NOTES

Garaging and Repairing Machines

Safety in garaging and repairing machinery is an important consideration. Follow the rules and procedures that apply to the machine local when repairing both gasoline and propane fuel systems.

Propane and gasoline have excellent safety records, however, injury can occur when mishandled. As shown in section 2, the physical properties of propane are somewhat different than gasoline, thus requiring different handling and safety procedures.

NFPA 58 chapter 8 : 6 lays out the basic procedures for garaging and repairing propane powered vehicles.

Vehicles with LP-Gas fuel systems shall be permitted to be serviced or stored inside garages, provided that :

(a) The fuel system is leak-free and the container is not filled beyond the limits specified.

(b) The container shutoff valve is closed when vehicles or engines are under repair except when engine is operated.

(c) The vehicle is not parked near sources of heat, open flames, or similar sources of ignition, or near inadequately ventilated pits.

Carbon Monoxide. Carbon monoxide (CO) is a colorless, tasteless, and odorless gas and gives no warning of its presence. Those exposed to it do not realize it is present until symptoms begin to develop.

The exhaust emissions from internal combustion engines can increase through the lack of maintenance. This can cause the carbon monoxide inside a building to climb above the OSHA maximum limit of 50 ppm during an eight-hour period.

Procedures to vent the exhaust to a safe environment should be carried out during maintenance and repair procedures.

LEVELS OF CARBON MONOXIDE EXPOSURE	EFFECTS OF CARBON MONOXIDE EXPOSURE
9 PPM (0.0009%)	The maximum allowable concentration for short-term exposure in living areas, according to the American Society of Heating, Refrigeration, and Air Conditioning Engineers
50 PPM (0.005%)	The maximum allowable US OSHA concentration for continuous exposure in any eight-hour period, according to federal law
200 PPM (0.02%)	Slight headaches, tiredness, dizziness, and nausea after 2-3 hours
460 PPM (0.04%)	Frontal headache within 1-2 hours. Life threatening after three hours. The maximum allowable concentration according to the US EPA and AGA
800 PPM (0.08%)	Dizziness, nausea, and convulsions within 45 minutes. Death within 1 hour

Examples 1 and 2 below are indications of the important role the current air/fuel mixture settings play in indoor air quality.

Example 1: A machine with 150 cu./in. engine running at 2,000 rpm full load will consume approximately 75 cu./ft. of air in 1 minute or 4,500 cu./ft. per hour.

If the exhaust CO reading is 4 percent, the machine would produce 180 cu./ft. of CO in one hour.

A warehouse 100' x 100' x 20' contains 200,000 cu./ft. of air.

OSHA standards allow a maximum of 50 ppm (parts per million) of CO in the factory's air, (which is 0.00005% of 200,000 = 10 cu./ft. of CO), it will take 3.3 minutes to contaminate the warehouse above OSHA standards.

Example 2: Same initial information as in Example 1, but the new exhaust reading is 0.2% CO. The machine will now produce 9 cu./ft. of CO in one hour and it will take 1 hr/6 min. to reach allowable standards for CO.

These examples did not allow for replacement air entering the building. Also, it is highly unlikely that a machine would operate in a full-power condition for the lengths of time noted in the examples. Nevertheless, the examples do illustrate how important the mixture setting is to air quality conditions.