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OPERATOR MANUAL

Includes Safety, Service and Replacement Part Information

**Model EP8HL
Hazardous Location
Ventilation Blower**

**Form: GOM7069501
Version 1.3**

Do not discard this manual. Before operation, read and comprehend its contents. Keep it readily available for reference during operation or when performing any service related function. When ordering replacement parts, please supply the following information: model number, serial number and part number. For customer service assistance, telephone 800.533.0524, +507.451.5510. Our Customer Service Department telefax number is 877.344.4375 (DIGGER 5), +507.451.5511. There is no charge for customer service activities .

Internet address: <http://www.generalequip.com>.
E-Mail location: general@generalequip.com.

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Congratulations on your decision to purchase a General light construction product. From our humble beginnings in 1955, it has been a continuing objective of General Equipment Company to manufacture equipment that delivers uncompromising value, service life and investment return. Because of this continuous commitment for excellence, many products bearing the General name actually set the standards by which competitive products are judged.

When you purchased this product, you also gained access to a team of dedicated and knowledgeable support personnel that stand willing and ready to provide field support assistance. Our team of sales representatives and inhouse factory personnel are available to ensure that each General product delivers the intended performance, value and investment return. Our personnel can readily answer your concerns or questions regarding proper applications, service requirements and warranty related problems.

General Equipment Company places great emphasis upon not only product performance, but also on product safety. It is important to remember that this product will only be as safe as the operators which utilize it. It just makes good, common sense to take the time to read and fully understand the contents of this manual before attempting to utilize this product in service. If you ever do have any questions or concerns about this product, please feel free to contact our Customer Service Department at the telephone numbers listed below for assistance.

If there is anything that I can do to assist your efforts when utilizing this product, please do not hesitate to contact me. For assistance after normal business hours, telephone me at 507.451.9409 or 507.363.1033. If I am not immediately available, I will attempt to return your call as soon as possible.

Sincerely,

GENERAL EQUIPMENT COMPANY

A handwritten signature in black ink, appearing to read "Dennis Von Ruden", written in a cursive style.

Dennis Von Ruden
President

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Notice to Operators

IF YOU CAN NOT READ OR DO NOT FULLY UNDERSTAND THE CONTENTS OF THIS MANUAL, PLEASE CONTACT THE FACTORY FOR PROPER ASSISTANCE BEFORE ATTEMPTING TO OPERATE THIS PRODUCT.

SI TU NO PUEDES LE'ER O NO COMPRENDES EL CONTENIDO DE ESTE MANUAL FAVOR DE PONERSE EN CONTACTO CON LA FABRICA PARA ASISTENCIA- A PROPIA ANTES DE INTENTAR PARA OPERAR ESTE PRODUCTO.

SOLLTEN SIE DIESE GEBRAUCHSANWEISUNG NICHT LESEN KOENNEN ODER ES NICHT VOLLKOMMEN VERSTEHEN, WENDEN SIE SICH BITTE AN DEN HERSTELLER FUER RICHTIGE HILFE EHE SIE VERSUCHEN DIESES PRODUKT ZU OPERIEREN.

SI VOUS NE LISEZ OU NE COMPRENDRE ENTIEREMENT LES MATIERES DE CE MANUEL, S'IL VOUS PLAIT, CONTACTEZ L'USINE POUR L'ASSISTANCE APPROPRIEE AVANT D'UTILISER LE PRODUIT.



These safety alert symbols identify important safety messages in this manual. When you see these symbols, be alert to the possibility of personal injury and carefully read the message that follows.

Do not allow anyone to operate the Blower without first reading this Operator's Manual and becoming familiar with its operation. The manufacturer of this Blower has gone to great extremes to provide the owner(s) and/or operator(s) with the finest equipment available for its intended job function of providing air for portable ventilation purposes. Yet, the possibility exists that the Blower can be utilized in and/or subjected to job applications not perceived and/or anticipated by the manufacturer. Such misuse and/or misapplication of the Blower can lead to the possibility of serious damage, injury or even death. It is the responsibility of the owner(s) and/or operator(s) to determine that the Blower is being utilized and/or operated within the scope of its intended job function. It is the responsibility of the owner(s) and/or operator(s) to establish, monitor and constantly upgrade all safety programs and/or practices utilized in and for the operation of the Blower. The purpose of such programs is to provide for owner(s) and/or operator(s) safety. Operators must be instructed to recognize and avoid unsafe conditions associated with their work (29 CFR 1926.21 (b)(2)) and/or applicable updated revisions. It is the responsibility of the owner(s) and/or operator(s) to determine that no modifications and/or alterations have been made to the Blower. Modifications and/or alterations can lead to the possibility of serious damage, injury or even death. It is the responsibility of the owner(s) and/or operator(s) to make this Operator's Manual available for consultation during all phases of operation. Refer to OSHA 2207 and/or applicable updated revisions which contains all OSHA job safety and health rules and regulations (1926 and 1910) covering construction.



The concept of portable air ventilation blowers has been successfully utilized for many years as a practical solution to many types of air ventilation job requirements. The basic concept is proven and well accepted within the associated marketplaces. Use of a Blower requires strenuous work activity. This type of work



activity can be considered to be greater in magnitude than that experienced with the use of many other types of both light construction and lawn and garden related equipment. This type of work activity should only be attempted by operators of adequate physical size and stature, mental awareness and physical strength and condition. The body parts most noticeably affected during the ventilation process are the arms, hands, wrists, shoulders, lower back and legs. The ventilation process can also produce excessive stress/strain directly to the back muscles, spinal vertebrae and many other body parts. Back related pain can be a side effect of utilizing a Blower. An operator with a chronic back related problem or a history of back and/or other medically related problems should not attempt to utilize the Blower. Use of the Blower may only aggravate this and any other medically related problem. Because of the diverse type of prevailing job applications, job site conditions, operator experience levels and operator physical characteristics, no warranty, guarantee, representation and/or liability is made by the manufacturer as to the absolute correctness or sufficiency of any operational procedure, operational position and/or technique. There is no absolute guarantee that an operator of any given experience level, physical size and/or physical condition will be immune to the possibility of and/or probable physical side effects of the normal use of the Blower. Each potential operator of the Blower must be made aware of and assume the operational and physical liability described and/or associated with the use of the Blower. Each potential operator not willing to assume the operational and physical liability described and/or associated with the use of the Blower should not operate the Blower. Proper levels of operator experience, skill and common sense are essential for maximizing the safe and efficient operation of the Blower.

Record the Blower and engine/electric motor serial numbers in the spaces provided below.

_____ Model Number

_____ Serial Number

_____ Engine/Electric Motor Serial Number

_____ Date of Purchase

Specifications and design are subject to change without notice or obligation. All specifications are general in nature and are not intended for specific application purposes. General Equipment Company reserves the right to make changes in design, engineering or specifications and to add improvements or discontinue manufacture at any time without notice or obligation. General Equipment Company and its agents accept no responsibility for variations which may be evident in actual products, specifications, pictures and descriptions contained in this publication.



Operator Instructional Data Sheet

The following undersigned operators of the Blower described and/or pertaining to this Operator's Manual have received formal safety and operational information/instruction from the undersigned owner(s)/instructor(s) in accordance to OSHA 29 CFR 1926.21 (b)(2) and/or applicable updated revisions pertaining to, but not necessarily limited to the:

- 1) **READING, COMPREHENSION AND ACKNOWLEDGEMENT OF THE MATERIAL COMPRISING THE ENTIRE CONTENTS OF THE APPLICABLE OPERATOR'S MANUAL AND SAFETY AND OPERATIONAL INFORMATION VIDEO TAPE FOR THE BLOWER.**
- 2) **FORMALIZED OPERATOR'S SAFETY PROGRAM TO BE DEvised BY THE OWNER OF THE BLOWER IN CONJUNCTION WITH THE CONTENTS OF THE APPLICABLE OPERATOR'S MANUAL AND SAFETY AND OPERATIONAL INFORMATION VIDEO TAPE FOR THE BLOWER.**
- 3) **OSHA RULES AND REGULATIONS RESEARCHED FOR AND/OR BY THE OWNER OF THE BLOWER AND DEEMED APPLICABLE TO THE SAFE AND PROPER USE AND/OR OPERATION OF THE BLOWER FOR ANY SPECIFIC JOB APPLICATION.**
- 4) **LOCAL LAWS, REGULATIONS AND CUSTOMS RESEARCHED FOR AND/OR BY THE OWNER OF THE BLOWER AND DEEMED APPLICABLE TO THE SAFE AND PROPER USE AND/OR OPERATION OF THE BLOWER FOR ANY SPECIFIC JOB APPLICATION.**
- 5) **FORMALIZED MAINTENANCE PROGRAM FOR THE BLOWER AND STATICALLY CONDUCTIVE DUCT(S) TO BE DEvised BY THE OWNER OF THE BLOWER IN ACCORDANCE WITH, BUT NOT NECESSARILY LIMITED TO, THE SPECIFICATIONS, GUIDELINES AND OPERATIONAL INFORMATION CONTAINED IN THE APPLICABLE OPERATOR'S MANUAL.**
- 6) **COMPREHENSIVE OPERATIONAL INSTRUCTIONS FOR THE CORRECT AND PROPER USE OF THE BLOWER AS PER THE CONTENTS OF THE APPLICABLE OPERATOR'S MANUAL AND SAFETY AND OPERATIONAL INFORMATION VIDEO TAPE.**

_____ Operator _____ Owner/Instructor _____ Date

_____ Operator _____ Owner/Instructor _____ Date

_____ Operator _____ Owner/Instructor _____ Date

NOTE: INSERT COPIES OF THIS PAGE WITHIN THE OPERATOR'S MANUAL IF SPACE FOR ADDITIONAL OPERATORS IS REQUIRED.



Safety Precautions

MODEL EP8HL PORTABLE AIR VENTILATION BLOWER.



DANGER

THE FOLLOWING SAFETY PRECAUTIONS PROVIDE SOME COMMON SENSE GUIDES TO PROMOTE SAFETY AND EFFICIENCY WITH THE BLOWER. NO WARRANTY, GUARANTEE OR REPRESENTATION IS MADE BY THE MANUFACTURER AS TO THE ABSOLUTE CORRECTNESS OR SUFFICIENCY OF ANY INFORMATION OR STATEMENT. THESE SAFETY PRECAUTIONS ARE INTENDED TO DEAL PRINCIPALLY WITH COMMON PRACTICES AND CONDITIONS ENCOUNTERED IN THE USE OF THE BLOWER AND ARE NOT INTENDED TO BE ALL INCLUSIVE. PROPER LEVELS OF OPERATOR EXPERIENCE, SKILL AND COMMON SENSE ARE ESSENTIAL FOR SAFE AND EFFICIENT OPERATION. THE BLOWER IS DESIGNED FOR PORTABLE AIR VENTILATION PURPOSES ONLY. THE BLOWER IS NOT DESIGNED FOR TRANSPORTING LIQUID, SEMI-SOLID OR SOLID MATERIALS. INCORRECT USE OF THE BLOWER CAN RESULT IN AN ELECTRICAL SHOCK AND/OR ELECTROCUTION. ALWAYS OPERATE THE BLOWER IN COMPLIANCE WITH CURRENT OSHA AND NATIONAL ELECTRIC CODE® REGULATIONS.



DANGER

INCORRECT USE OF THE BLOWER CAN RESULT IN PROPERTY DAMAGE, PERSONAL INJURY OR EVEN DEATH. TO REDUCE THIS POSSIBILITY, GIVE COMPLETE AND UNDIVIDED ATTENTION TO THE JOB AT HAND AND FOLLOW THESE SAFETY PRECAUTIONS.

PREPARATION

1) This Blower is a specialized type of powered equipment, designed for a specific job function and requires adequate and thorough instruction BEFORE it

is operated. Each operator must receive adequate, professional instruction regarding the proper operation of this Blower BEFORE being allowed to operate it. Refer to OSHA 2207 (and/or applicable updated revision) which contains all OSHA job safety and health rules and regulations (1926 and 1910) covering construction. BEFORE attempting to utilize this Blower, read this Operator's Manual and view the safety and operational information video tape supplied by the manufacturer to familiarize each operator with its correct operating procedures. When you are going to utilize this Blower-DO IT RIGHT-avoid the urge not to take the time to read this Operator's Manual BEFORE utilizing the Blower. DO NOT OPERATE THIS BLOWER UNTIL EACH OPERATOR COMPLETELY COMPREHENDS THE CONTENTS OF THIS MANUAL AND HAS VIEWED THE SAFETY AND OPERATIONAL INFORMATION VIDEO TAPE.

2) Develop a comprehensive program for the safe operation of the Blower by its owner(s) and/or operator(s). Such a program will include, but is not limited to: instructional requirements for operation, applicable OSHA requirements, local laws and regulations, job site safety and a Blower maintenance program. Constantly examine and upgrade this program to guarantee owner(s) and/or operators(s) safety. Each operator must be fully instructed regarding the specifics of this safety program. Refer to (29 CFR 1926.21 (b) (2)) and/or current revision.

3) Determine that the Blower is in its original, factory configuration and has not been modified in any manner. Many modifications can result in potentially dangerous configurations that can lead to property damage and/or personal injury. If there are any questions about possible modifications made to the Blower, contact the Customer Service Department for specific information BEFORE utilization. There is no charge for this service.

4) Minors should never be allowed to operate the Blower. Bystanders, especially children and animals should not be allowed in the area where a Blower is in use.

5) Operators must be in adequate physical condition, mental health and not under the influence of any substance (drugs, alcohol, etc.) which might impair vision, dexterity or judgement. Working with the Blower can be strenuous. If you have any condition that might be aggravated by strenuous work, check with your



doctor BEFORE operating the Blower. Guard against the possibility of back related injuries. Always lift the Blower with leg muscles and not with the back.

6) Clothing must be sturdy and snug fitting, but allow complete freedom of movement. Never wear loose fitting jackets, scarves, neckties, jewelry, flared or cuffed pants or anything that could become caught on controls or moving parts. Wear long pants to protect your legs. Protect your hands with heavy duty, nonslip gloves to improve your grip. Good footing is most important when transporting the Blower. Wear sturdy boots with nonslip soles. Steel-toed safety boots are highly recommended. Never wear tennis shoes or other similar type shoes which afford little or no protection. Wear an approved safety hard hat to protect the operator'(s)' head(s) where there is a danger of head injuries. Noise generated by the Blower can damage your hearing. Wear sound barriers (ear plugs or ear muffers) to protect your hearing. Continuous and regular operators should have their hearing checked regularly.

7) Visually inspect the Blower for damaged or worn parts. Check for loose and/or broken parts. Determine that all safety devices are operative and information plates are readable. Check to see that the Blower and all related accessories are in good mechanical condition BEFORE utilization.

8) The Blower utilizes an external wiring harness comprising of CSA certified, 14-3 AWG wire designed for extra hard usage. The Blower is designed to operate ONLY from a grounded, 115 volt nominal AC, 60 Hz, single phase power source that utilizes a receptacle designed for hazardous location use. All electrical wiring installations and connections must comply with all applicable National Electric Code® (NEC®) statutes and with all applicable local codes and practices. Consult current National Electric Code® publications for specific information.

9) Undersize wire size between the motor and the power source will adversely limit the starting and load carrying capabilities of the motor. Always utilize minimum AWG wire sizes for motor branch circuits. Consult the National Electric Code® Tables, Article 400, for specific information.

10) Ground the Blower motor securely. Determine that any "grounding" wire and/or device is, in fact, properly grounding the motor. Failure to properly ground the

motor may cause an electrical shock and/or electrocution, resulting in personal injury or even death. A ground fault circuit interrupter (GFCI) is a safety device that disconnects power from a circuit to a load when a potentially dangerous condition occurs. The GFCI opens the circuit when the fault current flow from a power line to ground exceeds the safe limit for humans. The GFCI protects against harmful electrical shock to a person caused by contact with a defective electrical product. A GFCI differs from a fuse or circuit breaker. A fuse or circuit breaker opens the circuit when the total current flow in the power line exceeds the safe limit of the power line. They are designed to protect against fire caused by overheating of a power line. Use of a portable GFCI gives on the job protection from electrical shock hazards caused by ground faults in commercial, industrial and residential applications. They are simple and easy to use: plug the portable GFCI into any suitable, grounded receptacle and plug the Blower into the GFCI for automatic protection against ground faults. For specific information, consult the National Electric Code® publications and OSHA publications 210-22D for construction sites and 555-3 for marinas (for use around any area containing water).

11) While the standards and regulations governing the use of a portable air ventilation blower may vary slightly, their basic content will each include the following parameters:

- a) The definition of a confined work space.
- b) The requirements for both initial and recurrent personnel training.
- c) The various classes of confined work spaces and their individual requirements for identification and permit to enter.

Because these standards and regulations are under constant revision, it is highly recommended that current information regarding any confined work space entry be obtained by first contacting your local Federal and State OSHA offices.

12) Work in a confined space requiring a permit will usually require the use of a self contained breathing apparatus, an approved safety belt and life line, and other, specialized equipment. In addition, a designated person is usually assigned to remain outside the confined work space and be in constant contact with the workers inside. The standby person has no duty



but to react in an emergency situation. Contact your local Federal and State OSHA offices for additional information.

13) Under certain conditions where flammable gases or vapors have displaced the oxygen level but are still too rich to burn, forced ventilation by the Blower may dilute them until these gases or vapors are within their explosive range. Improper job applications for any Blower can produce an explosion, resulting in property damage and/or personal injury.

14) There are several methods for ventilating a confined work space. The exact method and equipment selected are dependent upon the following factors:

- a) The size of the confined work space.
- b) The types of gases to be removed or exhausted.
- c) The source of makeup air.

Regulations require the testing of any confined work space for harmful gas contamination prior to entry. Always assume that a confined work space is contaminated. Do not enter any confined work space until it has been proven safe for work personnel. Contact your local Federal and State OSHA offices for additional information.

15) Know how the controls operate. Know how to stop the Blower quickly in an emergency.

16) The EP8HL Blower is certified by Canadian Standards Association for use only in the following hazardous location type atmospheres as defined by the National Electric Code®.

CLASS I, GROUP D
CLASS II, GROUP G
CLASS III

The EP8HL Blower can also be utilized in nonhazardous location atmospheres.

Before utilizing the Blower in a known and/or potential hazardous location type atmosphere, consult the National Electric Code® to determine that the anticipated atmosphere(s) to be encountered fall within the certified categories.

OPERATION

1) Give complete and undivided attention to the job at hand. Do not chew gum, smoke and/or use smokeless tobacco while utilizing the Blower. Do not attempt to eat and/or drink while utilizing the Blower. Determine that eyeglasses and/or hearing aid devices are properly secured. Use of the Blower is strenuous and causes fatigue. Help prevent the cause of an accident. Plan to take work breaks as required to help insure mental and physical alertness.

2) The Blower utilizes an external wiring harness comprising of CSA certified 14-3 AWG wire designed for extra hard usage. The Blower is designed to operate ONLY from a grounded, 115 volt nominal AC, 60 Hz, single phase power source utilizing a receptacle designed for hazardous location use. Do not modify the cord cap to a NEMA assembly of another design and/or rating. Do not operate the Blower from other than a 115 volt, nominal, single phase power source. Do not operate the Blower from other than a 60 Hz power source. Damage to the Blower motor will result.

3) Certain job site locations are classified as being hazardous because the atmosphere does or may contain gas, vapor or dust in explosive quantities. The National Electric Code® divides these locations into Classes and Groups according to the type of explosive agent which may be present. For specific information, consult the National Electric Code, Section 500.

4) Place the Blower on secure footing to prevent it from shifting while in use. Such movement can cause injury to the operator(s) or damage to the Blower itself.

5) Do not operate the Blower without the inlet and outlet screens properly secured and in place. Never replace the screens with other than factory supplied, replacement units. The screen grid must comply with current OSHA regulations regarding protective enclosures to prevent personal injury to the operator(s). Determine that the structural integrity of the screens will allow them to serve their protective function. Keep both screens free from obstructions and gathered debris to allow maximum air flow delivery.

6) Do not stand directly in front of and/or face the Blower outlet. Personal injury can result from being struck by debris thrown from the Blower wheel at a relatively high velocity.



7) Never operate the Blower without a duct properly attached to its outlet. Operating the Blower without a duct secured to its outlet will require additional attention to personal safety and the potential for damage to personal property. Keep all body parts, loose clothing and foreign objects clear of the rotating fan.

8) The Blower motor is of an explosion proof design. The motor must be mounted and operated in the normal, horizontal position to meet the enclosure definition. The Blower is designed for operation in job site areas that are reasonably dry, clean and provide for a continuous, dynamic source of air for cooling the motor. If you have any questions about proper operating environments, contact the Factory BEFORE utilizing the Blower.

MAINTENANCE, REPAIR AND STORAGE

1) Always stop the motor and disconnect the power source to prevent the accidental starting and/or the possibility of receiving an electrical shock before working on the Blower. An accidental starting and/or electrical shock can result in property damage, personal injury or even death.

2) Use only genuine, approved replacement parts for maintenance and repair. Use of parts manufactured by others can result in property damage and/or personal injury.

3) Follow the SERVICE instructions as outlined in the appropriate section of the Operator's Manual.

4) Always properly maintain the Blower. Frequently check all fasteners and individual parts. Built in safety features are effective only if they are maintained in good working condition. Keep the Blower clean and properly serviced. Heavy accumulations of dust and dirt will result in overheating and premature failure of the Blower motor. Clean the motor surfaces and all ventilation openings periodically, preferably with a vacuum cleaner. Replace any questionable part or assembly with a genuine, approved, replacement part. Do not attempt any maintenance or repair work not described in the Operator's Manual. Have such work performed at your dealer's servicing shop.

5) Do not energize the electric motor with the shaft key (if so equipped) exposed on the open shaft.

Personal injury can result from being struck by a square key being thrown from the motor shaft.

6) Some fastener devices utilized on the Blower may be intended to help prevent vandalism. Whenever a fastener device is replaced in the field, determine that the replacement is of the same type, grade and finish as originally specified. If there are any questions about proper fastener devices, contact the Customer Service Department for specific information. There is no charge for this service.



Assembly

MODEL EP8HL HAZARDOUS LOCATION, PORTABLE, AIR VENTILATION BLOWER.

Open the shipping carton immediately upon receipt. Visually inspect the contents of the carton for freight damage and/or missing parts. If shipping damage is evident, contact the delivering carrier to arrange for an inspection of the damage by their claims representative. If missing parts are detected, notify your dealer who will assist you in obtaining them.

Included in the shipment should be the following:

- 1 each, Blower
- 1 each, lifting handle
- 1 each, bag of assorted hardware
- 1 each, Operator's Manual and related educational material

INSTALLING THE RUBBER MOUNTS TO THE FRAME.

Tools Required: 2 each, 7/16 inch wrenches

The EP8HL Blower is shipped from the factory secured to a plywood base. The base provides support and additional structural integrity for the Blower during transit. Before placing the Blower into service, proceed to remove it from the plywood base.



DANGER

DO NOT OPERATE THE BLOWER WITH THE PLYWOOD BASE CONNECTED TO THE FRAME. SECURING THE BLOWER TO THE BASE REQUIRES THE USE OF STEEL FASTENERS. DO NOT OPERATE THE BLOWER WITH THE STEEL FASTENERS SECURING THE RUBBER MOUNTS TO THE FRAME. THESE FASTENERS CAN CREATE A RANDOM SPARK WHICH CAN BE THE IGNITION SOURCE OF AN EXPLOSION. SUCH AN OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

1) Using the wrenches, remove the steel fasteners from the frame. Properly discard these fasteners by a suitable method to prevent their accidental use on the

Blower. No steel fasteners are permitted to be utilized in open, exposed areas of the Blower.

2) Open the plastic bag containing the four (4) 1/4 inch diameter x 1 inch long aluminum capscrews and related hardware.

3) Install an aluminum capscrew into the recess area provided on the rubber mount. The head of the aluminum capscrew will thrust against the metal support washer of the rubber mount.

4) Install the lockwasher and aluminum hexagon nut. Using the wrenches, secure the assembly to the frame until snug. Do not over torque the aluminum fasteners. Damage to the fasteners can result. FIGURE 1.

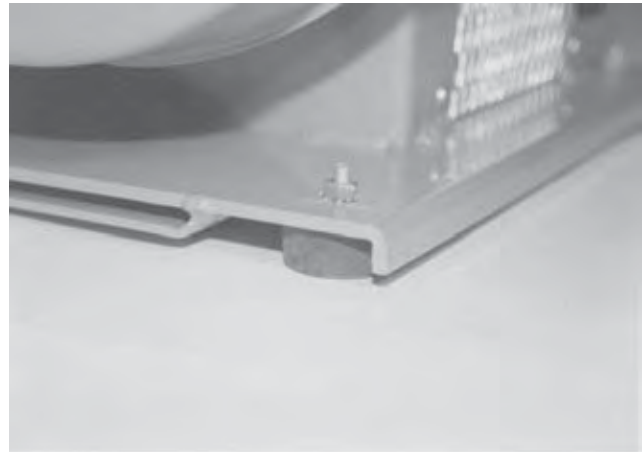


FIGURE 1

5) Repeat the process for the remaining rubber mounts.

6) In the event that an aluminum capscrew and hexagon nut becomes damaged while installing a rubber mount, replacement hardware is provided. If these replacements are not required, discard by a suitable method.

INSTALLING THE LIFTING HANDLE.

Tools Required: 1 each, 1/2 inch wrench

1) Install the lifting handle to the studs provided on the blower housing. Secure tight with the provided lock washers and hexagon nuts. Do not over torque the aluminum fasteners. Damage to the fasteners can result. FIGURE 2.



FIGURE 2

DANGER

DO NOT OVER TORQUE THE HEXAGON NUTS. IMPROPER TORQUE VALUES CAN STRIP THE CORRESPONDING THREADS, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY. DO NOT SUBSTITUTE STEEL FASTENERS FOR ANY ALUMINUM TYPES PROVIDED. THE USE OF STEEL FASTENERS IN CRITICAL LOCATIONS CAN INCREASE THE POTENTIAL FOR A RANDOM SPARK BEING THE CAUSE OF AN EXPLOSION.

DANGER

FAILURE TO PROPERLY INSTALL THE LIFTING HANDLE FASTENERS MAY RESULT IN LOOSE FASTENERS THAT CAN BECOME LODGED IN THE BLOWER WHEEL AND EXIT THE OUTLET AT HIGH SPEED. THE RESULT CAN CAUSE PROPERTY DAMAGE AND/OR PERSONAL INJURY.

2) In the event that an aluminum hexagon nut becomes damaged while installing the handle, replacement units are provided. If these replacements are not required, discard by a suitable method.

3) Check all fasteners for proper security. All external fasteners (with the exception of the carry handle and duct mounting studs) are constructed from aluminum

or stainless steel. Aluminum fastener torque values are significantly less than that of steel. Consult a fastener torque chart for the proper torque value if any fastener is found to require retorquing. Visually inspect for loose or damaged parts. Determine that all controls work freely, all safety devices are operative and that information plates are readable. It is essential that the Blower and all related accessories are in good mechanical condition before you attempt to use them.

Check all wiring for security. If the wiring appears not to be proper for the installation and/or application, contact the Customer Service Department for assistance BEFORE utilizing the Blower. There is no charge for this service.

DANGER

OPERATION OF THE EP8HL BLOWER REQUIRES A DIRECT CONNECTION TO A 115 VOLT NOMINAL, SINGLE PHASE, ALTERNATING CURRENT (AC), POWER SOURCE SPECIFICALLY DESIGNED FOR HAZARDOUS LOCATIONS. FAILURE TO OPERATE THE BLOWER FROM THIS POWER SOURCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

IN THE EVENT THAT A POWER SOURCE DESIGNED FOR USE IN HAZARDOUS LOCATIONS IS NOT AVAILABLE FOR DIRECT CONNECTION TO THE EP8HL BLOWER, PROPERLY DESIGNED AND INSTALLED EXTENSION CORDS CAN BE UTILIZED TO OBTAIN ELECTRICAL POWER FROM A SOURCE NOT LOCATED IN A HAZARDOUS LOCATION. ALL EXTENSION CORDS MUST MEET THE APPLICABLE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE®

CAUTION

Determine that all electrical installations meet the applicable National Electric Code®, Federal, State and local codes and regulations when the Blower

is being operated in both the hazardous location atmospheres listed on the data plate and in nonhazardous atmospheres.

Introduction

WARNINGS TO OPERATORS.



CAUTION

Working in hazardous location type atmospheres requires a formal training program that is designed and taught by qualified personnel. Working in hazardous location type atmospheres can be extremely dangerous. It is much more complex than just plugging a blower into a power source and expecting it to circulate air. The use of improper work techniques, clothing, tools and procedures can lead to property damage and/or personal injury, including death. Every day, work locations such as factories, refineries and grain elevators suffer explosions that inflict serious damage to both property and personnel. Many times, these explosions could have been avoided with proper training, equipment and procedures.



CAUTION

Do not attempt to operate the EP8HL Blower until a formal confined space ventilation training program for use in hazardous location type atmospheres has been designed and taught to each operator and/or associated work personnel. Insurance companies, technical schools, OSHA, national safety organizations etc., can directly assist in providing and/or developing formalized confined space ventilation training programs for use in hazardous location type atmospheres. Providing recurrency type training is also extremely important to insure that each operator is familiar with current procedures and policies regarding their work activities within a hazardous location type atmosphere.



CAUTION

Because of the wide number of job applications for the EP8HL Blower, it is impossible to develop a written Operator's Manual that is all inclusive and addresses and/or answers every specific question or phase of the confined space ventilation process in and/or associated with hazardous type atmospheres. Instead, the intent of this manual is to provide a program of basic procedures and skill levels required to successfully operate the Blower in conjunction with a formal confined space ventilation program in and/or associated with hazardous location type atmospheres. Without a formal training program the following will probably take place:

- 1) Work personnel will not obtain optimum productivity rates.
- 2) A serious explosion will result. The explosion can be created by the Blower, related equipment or work procedures and/or policies. The explosion can result in property damage and/or personal injury, including death.
- 3) Serious injury will occur to operators and/or associated work personnel without the occurrence of an explosion.

MODEL EP8HL BLOWER DESIGN CONSIDERATIONS.

To help differentiate the EP8HL Blower against other, portable air ventilation blower products manufactured by General Equipment Company, the following design considerations were made:

- 1) Difference in paint color. The EP8HL Blower and all painted accessories feature a yellow color that is different from the standard, dark orange color utilized for nonhazardous type blowers.
- 2) Material variance. The main frame and all major metal accessories are fabricated from aluminum instead of steel.



CAUTION

While being lighter than steel and featuring spark proof construction, aluminum will not tolerate the same level of abuse and damage as steel. An extra level of care, awareness and common sense must be exercised when utilizing the EP8HL Blower to minimize the potential effects of external damage.

3) Data plate construction. All data plates utilized on the EP8HL Blower are manufactured from materials and processes meeting Canadian Standards Association® certification requirements for use in hazardous location type atmospheres. Plates are permanently affixed by the use of rivets.



DANGER

DO NOT REMOVE AND/OR ALTER ANY DATA PLATE FROM THE EP8HL BLOWER. LACK OF AND/OR ALTERED DATA PLATES WILL NOT PROVIDE PROPER INFORMATION DURING USE. THIS OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

4) Data plate nomenclature. The name/model number decal affixed to the frame describes the unit as being designed for use in specific hazardous locations. The certified hazardous location classes and groups are also depicted. The EP8HL Blower is designed to be utilized only in the hazardous location atmospheres depicted on the data plate. Use in any other hazardous location atmosphere can produce an explosion, resulting in property damage and/or personal injury.

5) Cord cap. The NEMA 5-20P plug provided as standard equipment with the EP8HL Blower will not directly connect into a standard NEMA 5-15R wall receptacle found in nonhazardous locations. This feature is intended to serve as a safety device and minimize the potential for accidental connection to a standard power receptacle located within a hazardous location type atmosphere.

6) Duct design. The industry standard ducts intended for use in nonhazardous location type atmospheres (usually orange or yellow in color) can not be made to directly attach to the EP8HL Blower without major

modifications to the Blower housing castings. This feature is intended to minimize the potential of a nonconductive duct being utilized within a hazardous location type atmosphere. A nonconductive duct can not properly dissipate a static electrical charge through the power cord ground wire. Just touching a nonconductive duct can create a random spark that could be the ignition source of an explosion, resulting in property damage and/or personal injury.

MODEL EP8HL BLOWER OPERATING CLASSIFICATIONS AND LIMITATIONS.

The EP8HL Blower is certified by Canadian Standards Association® for use only in the following hazardous location type atmospheres as defined by the National Electric Code®. Refer to the current National Electric Code® for specific information.

CLASS 1, GROUP D
CLASS II, GROUP G
CLASS III

The EP8HL Blower can also be utilized in nonhazardous location type atmospheres.



DANGER

DO NOT OPERATE THE EP8HL BLOWER IN A HAZARDOUS LOCATION TYPE ATMOSPHERE NOT MEETING THE ABOVE CLASS AND GROUP AS DEFINED BY THE NATIONAL ELECTRIC CODE. USE IN ANY OTHER HAZARDOUS LOCATION TYPE ATMOSPHERE CAN PRODUCE AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

Canadian Standards Association® was chosen because its requirements are generally more restrictive and stringent than the corresponding Underwriter's Laboratory® (UL®) standards. During the manufacturing process, each Blower is subject to a number of rigid, quality control audits and checks to insure its conformity to the CSA® certification standards. Because of the rigid certification standards required by the Canadian Standards Association® and the rigid quality control standards set forth during manufacture, General Equipment Company will vigorously pursue and defend itself against any



product liability lawsuit brought forth against it for any alleged defect occurring from and/or associated with the use of the EP8HL Blower.

Operation

DANGER

THE BLOWER IS DESIGNED FOR PORTABLE AIR VENTILATION PURPOSES ONLY. THE BLOWER IS NOT DESIGNED FOR TRANSPORTING LIQUID, SEMI-SOLID OR SOLID MATERIAL(S). IMPROPER USE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

NATIONAL ELECTRIC CODE® DISCLAIMER.

CAUTION

The information presented in this publication has been assembled from various sources. Although every attempt has been made to insure its accuracy, neither General Equipment Company nor its agents or any contributor to this publication assumes responsibility for any inaccuracies or omissions in the data presented. As a safety precaution, information to be utilized from this publication should be verified from the current National Electric Code® and other sources.

DANGER

BEFORE OPERATING THE EP8HL BLOWER DETERMINE BY ALL FEASIBLE METHODS INCLUDING, BUT NOT LIMITED TO, ATMOSPHERIC TESTING, KNOWLEDGE OF APPLICABLE PROCESSES AND COMMON SENSE IF THE CONFINED SPACE HAS THE CHARACTERISTICS THAT DEFINES IT AS BEING AN NEC® CLASS I GROUP D, CLASS II GROUP G OR CLASS III LOCATION. THE CHARACTERISTICS WILL DETERMINE IF THE CONFINED SPACE IS A HAZARDOUS LOCATION AND/OR A PERMIT REQUIRED ACCESS.

DANGER

A HAZARDOUS LOCATION MAY REQUIRE ADDITIONAL CONSIDERATIONS INCLUDING, BUT NOT LIMITED TO, PROPER ELECTRICAL WIRING DEVICES FOR THE BLOWER, STATICALLY CONDUCTIVE CLOTHING, STATICALLY CONDUCTIVE SHOES, SPARK PROOF TOOLS AND HAZARDOUS LOCATED CERTIFIED LIGHTING. CONSULT APPLICABLE NATIONAL ELECTRIC CODE® AND/OR OSHA REGULATION FOR SPECIFIC INFORMATION.

CAUTION

Before operating the Blower, obtain a copy of the current National Electric Code® and/or review guide for the use of electrical products in hazardous location type atmospheres.

Specific purposes of this material are:

- 1) To assist the owner and/or operator of the Blower in interpreting the National Electric Code®.
- 2) To provide information that will assist the owner and/or operator in minimizing the fire hazards encountered in classified locations, including references to sources where more detailed information can be obtained.
- 3) To acquaint the owner and/or operator with the various types of electrical equipment and equipment designed for use in hazardous locations.
- 4) To provide a guide for the correct selection and installation of electrical products and components in conformance with the National Electrical Code®.
- 5) To provide a guide for the selection and development of appropriate training materials and operational procedures for use in hazardous atmospheres.

CONFINED SPACE REGULATION DISCLAIMER.



CAUTION

Before operating the Blower, obtain a copy of OSHA Standard 29 CFR 1910.146 and/or current revision. This standard provides a comprehensive regulatory framework by which employers can effectively protect employees who work in confined work spaces.

BASIC INFORMATION AND DEFINITIONS PERTAINING TO CONFINED SPACE REGULATIONS.

Many confined work places contain spaces which are considered "confined" because their configurations hinder the activities of any workers who must enter, work in or exit them. For example, employees working in process vessels generally must squeeze in and out through narrow openings and perform their tasks while cramped or contorted. In addition there are many instances where employees who are working in confined work spaces also face increased risk of exposure to serious hazards. In some cases, confinement itself poses entrapment hazards. In other cases confined space work keeps workers closer to hazards such as asphyxiating atmospheres or the moving parts of a mixer, than they would be otherwise.

Accordingly, under the regulation, OSHA distinguishes between confined work spaces that pose a threat of death or serious bodily harm and those that pose no such threat---existing or potential. This distinction is accomplished through a series of three definitions essential to the application of the standard. The first is defined as follows:

- 1) The space is large enough and so configured that a worker can bodily enter and perform assigned work.
- 2) The space has limited or restricted means for entry or exit.
- 3) The space is not designed for continuous worker occupancy. 29 CFR 1910.146(d).

The term "non permit required confined work space" is defined in the standard as follows: "a confined space that does not contain or with respect to atmospheric hazards have the potential to contain any hazard

capable of causing death or serious harm. 29 CFR 1910.146(b).

The term "permit required confined space" means a confined space that presents or has a potential to present one or more of the following:

- 1) An atmospheric hazard.
- 2) An engulfment hazard.
- 3) A configuration hazard.
- 4) Any other recognized serious hazard. 29 CFR 1910.146(b).

Under 29 CFR 1910.146(c)(1), the employer shall evaluate the workplace to determine if any spaces require a permit to enter. If the work space requires a permit, then 29 CFR 1910.146(c)(2) requires the employer to inform exposed workers of such dangers by posting signs or any other equally effective method or means to communicate the potential dangers. If the employer decides its employees will not enter a confined work space requiring a permit, he must follow the protocol found in 29 CFR 1910.146(1), (2), (3), (6) and (8).

If workers will enter a confined work space requiring a permit, then the employer shall develop and implement a written permit confined work space entry program found in 29 CFR 1910.146(d).

HAZARDOUS LOCATION ATMOSPHERE CERTIFICATION STANDARDS FOR THE MODEL EP8HL BLOWER.

The EP8HL Blower is certified by the Canadian Standards Association® (CSA®) for use in the following hazardous location type atmospheres as defined by the National Electric Code®. Refer to the current National Electric Code® for specific information.

- CLASS I, GROUP D
- CLASS II, GROUP G
- CLASS III

The Blower can also be utilized in nonhazardous location type atmospheres.





DANGER

DO NOT OPERATE THE EP8HL BLOWER IN A HAZARDOUS LOCATION ATMOSPHERE NOT MEETING THE ABOVE CLASS AND GROUP AS DEFINED BY THE NATIONAL ELECTRIC CODE. USE IN ANY OTHER HAZARDOUS LOCATION CAN PRODUCE AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

BASIC DEFINITIONS OF HAZARDOUS LOCATION TYPE ATMOSPHERES.

Class I Locations (Gases).

An area where flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

Class II Locations (Dust).

An area where presence of combustible dust presents a fire or explosion hazard.

Class III Locations (Fibers).

An area made hazardous because of the presence of easily ignitable fibers or filings, but in which such fibers or filings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures.

AIR VENTILATION BLOWER APPLICATIONS FOR CONFINED SPACE USE IN HAZARDOUS LOCATION TYPE ATMOSPHERES.

A hazardous location air ventilation blower may be required in any confined work space where the presence of flammable gases, vapors or finely pulverized dusts in the atmosphere is sufficient to create a threat of an explosion or fire. It may also be required where easily ignitable fibers or filings are present. The following information is a representative (but not totally complete) list of the types of locations and operations that require hazardous location air ventilation blowers for use in confined space applications in at least certain areas. Consult the current National Electric Code® for specific information.

Typical Class I Locations Include:

- Petroleum refining facilities.
- Dip tanks containing flammable or combustible liquids.
- Dry cleaning plants.
- Plants manufacturing organic coatings.
- Spray finishing areas (residue must be considered).
- Petroleum dispensing areas.
- Solvent extraction plants.
- Plants manufacturing or using ptxoxylin (nitro-cellulose) type and other plastics (Class II also).
- Locations where inhalation anesthetics are used.
- Utility gas plants and operations involving storage and handling of liquified petroleum and natural gas.
- Aircraft hangars and fuel servicing areas.

Typical Class II Locations Include:

- Grain elevators and bulk handling facilities.
- The manufacture and storage of magnesium and aluminum powder.
- The manufacture and storage of starch.
- Fireworks manufacture and storage.
- Flour and feed mills.
- Areas for packaging and handling of pulverized sugar and coca.
- Some coal preparation plants and coal handling facilities.
- Spice grinding plants.
- Confectionery manufacturing plants.

Typical Class III Locations Include:

- Wood working plants.
- Textile mills.
- Cotton gins and cotton seed mills.
- Flax producing plants.

SPARKPROOF CONSTRUCTION CONSIDERATIONS FOR HAZARDOUS LOCATION TYPE CONFINED SPACE VENTILATION.

The EP8HL Blower incorporates spark proof construction in its design to minimize the potential for a random spark being the ignition source of an explosion during use in a hazardous location. All major components are fabricated from materials that will not produce a spark when struck by a direct blow: high strength aluminum frame and blower housing; galvanized intake and exhaust screens; aluminum fasteners in open, exposed areas and a PVC coated,



steel carry handle. All wiring devices and components are designed and certified for use in the applicable hazardous locations. The electric motor and all related wiring components of steel construction are positioned to afford protection against a direct impact blow.

As an illustrative example, consider the potential consequences if a tool is dropped and strikes a ventilation blower in use. If the blower is in use within a nonhazardous atmosphere, the risk for an explosion is minimal. However, if the same tool strikes the exposed, steel surfaces of a blower being operated in a hazardous location that contains gasoline fumes, the results could be drastically different. The blow produced by the tool could create a random spark. In the case of gasoline fumes, the addition of a proper air and fume mixture could result in an explosion. Minimizing this potential for a spark ignition is also an important reason why spark proof tools, statically conductive shoes/clothing and related equipment are also utilized in hazardous locations. By incorporating basic spark proof construction techniques, the potential for a spark ignited explosion caused by a direct blow against an exterior surface of the EP8HL Blower can be greatly minimized. The use of an explosion proof motor alone or with a housing design of steel construction does not qualify the blower as explosion proof. An explosion proof motor only means that the motor has the structural capacity to survive an internal explosion. No air ventilation blower is totally explosion proof. Only a product utilizing proper design and certification standards can minimize the risk of providing air ventilation in the applicable hazardous atmospheres.

STATIC ELECTRICITY CONSIDERATIONS FOR HAZARDOUS LOCATION TYPE CONFINED SPACE VENTILATION.

The formation and dissipation of static electricity is a natural occurrence of any air movement. A common example is the natural air movement that occurs with the heating and cooling of the earth's atmosphere. The resulting winds are responsible for the ionization of negative and positive charged air molecules. Eventually, severe charge levels can result in a rapid discharge in the form of lightning. The phenomenon of static electric discharge is an important consideration during the operation of an air ventilation blower in a hazardous location type atmosphere. A static discharge can be the ignition source for an explosion. Only proper product design considerations along with

proper levels of knowledge, skill and common sense for the air ventilation process can be utilized to minimize the potential for such an occurrence.

These design considerations collectively employ a systems approach to problem solving, including the use of statically conductive air ducts and a properly grounded, electrical power source.

Air ducts normally used for ventilating a nonhazardous location type confined space are fabricated from materials such as a vinyl impregnated polyester. This material does not conduct a static charge build-up. Air ducts used for ventilating a hazardous location type confined space are designed to conduct and dissipate the electric charges created by the movement of air through the duct. Without this added conductive property, air movement creates static electricity charges on the duct surface that would have no method for dissipation. Just touching a nonconductive duct could allow the charge to be dissipated in the form of a random spark. Such an occurrence could be the ignition source of an explosion if the Blower is being operated in the appropriate hazardous location type atmosphere. Instead, the statically conductive duct used with the EP8HL Blower allows a static electrical charge to be effectively conducted through its length until it is eventually dissipated through the ground wire of the electric power cord. The EP8HL Blower is designed so that only the statically conductive ducts can be utilized with it, thereby minimizing the potential use of a standard, nonconductive duct in a hazardous location type atmosphere.

EXPLOSIVE CHEMICAL PROPERTIES CONSIDERATIONS FOR HAZARDOUS LOCATION TYPE CONFINED SPACE VENTILATION.

Certain chemicals may have characteristics that require safeguards beyond those required for any of the certified atmospheric groups. Carbon Disulfide is an example of such a chemical because of its low ignition temperature and the small joint clearance to arrest its flame propagation.

Certain metal dusts may have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium and their commercial alloys. For example, zirconium, thorium and uranium dusts have extremely low ignition temperatures and minimal ignition energies



lower than any material classified in any of the Class I or Class II groups.

Combustible dusts which are electrically nonconductive include dusts produced in the handling and processing of grain, grain products, pulverized sugar, cocoa, dried egg and milk powders, pulverized spices, starches and pastes, potato and wood flour, oil meal from beans and seed, dried hay and other organic materials which may produce combustible dusts when processed or handled. Electrically conductive dusts are those dusts with a resistivity less than 105 ohm-centimeter. Dusts containing magnesium or aluminum are particularly hazardous and the use of extreme caution is necessary to avoid an ignition and resulting explosion. Explosion severity is the measure of maximum explosion pressure and maximum rate of pressure rise. It is the measure of how violent the ensuing explosion will be. Closely associated with the maximum pressure and rate of pressure rise is the length of time that pressure is exerted on the surroundings. All of these factors contribute to the total impulse, rather than the force exerted at any one moment, that determines the destructiveness of an explosion. This explains in part why dust explosions, which have slower rates of pressure rise, may be more destructive than gas explosions.

Dust that is carbonized or excessively dry is highly susceptible to spontaneous ignition. Equipment and wiring of the type defined in Article 100 of the National Electric Code® as explosion proof shall not be required and shall not be acceptable in Class II locations unless approved for such locations.

Complete information relative to the use, handling and/or manufacture of applicable chemicals and their explosive properties as pertaining to confined space air ventilation can be obtained from the National Fire Protection Association.

FLOW RATES FOR MODEL EP8HL HAZARDOUS LOCATION, PORTABLE AIR VENTILATION BLOWER.

FREE AIR	1277.4 CFM (35.7 CMM)
ONE 90° BEND	738.0 CFM (20.7 CMM)
TWO 90° BENDS	578.8 CFM (16.2 CMM)

Flow rates for the EP8HL Blower were calibrated by the Colorado Engineering Experiment Station, Inc. Blower components were tested per AT&T standard EL2723/PL2709 in a chamber built in accordance with AMCA standard 210-67. The test was performed with a single, 8 inch (203 mm) diameter x 15 feet (4.5 m) flexible, reinforced duct connected to the Blower outlet. Flow rates were obtained with a nominal electric motor speed of 1725 RPM. The published flow rates are intended to serve only as a reference. Manufacturing tolerances and specific operating parameters will affect the overall flow rate(s) for each particular Blower.

 **CAUTION**

The air flow rate decreases as the length of the flexible, reinforced duct increases for both exhaust and suction job applications. Measured flow rates (with the use of ducts) will increase with the use of a flexible, reinforced duct less than 15 feet (4.5 m) in length and decrease with the use of a flexible, reinforced duct greater than 15 feet (4.5 m) in length. Flow rates will also vary with the specific ducts manufactured and/or supplied by various Original Equipment Manufacturer (OEM) sources.

CONNECTING THE MODEL EP8HL BLOWER TO THE POWER SOURCE.

BEFORE utilizing the Blower, read the Operator's Manual and view the Safety and Operational Information Video Tape supplied with each unit. If, after reading the Operator's Manual and viewing the Safety and Operational Information Video Tape, there are any questions regarding the proper operation of the Blower, contact the dealer or the Customer Service Department for assistance BEFORE utilization. There is no charge for this service.

- 1) Position the Blower into any relative wind upwind from the work location and with the air inlet facing the wind to maximize the air flow.
- 2) The voltage, frequency and phase of the power supply should be consistent with the motor nameplate rating. The motor will operate satisfactorily on voltages within 10% of the nameplate value or frequency within 5 percent. The combined variation must not exceed 10 percent. The Blower is designed to operate from a



grounded, 115 volt nominal AC, 60 Hz, single phase power source meeting any applicable hazardous location considerations. Operation from other type power sources can result in property damage and/or personal injury.

3) The Blower power cord is to be connected only to a properly grounded, NEMA 5-20R receptacle meeting the National Electric Code® requirements for use in the applicable hazardous location. Refer to current revisions of National Electric Code Articles 501-11, 501-12, 502-12, 502-13, 503-10 and 503-11 for specific information. FIGURE 3.



FIGURE 3

Determine that the power outlet to be utilized is properly grounded. This can be accomplished with proper testing equipment and procedures. If there are any questions regarding the suitability of a specific power outlet, contact the Customer Service Department for assistance BEFORE utilizing the Blower. There is no charge for this service. A qualified electrician can also be consulted. It is recommended that a properly tested, externally mounted, ground fault circuit interrupter (GFCI) be utilized at all times as an additional safety precaution. Plug the blower/extension cord into the ground fault circuit interrupter of proper type and capacity. Plug the ground fault circuit interrupter into a proper electrical power source. This configuration will allow any fault over the length of a defective cord to be indicated.

DANGER

FOR MAXIMUM PROTECTION AGAINST A FAULT, ALWAYS CONFIGURE THE GROUND FAULT CIRCUIT INTERRUPTER TO BE DIRECTLY PLUGGED INTO THE ELECTRICAL POWER SOURCE. A CONFIGURATION WITH THE GROUND FAULT CIRCUIT INTERRUPTER PLACED BETWEEN THE BLOWER AND THE ELECTRICAL POWER SOURCE WILL NOT AFFORD MAXIMUM PROTECTION AGAINST A POTENTIAL FAULT.

National Electric Code® limits flexible power cords to connections between portable utilization equipment such as the EP8HL Blower and the fixed portion of a supply circuit. A cord connector used as an extension cord, therefore, is not permitted unless specifically approved for the location. Cords required for those locations are those for "extra hard usage" (NEC® Table 400-4) and must include a grounding conductor identified with markings as specified in NEC® 400-23.

NEC® 501-11 also states requirements for terminal connections and seals. NEC® 502-12, flexible cords, Class II, Divisions 1 and 2 states that the cord shall be provided with suitable seals to prevent the entrance of dust where the flexible cord enters boxes or fittings that are required to be dust/ignition proof.

NEC® 502-13, receptacles and attachment plugs states that for Division 1 and 2 locations, receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of the flexible cord and shall be approved for Class II locations. For Division 2 locations, receptacles and attachment plugs shall be of the type providing for connection to the grounding conductor of the flexible cord and shall be so designed that connection to the supply circuit cannot be made or broken while live parts are exposed.

In addition to that already presented for Class I and Class II locations, NEC® 503-11, flexible cords, Class III, Divisions 1 and 2 states that the power cord be provided with suitable means to prevent the entrance of fibers or filings where the cord enters boxes or fittings.

NEC® 503-11, receptacles and attachment plugs, Class III Divisions 1 and 2 states that receptacles and attachment plugs shall be of the grounding type and shall be so designed to minimize the accumulation or

the entry of fibers or filings and shall prevent the escape of sparks or molten particles.

DANGER

THE HAZARDOUS LOCATION CORD PLUG SUPPLIED WITH THE EP8HL BLOWER AS ORIGINAL EQUIPMENT MUST BE UTILIZED WITH THE APPROPRIATE FEMALE RECEPTACLE FOR OPERATION IN THE SPECIFIC HAZARDOUS LOCATION ATMOSPHERE. USE OF A STANDARD, NONHAZARDOUS LOCATION RECEPTACLE IN A HAZARDOUS LOCATION ATMOSPHERE CAN CREATE A RANDOM SPARK. SUCH OCCURRENCE CAN BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

4) A factory supplied extension cord comprised of extra hard usage cord material and an Appleton ECCL2023 receptacle certified for use in the appropriate hazardous location atmospheres is available in 50 and 100 foot lengths. Both extension cord lengths are intended to be soft wired into nonhazardous location type power sources located outside of the hazardous type confined space location.

DANGER

FOR POWER REQUIREMENTS, DO NOT EXCEED 100 FOOT MAXIMUM EXTENSION CORD LENGTH. IF TWO 50 FOOT EXTENSION CORDS ARE BEING CONNECTED TOGETHER, ALL WIRING DEVICES MUST BE DESIGNED FOR USE IN THE APPROPRIATE HAZARDOUS LOCATION ATMOSPHERES. FAILURE TO UTILIZE PROPER WIRING DEVICES CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

Extension cords meeting hazardous location requirements can be fabricated in the field utilizing a 10-3 AWG, CSA certified, extra hard usage cord material and an Appleton ECCL2023, or equivalent, receptacle certified for use in the appropriate hazardous location type atmospheres. An Appleton NCP 2023, or equivalent, male plug certified for use in the appropriate hazardous location type atmosphere must be utilized when a connection is made to a power

source within a hazardous location type atmosphere. Only when the cord plug is being connected to a power source outside of the hazardous location envelope can it be of a nonhazardous type. FIGURE 4.



FIGURE 4

5) The EP8HL Blower utilizes the ground cable of the power cord to dissipate static charges that are created from the air ventilation process. For dissipation process to function, a properly operating ground system must be utilized.

DANGER

ALWAYS UTILIZE A PROPERLY FUNCTIONING GROUND FAULT CIRCUIT INTERRUPTER (GFCI) DEVICE WHEN OPERATING THE EP8HL BLOWER IN BOTH HAZARDOUS AND NONHAZARDOUS LOCATION TYPE ATMOSPHERES. THIS DEVICE WILL PREVENT BLOWER OPERATION IN THE EVENT THAT A PROPER GROUNDING SYSTEM IS NOT AVAILABLE. WITHOUT A PROPER GROUNDING SYSTEM, A STATIC ELECTRICAL CHARGE CAN NOT BE DISSIPATED, ALLOWING THE POTENTIAL FOR THE CREATION OF A RANDOM SPARK WHICH CAN PRODUCE AN EXPLOSION. SUCH AN OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

GROUND FAULT CIRCUIT INTERRUPTER DEVICES ARE AVAILABLE FOR USE IN BOTH HAZARDOUS AND NONHAZARDOUS LOCATION TYPE ATMOSPHERES. CONSULT AN ELECTRICAL PRODUCTS DISTRIBUTOR OR THE CUSTOMER SERVICE DEPARTMENT FOR SPECIFIC INFORMATION BEFORE ATTEMPTING TO UTILIZE THE BLOWER WITH A GROUND FAULT CIRCUIT INTERRUPTER. THERE IS NO CHARGE FOR THIS SERVICE.

6) Determine that all electrical connections meet the applicable requirements of the National Electric Code®. Consult a copy of the current National Electric Code® and/or qualified electrician for specific information.

7) The Blower is started by pulling the ON/OFF switch to the ON position.

8) The Blower is stopped by pushing the ON/OFF switch to the OFF position.

USE OF THE FACTORY SUPPLIED, STATICALLY CONDUCTIVE DUCTS WITH THE MODEL EP8HL BLOWER.

DANGER

THE NORMAL VENTILATION PROCESS CREATES A STATIC ELECTRICAL CHARGE AS A RESULT OF AIR MOVING ACROSS THE SURFACES OF THE BLOWER AND DUCT. DO NOT MODIFY THE EP8HL BLOWER TO UTILIZE A STANDARD, NONCONDUCTIVE DUCT IN BOTH HAZARDOUS AND NONHAZARDOUS TYPE ATMOSPHERES. A NONCONDUCTIVE TYPE DUCT CAN NOT PROPERLY DISSIPATE A STATIC ELECTRICAL CHARGE. IMPROPER DISSIPATION OF A STATIC ELECTRICAL CHARGE CAN BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

WHILE IN USE IN HAZARDOUS TYPE ATMOSPHERES, STATICALLY CONDUCTIVE DUCTS MUST BE STORED IN DEVICES MEETING A SPARK PROOF CLASSIFICATION. USE OF STORAGE DEVICES NOT MEETING A SPARK PROOF CLASSIFICATION CAN CREATE A RANDOM SPARK THAT CAN BE THE IGNITION SOURCE OF AN EXPLOSION. THIS OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

BECAUSE THE STORAGE CANNISTERS UTILIZED FOR STORAGE OF THE STATICALLY CONDUCTIVE DUCTS DO NOT EMPLOY AN EXTERNAL STATIC GROUNDING STRAP AND CLAMP, THERE IS NO INDEPENDENT SYSTEM FOR THE DIRECT DISSIPATION OF A STATIC ELECTRICAL CHARGE. TO MINIMIZE THE POTENTIAL FOR A RANDOM SPARK BEING THE IGNITION SOURCE OF AN EXPLOSION, DETERMINE THAT A CANNISTER OF SPARK PROOF CONSTRUCTION IS PROPERLY GROUNDED BEFORE REMOVING AND/OR STORING THE DUCT.

1) For normal exhaust (air blowing) operations, install the part number SCFD815 or SCFD825 statically conductive duct to the Blower outlet. FIGURE 5. The EP8HL Blower is designed to utilize only factory supplied, statically conductive ducts. If it is determined that the statically conductive duct can not be installed on the Blower by the procedure below, contact the Customer Service Department for assistance BEFORE utilizing the Blower. There is no charge for this service.

a) Align the slots in the cuff with the retaining capscrews.

b) Slide the cuff forward against the retaining capscrews as far as possible.

c) Tighten the aluminum knobs against the cuff. Check to determine that the cuff will withstand a 10 pound minimum force to pull it loose from the housing.

d) Visually inspect the static ground strap clamp to determine that it is clean and/or free of dirt and/or corrosion. If the clamp is determined not to be usable, perform the necessary maintenance procedures to properly remove all accumulated dirt and/or corrosion. Discard and properly replace any clamp with a factory replacement part if the copper plating has been removed in other than the actual clamping jaw area.

CAUTION

Utilize all appropriate safety precautions and wear all appropriate safety apparel when removing the accumulated dirt and/or corrosion from the static ground strap clamp.

e) Determine that the ground location area on the Blower housing is clean and/or free of dirt and/or corrosion. If the ground location area is determined not to be usable, perform the necessary maintenance procedures to properly remove all accumulated dirt and/or corrosion. Refer to the safety note above. Secure the ground strap clamp to the designated, bare aluminum location on the Blower housing as depicted by the information plates. The procedure is similar to that utilized to secure clamps to a storage battery. Determine that a proper ground connection has been made. FIGURE 6.



FIGURE 5

DANGER

THE EP8HL BLOWER IS DESIGNED TO UTILIZE ONLY THE FACTORY SUPPLIED, STATICALLY CONDUCTIVE DUCTS. USE OF ANY OTHER DUCT WILL VOID BOTH THE CANADIAN STANDARDS ASSOCIATION CERTIFICATION AND FACTORY WARRANTY. FACTORY SUPPLIED, STATICALLY CONDUCTIVE DUCTS EMPLOY A CAPTIVE ATTACHING MECHANISM DESIGNED TO PROPERLY GROUND THE DUCT TO THE BLOWER. IN ADDITION, STATIC GROUNDING STRAP CLAMPS ARE PROVIDED FOR DIRECT CONNECTION TO THE BLOWER FRAME IN THE DESIGNATED LOCATION AS DEPICTED BY THE INFORMATION PLATES. THE STATIC GROUNDING STRAPS SERVE AS A REDUNDANCY SYSTEM IN THE EVENT THAT THE DUCT IS NOT PROPERLY GROUNDED TO THE BLOWER HOUSING WITH THE CAPTIVE ATTACHING MECHANISM.



FIGURE 6

DANGER

DO NOT OPERATE THE EP8HL BLOWER WITHOUT THE STATIC GROUNDING STRAP PROPERLY ATTACHED TO THE DESIGNATED LOCATION ON THE BLOWER HOUSING. IMPROPER STATIC CHARGE DISSIPATION CAN ALLOW A SPARK TO BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

TO MINIMIZE THE POTENTIAL FOR A STATIC DISCHARGE BEING THE IGNITION SOURCE OF AN EXPLOSION IN A HAZARDOUS TYPE LOCATION, DO NOT USE A NONFACTORY SUPPLIED, STATICALLY CONDUCTIVE DUCT WITH THE BLOWER. A NONFACTORY, STATICALLY CONDUCTIVE DUCT MAY NOT ALLOW FOR PROPER GROUNDING TO THE BLOWER HOUSING. IMPROPER STATIC CHARGE DISSIPATION CAN ALLOW A RANDOM SPARK TO BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

AN IMPROPER DUCT CLAMPING PROCEDURE WILL NOT PROPERLY GROUND THE STATICALLY CONDUCTIVE DUCT TO THE BLOWER FRAME. AN IMPROPER GROUND CONNECTION WILL NOT ALLOW A STATIC ELECTRICAL CHARGE FROM BEING PROPERLY DISSIPATED THROUGH THE GROUND WIRE OF THE ELECTRIC POWER CABLE OF THE BLOWER. IMPROPER STATIC CHARGE DISSIPATION CAN ALLOW A RANDOM SPARK TO BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

2) For normal suction (air evacuation) operations, connect the part number SCFD815 or SCFD825 statically conductive duct to the Blower inlet. Follow the same installation procedure to the Blower inlet as outlined above. FIGURE 7.

3) Maximum recommended duct length is 25 feet (7.6 m). A duct length exceeding this nominal figure can significantly reduce the air flow delivery performance of the Blower. However, field experience indicates that there can be an occasion where statically conductive ducts are required to be coupled together for a specific job application. If, after properly reviewing all safety and operational considerations of the job application, the decision is still made to couple two ducts together, follow this procedure:

a) Visually inspect each duct for proper structural integrity.

b) Inspect each static ground wire and clamp for proper structural integrity and freedom of dirt and /or corrosion accumulation.

c) Attach the cuff ends of two statically conductive ducts together by the use of the part number FD8C Connector. This unit is fabricated from galvanized steel or by the use of another spark proof construction method that is statically conductive. Secure the cuffs with a spark proof strapping method.

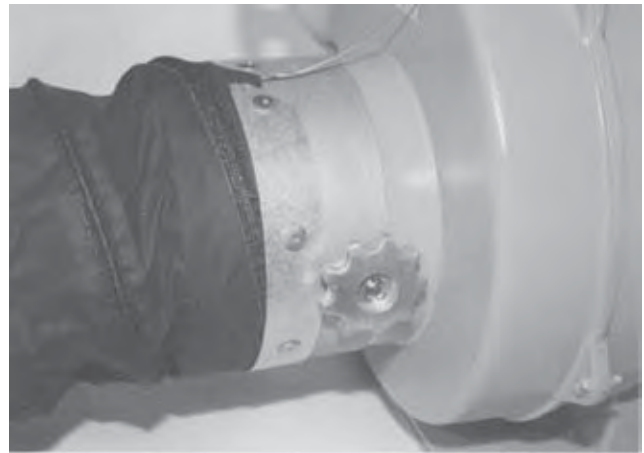


FIGURE 7

DANGER

DO NOT UTILIZE CLAMPING DEVICES THAT ARE NOT OF SPARK PROOF CONSTRUCTION. THE USE OF IMPROPER CLAMPING DEVICES CAN ALLOW A RANDOM SPARK TO BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

d) Connect the static ground clamps together. FIGURE 8.

4) Determine that the statically conductive duct is properly attached to the blower housing. If it is determined that the duct can not be properly installed as outlined above, contact the Customer Service Department for assistance BEFORE utilizing the Blower. There is no charge for this service.



FIGURE 8

5) Determine that the Blower is providing air flow in the required direction (exhaust or suction configuration). If it is determined that the air flow direction is improper, reevaluate the configuration and/or contact the Customer Service Department for assistance BEFORE utilizing the Blower. There is no charge for this service.



CAUTION

For both normal exhaust and suction operations, follow any air flow direction arrows (if so equipped) marked on the statically conductive duct to insure maximum air flow delivery. Failure to properly secure the duct to the Blower can result in property damage and/or personal injury.



DANGER

FOR BOTH EXHAUST AND SUCTION OPERATIONS, THE MINIMUM RECOMMENDED SAFE DUCT DIAMETER IS 8 INCHES (203 mm). FOR BOTH EXHAUST AND SUCTION OPERATIONS, THE MAXIMUM RECOMMENDED SAFE DUCT LENGTH IS 25 FEET (7.6 m).



DANGER

BEFORE UTILIZING THE BLOWER, CHECK ALL APPLICABLE FEDERAL, STATE, INDUSTRY AND LOCAL REGULATIONS REGARDING THE USE OF FLAME RESISTANT AND/OR SELF EXTINGUISHING DUCT MATERIALS FOR THE INTENDED JOB APPLICATION. IT IS THE RESPONSIBILITY OF THE OWNER(S) AND/OR OPERATOR(S) TO DETERMINE THAT THE DUCT MATERIAL IN USE FOR THE JOB APPLICATION MEETS ALL APPLICABLE FIRE CODE AND OSHA REQUIREMENTS.

6) When storing a statically conductive duct into a cannister, determine that the static ground wire does not become trapped between the attachment cuff and the cannister cover. The static ground wire can be routed in an attachment cuff slot to minimize any potential for damage.

GENERAL INFORMATION REGARDING PORTABLE AIR VENTILATION BLOWER USE DURING CONFINED SPACE ENTRY.

What is meant by natural ventilation?

Because air may not always circulate properly in and out of a confined work space due to its geometry and/or design, the atmosphere inside can be very different from that of the outside. Deadly gases can be trapped inside, particularly if the work space is used to store or process chemicals or organic materials which may decompose. There may not be enough oxygen inside the confined work space to support human life. The air can also be so oxygen rich that it can increase the chance of a fire or explosion if an ignition source is presented.



DANGER

NEVER ASSUME THAT THE AIR INSIDE ANY CONFINED WORK SPACE WILL SUPPORT HUMAN LIFE UNTIL IT HAS BEEN TESTED. ALWAYS DETERMINE THE OXYGEN LEVEL IN THE

CONFINED WORK SPACE BEFORE ALLOWING PERSONNEL TO ENTER. IT MAY SAVE A LIFE OR MINIMIZE THE CHANCE OF AN EXPLOSION.

What are the hazards involved when entering and working in a confined work space?

The atmosphere inside a confined work space can be extremely hazardous because of the lack of natural air movement. This lack of natural air movement can result in the following types of atmospheres:

- 1) Oxygen deficient atmosphere.
- 2) Flammable atmosphere.
- 3) Toxic atmosphere.

What is an oxygen deficient atmosphere?

An oxygen deficient atmosphere has less than 19.5 percent available oxygen for human consumption. Another definition is an atmosphere with a partial pressure of oxygen (PO₂) of less than 132 mm Hg. Normal air at sea level contains approximately 21 percent oxygen at a PO₂ of 160 mm Hg. Things can change with altitude. For instance, in Denver, Colorado, with an altitude of approximately one mile, normal air contains approximately 21 percent oxygen at a PO₂ of 132 mm Hg. Any atmosphere with less than 19.5 percent oxygen should not be entered without an approved, self-contained breathing apparatus (SCBA).

The oxygen level in a confined work space can also decrease because of the nature of the work being performed in it. Operations such as welding, cutting or brazing will decrease the oxygen level in the space. Certain chemical reactions such as rusting or bacterial action such as fermentation can also decrease the oxygen level.

The oxygen level can also be decreased if it is displaced by another gas such as carbon dioxide or nitrogen. Total displacement of oxygen by another gas will result in unconsciousness, followed by death.

 **DANGER**

THE OXYGEN LEVEL IN A CONFINED SPACE IS A CRITICAL FACTOR FOR WORKER SAFETY. AN INSUFFICIENT OXYGEN LEVEL CAN CAUSE DEATH. AN EXCESSIVE OXYGEN LEVEL CAN READILY SUPPORT AN EXPLOSION.

What is a flammable atmosphere?

Two factors make a confined work space atmosphere flammable:

- 1) The oxygen level present in the space.

Different gases have different flammable ranges. If an ignition source (ie: flame from a match, a spark from a direct blow, etc.) is introduced into a confined work space containing a flammable atmosphere, an explosion will result.

- 2) A flammable gas, vapor or dust in the proper mixture.

An atmosphere containing 23.5 percent or greater oxygen is referred to as an oxygen rich atmosphere. These atmospheres will cause flammable materials such as clothing and hair to burn violently when ignited.

 **DANGER**

NEVER USE PURE OXYGEN TO VENTILATE A CONFINED WORK SPACE. VENTILATE WITH A SUITABLE PORTABLE AIR VENTILATION BLOWER WITH NORMAL, AMBIENT AIR. TEST UNTIL THE ATMOSPHERE IS WITHIN PROPER LIMITS. RETEST AS NECESSARY.

What is a toxic atmosphere?

Most substances such as liquids, vapors, gases, mists, solids and dusts should be considered hazardous in a confined work space. Toxic substances can be formed by the following:

- 1) While the product is being stored.

A product that is stored in a confined work space can



be absorbed into the walls and give off toxic gases when removed or when cleaning remaining residue. A good example is removing various types of sludge from holding tanks. The decomposed material can give off deadly hydrogen sulfide gases.

2) While a work process is being performed.

Certain work processes generate toxic gases in the atmosphere of a confined work space. Everyday examples include welding, torching, brazing, painting, sanding, degreasing, etc. Solvents utilized for cleaning or degreasing can release vapors that can be very toxic. In properly ventilated work areas, these processes may pose no significant health hazard. However, within a confined work space, the by-products from these processes can be deadly.

3) In areas adjacent to the confined work space.

Remember that toxicants produced by work being performed in the immediate area of a confined work space can enter and accumulate at levels that can provide a significant health hazard. For example: a portable air ventilation blower can introduce carbon monoxide from street level into an underground sewer or utility space at dangerous levels to workers. The methods used to minimize this possibility include proper planning and continual testing of the confined work space.

Conditions with toxic materials can be referred to as Immediately Dangerous to Life or Health (IDLH). This definition would include any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a work space.

Never take the possibility of toxicants in a confined work space lightly. Their effects can cause death in just a matter of seconds or over a long period of time. Take the time to fully understand what you are dealing with and possible complications and/or consequences.

What is a permit system?

A permit is actually a written check list utilized by workers to define the type of work to be accomplished, the expected hazards, the types of personal safety equipment required and the types of support equipment required. A permit will have a section to

document atmospheric gas tests and include the necessary signed authorizations from supervisory personnel.

Who issues a permit?

The responsibility of issuing a permit for a confined work space entry lies with the employer. By regulation, it is the responsibility of the employer to provide for worker safety during a confined work space entry. Government agencies do not normally issue a permit. Permits are issued by the employer. An employer can utilize a standard permit entry form or custom design it to meet specialized requirements. Employers should think of a written permit as an insurance policy. It requires workers to first analyze the job. It then makes them determine specific hazard potentials and equipment requirements. Finally, it requires them to document atmospheric testing data before receiving a signed authorization to enter the space. A permit requires workers to communicate, think and then document before making the entry. Without a permit, there would be no formal system to help safeguard the health of workers and minimize potential tragedies.



CAUTION

Never attempt a confined work space entry without first determining what source of applicable regulations will be consulted, the type of classification and the possible use of a permit. Even if not required by the regulation source, a permit is still the best insurance policy against the occurrence of an accident with deadly consequences.

TYPICAL CONFINED SPACE AIR VENTILATION PROCEDURES.

1) The EP8HL Blower must never be utilized by itself for portable, air ventilation purposes. Personnel and property safety can only be assured after making thorough gas detection tests combined with Blower ventilation and continual retesting. Because air may not flow in and out of a confined work space freely due to design considerations, the atmosphere inside can be very different from the outside. Deadly gases may be trapped inside, particularly if the space is used to store or process chemical or organic substances that decompose. There may not be adequate oxygen inside

the confined work space to support life, or the atmosphere could be so oxygen rich that it is likely to increase the chance of an explosion if an ignition source is present.

DANGER

ALWAYS ASSUME THAT EVERY MANHOLE OR CONFINED WORK SPACE AREA IS CONTAMINATED UNTIL IT HAS BEEN PROVEN THAT IT IS SAFE FOR WORK PERSONNEL. NEVER ENTER A MANHOLE OR CONFINED WORK SPACE AREA, EVEN FOR A MOMENT, UNTIL IT HAS BEEN THOROUGHLY TESTED WITH APPROPRIATE GAS DETECTION EQUIPMENT AND THEN VENTILATED FOR AT LEAST A MINIMUM OF 5 MINUTES WITH THE BLOWER OPERATING AT MAXIMUM SPEED.

2) Purge the Blower duct at street level for at least one minute before placing it into the manhole or confined work area. Determine that the Blower intake is away from carbon monoxide fumes or any other source of harmful fumes or gases. If ventilating street level air into a confined work space, a duct can be installed on the Blower inlet and suspended above the street as far as possible and/or practical. This procedure can minimize the amount of Carbon Monoxide contamination that is introduced into the confined work space. The most effective positioning of the outlet end of the Blower duct is on a cable rack or another supporting structure midway up a side wall, with the ventilating air being directed at an end wall. FIGURE 9 and FIGURE 10. This arrangement will provide for more even air distribution and will more effectively eliminate air spaces in corners where harmful gases may accumulate. Whenever possible, it is recommended that the Blower be utilized on a continuous duty cycle basis for both suction and exhaust ventilation applications.

3) Prior to entering the manhole or confined work area, suspend the sampling hose from the top rail of the manhole guard (or confined work space opening) with the connector end hanging down into the work area. Attach the tester to the sampling hose and purge by aspirating air through the tester for several seconds. Test for contamination as per the instructions. Then, aspirate the ambient air into the tester and note the indication on the meter.

4) Make periodic tests while working and always after taking any work break. Harmful gases can accumulate in areas not previously found before, which necessitates a continual testing program. If available, portable gas detection units should be worn by all personnel within the confined work space at all times to provide a continuous warning against the accumulation of harmful gases. Consult the material supplied by the gas detection unit manufacturer for specific information.

5) Utilize appropriate testing equipment and procedures: test, ventilate, test and continue to ventilate.

IMPROPER VENTILATION CONFIGURATION (For Illustrative Purposes ONLY!)

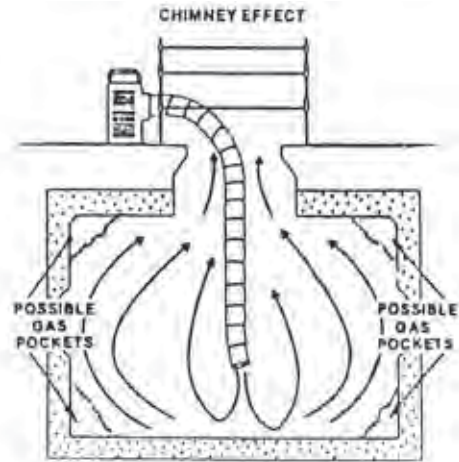


FIGURE 9

PROPER VENTILATION CONFIGURATION (For Illustrative Purposes ONLY!)

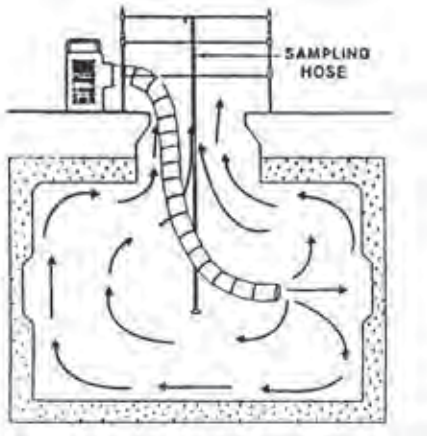


FIGURE 10

6) Continuous atmospheric testing with the appropriate equipment is recommended. Contact the nearest OSHA office for more specific and current information regarding confined space procedures in hazardous type locations, policies and requirements. Such information is regularly subject to change and revision.

DANGER

THE FINAL WORKING PROCEDURE FOR ANY JOB APPLICATION INVOLVING THE USE OF THE BLOWER MUST BE INDIVIDUALLY DETERMINED AFTER CAREFUL ANALYSIS OF ALL FACTORS AND/OR CONDITIONS PRESENT. THE NEAREST OSHA OFFICE IS A VALUABLE SOURCE FOR APPLICABLE INFORMATION REGARDING THE SAFE OPERATION OF THE BLOWER.

STOPPING THE MODEL EP8HL BLOWER.

1) Stopping the EP8HL Blower is accomplished by pushing the ON/OFF switch to the OFF position.

CAUTION

Do not disconnect the cord plug from the receptacle by pulling on the power cord. Such action can result in property damage and/or personal injury. Grasping the plug and receptacle firmly in hand, twist the assembly to disconnect and remove the plug from the receptacle.

Service

DANGER

ALWAYS STOP THE MOTOR AND DISCONNECT THE POWER SOURCE TO PREVENT THE ACCIDENTAL STARTING AND/OR THE POSSIBILITY OF RECEIVING AN ELECTRICAL SHOCK BEFORE WORKING ON THE BLOWER. SUCH AN OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

DO NOT ATTEMPT ANY SERVICE WORK ON THE BLOWER WITHIN A HAZARDOUS LOCATION TYPE ATMOSPHERE. SERVICE WORK CAN PRODUCE A RANDOM SPARK WHICH CAN BE THE IGNITION SOURCE OF AN EXPLOSION. SUCH AN OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

BLOWER HOUSING MAINTENANCE.

Do not operate the Blower with a large accumulation of dirt and other debris within the blower housing assembly. Such a collection of foreign material can affect air flow delivery performance and should be removed periodically. Keep the ground strap clamp location, as indicated by the information plates on the Blower housing, clean and free of dirt and/or corrosion.

REMOVING THE BLOWER WHEEL FROM THE MOTOR SHAFT.

Tools Required:

- 2 each, 7/16 inch wrenches
- 1 each, wheel puller (if required)
- 1 each, 5/32 inch Allen wrench

1) Remove the front housing casting with the 7/16 inch wrenches. The exhaust screen is held in place by four depressions in the casting. The exhaust screen can only be removed when the front casting is removed.

2) Loosen the set screw with the 5/32 inch Allen wrench and remove the blower wheel from the motor shaft. A wheel puller can be utilized if required. FIGURE 11. Clean as required with a safety solvent.

CAUTION

Observe all applicable safety precautions for the solvent.

3) Clean the surfaces of the Blower with a safety solvent.

CAUTION

Observe all applicable safety precautions for the solvent.

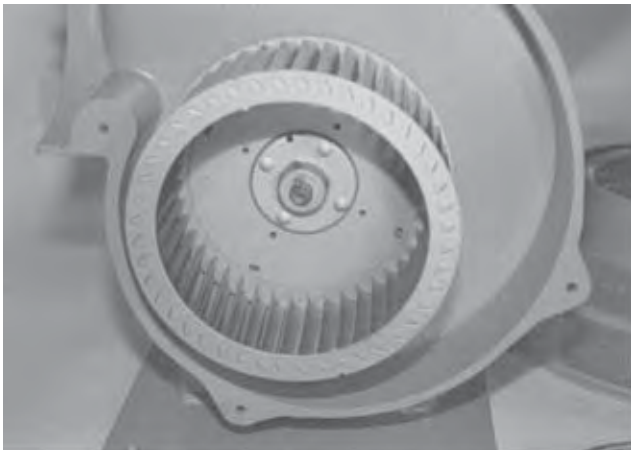


FIGURE 11

4) Reinstall the blower wheel on the motor shaft while aligning one of the setscrews created by the keyslot in the wheel. Position the fan as close to the inlet venturi as possible without the blades coming in direct contact with the venturi or interior wall of the blower housing. Tighten the setscrew until the fan is snug on the shaft. Rotate the fan to determine that it is not in contact with the venturi and/or interior wall. Tighten both setscrews until the fan is secure to the shaft.

5) Reinstall the exhaust screen assembly when the front casting is reassembled to the Blower. The applicable fasteners are constructed of aluminum. Do not over torque the fasteners.

DANGER

REPLACE ANY DAMAGED FASTENER WITH A FACTORY APPROVED REPLACEMENT PART ONLY. USE OF STEEL FASTENERS CAN RESULT IN A DIRECT BLOW CREATING A RANDOM SPARK. SUCH AN OCCURRENCE COULD BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

DETERMINE THAT THE STRUCTURAL INTEGRITY OF THE INLET AND OUTLET SCREENS WILL ALLOW THEM TO SERVE THEIR PROTECTIVE FUNCTION. DO NOT REINSTALL A DAMAGED AND/OR DEFECTIVE SCREEN. DO NOT OPERATE THE BLOWER WITHOUT THE INLET AND OUTLET SCREENS PROPERLY SECURED AND IN PLACE. DO NOT OPERATE THE BLOWER IF THE GALVANIZED PLATING ON THE SCREENS HAS BECOME WORN AND/OR DAMAGED. THE GALVANIZED PLATING AFFORDS SPARK PROOF CONSTRUCTION, MINIMIZING A RANDOM SPARK BEING THE IGNITION SOURCE OF AN EXPLOSION. SUCH AN OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

DANGER

REPLACE ANY DAMAGED INLET OR OUTLET SCREEN WITH A FACTORY APPROVED REPLACEMENT PART ONLY. USE OF AN IMPROPER SCREEN CAN CREATE A RANDOM SPARK. SUCH AN OCCURRENCE CAN BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

6) The blower wheel is factory balanced at the time of manufacture and should not require rebalancing under normal usage. Proper balance is essential to minimize wheel vibration and maximize air flow delivery. Periodically, apply a light coat of dry film lubricant to prevent the formation of rust on the wheel.

DANGER

IF THE BLOWER IS OPERATED IN A CORROSIVE ATMOSPHERE, REMOVE THE FRONT BLOWER HOUSING AS ABOVE, CLEAN AND REMOVE ANY CORROSIVE MATERIAL FROM THE WHEEL AND HOUSING. UTILIZE APPROPRIATE SAFETY APPAREL AND RELATED EQUIPMENT TO REMOVE THE CORROSIVE MATERIAL. DISPOSE OF ALL HAZARDOUS MATERIALS BY ACCEPTABLE PRACTICES AND/OR METHODS.

DANGER

DO NOT PAINT OR ALTER THE BLOWER WHEEL CONFIGURATION IN ANY MANNER. THE RESULT WILL BE AN UNBALANCED WHEEL CONDITION. AN UNBALANCED WHEEL ROTATING AT HIGH SPEED CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

ELECTRIC MOTOR MAINTENANCE.

The electric motor is capable of operating for many years with a reasonably small amount of maintenance. Before attempting to service the motor, disconnect the Blower from the power supply. Remove the top cover. Clean the motor surfaces periodically, preferably with a vacuum cleaner. Heavy accumulations of dirt and lint will result in overheating and premature failure of the motor. The electric motor is equipped with ball bearings and under normal service and ambient temperatures, should not require relubrication for many years. If you feel that the motor requires relubrication, contact the local service representative of the motor manufacturer for specific information.

STATICALLY CONDUCTIVE DUCT MAINTENANCE.

Special air ducts are fabricated from a statically conductive material to dissipate static electrical

charges through the ground wire of the power source cord. Available in industry standard lengths, each duct incorporates a captive cuff assembly that provides a positive ground connection to the Blower when properly installed. In addition, a separate static ground strap for direct clamping to the Blower is provided for static dissipation redundancy. A duct repair kit, Part Number EP8HL-1200, is available to facilitate field repairs to the duct material. This kit includes replacement patching material, a special statically conductive adhesive, a Material Safety Data Sheet and complete instructions. To maintain the static conductive properties, ducts can be field repaired only with this factory approved kit.

DANGER

FIELD REPAIR A STATICALLY CONDUCTIVE DUCT WITH A FACTORY APPROVED REPAIR KIT ONLY. USE OF "DUCT" TAPE OR OTHER, NON CONDUCTIVE REPAIR MATERIALS WILL NOT PROPERLY DISSIPATE A STATIC ELECTRICAL CHARGE. SUCH AN OCCURRENCE CAN CREATE A RANDOM SPARK THAT CAN BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

Duct storage canisters feature spark proof construction for added safety in hazardous location type confined work spaces. Heavy gauge, welded aluminum construction and a full, hinged cover provide positive protection against damage during storage or transit.

DANGER

DO NOT UTILIZE ANY DUCT STORAGE ACCESSORY IN A HAZARDOUS LOCATION TYPE ATMOSPHERE THAT DOES NOT MEET THE SPARK PROOF DESIGN CONSIDERATION. A DIRECT BLOW AGAINST A NON SPARK PROOF STORAGE ACCESSORY CAN CREATE A RANDOM SPARK THAT CAN BE THE IGNITION SOURCE OF AN EXPLOSION. SUCH AN OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

With use, the inside of the duct will become covered with an oil/dirt film that can create additional friction between the moving air and the duct. The result can be lower air flow rates. For maximum Blower performance, the duct should be periodically inspected and cleaned as necessary with mild soap and water.

DANGER

AN ACCUMULATION OF FOREIGN MATERIAL IN AND/OR ON THE SURFACE OF THE DUCT MATERIAL MAY PREVENT THE PROPER DISSIPATION OF A STATIC CHARGE. IMPROPER DISSIPATION OF STATIC CHARGES CAN BE THE IGNITION SOURCE OF AN EXPLOSION. SUCH AN OCCURRENCE CAN RESULT IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

Statically conductive ducts are provided with spark proof data plate that is permanently affixed to the cuff. The data plate provides the applicable part and serial numbers for use in establishing a scheduled maintenance program.

It is highly recommended that a scheduled maintenance program be established and utilized to properly qualify the conductive properties of a statically conductive duct. With use over a period of time, normal wear and/or damage to the fabric material, wire helix, attachment cuffs and/or static ground strap clamp may not allow for proper dissipation of static charges.

A statically conductive duct should be inspected before each use to determine its structural integrity and proper fitness for use. Each statically conductive duct should be inspected and/or repaired under a scheduled maintenance program. The maintenance interval for a statically conductive duct is user defined. Typical scheduled maintenance time intervals will vary from each use. The maximum time period should not exceed one year, regardless of the amount of usage.

A typical scheduled maintenance program for a statically conductive duct would include, but not be limited to the following:

1) Clean and visually inspect each component of the duct for wear and/or damage. Determine that the following components have proper structural integrity:

- a) Wire helix.
- b) Fabric material.
- c) Attachment cuff.
- d) Static ground strap.
- e) Static ground strap clamp.

Replace any component with a factory approved replacement part only.

2) Lay and fully extend the duct in a circular pattern on a suitable, nonconductive surface. Clean, dry cardboard makes an excellent maintenance surface for this procedure. It is important that the duct be fully extended so that no portion of the duct is in direct contact with another portion.

3) Measure the conductivity of the duct with an Ohmmeter. Follow the procedure as outlined in the operation instructions for properly calibrating the Ohmmeter.

a) Touch one lead to the aluminum attachment cuff and hold the other lead tight against the material near the end of the duct. Measure the resistance value.

b) Connect the leads to the ground strap clamps and measure the resistance value.

4) Connections that yield an infinite resistance value indicate:

a) Improper connections that should be rechecked for integrity.

b) An open circuit. The duct no longer has the capability of dissipating a static charge. If further testing confirm infinite resistance values, the statically conductive duct should be properly discarded and replaced with a factory approved replacement part only. Contact the Customer Service Department for specific information. There is no charge for this service.

DANGER

DO NOT UTILIZE A STATICALLY CONDUCTIVE DUCT THAT MEASURES AN INFINITE RESISTANCE TEST VALUE. AN INFINITE RESISTANCE VALUE INDICATES THAT THE DUCT IS NO LONGER CAPABLE OF PROPERLY DISSIPATING A STATIC CHARGE. IMPROPER STATIC CHARGE DISSIPATION CAN ALLOW A

RANDOM SPARK TO BE THE IGNITION SOURCE OF AN EXPLOSION, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

Troubleshooting

ELECTRIC MOTOR FAILS TO OPERATE.

Improper cord cap connection to power source. Inspect connection.

Inoperative ON-OFF switch. Inspect and/or test. Repair and/or replace as required.

Wiring harness lead to motor or switch loose or disconnected. Inspect and reconnect.

BLOWER LACKS AIR FLOW DELIVERY.

Motor overheating. Inspect motor surfaces and ventilation openings. See **Service** section.

Motor requires relubrication. See **Service** section. Improper electrical power. Check power source for proper voltage, frequency and/or phase. See **Operation** section.

Inlet and/or outlet screens blocked with debris. See **Service** section.

Blower wheel and/or housing filled with debris. See **Service** section.

Damaged duct restricts air flow delivery. Repair or replace duct as required.

STORAGE

Proper procedure for long term storage of the Blower will protect it against the effects of corrosion and damage. If the Blower is not to be operated for a period of 30 days or more, proceed to store as follows:

1) Clean all accumulated dirt and grease from the Blower utilizing a safety solvent.



CAUTION

Observe all applicable safety precautions for the solvent.

2) Follow the procedure as outlined in the material provided by the electric motor manufacturer detailing long term storage of the motor.

3) Check all visible parts for wear, breakage or damage. Order any part required to make the necessary repair. This will avoid a needless delay when operating the Blower at next use.

4) Apply a light coat of dry film lubricant to the blower wheel to prevent the formation of rust.

5) Store the Blower inside. If the Blower must be stored outside, protect it with a suitable covering.

Specifications

MOTOR

TYPE 1/3 HP, explosion proof, totally enclosed nonventilated (TENV), 115 VAC, 60 Hz, single phase, ball bearing and thermal protection equipped.

FULL LOAD AMPERAGE 4.2 Amperes

BLOWER

TYPE Centrifugal
INLET & OUTLET SIZE 8 inches (203 mm) diameter
MAXIMUM COMBINED SAFE DUCT LENGTH TO MAXIMIZE BLOWER PERFORMANCE 25ft (7.6m)

MINIMUM SAFE DUCT DIAMETER TO MAXIMIZE BLOWER PERFORMANCE 8 in (203 mm) nominal diameter



GENERAL

HAZARDOUS LOCATION ATMOSPHERE CERTIFICATION STANDARDS Certified by the Canadian Standards Association® (CSA®) for use in National Electric Code® Class I, Group D; Class II, Group G and Class III Hazardous Atmospheres.

Appendix

PURPOSE OF THE APPENDIX

* to assist the operator(s) of the Model EP8HL Blower in interpreting the National Electrical Code®.

* to provide information that will assist in minimizing the fire hazards encountered in classified locations, including references where more detailed information can be obtained.

* to acquaint the operator(s) with the various types of electrical equipment and equipment design used in hazardous locations.

* to provide a guide for the correct selection and installation of electrical products in conformance with the National Electrical Code®.

Information Disclaimer

The information presented in this Operator's Manual has been assembled from various sources. Although every attempt has been made to ensure its accuracy, neither General Equipment Company nor its contributors to this publication assumes responsibility for any inaccuracies or omissions in the data presented. As a safety precaution, information to be utilized from this Operator's Manual should be verified from the National Electrical Code® and other sources.

Trademark Ownership

The National Electrical Code® is a registered trademark of the National Fire Protection Association®.

Technical Help is Available

The information presented in this Operator's Manual provides extensive help in determining proper operational procedures and code requirements for the use of the Model EP8HL Blower in hazardous

locations. However, even though every attempt has been made to provide data, questions inevitably arise. In these circumstances, contact the Customer Service Department of General Equipment Company for technical assistance. Our staff of technical personnel is at your service.

EXPLOSIVE PROPERTIES OF CLASS I GASES AND VAPORS

The following explains the data presented as to:

- a) FLASH POINT
- b) IGNITION TEMPERATURE
- c) FLAMMABLE LIMITS
- d) VAPOR DENSITY

Definition of Flash Point

This is the minimum temperature to which a combustible or flammable liquid (and some solids) must be heated until sufficient vapors are driven off to flash when brought into contact with a flame. Although heat producing equipment is rated according to ignition temperature, knowledge of flash point is important. Substances with low flash points are not only more susceptible to spark ignition sources, but are more difficult to control in the event of a fire.

Definition of Ignition Temperature

This is the minimum temperature required, at normal atmospheric pressures in the absence of spark or flame, to set a gas or vapor afire, that is, to cause self-sustained combustion independently of the heating or heated element. Ignition temperature is the criteria used by NEC® and UL® in rating electrical heat producing equipment, such as lighting fixtures and motors. In Class I, Division 1 areas, the hottest exposed surface of the fixture can not exceed the ignition temperature of the gas or vapor encountered. In Class I, Division 2 areas, the hottest surface of a lighting fixture's lamp can not exceed the ignition temperature of the gas or vapor involved. However, in applying these requirements to the following tables, keep in mind that ignition temperatures should be taken as approximations only, as these figures will vary widely according to test methods employed, sample purity, etc.



Definition of Flammable (Explosive) Limits

Flammable limit, like flash point, is an important index of the relative hazards of the various gases and vapors.

There are minimum and maximum concentrations of flammable gases or vapors above and below which the mixture will not burn or explode. The Lower Limit is where the substance is too "lean" to burn or explode and the Upper Limit is where it is too "rich" to burn or explode. For example, hydrogen is too lean to ignite below a 4.0 percent concentration and too rich to ignite above a 75 percent concentration. However, the Upper Limit should not be taken as a measure of safety, because as gases or vapors are released, they reach concentration levels within the explosive range before they reach the Upper Limit. Explosions of a flammable vapor-air mixture near the Upper Limit or Lower Limit are less intense than those occurring in the intermediate concentrations of the mixture.

The flammable limits shown in the following tables are based on normal atmospheric temperatures and pressures, unless otherwise indicated. At higher temperatures, the Lower Limit would be lower and the Upper Limit higher; that is, the explosive range would be wider.

Definition of Vapor Density

This is the weight of a volume of a vapor or gas with no air present compared to the weight of an equal volume of dry air at the same normal atmospheric temperature and pressure. Vapor densities are ordinarily used only to determine the settling or rising tendency of a mixture. A figure of less than 1.0 in the following tables indicates that the vapor is lighter than air and will tend to rise. A figure greater than 1.0 indicates the reverse.

Examples of lighter than air gases are methane natural gas and hydrogen gas, which the tables show to have respective densities of 0.6 and 0.1. These gases in indoor locations tend to concentrate near the ceiling where lighting fixtures, for example, are customarily mounted. At the other extreme are heavier than air mixtures, like ethyl ether vapors, that may travel at low levels for a considerable distance to sources of ignition. CAUTION: certain substances, while perhaps not extremely hazardous in pure states, react violently with other materials. For data on such substance, see NFPA Manual of Chemical Reactions, 491M-1991.

EXPLANATIONS OF THE FOLLOWING CLASS I GAS AND VAPOR TABLES.

Data on Class I gases and vapors presented in the following tables contains the latest information available from NFPA at the publication date of this manual. The data is based primarily on NFPA 497M-1991, Manual for Classification of Gases, Vapors and Dusts for Electrical Equipment in Hazardous (Classified) Locations with additional data secured from NFPA 325M-1991, Fire Hazardous Properties of Flammable Liquids, Gases and Volatile Solids. These publications are the latest available on these subject areas from NFPA at the publication date of this manual. The data on explosive properties of Class I gases and vapors is as follows:

TABLES I and II. These are flammable chemicals with flash points below 100°F and are therefore the most hazardous. Normally, special electrical equipment is required where these flammable chemicals are present, as these substances form ignitable or explosive mixtures with air at ambient temperatures.

TABLES III and IV. These are combustible vapors with higher flash points than the flammable gases and vapors listed in Tables I and II. The flash points of vapors in Table III range from 100°F and flash points of vapors in Table IV range from 140°F or more, but less than 200°F.

EXPLOSIVE PROPERTIES OF CLASS II COMBUSTIBLE DUSTS.

The following tables depict ignition temperatures of classified combustible dusts. Ignition temperatures are shown because they are the criteria used by NEC® and UL® for classifying heat producing equipment, such as lighting fixtures.

Ignition Temperature Definition

Ignition temperature is defined as the minimum temperature required, at normal atmospheric temperatures in the absence of spark or flame, to ignite a dust layer or dust cloud.

Ignition temperature is tested in two ways:

- a) Layer Ignition Temperature
- b) Dust Cloud Ignition Temperature.



Layer Ignition Temperature is the ignition point of combustible dusts that collect on beams, ledges, machinery and other surfaces that are subject to flash fires. Cloud Ignition Temperature measures the ignition point of dust suspended in the air as dust clouds. In most cases, the ignition temperature of Dust Layers is lower than that for Dust Clouds. Therefore, the probability of ignition is greater for Dust Layers than for Dust Clouds, although Dust Cloud explosions are far more violent than that caused by Dust Layers. Inasmuch as Dust Layer ignition temperatures are lower than that for Dust Clouds, the Dust Layer ignition temperatures are shown in the following tables, unless otherwise indicated with footnotes.

Dust Layers, in more than 95 percent of the cases, have lower ignition temperatures than dust clouds. Many of the ignition temperatures of the dust layers presented in the following tables are close to NEC® limitations on maximum surface temperatures for heat producing equipment used in Class II areas. For example, NEC® Table 500-3(f) limits surface temperature of lighting fixtures to 165°C in Class II, Group G atmospheres. However, if that equipment reaches that maximum surface temperature, that equipment can not be used in areas where, for example, manganese vancide (a pesticide) is present, because the table shows that dust to have a layer ignition temperature of 120°C.

Dust Clouds generally have higher ignition temperatures than dust layers. Except for those few that have low ignition temperatures, such as uranium dust (an unclassified dust), most dust clouds are unlikely to ignite from temperature alone. Although most dust clouds require a relatively large amount of energy to ignite, virtually any spark ignition source can cause a severe dust explosion. For example, a lighted match can provide a flame with a temperature up to 2000°F, more than enough energy to ignite virtually any combustible dust cloud.

Therefore, where dust clouds are encountered, the best protection is to eliminate common sources of ignition, such as welding sparks, open flame and hot filaments of light bulbs.

Definition of Combustible Dust

NFPA defines a combustible dust as one with an Ignition Sensitivity equal to or greater than 0.2 and an Explosion Severity equal to or greater than 0.5. Dust

with ratings below these levels are not considered combustible; that is, they are not generally considered to be significant explosion hazards. Ignition Sensitivity and Explosion Severity determine whether or not the dust is combustible.

Definition of Ignition Sensitivity

This is a measure of the ease with which a combustible dust may be ignited. It is related to ignition temperature, minimum energy required for ignition and minimum concentration of the dust (oz. per cu. ft.). Although there are some exceptions, most dusts are more difficult to ignite than gases and vapors.

Definition of Explosion Severity

This is a measure of maximum explosion pressure and maximum rate of pressure rise. It is how violent the ensuing explosion will be.

Closely associated with the maximum pressure and rate of pressure rise is the length of time that pressure is exerted on the surroundings. All of these factors contribute to the total impulse, rather than the force exerted at any one moment, that determines the destructiveness of an explosion. This explains in part why dust explosions, which have slower rates of pressure rise, may be more destructive than gas explosions.

Dusts with high Explosion Severities include starches, hemp hurd, pectin, dinitrotoluamide, nitrososoamine, sorbic acid, aspirin, nitropropyridone, aluminum flake, aluminum/nickel alloys, aluminum/magnesium alloys, magnesium, titanium hydride, calcium silicide, DK rosin and petrin acrylate monomer. For more detailed information on Explosion Severities of dusts, consult [NFPA Fire Protection Handbook](#).

MISCELLANEOUS FACTORS AFFECTING EXPLOSIBILITY OF DUSTS.

Factors other than the nature of the dust itself include particle size, moisture content and concentration.

Particle Size

The smaller the particle, the easier it is to ignite the dust. The smaller the particle, the greater the pressure rise and the lower the ignition temperature, the



explosive limit concentration and the energy necessary for ignition.

Moisture Content

Moisture in dust particles raise the ignition temperature rating of the dust. For example, the ignition temperature of cornstarch may rise as much as 122°F with an increase in moisture from 1.6 percent to 12.55 percent. However, in a practical sense, this ignition is only temporary, because most ignition sources have more than enough heat to vaporize the moisture and ignite the dust. Moisture content of dusts affects electrical conductivity.

Minimum Explosion Concentration

As with gases, there are limiting concentrations of dusts within which an explosion can or can not occur. Near the Lower Limit of concentration, less heat is generated and smaller peak pressures are developed. The maximum effect occurs at a point less than maximum concentration, as with gases and vapors (absorption of heat by unburned dust is apparently the reason for less than maximum explosive pressures). Actually, the Upper Limit has not been determined experimentally and would have little practical value anyway.

TABLE I: Class I Flammable Gases and Vapors Having Less Than 100°F Flash Point— Groups A, B, C and D Determined by Actual Tests^o

Normally, Special Electrical Equipment IS Required Where these Flammable Gases or Vapors are Present, as these Chemicals Form Ignitable or Explosive Mixtures with Air at Ambient Temperatures.

Substance	Flash Point		Ignition Temp.		Flammable (Explosive) Limits Percent by Volume		Vapor Density (Air = 1)
	°F	°C	°F	°C	Lower	Upper	
Group A Atmospheres							
Acetylene	Gas		581	305	2.5	100	0.9
Group B Atmospheres							
Acrolein (inhibited)Ⓞ	-15	-26	428*	220*	2.8	31.0	1.9
1,3-Butadiene Ⓞ	Gas		788	420	2.0	12.0	1.9
Ethylene Oxide Ⓞ	-20		804	429	3.0	100	1.5
Hydrogen	Gas		932**	500**	4.0	75.0	0.1
Manufactured Gas (containing more than 30% H ₂ by volume)	Ⓞ	Ⓞ	Ⓞ	Ⓞ	Ⓞ	Ⓞ	Ⓞ
Propylene Oxide Ⓞ	-35	-37	840	449	2.3	36.0	2.0
Propyl Nitrate	68	20	347	175	2.0	100	NAⓄ
Group C Atmospheres							
Acetaldehyde	-38	-39	347	175	4.0	60.0	1.5
Allyl Alcohol	70	21	713	378	2.5	18.0	2.0
n-Butyraldehyde	-8	-22	425	218	1.9	12.5	2.5
Carbon Monoxide	Gas		1128	609	12.5	74.0	1.0
Crotonaldehyde	55	13	450	232	2.1	15.5	2.4
Diethyl Ether (Ethyl Ether)	-49	-45	320***	160***	1.9	36.0	2.6
Diethylamine	-9	-23	594	312	1.8	10.1	2.5
Epichlorohydrin	81	31	772	411	3.8	21.0	3.2
Ethylene	Gas		842	450	2.7	36.0	1.0
Ethylenimine	12	-11	608	320	3.3	54.8	1.5
Ethyl Mercaptan	<0	<-18	572	300	2.8	18.0	2.1
Hydrogen Cyanide (Hydrocyanic Acid)	0	-18	1000	538	5.6	40.0	0.9
Hydrogen Sulfide	Gas		500	260	4.0	44.0	1.2
Methylacetylene	Gas		NAⓄ	NAⓄ	1.7	NAⓄ	1.4
Methyl Ether	Gas		662	350	3.4	27.0	1.6
Methyl Formal	NAⓄ	NAⓄ	460	238	NAⓄ	NAⓄ	NAⓄ
2-Nitropropane	75	24	802	428	2.6	11.0	3.1
n-Propyl Ether	70	21	370+	188+	1.3	7	3.53
Tetrahydrofuran	6	-14	610	321	2.0	11.8	2.5
Triethylamine	16	-7	480	249	1.2	8.0	3.5
Unsymmetrical Dimethyl Hydrazine (UDMH)	-5	-15	480	249	2.0	95.0	2.0
Group D Atmospheres							
Acetone	-4	-20	869	465	2.5	12.8	2.0
Acrylonitrile	32	0	898	481	3.0	17.0	1.8
Ammonia	Gas		928	498	15.0	28.0	0.6
Benzene (Benzol)	12	-11	928	498	1.2	7.8	2.8
Butane	-76	-60	550	287	1.6	8.5	2.0
1-Butanol (Butyl Alcohol)	98	37	650	343	1.4	11.2	2.6
2-Butanol (Secondary Butyl Alcohol)	75	24	761	405	1.7Ⓞ	9.8Ⓞ	2.6
n-Butyl Acetate	72	22	790	421	1.7	7.6	4.0
iso-Butyl Acetate	64	18	790	421	1.3	10.5	4.0
Cyclopropane	Gas		938	503	2.4	10.4	1.5
Di-isobutylene	23	-5	736	391	0.8	4.8	3.87
Ethane	Gas		882	472	3.0	12.5	1.0
Ethanol (Ethyl Alcohol)	55	13	685	363	3.3	19.0	1.6
Ethyl Acetate	24	-4	800	427	2.0	11.5	3.0
Ethyl Acrylate (inhibited)	50	10	702	372	1.4	14.0	3.5
Ethylamine	<0	<-18	725	385	3.5	14.0	1.6

GROUP D ATMOSPHERES CONTINUED ON FOLLOWING PAGE



Substance	Flash Point		Ignition Temp.		Flammable (Explosive) Limits Percent by Volume		Vapor Density (Air = 1)
	°F	°C	°F	°C	Lower	Upper	
Group D Atmospheres (continued)							
Ethylenediamine (Anhydrous 76%)	150	66	725	385	2.5	12.0	2.1
Ethylene Dichloride	56	13	775	413	6.2	16.0	3.4
Gasoline	-50	-46	536 to 880	280 to 471	1.3	7.1	3-4 [ⓐ]
Heptane	25	-4	399	204	1.05	6.7	3.5
Hexane	-7	-22	437	225	1.1	7.5	3.0
Isoprene	-65	-54	428 [†]	220 [†]	1.5	8.9	2.4
Isopropyl Ether	-18	-28	830	443	1.4	7.9	3.5
Mesityl Oxide	87	31	652	344	1.4	7.2	3.4
Methane (Natural Gas)	* Gas		999	537	5.0	15.0	0.6
Methanol (Methyl Alcohol)	52	11	725 ^{††}	385 ^{††}	6.0	36.0	1.1
Methyl Ethyl Ketone	16	-9	759	404	1.4 [ⓑ]	11.4 [ⓑ]	2.5
Methyl Isobutyl Ketone	64	18	840	449	1.2 [ⓑ]	8.0 [ⓑ]	3.5
2-Methyl-1-Propanol (Isobutyl Alcohol)	82	28	780	416	1.7 [ⓑ]	10.6 [ⓑ]	2.6
2-Methyl-2-Propanol (Tertiary Butyl Alcohol)	52	11	892	478	2.4	8.0	2.6
Naphtha (Petroleum)	<0	<-18	550	288	1.1	5.9	2.5
Octane	56	13	403	206	1.0	6.5	3.9
Pentane	<-40	<-40	470 ^{†††}	243 ^{†††}	1.5	7.8	2.5
1-Pentanol (Amyl Alcohol)	91	33	572	300	1.2	10.0 [ⓑ]	3.0
Propane	Gas		842	450	2.1	9.5	1.6
1-Propanol (Propyl Alcohol)	74	23	775	413	2.2	13.7	2.1
2-Propanol (Isopropyl Alcohol)	53	12	750	399	2.0	12.7 [ⓑ]	2.1
Propylene	Gas		851	455	2.0	11.1	1.5
Pyridine	68	20	900	482	1.8	12.4	2.7
Styrene	88	31	914	490	0.9	6.8	3.6
Toluene	40	4	896	480	1.1	7.1	3.1
Vinyl Acetate	18	-8	756	402	2.6	13.4	3.0
Vinyl Chloride	-108.4	-78	882	472	3.6	33.0	2.2
Xylenes	81 to 90	27 to 32	867 to 984	464 to 529	1.0 to 1.1	6.0 to 7.0	3.7

ⓐ All figures are based on experiments conducted at normal atmospheric pressures and at normal temperatures, where temperature is not a variable, unless otherwise indicated.

ⓑ Varies according to mixture. Some mixtures may be Group B. ⓓ Not Available. ⓔ At 212°F (100°C) ⓕ Varies with different grades of gasoline. ⓖ At 200°F (93°C)

ⓗ At 123°F (51°C) ⓘ At 202°F (94°C)

ⓙ Electrical equipment for Group C permitted if external seals are installed per NEC® 501-5(a)

ⓚ Electrical equipment for Group D permitted if external seals are installed per NEC® 501-5(a)

*455°F (235°C) in NFPA 497M-1991 and 428°F (220°C) in NFPA 325M-1991.
 **968°F (520°C) in NFPA 497M-1991 and 932°F (500°C) in NFPA 325M-1991.
 ***320°F (160°C) in NFPA 497M-1991 and 356°F (180°C) in NFPA 325M-1991.
 †419°F (215°C) in NFPA 497M-1991 and 370°F (188°C) in NFPA 325M-1991.
 ‡428°F (220°C) in NFPA 497M-1991 and 743°F (395°C) in NFPA 325M-1991.
 ††725°F (385°C) in NFPA 497M-1991 and 867°F (464°C) in NFPA 325M-1991.
 †††470°F (243°C) in NFPA 497M-1991 and 500°F (260°C) in NFPA 325M-1991.



TABLE II: Class I Flammable Gases and Vapors Having Less Than 100°F Flash Points— Groups A, B, C and D Determined by Chemical Analysis^o

Normally, Special Electrical Equipment IS Required Where these Flammable Gases or Vapors are Present, as these Chemicals Form Ignitable or Explosive Mixtures with Air at Ambient Temperatures.

Substance	Flash Point		Ignition Temp.		Flammable (Explosive) Limits Percent by Volume		Vapor Density (Air = 1)
	°F	°C	°F	°C	Lower	Upper	
Group B Atmospheres							
Formaldehyde	Gas		795	424	7.0	73.0	1.0
Group C Atmospheres							
Butyl Mercaptan (1-Butanethiol)	35	2	NA ^o	NA ^o	NA ^o	NA ^o	3.1
Dicyclopentadiene	90	32	937	503	NA ^o	NA ^o	4.6
Di-isopropylamine	30	-1	600	316	1.1	7.1	3.5
Dimethylamine	Gas		752	400	2.8	14.4	1.6
1,4-Dioxane	54	12	356	180	2.0	22.0	3.0
Di-n-propylamine	63	17	570	299	NA ^o	NA ^o	3.5
n-Ethyl Morpholine	90	32	NA ^o	NA ^o	NA ^o	NA ^o	4.0
Hydrogen Selenide	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Isobutyraldehyde	-1	-18	385	196	1.6	10.6	2.5
Isopropyl Glycidyl Ether	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Methylacetylene-Propadiene (stabilized)	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Methyl Mercaptan	NA ^o	NA ^o	NA ^o	NA ^o	3.9	21.8	1.7
Monomethyl Hydrazine	17	-8	382	194	2.5	92.0	1.6
Nitroethane	82	28	778	414	3.4	NA ^o	2.6
Nitromethane	95	35	785	418	7.3	NA ^o	2.1
1-Nitropropane	96	36	789	421	2.2	NA ^o	3.1
Propionaldehyde (Propanol)	-22	-30	405	207	2.6	17.0	2.0
Valeraldehyde	54	12	432	222	NA ^o	NA ^o	3.0
Group D Atmospheres							
Acetonitrile	42	6	975	524	3.0	16.0	1.4
Allyl Chloride	-25	-32	905	485	2.9	11.1	2.6
n-Amyl Acetate	60	16	680	360	1.1	7.5	4.5
sec-Amyl Acetate	89	32	NA ^o	NA ^o	NA ^o	NA ^o	4.5
sec-Butyl Acetate	88	31	NA ^o	NA ^o	1.7	9.8	4.0
Butylamine	10	-12	594	312	1.7	9.8	2.5
Butylene (1-Butene)	Gas		725	385	1.6	10.0	1.9
Chlorobenzene	82	28	1099	593	1.3	9.6	3.9
Chloroprene	-4	-20	NA ^o	NA ^o	4.0	20.0	3.0
Cyclohexane	-4	-20	473	245	1.3	8.0	2.9
Cyclohexene	<20	<-7	471	244	NA ^o	NA ^o	2.8
Cumene	96	36	795	424	0.9	6.5	4.1
1,1-Dichloroethane	2	-17	820	438	5.4	11.4	NA ^o
1,2-Dichloroethylene	36	2	860	460	5.6	12.8	3.4
1,3-Dichloropropene	95	35	NA ^o	NA ^o	5.3	14.5	3.8
Ethyl Benzene	70	21	810	432	0.8	6.7	3.7
Ethyl Chloride	-58	-50	966	519	3.8	15.4	2.2
Ethyl Formate	-4	-20	851	455	2.8	16.0	2.6
Heptene (Heptylene)	<32	<0	500	260	NA ^o	NA ^o	3.4
2-Hexanone (Methyl Butyl Ketone)	77	25	795	424	NA ^o	8.0	3.5
Hexenes (2-Hexene)	<20	<-7	473	245	NA ^o	NA ^o	3.0
Isoamyl Acetate	77	25	680	360	1.0 ^o	7.5	4.5
Isobutyl Acrylate	82	28	800	427	NA ^o	NA ^o	4.4

GROUP D ATMOSPHERES CONTINUED ON FOLLOWING PAGE



Substance	Flash Point		Ignition Temp.		Flammable (Explosive) Limits Percent by Volume		Vapor Density (Air = 1)
	°F	°C	°F	°C	Lower	Upper	
Group D Atmospheres (continued)							
Isopropyl Acetate	35	2	860	460	1.8 [ⓐ]	8.0	3.5
Isopropylamine	-35	-37	756	402	NA [ⓑ]	NA [ⓑ]	2.0
Liquefied Petroleum Gas	NA	NA	761 to 842	405 to 450	1.5 [ⓑ]	8.6 [ⓑ]	2.0 [ⓑ]
Methyl Acetate	14	-10	850	454	3.1	16.0	2.8
Methyl Acrylate	27	-3	875	468	2.8	25.0	3.0
Methylamine		Gas	806	430	4.9	20.7	1.0
Methylcyclohexane	25	-4	482	250	1.2	6.7	3.4
Methyl Formate	-2	-19	840	449	4.5	23.0	2.1
Methyl Isocyanate	19	-7	994	534	5.3	26.0	2.0
Methyl Methacrylate	50	10	792	422	1.7	8.2	3.6
Nonane	88	31	401	205	0.8	2.9	4.4
Nonene	78	26	NA [ⓑ]	NA [ⓑ]	NA [ⓑ]	NA [ⓑ]	4.4
Octene (1-Octene)	70	21	446	230	NA [ⓑ]	NA [ⓑ]	3.9
2-Pentanone (Methyl Propyl Ketone)	45	7	846	452	1.5	8.2	3.0
1-Pentene	0	-18	527	275	1.5	8.7	2.4
n-Propyl Acetate	55	13	842	450	1.7 [ⓐ]	8.0	3.5
Propylene Dichloride	60	16	1035	557	3.4	14.5	3.9
Turpentine	95	35	488	253	0.8	NA [ⓑ]	NA [ⓑ]
Vinylidene Chloride	-19	-28	1058	570	6.5	15.5	3.4

[ⓐ] How above vapors were classified as Group B, C or D

These vapors were classified as Group B, C or D by chemical analysis rather than by actual tests by Underwriters Laboratories Inc. More specifically, the classifications were based on "analogy with tested materials and chemical structure." They are therefore only tentative classifications and may actually be incorrect in some instances. Therefore, it may be advisable to submit these untested chemicals to a qualified testing laboratory for verification of the group classifications.

The gases and vapors shown above are, almost without exception, *in addition* to those listed in the 1981 NEC[®] 500-2 Table.

[ⓑ] Not Available [ⓐ] At 212°F (100°C) [ⓐ] 100°F (38°C) [ⓐ] Commercial Butane



TABLE III: Class I Combustible Vapors Having Flash Points of 100°F or More, But Less Than 140°F—Groups B, C and D Determined by Chemical Analysis^o

Normally, Special Electrical Equipment IS NOT Required Where these Combustible Vapors are Present, as these Chemicals Do Not Form Ignitable Mixtures with Air at Ambient Temperatures Unless Heated Beyond their Flash Points.

Substance	Flash Point		Ignition Temp.		Flammable (Explosive) Limits Percent by Volume		Vapor Density (Air = 1)
	°F	°C	°F	°C	Lower	Upper	
Group B Atmospheres							
Allyl Glycidyl Ether ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
n-Butyl Glycidyl Ether ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Group C Atmospheres							
Ethylene Glycol Monoethyl Ether	102	39	545	285	1.8 ^o	14 ^o	2.6
Ethylene Glycol Monoethyl Ether Acetate	120	49	740	392	1.5 ^o	12.3 ^o	4.1
2-Ethylhexaldehyde	112	44	375	191	0.85 ^o	7.2 ^o	4.4
Hydrazine	100	38	74 to 518	23 to 270	2.9	98.0	1.1
Iso-octyl Aldehyde	NA ^o	NA ^o	387	197	NA ^o	NA ^o	NA ^o
Morpholine ^o	98	37	555	290	1.4	11.2	3.0
Tetramethyl Lead	100	38	NA ^o	NA ^o	NA ^o	NA ^o	6.5
Group D Atmospheres							
Acetic Acid ^o	103	39	867	464	4.0	19.9 ^o	2.1
Acetic Anhydride	120	49	600	316	2.7	10.3	3.5
Acrylic Acid	122	50	820	438	2.4	8.0	2.5
t-Butyl Acetate	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
n-Butyl Acrylate (inhibited)	84	29	559	293	1.7	9.9	4.4
Cyclohexanone	111	44	788	420	1.1 ^o	9.4	3.4
p-Cymene	117	47	817	436	0.7 ^o	5.6	4.6
Decene (1-Decene)	<131	<55	455	235	NA ^o	NA ^o	4.8
Diethyl Benzene	133 to 135	56 to 57	743 to 842	395 to 450	NA ^o	NA ^o	4.6
Di-isobutyl Ketone	120	49	745	396	0.8 ^o	7.1 ^o	4.9
Dimethyl Formamide	136	58	833	445	2.2 ^o	15.2	2.5
Dipentene	113	45	458	237	0.7 ^o	6.1 ^o	4.7
Ethyl sec-Amyl Ketone	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Ethyl Butanol	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Ethyl Butyl Ketone	115	46	NA ^o	NA ^o	NA ^o	NA ^o	4.0
Ethylene Glycol Monomethyl Ether	102	39	455	235	1.8 ^o	14 ^o	2.6
Ethyl Silicate	125	52	NA ^o	NA ^o	NA ^o	NA ^o	7.2
Formic Acid (90%)	122	50	813	434	18.0	57.0	1.6
Fuel Oils	110 to 336	43 to 169	410 to 765	210 to 407	0.7	5.0	NA ^o
sec-Hexyl Acetate	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Isoamyl Alcohol	109	43	662	350	1.2	9.0 ^o	3.0
Kerosene	110 to 162	43 to 72	410	210	0.7	5.0	4.5
Methyl Amyl Alcohol (Methyl Isobutyl Carbinol)	106	41	NA ^o	NA ^o	1.0	5.5	3.5
Methyl n-Amyl Ketone	102	39	740	393	1.1 ^o	7.9 ^o	3.9
o-Methylcyclohexanone	118	48	NA ^o	NA ^o	NA ^o	NA ^o	3.9
alpha-Methyl Styrene	127	53	1000	538	0.8	11.0	4.1
Naphtha (Coal Tar)	<0	<-18	531	277	1.1	5.9	2.5
Propionic Acid	126	52	870	466	2.9	12.1	2.5
Tripropylamine	105	41	NA ^o	NA ^o	NA ^o	NA ^o	4.9

^o All chemicals in the above Table III are Class II Combustible Liquids per NFPA Standard 321. Like the chemicals in Table II, these vapors (except Acetic Acid and Morpholine) were classified as Group B, C or D by chemical analysis. It may, therefore, be necessary to have a testing laboratory verify these Group classifications. With the exception of Ethylene Glycol Monomethyl Ether, Isoamyl Alcohol, Morpholine and Acetic Acid, all chemicals in the above Table III are in addition to the 1981 NEC® Table 500-2. (Where there was a discrepancy between NFPA 497M-1991 and NFPA 325M-1991 in regard to ignition temperatures, the lower values are shown in Table III above.)

^o Not Available ^o At 200°F (93°C) ^o At 212°F (100°C) ^o At 302°F (150°C) ^o At 275°F (135°C)
^o 151°F (66°C) ^o At 250°F (121°C) ^o Acetic Acid and Morpholine were classified by actual tests.
^o Electrical equipment for Group C permitted if external seals are installed per NEC® 501-5(a)
^o at STP



Table IV: Class I Combustible Vapors Having Flash Points of 140°F or More But Less Than 200°F—Groups C and D Determined by Chemical Analysis^o

Normally, Special Electrical Equipment IS NOT Required Where these Combustible Vapors are Present, as these Chemicals Do Not Form Ignitable Mixtures with Air at Ambient Temperatures Unless Heated Beyond their Flash Points.

Substance	Flash Point		Ignition Temp.		Flammable (Explosive) Limits Percent by Volume		Vapor Density (Air = 1)
	°F	°C	°F	°C	Lower	Upper	
Group C Atmospheres							
n-Butyl Formal	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Chloroacetaldehyde	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
1-Chloro-1-Nitropropane	144	62	NA ^o	NA ^o	NA ^o	NA ^o	4.3
n-Decaldehyde	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
1,1-Dichloro-1-Nitroethane	168	76	NA ^o	NA ^o	NA ^o	NA ^o	5.0
Diethylaminoethanol (N-N-Diethylethanolamine)	140	60	608	320	NA ^o	NA ^o	4.0
Diethylene Glycol Monobutyl Ether	172	78	400	204	0.85	24.6	5.6
Diethylene Glycol Monomethyl Ether	201	94	400	204	1.2 ^o	23.5 ^o	NA ^o
N-N-Dimethyl Aniline	145	63	700	371	NA ^o	NA ^o	4.2
Dipropylene Glycol Methyl Ether	185	86	NA ^o	NA ^o	1.1 ^o	3.0	5.1
Ethylene Glycol Monobutyl Ether	143	62	460	238	1.1 ^o	12.7 ^o	4.1
Ethylene Glycol Monobutyl Ether Acetate	160	71	645	340	0.88 ^o	8.54 ^o	NA ^o
2-Ethyl-3-Propyl Acrolein	155	68	NA ^o	NA ^o	NA ^o	NA ^o	4.4
Furfural	140	60	600	316	2.1	19.3	3.3
Furfuryl Alcohol	167	75	915	490	1.8	16.3	3.4
Isodecaldehyde	185	85	NA ^o	NA ^o	NA ^o	NA ^o	5.4
Monomethyl Aniline (o-Toluidine)	185	85	900	482	NA ^o	NA ^o	3.7
Group D Atmospheres							
Acetone Cyanohydrin	165	74	1270	688	2.2	12.0	2.9
Adiponitrile	200	93	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Aniline	158	70	1139	615	1.3	11.0	3.2
Benzyl Chloride	153	67	1085	585	1.1	NA ^o	4.4
t-Butyl Toluene	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
n-Butyric Acid	161	72	830	443	2.0	10.0	3.0
Cresol	178 to 187	81 to 86	1038 to 1110	559 to 599	1.1 to 1.4	NA ^o	3.7
Cyclohexanol	154	68	572	300	NA ^o	NA ^o	3.5
n-Decanol	180	82	550	288	NA ^o	NA ^o	5.5
Diacetone Alcohol	148	64	1118	603	1.8	6.9	4.0
o-Dichlorobenzene	151	66	1198	647	2.2	9.2	5.1
Dimethyl Sulfate	182	83	370	188	NA ^o	NA ^o	4.4
Dodecene (Dodecylene)	<212	<100	491	255	NA ^o	NA ^o	5.8
Ethylene Chlorohydrin (2-Chloroethanol)	140	60	797	425	4.9	15.9	2.8
2-Ethyl Hexanol	164	73	448	231	0.88	9.7	4.5
2-Ethyl Hexyl Acrylate	180	82	485	252	NA ^o	NA ^o	NA ^o
Hexanol (Hexyl Alcohol)	145	63	NA ^o	NA ^o	NA ^o	NA ^o	3.5
Iso-octyl Alcohol	180	82	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Isophorone	184	84	860	460	0.8	3.8	NA ^o
Methylcyclohexanol	149	65	565	296	NA ^o	NA ^o	3.9
2-Methyl-5-Ethyl Pyridine	155	68	NA ^o	NA ^o	1.1	6.6	4.2
Monothanolamine	186	86	770	410	3.0 ^o	23.5 ^o	2.1
Monoisopropanolamine (1-Amino-2-Propanol)	171	77	705	374	NA ^o	NA ^o	2.6
Nitrobenzene	190	88	900	482	1.8 ^o	NA ^o	4.3
Nonyl Alcohol (Disobutyl Carbinol)	165	74	NA ^o	NA ^o	0.8 ^o	6.1 ^o	5.0
n-Octyl Alcohol	178	81	NA ^o	NA ^o	NA ^o	NA ^o	4.5
Phenyldiazine	190	88	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Propiolactone	165	74	NA ^o	NA ^o	2.9	NA ^o	2.5
Propionic Anhydride	145	63	545	285	1.3	9.5	4.5
Tetrahydronaphthalene	160	71	725	385	0.8 ^o	5.0 ^o	4.6
Tridecene	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Triethylbenzene	181	83	NA ^o	NA ^o	56 ^o	NA ^o	5.6
Undecene	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o	NA ^o
Vinyl Toluene	127	53	921	494	0.8	11.0	4.1

^o These are Class IIIA Combustible Liquids per NFPA Standard 321. Groups C and D were determined by analogy with tested materials and chemical structure. It may be necessary to have these chemicals tested by a qualified laboratory to verify above Group classifications. All chemicals listed are in addition to 1981 NEC® Table 500-2. ^o Not Available ^o At 200°F (93°C) ^o At 275°F (135°C) ^o At 300°F (149°C) ^o At 212°F (100°C) ^o At 302°F (150°C) ^o At 360°F (182°C) ^o At 264°F (140°C) ^o At 239°F (115°C)



Group E Electrically Conductive Combustible Dusts^o

Dust Layer Ignition Temperature is Shown Unless Otherwise Indicated

Type of Dust ^o	Minimum Cloud or Layer Ignition Temp.		Type of Dust ^o	Minimum Cloud or Layer Ignition Temp.	
	^o F	^o C		^o F	^o C
Metal, Alloys and Compounds:			Ferrosilicon (88%, 9% Fe)	1472	800
Aluminum, atomized collector fines	1022 ^o	550 ^o	Ferrotitanium (19% Ti, 74.1% Fe, 0.06% C)	698 ^o	370 ^o
Aluminum, A422 flake	608	320	Iron, 98%, H ₂ reduced	554	290
Aluminum—cobalt alloy (60-40)	1058	570	Iron, 99%, Carbonyl	590	310
Aluminum—copper alloy (50-50)	1526	830	Magnesium, Grade B, milled	806	430
Aluminum—lithium alloy (15% Li)	752	400	Manganese	464	240
Aluminum—magnesium alloy (Dowmetal)	806 ^o	430 ^o	Tantalum	572	300
Aluminum—nickel alloy (58-42)	1004	540	Thorium, 1.2% O ₂	518 ^o	270 ^o
Aluminum—silicon alloy (12% Si)	1238 ^o	670 ^o	Tin, 96%, atomized (2% Pb)	806	430
Boron, commercial-amorphous (85% B)	752	400	Titanium, 99%	626 ^o	330 ^o
Calcium Silicide	1004	540	Titanium Hydride, (95% Ti, 3.8% H ₂)	896 ^o	480 ^o
Chromium, (97%) electrolytic, milled	752	400	Vanadium, 86.4%	914	490
Ferromanganese, medium carbon	554	290	Zirconium Hydride, (93.6% Zr, 2.1% H ₂)	518	270

^o Per NEC® 500-5(a) FPN. *Only Group E dusts are considered to be electrically conductive for classification purposes.*

^o Certain metal dusts may have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, thorium hydride and uranium dusts have extremely low ignition temperatures (as low as 20°C) and minimum ignition energies lower than any material classified in any of the Class I or Class II groups.

^o Dust Cloud is normally higher than Dust Layer ignition temperature. However, for this material, the Dust Cloud ignition temperature is lower. Therefore, the Dust Cloud ignition temperature is shown.

^o Dust Layer ignition temperature is shown because Dust Layer ignition temperature is not available. Caution should be used, because Dust Layer is usually lower than Dust Cloud ignition temperature.

Group F Combustible Dusts

Dust Layer Ignition Temperature is Shown Unless Otherwise Indicated

Type of Dust	Minimum Cloud or Layer Ignition Temp.		Type of Dust ^o	Minimum Cloud or Layer Ignition Temp.	
	^o F	^o C		^o F	^o C
Asphalt, (Blown Petroleum Resin)	950*	510*	Gilsonite	932	500
Charcoal	356	180	Lignite, California	356	180
Coal, Kentucky Bituminous	356	180	Pitch, Coal Tar	1310**	710**
Coal, Pittsburgh Experimental	338	170	Pitch, Petroleum	1166**	630**
Coal, Wyoming	—	—	Shale, Oil	—	—



Group G Combustible Dusts

Dust Layer Ignition Temperature is Shown Unless Otherwise Indicated

Type of Dust	Minimum Cloud or Layer Ignition Temp. °F	Minimum Cloud or Layer Ignition Temp. °C	Type of Dust	Minimum Cloud or Layer Ignition Temp. °F	Minimum Cloud or Layer Ignition Temp. °C
Agricultural Dusts:			Aryl-nitrosomethylamide	914	490
Alfalfa Meal	392	200	Azelaic Acid	1130	610
Almond Shell	392	200	2,2-Azo-bis-butyronitrile	662	350
Apricot Pit	446	230	Benzoic Acid	824	440
Cellulose	500	260	Benzotriazole	824	440
Cherry Pit	428	220	Bisphenol-A	1058	570
Cinnamon	446	230	Chloroacetoacetanilide	1184	640
Citrus Peel	518	270	Diallyl Phthalate	896	480
Cocoa Bean Shell	698	370	Dicumyl Peroxide (suspended on CaCO ₃), 40-60	356	180
Cocoa, natural, 19% fat	464	240	Dicyclopentadiene Dioxide	788	420
Coconut Shell	428	220	Dihydroacetic Acid	806	430
Corn	482	250	Dimethyl Isophthalate	1076	580
Corn Cob Grit	464	240	Dimethyl Terephthalate	1058	570
Corn Dextrine	698	370	3,5-Dinitrobenzoic Acid	860	460
Cornstarch, commercial	626	330	Dinitrotoluamide	932	500
Cornstarch, modified	392	200	Diphenyl	1168	630
Cork	410	210	Ditertiary Butyl Paracresol	878	470
Cottonseed Meal	392	200	Ethyl Hydroxyethyl Cellulose	734	390
Cube Root, South Amer.	446	230	Fumaric Acid	968	520
Flax Shive	446	230	Hexamethylene Tetramine	770	410
Garlic, dehydrated	680	360	Hydroxyethyl Cellulose	770	410
Guar Seed	932	500	Isotocic Anhydride	1292	700
Gum, Arabic	500	260	Methionine	680	360
Gum, Karaya	464	240	Nitrosoamine	518	270
Gum, Manila (copal)	680	360	Para-oxy-benzaldehyde	716	380
Gum, Tragacanth	500	260	Paraphenylene Diamine	1148	620
Hemp Hurd	428	220	Paratertiary Butyl Benzoic Acid	1040	560
Lycopodium	590	310	Pentaerythritol	752	400
Malt Barley	482	250	Phenylbetanaphthylamine	1256	680
Milk, Skimmed	392	200	Phthalic Anhydride	1202	650
Pea Flour	500	260	Phthalimide	1166	630
Peach Pit Shell	410	210	Salicylanilide	1130	610
Peanut Hull	410	210	Sorbic Acid	860	460
Peat, Sphagnum	464	240	Stearic Acid, Aluminum Salt	572	300
Pecan Nut Shell	410	210	Stearic Acid, Zinc Salt	950	510
Pectin	392	200	Sulfur	428	220
Potato Starch, Dextrinated	824	440	Terephthalic Acid	1256	680
Pyrethrum	410	210	Drugs:		
Rauwolfia Vomitoria Root	446	230	2-Acetylamino-5-nitrothiazole	842	450
Rice	428	220	2-Amino-5-nitrothiazole	860	460
Rice Bran	914	490	Aspirin	1220	660
Rice Hull	428	220	Gulasonic Acid, Diacetone	788	420
Safflower Meal	410	210	Mannitol	860	460
Soy Flour	374	190	Nitropyridone	806	430
Soy Protein	500	260	I-Sorbose	698	370
Sucrose	662	350	Vitamin B1, mononitrate	680	360
Sugar, Powdered	698	370	Vitamin C (Ascorbic Acid)	536	280
Tung, Kernels, Oil-Free	464	240	Dyes, Pigments, and Intermediates:		
Walnut Shell, Black	428	220	Beta-naphthalene-azo-Dimethylaniline	347	175
Wheat	428	220	Green Base Harmon Dye	347	175
Wheat Flour	680	360	Red Dye Intermediate	347	175
Wheat Gluten, gum	968	520	Violet 200 Dye	347	175
Wheat Starch	716	380	Pesticides:		
Wheat Straw	428	220	Benzethonium Chloride	716	380
Woodbark, Ground	482	250	Bis(2-Hydroxy-5-chlorophenyl) methane	1058	570
Wood Flour	500	260	Crag No. 974	590	310
Yeast, Tortula	500	260	Dieldrin (20%)	1022	550
Chemicals:			2, 6-Ditertiary-butyl-paracresol	788	420
Acetoacetanilide	824	440	Dithane	356	180
Acetoacet-p-phenetidine	1040	560	Ferbam	302	150
Adipic Acid	1022	550	Manganese Vancide	248	120
Anthranilic Acid	1076	580			

Type of Dust	Minimum Cloud or Layer Ignition Temp. °F	Minimum Cloud or Layer Ignition Temp. °C	Type of Dust	Minimum Cloud or Layer Ignition Temp. °F	Minimum Cloud or Layer Ignition Temp. °C
Sevin	284	140	Polyvinyl Acetate/Alcohol	824	440
α, α -Trithiobis (N,N-Dimethylthio-formamide)	446	230	Polyvinyl Butyral	734 [ⓐ]	390 [ⓐ]
Thermoplastic Resins and Molding Compounds:			Vinyl Chloride-Acrylonitrile Copolymer	878	470
Acetal, Linear (Polyformaldehyde)	824 [ⓐ]	440 [ⓐ]	Polyvinyl Chloride-Dioctyl Phthalate Mixture	608 [ⓐ]	320 [ⓐ]
Acrylamide Polymer	464	240	Vinyl Toluene-Acrylonitrile Butadiene Copolymer	936 [ⓐ]	530 [ⓐ]
Acrylonitrile Polymer	860	460	Thermosetting Resins and Molding Compounds:		
Acrylonitrile-Vinyl Pyridine Copolymer	464	240	Allyl Alcohol Derivative (CR-39)	932 [ⓐ]	500 [ⓐ]
Acrylonitrile-Vinyl Chloride-Vinylidene Chloride Copolymer (70-20-10)	410	210	Urea Formaldehyde Molding Compound	860 [ⓐ]	460 [ⓐ]
Methyl Methacrylate Polymer	824 [ⓐ]	440 [ⓐ]	Urea Formaldehyde-Phenol Formaldehyde Molding Compound (Wood Flour Filler)	464	240
Methyl Methacrylate-Ethyl Acrylate Copolymer	896 [ⓐ]	480 [ⓐ]	Epoxy	1004 [ⓐ]	540 [ⓐ]
Methyl Methacrylate-Ethyl Acrylate-Styrene Copolymer	824 [ⓐ]	440 [ⓐ]	Epoxy-Bisphenol A	950 [ⓐ]	510 [ⓐ]
Methyl Methacrylate-Styrene-Butadiene-Acrylonitrile Copolymer	896 [ⓐ]	480 [ⓐ]	Phenol Furfural	590	310
Methacrylic Acid Polymer	554	290	Phenol Formaldehyde	1076 [ⓐ]	580 [ⓐ]
Cellulose Acetate	644	340	Phenol Formaldehyde Molding Cmpd (Wood Flour Filler)	932 [ⓐ]	500 [ⓐ]
Cellulose Triacetate	806 [ⓐ]	430 [ⓐ]	Phenol Formaldehyde, Polyalkylene-Polyamine Modified	554	290
Cellulose Acetate Butyrate	698 [ⓐ]	370 [ⓐ]	Polyethylene Terephthalate	932 [ⓐ]	500 [ⓐ]
Cellulose Propionate	860 [ⓐ]	460 [ⓐ]	Styrene Modified Polyester-Glass Fiber Mixture	680	360
Ethyl Cellulose	608 [ⓐ]	320 [ⓐ]	Polyurethane Foam, No Fire Retardant	824	440
Methyl Cellulose	644	340	Polyurethane Foam, Fire Retardant	734	390
Carboxymethyl Cellulose	544	290	Special Resins and Molding Compounds:		
Hydroxyethyl Cellulose	644	340	Alkyl Ketone Dimer Sizing Compound	320	160
Chlorinated Polyether Alcohol	860	460	Cashew Oil, Phenolic, Hard	356	180
Nylon Polymer (Polyhexa-methylene Adipamide)	806	430	Chlorinated Phenol	1058 [ⓐ]	570 [ⓐ]
Polycarbonate	1310 [ⓐ]	710 [ⓐ]	Coumarone-Indene, Hard	968 [ⓐ]	520 [ⓐ]
Polyethylene, High Pressure Process	716	380	Ethylene Oxide Polymer	862 [ⓐ]	350 [ⓐ]
Polyethylene, Low Pressure Process	788 [ⓐ]	420 [ⓐ]	Ethylene-Maleic Anhydride Copolymer	1004 [ⓐ]	540 [ⓐ]
Polyethylene Wax	752 [ⓐ]	400 [ⓐ]	Lignin, Hydrolyzed, Wood-Type, Fines	842 [ⓐ]	450 [ⓐ]
Carboxypolymethylene	968 [ⓐ]	520 [ⓐ]	Petrin Acrylate Monomer	428 [ⓐ]	220 [ⓐ]
Polypropylene (No Antioxidant)	788 [ⓐ]	420 [ⓐ]	Petroleum Resin (Blown Asphalt)	932	500
Rayon (Viscose) Flock	482	250	Rosin, DK	734 [ⓐ]	390 [ⓐ]
Polystyrene Molding Cmpd.	1040 [ⓐ]	560 [ⓐ]	Rubber, Crude, Hard	662 [ⓐ]	350 [ⓐ]
Polystyrene Latex	932	500	Rubber, Synthetic, Hard (33% S)	608 [ⓐ]	320 [ⓐ]
Styrene-Acrylonitrile (70-30)	932 [ⓐ]	500 [ⓐ]	Shellac	752 [ⓐ]	400 [ⓐ]
Styrene-Butadiene Latex (> 75% Styrene; Alum Coagulated)	824 [ⓐ]	440 [ⓐ]	Sodium Resinate	428	220
Polyvinyl Acetate	1022 [ⓐ]	550 [ⓐ]	Styrene—Maleic Anhydride Copolymer	878 [ⓐ]	470 [ⓐ]

- ⓐ Dust Cloud is normally higher than Dust Layer ignition temperature. However, for this material, the Dust Cloud ignition temperature is lower. Therefore, the Dust Cloud ignition temperature is shown.
- ⓑ Dust Cloud ignition temperature is shown because Dust Layer ignition temperature is not available. Caution should be used, because Dust Layer is usually lower than Dust Cloud ignition temperature.
- ⓒ Dust Cloud ignition temperature is shown because the material melts before it ignites.
- ⓓ Dust Cloud ignition temperature is shown because the material sublimes before it ignites.

General Note on Groups E, F and G: NFPA 497M-1991 has classified 25 Group E, 10 Group F and 185 Group G combustible dusts. These lists, shown on pages 15, 16 and 17, do not include all dusts that may be encountered in business and industry. Some dusts were not classified because they have explosive characteristics that require safeguards that go beyond those required for combustible dusts classified by NEC®. On the other

hand, other dusts were not classified because they do not present a significant hazard, that is, they are not combustible. However, any combustible dust not included in these tables (such as thorium hydride and uranium) should be investigated by a qualified testing laboratory (see NFPA "Fire Protection Handbook"; for additional dusts not classified by NEC®). Even such pesticide combustible dusts as Ferbam, Manganese Vancide and

Sevin classified above, which have ignition temperatures below that which would be safe within the operating temperature ranges presented in NEC® 500-3(f) Table, may present serious problems. Also, caution is advised with combustible dusts that melt or sublime below the operating temperature of the electrical equipment (see footnotes 3 and 4).

