1,1-Dichloroethylene; VDC	**OV**	Poor warning
Vinylidene fluoride			**500**	1,1-Difluoroethene; 1,1-Difluoro-ethylene; Ethene, 1,1-difluoro; Ethylene, 1,1-difluoro; Halocarbon 1132A; VDF; Vinylidene difluoride	**SA**	Warning unknown. Ineffective sorbents.
N-Vinyl-2-pyrrolidone			**0.05**	1-Ethenyl-2-pyrrolidinone; Vinylbutyrlactam; Vinylpyrrolidinone; 1-Vinylpyrrolidinone; N-Vinylpyrrolidinone; Vinylpyrrolidone	**OV**	
Vinyl toluene	5000	10	**50***	Methylstyrene, Tolyethylene	**(F)OV**	See Comment E, page 8. 3M 3510 Monitor.
Vinyltrichlorosilane			**1 (ceiling) (AIHAWEEL)**	Trichlorovinylsilane; Trichlorovinyl silicon; Vinylsilicon trichloride; Silane trichlorovinyl; Silane trichloroethenyl; trichlorovinyl silicane	**OV/AG**	
VM & P Naphtha		1-40	**300**	Varnish Makers' & Painters' Naphtha, Ligroin	**(F)OV**	3M 3510 Monitor
Wood, dust **(All varieties except Western Red Cedar)** **(Western Red Cedar)**			**1 mg/m³*** **0.5 mg/m³***		**N95** **N95**	
Xylene (o-, m-, and p-isomers)	1000	0.851 0.324 0.49	**100**	1,2-Dimethyl-benzene; 1,3-Dimethyl-benzene; 1,4-Dimethyl-benzene	**OV**	3M 3510 Monitor

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NOTE: For explanation of column headings, refer to Format Explanation starting on page 3.

Chemical Name	IDLH (PPM)	Odor Threshold (PPM)	OEL (PPM)	Synonyms	Respirator Recommended (to 10X OEL)	Comments
m-Xylene a,a'-diamine			**0.1 mg/m³ (ceiling) -skin-**	MXDA	**OV/N95**	See Comment D, page 7
Xylidine (as inhalable aerosol and vapor)	150	0.005-0.06	**0.5* -skin-**	Aminodiymethyl benzene, Aminoxylene dimethylaniline, Dimethylaminobenzene	**OV/N95**	
Yttrium, metal and compounds (as Y)			**1 mg/m³**	Specific compound	**N95**	
Zinc chloride, fume	4800 mg/m³		**1 mg/m³**		**N95**	
Zinc chromate (as Cr)			**0.01 mg/m³***	Basic zinc chromate, Zinc potassium chromate, Zinc yellow	**N95**	
Zinc oxide (Respirable particulate mass)			**2 mg/m³**	Zincite, Zinc white	**N95**	
Zinc stearate			**10 mg/m³***	Synpro stearate, Zinc distearate, Dermarone	**N95**	
Zirconium and compounds (as Zr)	500 mg/m³		**5 mg/m³**		**N95**	

* TLV is lower than PEL.

3M™ Health and Safety Software Library

3M offers the only software library that helps you choose the right respirator and comply with respiratory protection and hearing conservation regulations.

3M™ Select Software©
- Helps you select the most appropriate respirator for the job.
- Just point and click to select the appropriate respirator.
- You'll know which respirator to use in a variety of different environments.
- Analyze combinations of over 600 different contaminants in varying concentrations.

3M™ Respirator Compliance Software
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- Eliminates the guesswork. Helps you develop a complete respiratory protection program that complies with the latest regulations.
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3M™ Hearing Compliance Software
- Helps you develop and manage your hearing conservation program.
- Helps you develop a customized program manual.
- Organizes record keeping.
- Provides extensive reporting capability.
- Integrates with 3M™ Respirator Compliance Software.

PC System Requirements:
Computer: Minimum 486 IBM PC or fully compatible, CD-ROM drive required to install software on hard drive. VGA graphics or compatible adapter. 15 MB required on hard drive for each program.

Operating System: Windows® 3.1, Windows® 98, Windows® NT®, Windows® XP or Windows® for Workgroups.

Memory: 16 MB RAM memory and a minimum of an additional 16 MB virtual memory.

3M™ Service Life Software

3M's Service Life Software helps calculate end of service life for 3M organic vapor respirator cartridges based on workplace conditions such as contaminant concentration, temperature, work rate and atmospheric pressure.

3M™ Service Life Software can be accessed at the 3M web site: **www.3M.com/OccSafety.**

3M™ Select Software©

3M Select Software© helps you choose the proper respirator for different hazardous environments.

3M Select Software©	
Features	**Benefits**
Simple to use	Just point and click, then follow the prompts to select an appropriate respirator. Interactive user's manual is on-line.
Accurate	Knowing the contaminants and their concentrations, the program leads you to an appropriate respirator recommendation.
Explains the solution	Helps you understand the selection process.
Combines contaminant reference information from a variety of resources	Includes IDLH, exposure limit, odor threshold, molecular weight and more. No need to acquire and wrestle with a pile of documents. Saves time.
Uses health hazard data to calculate proper solutions when multiple contaminants are present	Analyzes combinations of over 600 different contaminants in varying concentrations.
Traceable audit reports	OSHA requires an audit trail. View or print the audit trail based on the contaminants and concentrations you've selected.

Data for this guide compiled
December 2008.

Always refer to latest TLV Guide and OSHA standards
for possible changes and rulings.

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• Technical Assistance 1-800-243-4630
• Internet **www.3M.com/OccSafety**

To sign up to receive the updated 2010 Respirator Selection Guide, visit www.3M.com/RespGuide.

Occupational Health and
Environmental Safety Division
3M Center, Building 235-2W-70
St. Paul, MN 55144-1000

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Respirator Codes and Descriptions

ERNEST D. MENOLD, INC.
General Sheet Metal Contractor

Respirator Qualitative Fit Test Report

Employee Name: _____

Fit Test Method: Saccharin _____

Respirator Make and Model: _____

Respirator Size: _____

Check List:

- ❑ Normal Breathing
- ❑ Deep Breathing
- ❑ Turning head side to side
- ❑ Moving head up and down
- ❑ Talking - Read the following…

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.

- ❑ Bending over
- ❑ Normal breathing

Fit Test Results:(circle one) Pass Fail

Comments: _____

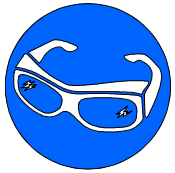
_____

Employees Signature: _____ Date: _____

Test Administered by: _____ Date: _____

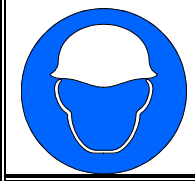
I am reviewing (check the appropriate box):	❑ A worksite	Specify location:
	❑ A single employee's job description	Name of employee:
		Working title of position:
		Position Number:
	❑ A job description for a class of employees	Working title of positions:
		Position Number(s):

Your name:	**DEPARTMENT:**	**Date:**



EYE HAZARDS (Appendix B). Tasks that can cause eye injury include: working with chemicals or acids; chipping, sanding, or grinding; welding; furnace operations; and, metal and wood working.

Check the appropriate box for each hazard:			*Description of hazard(s):*	*Based upon the hazard assessment, the following PPE is required:*
Chemical Exposure	Yes ❑	No ❑		
High Heat/Cold	Yes ❑	No ❑		
Dust/Flying Debris	Yes ❑	No ❑		
Impact	Yes ❑	No ❑		
Light/Radiation	Yes ❑	No ❑		



HEAD HAZARDS (Appendix C). Tasks that can cause head injury include: working below other workers who are using tools or materials that could fall; working on energized electrical equipment or utilities; and, working in trenches or confined spaces.

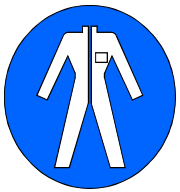
Check the appropriate box for each hazard:			*Description of hazard(s):*	*Based upon the hazard assessment, the following PPE is required:*
Impact	Yes ❑	No ❑		
Electrical Shock	Yes ❑	No ❑		

FOOT HAZARDS (Appendix D). Tasks that can cause foot injury include: exposure to chemicals or acids; welding or cutting; foundry operations; materials handling; renovation or construction; electrical work; and, spray finishing or other work with flammable or explosive materials.

Check the appropriate box for each hazard:			*Description of hazard(s):*	*Based upon the hazard assessment, the following PPE is required:*
Chemical Exposure	Yes ❑	No ❑		
High Heat/Cold	Yes ❑	No ❑		
Impact/Compression	Yes ❑	No ❑		
Slips/Trips	Yes ❑	No ❑		
Puncture	Yes ❑	No ❑		
Slippery/Wet Surfaces	Yes ❑	No ❑		
Explosive/Flammable Atmospheres	Yes ❑	No ❑		
Electrical	Yes ❑	No ❑		

HAND HAZARDS (Appendix E). Hand injury can be caused by: work with chemicals or acids; exposure to cut or abrasion hazards (for example, during demolition, renovation, or woodworking); and, work with very hot or cold objects or materials. BLOODBORNE PATHOGENS – ADDITIONAL TRAINING/MONITORING IS REQUIRED!

Check the appropriate box for each hazard:			*Description of hazard(s):*	*Based upon the hazard assessment, the following PPE is required:*
Chemical Exposure	Yes ❑	No ❑		
High Heat or Cold	Yes ❑	No ❑		
Cuts/Abrasion	Yes ❑	No ❑		
Puncture	Yes ❑	No ❑		
Electrical Shock	Yes ❑	No ❑		
Bloodborne Pathogens (see Appendix E)	Yes ❑	No ❑		



BODY/TORSO HAZARDS (Appendix F). Injury of the body or torso occur during: exposure to chemicals, acids, or other hazardous materials; abrasive blasting; welding, cutting, brazing; chipping, sanding, or grinding; use of chainsaws or similar equipment; foundry operations; and, work around electrical arcs.

Check the appropriate box for each hazard:			*Description of hazard(s):*	*Based upon the hazard assessment, the following PPE is required:*
Chemical Exposure	Yes ❑	No ❑		
Extreme Heat/Cold	Yes ❑	No ❑		
Abrasion	Yes ❑	No ❑		
Impact	Yes ❑	No ❑		
Electrical Arc	Yes ❑	No ❑		

FALL HAZARDS (Appendix G). Personnel may be exposed to fall hazards when performing work on a surface with an unprotected side or edge that is 6 feet or more above a lower level, or 10 feet or more on scaffolds. Fall protection may also be required when using vehicle manlifts, elevated platforms, tree trimming, performing work on poles, roofs, or fixed ladders. ADDITIONAL TRAINING/MONITORING IS REQUIRED!

Check the appropriate box for each hazard:			*Description of hazard(s):*	*Based upon the hazard assessment, the following PPE is required:*
Fall hazard	Yes ❑	No ❑		

NOISE HAZARDS (Appendix G). Personnel may be exposed to noise hazards when machining, grinding, sanding, using pneumatic equipment, generators, motors, jackhammers, or similar equipment. ADDITIONAL TRAINING/MONITORING IS REQUIRED!

Check the appropriate box for each hazard:			*Description of hazard(s):*	*Based upon the hazard assessment, the following PPE is required:*
Noise hazard	Yes ❑	No ❑		

RESPIRATORY HAZARDS (Appendix G). Personnel may be exposed to respiratory hazards that require the use of respirators: when using certain chemicals outside of chemical fume hood; when applying paints or chemicals in confined spaces; when welding, cutting, or brazing on certain metals; and, when disturbing asbestos, lead, silica, or other particulate hazards. ADDITIONAL TRAINING/MONITORING IS REQUIRED!

Check the appropriate box for each hazard:			*Description of hazard(s):*	*Based upon the hazard assessment, the following PPE is required:*
Chemical exposure	Yes ❑	No ❑		
Confined space work	Yes ❑	No ❑		
Particulate exposure	Yes ❑	No ❑		
Welding/related hazard	Yes ❑	No ❑		

I certify that the above inspection was performed to the best of my knowledge and ability, based on the hazards present on this date (signature)

_____

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

Training Record

This certifies that I have trained the following employee(s) on how to inspect, wear, clean, maintain, and care for his or her personal protective equipment (PPE). I have explained when PPE is required to be worn, and emphasized that the use of PPE does not eliminate the hazard and that caution must always be used.

Name of Trainer: _____ Date: _____

Name and Signature of Employee	Date Trained	Type(s) of PPE to Be Used

ERNEST D. MENOLD, INC.

General Sheet Metal Contractor

Scaffold Safety Checklist

Serious injury or death can result from your failure to comply with all applicable safety requirements of federal, state and local regulations and safety guidelines before erecting, using or dismantling a scaffold.

Scaffold Set Up

- ❑ Is the scaffold being erected under the direction of a competent person?
- ❑ Are all employees involved with (or near) the scaffold wearing hard hats?
- ❑ Are footings sound and rigid and not set on soft, muddy, or frozen ground (that could melt), or resting on blocks?
- ❑ Is the scaffold level?
- ❑ Are wheels / castors locked?
- ❑ Is the scaffold able to hold four times its maximum intended load?
- ❑ Is the platform complete front to back and side to side (fully planked or decked, with no gaps greater than 1 inch)?
- ❑ Are guardrails and toe-boards in place on all open sides?
- ❑ Are all sections pinned or appropriately secured?
- ❑ Is there a safe way to get on and off the scaffold without climbing on cross-braces?
- ❑ Is the front face within 14 inches of the work (or within 3 feet for outrigger scaffolds)?
- ❑ Does the scaffold meet electrical safety clearance distances?

Scaffold Usage

- ❑ Is the scaffold inspected by a competent person before being put in use?
- ❑ If the scaffold is over 10 feet high, is personal fall protection provided, or are guardrails over 38 inches high?
- ❑ Are hardhats worn by workers on and around the scaffold?
- ❑ Are scaffold loads (including tools and other equipment) kept to a minimum and removed when the scaffold is not in use (like at the end of a day)?
- ❑ Are employees removed from scaffolds during high winds, rain, snow, or bad weather?
- ❑ Are materials secured before moving a scaffold?
- ❑ Are employees removed from the scaffold before they are moved?
- ❑ Are heavy tools, equipment, and supplies hoisted up (rather than carried up by hand)?

Competent Person Signature: _____

Date: _____