INSTALLATION MANUAL

MQ POWER

Industrial Generator Sets

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MQ Power
18910 WILMINGTON AVE.
CARSON, CALIFORNIA 90746
310-537-3700
800-421-1244
FAX: 310-537-3927

PARTS DEPARTMENT:
800-427-1244
FAX: 800-672-7877

SERVICE DEPARTMENT:
800-478-1244
FAX: 310-537-4259

E-mail: mq@multiquip.com •www:multiquip.com

Transporting

- Always shutdown engine before transporting.
- Never transport generator with air intake doors open.
- Tighten fuel tank cap securely.
- Drain fuel when transporting generator over long distances or bad roads.
- Always tie-down the generator during transportation by securing the generator.
- If generator is mounted on a trailer, make sure trailer complies with all local and state safety transportation laws. See page 10 for basic towing procedures.

Emergencies

- Always know the location of the nearest ***fire extinguisher*** and ***first aid kit.*** Know the location of the nearest telephone. Also know the phone numbers of the nearest ***ambulance***, ***doctor*** and ***fire department***.

Maintenance Safety

- **NEVER** lubricate components or attempt service on a running machine.
- Always allow the machine a proper amount of time to cool before servicing.
- Keep the machinery in proper running condition.
- Fix damage to the machine immediately and always replace broken parts.
- Dispose of hazardous waste properly. Examples of potentially hazardous waste are used motor oil, coolant, fuel, and fuel filters.
- **DO NOT** use plastic containers to dispose of hazardous waste.
- **DO NOT** pour waste, oil, coolant or fuel directly onto the ground, down a drain or into any water source

Loading and Unloading (Crane)

- Before lifting, make sure the generator's lifting hook is secure and that there is no apparent damage to the generator itself (loose screws, nuts and bolts). If any part is loose or damaged, please take corrective action before lifting.
- Always drain fuel prior to lifting.
- Always make sure crane or lifting device has been properly secured to the hook of guard frame on generator.
- **NEVER** lift the machine while the engine is running.
- Use adequate lifting cable (wire or rope) of sufficient strength.
- When lifting the generator, always use the balanced center-point suspension hook and lift straight upwards.
- **NEVER** allow any person or animal to stand underneath the machine while lifting.
- When loading the generator on a truck, be sure to use the front and back frame bars as a means to secure the generator during transport.

NOTE:

When the generator is not in use, close the rain doors to keep the internal area clean and protected from rodents.

INTRODUCTION

About This Manual

This manual provides installation instructions for MQ Power's Industrial generator sets (gensets). This manual will contain the following information:

1. **Mounting Recommendations** — This section provides mounting recommendations for fastening the generator set to a mounting skid (base), allowing the proper space requirements for normal operation, and service requirements.

2. **Mechanical Connections** — This section provides the location of connection points for fuel, exhaust, ventilation, and cooling.

3. **Electrical Connections** — This section provides the location of electrical connection points for the control, generator, and starting system.

4. **Pre-Start** — Checklist of items or procedures needed to prepare the generator set for operation.

5. **Initial Start-Up** — This section provides information to test the complete system to ensure proper installation, satisfactory performance, and safe operation. Refer to the Operation manual for troubleshooting information.

6. **Installation Checklist** — This section provides reference checks upon completion of installation.

Safety Considerations

The genset has been carefully designed to provide safe and efficient service when properly installed, maintained, and operated. However, the overall safety and reliability of the complete system is dependent on many factors outside the control of the generator set manufacturer. To avoid possible safety hazards, make all electrical and mechanical connections to the generator set exactly as specified in this manual. All systems external to the generator (fuel, exhaust, electrical, etc.) must comply with all applicable codes. Make certain all required inspections and test have been completed and all code requirements have been satisfied before certifying the installation is complete and ready for service.

INSTALLATION OVERVIEW

These installation recommendations apply to typical installations with standard model gensets. Whenever possible, these recommendations also cover factory designed options or modifications. However, because of the large amount of variables involved with any installation, it is not possible to prove specific recommendations for every situation.

This manual *does not* provide application information for selecting a genset or designing the complete installation. This manual is a reference tool only. If there are any questions not answered by this manual, contact your nearest MQ Power dealer or distributor for assistance.

Application and Installation

A standby power system must be carefully planned and correctly installed for proper operation. This involves two essential elements of application and installation.

Application

Application, as it applies to genset installations) refers to the design of the complete standby power system that usually includes power distribution equipment, transfer switches, ventilation equipment, and mounting pads. This also includes cooling, exhaust, and fuel systems.

Each component must be correctly designed so the complete system will function as intended. Application and design is an engineering function generally done by specifying engineers or other trained specialists. Specifying engineers are responsible for the design of the complete standby system and for selecting the materials and products to be used.

Installation

Installation refers to the actual setup and assembly of the standby power system. The installers set up and connect the various components of the system as specified in the system design plan. The complexity of the standby system normally requires the special skills of qualified electricians, plumbers, sheet metal workers, engineers, etc. to complete the various segments of the installation. This is necessary so all components are assembled using standard methods and practices.

Mounting Foundation

Figure XX below shows the typical footing on a foundation in soil with a low load bearing capacity.

Figure XX below shows the typical foundation installation.

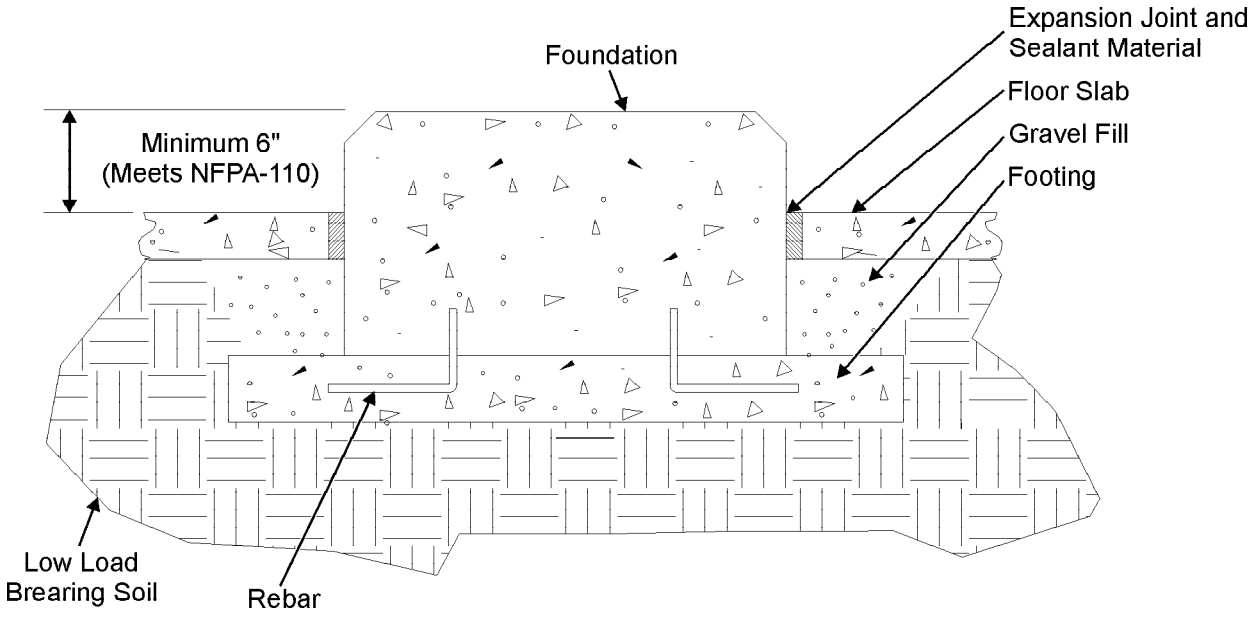


Figure XX. Typical Footing

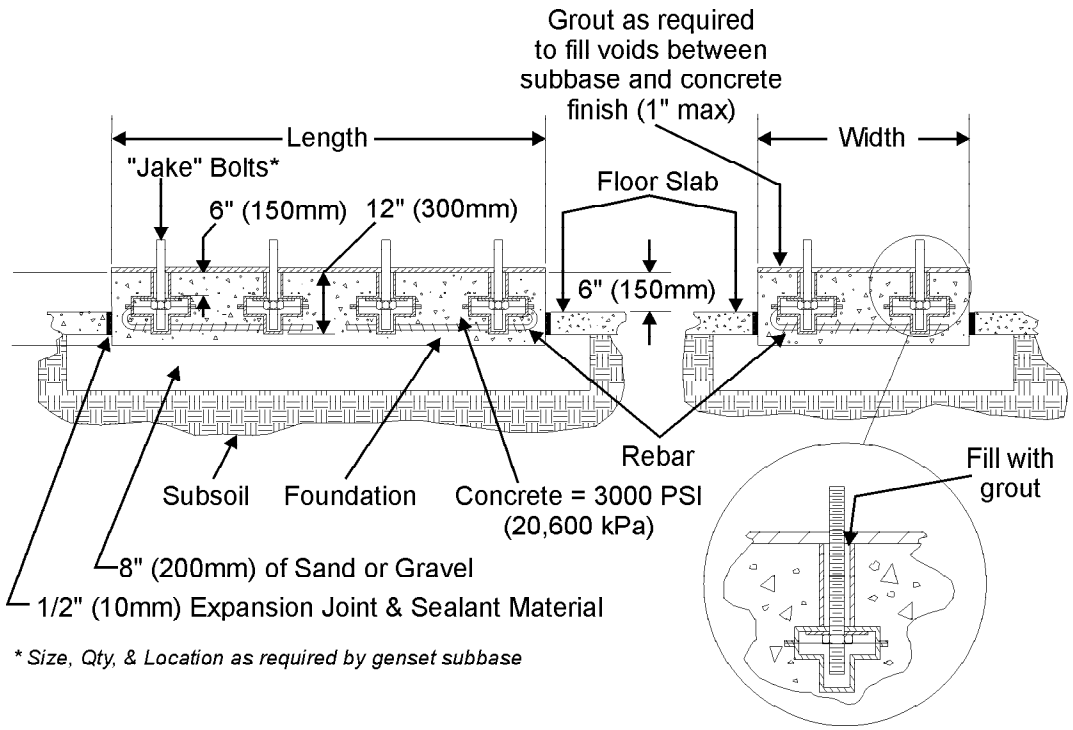


Figure XX. Typical Foundation

General Information

Generator set installations must be engineered so the generator set will function properly under the expected load conditions. Use these instructions as a general guide only. Follow the instructions of the consulting engineer when locating or installing any components. The complete installation must comply with all local, state, and federal building codes, fire ordinances, and other applicable regulations.

Always consider the following prior to installation:

- Level mounting surface
- Adequate cooling air
- Adequate fresh induction air
- Discharge or circulated air
- Discharge of exhaust gases
- Electrical connections
- Accessibility for operation and servicing
- Noise levels
- Vibration isolation

Location

The generator set location is decided mainly by related systems such as ventilation, wiring, fuel, and exhaust. The set should be located as near as possible to the main power breaker box.

The generator set should be installed in a protected location that is guarded against vandalism, theft, and unauthorized tampering.

Always provide an optimal installation site that is away from extreme ambient temperatures and that will provide maximum protection against adverse weather conditions.

WARNING:

Incorrect installation or service can result in severe personal injury or death, and/or equipment damage. Only qualified service personnel should be allowed to perform electrical and mechanical component installation

NOTICE:

Always consult local pollution controls or air quality authorities before completing your construction plans.

Mounting

Generator sets are mounted on a steel skid that provides proper support. Vibration isolators are recommended between the skid and the foundation to provide stable operation and avoid installation damage. Bolting the generator set directly to the floor or foundation can result in excessive noise and vibration, and possible damage to the genset and floor foundation.

Mount the generator set on a substantial and level base such as a concrete pad. Use 3/4 inch anchored mounting bolts to secure the vibration isolators to the skid using flat or bevel washers and hexagonal nut for each bolt. (See Figure XX below.)

The isolators should be located as shown on the genset outline drawing.

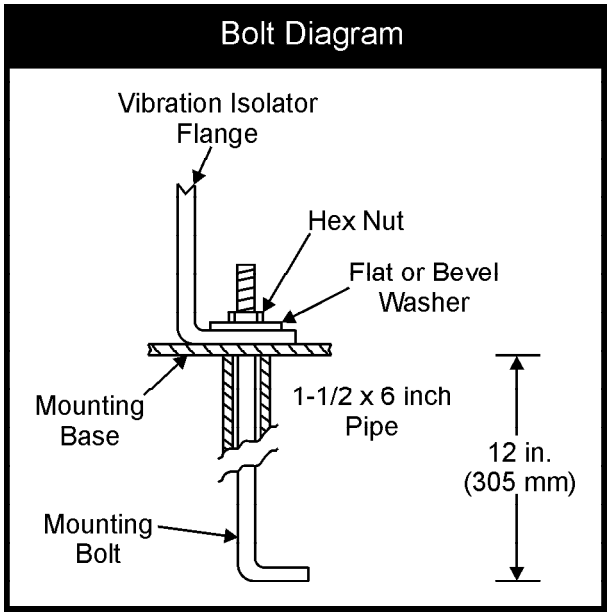


Figure XX. Bolt Diagram

Access to Set

Whenever choosing a generator site location, always allow room for service personnel and operators to gain the proper access to the unit. Always provide adequate lighting around the unit.

For convenience in general servicing such as radiator, fan belt, and oil filter maintenance, the surface of the mounting base should be at least 6 inches (152mm) above the floor.

Vibration Isolators

Installation and Adjustment Procedure

1. Place the vibration isolators on the genset support structure. The isolators should be shimmed or grouted to ensure that all of the isolator bases are within 0.25 inch (6 mm) elevation of each other. The surface the isolator bases rest on must also be flat and level. (See Figure XX to the right.)
2. Loosen the snubber lock nuts so that the top plate of the isolator is free to move vertically and horizontally. Be sure the top plate is correctly aligned with the base and springs.
3. Place the genset onto the isolators while aligning the skid's mounting with the threaded isolator hole. The top plates will move down and approach the base of the isolator as the weight of the generator is applied.
4. Once the genset is in position, the isolators may require adjusting so that the set is level. The isolators are adjusted by inserting the leveling bolt through the skid and into the isolator (the leveling bolt's locking nut should be threaded up towards the bolt head). The leveling bolt will adjust the clearance between the top plate and the isolator base. A nominal clearance of 0.25 inch (6 mm) or greater is desired. This will provide sufficient clearance for the rocking that occur during start-up and shutdown. If the 0.25 inch clearance is not present, turn the leveling bolt until the desired clearance is achieved.

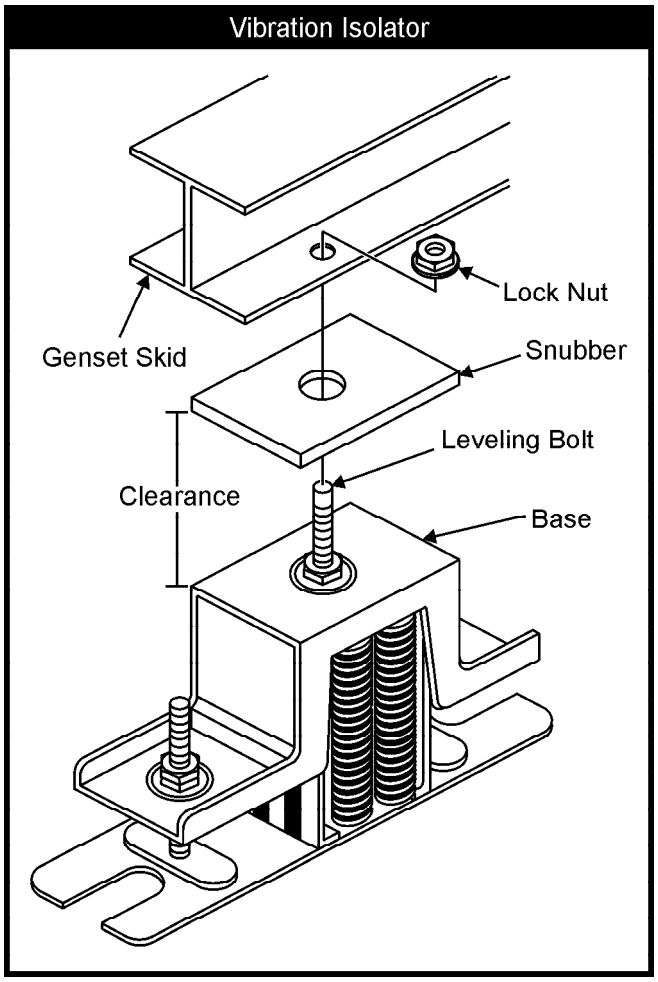
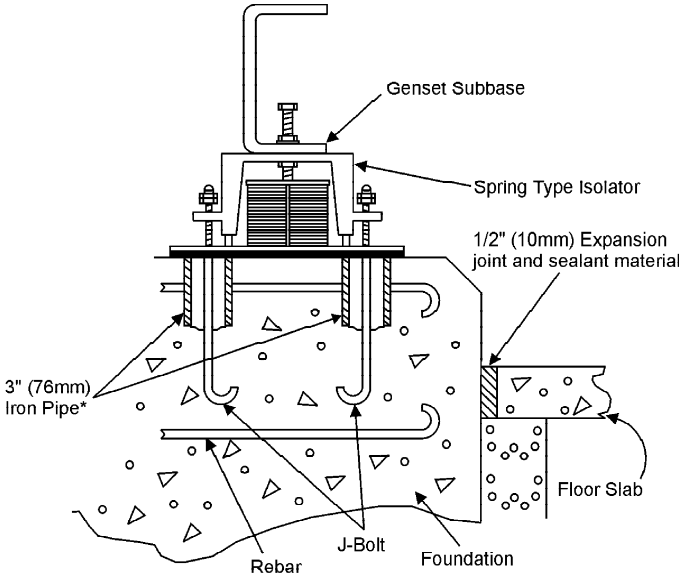


Figure XX. Vibration Isolator

Set mounted radiator-cooled generator sets:

Make sure radiator skid and engine/alternator skid are level with each other after adjusting isolators. Improper fan belt alignment may occur is the unit is not level.

5. Adjust the leveling bolts until the set is level and sufficient clearance still remains. The clearance on all isolators should be roughly equal. Once all isolators have been set, lock the leveling bolt in place with the lock nut.
6. The snubber nuts must remain loose and therefore provide better isolation between the genset and support structure.



*Use of expansion bolts also acceptable

Figure XX. Vibration Isolator Installation

MECHANICAL CONNECTIONS

Introduction

After considering all applicable laws and finding a suitable location site for the generator set, the installer should consider the mechanical connections that will be necessary to make during installation. The four (4) systems that will require mechanical connections are the following:

- Fuel system
- Exhaust system
- Ventilation system
- Cooling system

Fuel System Installation

Proper installation of the fuel system is essential in obtaining proper genset performance, safe working conditions, and preventing property and environmental damage.

It is important to have a clean installation, making every effort to prevent entrance of moisture, dirt, or contaminants of any kind. Clean all fuel system components before installing.

Use only compatible metal fuel lines to avoid electrolysis when fuel lines must be buried. Buried fuel lines must be protected from corrosion. Use a *flexible* section of tubing between the engine and fuel supply line to provide vibration isolation.

Refer to the generator set manual for outline drawings and detailed information.

Diesel Fuel

MQ Power Industrial generator-sets use ASTM No. 2 Diesel fuel. If an alternate diesel fuel is required, consult the appropriate engine manual.

WARNING:

Never use galvanized or copper fuel lines, fittings, or fuel tanks. Condensation in the tank and lines combines with the sulfur in diesel fuel to produce sulfuric acid. The molecular structure of the copper or galvanized lines or tanks reacts with the acid and contaminates the fuel.

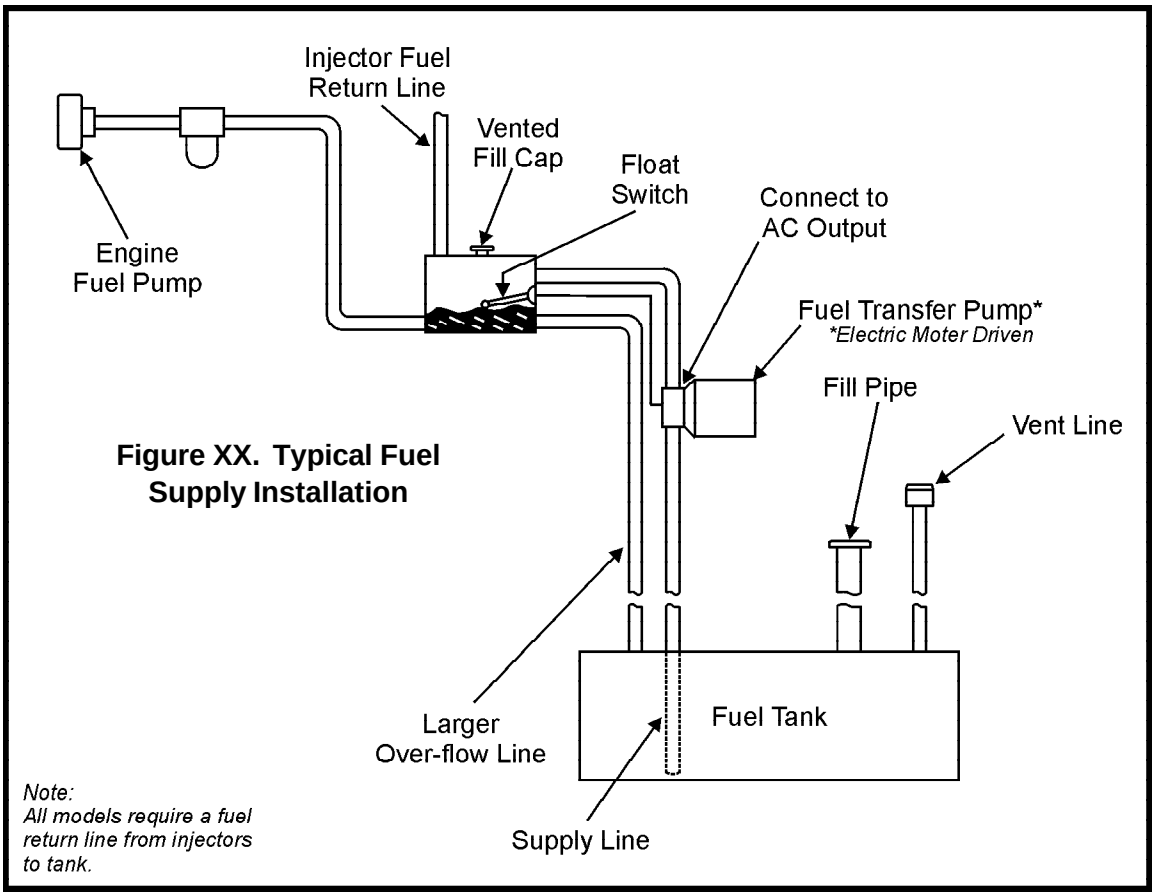


Figure XX. Typical Fuel Supply Installation

Supply Tank

Locate the supply fuel tank as close as possible to the generator set and within the five (5') foot (1.5 m) lift capacity of the engine fuel pump. Install a fuel tank that has sufficient capacity to keep the genset operating continuously at full load for at least 36 hours. Refer to the generator set manual for detailed fuel consumption data.

WARNING:

Fuel leaks create fire and explosion hazards which can result in severe personal injury or death. Always use flexible tubing between engine and fuel supply to avoid line failure and leaks due to vibration. The fuel system must meet applicable codes.

Supply Tank (continued)

If the main fuel tank is installed below the lift capabilities of the standard engine fuel pump, a transfer tank (referred to as a day tank) and auxiliary pump will also be required. If an overhead main fuel tank is installed, a transfer tank and float valve will be required to prevent fuel head pressures from being placed on the fuel system components.

For critical start applications, where generator sets are paralleled or must satisfy emergency start-time requirements, it is recommended that a fuel tank or reservoir be located such that the lowest possible fuel level is not less than six (6") inches (150 mm) above the fuel pump inlet. This will prevent air from accumulating in the fuel line while the set is in standby, eliminating the period during start-up when it has to be purged.

Day Tank (if used)

Fuel day tanks are used when the standard engine fuel pump does not have the capacity to draw the fuel from the supply tank; or the supply tank is overhead and presents problems of high fuel head pressure for the system.

Supply Tank Lower than Engine Installation

If a supply tank is lower than the engine, the day tank is installed near the generator set and within the engine fuel pump lift capability, but below the fuel injection system. Install an auxiliary fuel pump as close as possible to the supply tank to pump fuel from the supply tank to the day tank. A float switch in the day tank controls operation of the auxiliary fuel pump.

The supply tank top must be below the day tank top to prevent siphoning from the fuel supply to the day tank.

Provide a return line from the engine injection system return connection to the day tank (near the top). Provide a day tank overflow line to supply tank in case the float switch fails to shut off the fuel transfer pump.

WARNING:

Failure to provide an overflow line to the supply tank from the day tank can cause spilled fuel, safety hazards, and damage to equipment.

Supply Tank Higher than Engine Installation

If a supply tank is higher than the engine, the day tank is installed near the generator set, but below the fuel injection system. Fuel lines should at least be as large as the fuel pump inlet. The engine fuel return line must enter the day tank.

Include a shutoff valve in the fuel line between the fuel supply tank and the day tank to stop fuel flow when the generator set is off.

Engine fuel Connections

Identification tags are attached to the fuel supply line and fuel return line connections by the factory. Flexible lines for connecting between the engine and stationary fuel line are supplied as standard equipment.

WARNING:

Fuel leaks and spills can cause environmental contamination. Make sure the area surrounding the fuel tanks and lines will prevent fuel from entering soil, sewers, and water.

Exhaust System Installation

Proper exhaust system installation will ensure safe working conditions and maximum engine efficiency. Always pipe exhaust gases to the outside of any enclosure. Locate the exhaust outlets away from any air inlets to avoid gases re-entering the enclosure. Exhaust installations are subject to various detrimental conditions such as extreme heat, infrequent operation, and light loads.

Once the exhaust system has been installed, it is important to regularly inspect the exhaust system both visually and audibly to see that the entire system remains fume tight and safe for operation.

WARNING:

Inhalation of exhaust gases can result in sever personal injury or death.

Use extreme care during installation to provide a tight exhaust system. Terminate exhaust pipe away from enclosed or sheltered areas, windows, doors, and vents.

Exhaust System Installation (continued)

Use an approved thimble where exhaust pipes pass through wall or partitions. Insulated wall/roof thimbles are used where exhaust pipes pass through a combustible roof or wall. This should include structures, such as wood framing or insulated steel decking, etc. Uninsulated wall/roof thimbles are used where exhaust pipes pass through a noncombustible wall or roof, such as concrete. Refer to NFPA 37, Section 6-3 "Stationary Combustion Engines and GAs Turbines" for accepted design practices. Build according to the code requirements in effect at the installation site.

WARNING:

Do not use exhaust heat to warm a room, compartment, or storage area.

WARNING:

Weight applied to the engine manifold can result in turbocharger damage. Support the muffler and exhaust piping so no weight or stress is applied to the engine exhaust elbow.

Exhaust System Installation (continued)

Rain caps are available for the discharge end of the vertical exhaust pipes. The rain cap clamps onto the end of the pipe and opens from the exhaust discharge force from the generator set. When the generator set is stopped, the rain cap automatically closes, protecting the exhaust system from rain, snow, etc.

When installing the exhaust system, use a section of flexible exhaust pipe between the engine and remainder of the exhaust system. Support exhaust system to minimize weight applied to engine exhaust outlet elbow/turbocharger connection.

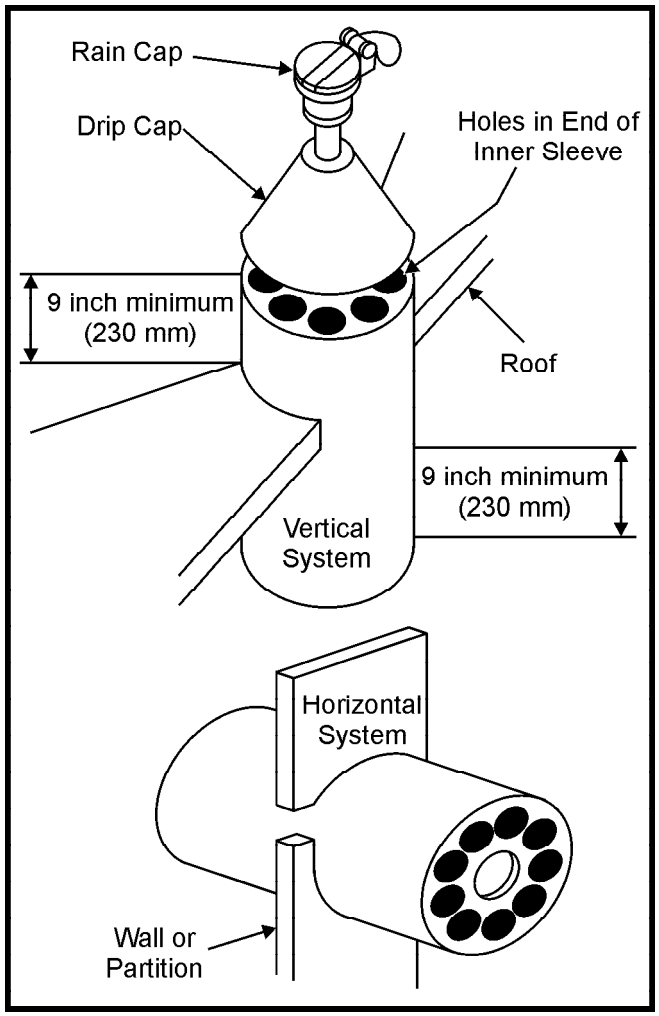


Figure XX. Mounting Exhaust Thimble

Exhaust System Installation (continued)

When installing the exhaust system, avoid sharp bends by using sweeping, long radius elbows and provide adequate support for muffler and tail pipe. Pitch a horizontal run of exhaust pipe DOWNWARD to allow any moisture condensation to drain away from the engine. If an exhaust pipe must be turned upward, install a condensation trap at the point where the rise begins. See Figure XX.

Shield or insulate exhaust lines if there is any possibility of personal contact. Allow at least twelve inches (12" or 305 mm) of clearance if the pipes pass close to a combustible wall or partition.

WARNING:

Exhaust pipes are very hot and they can cause severe personal injury or death from direct contact or from fire hazard. Shield or insulate exhaust pipes if there is danger of personal contact or when routed through walls or near other combustible materials.

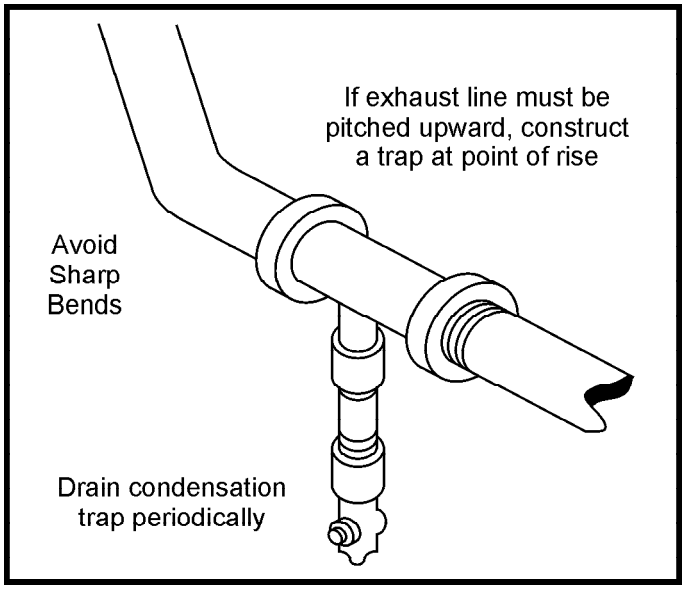


Figure XX. Condensation Trap

Ventilation and Cooling

Generator Sets create considerable heat that must be removed by proper ventilation. Outdoor installations rely on natural air circulation but indoor installations need properly sized and positioned vents for adequate air flow.

Vents and Ducts

For indoor installations, locate vents so incoming air passes through the immediate area of the installation before exhausting. Install the air outlet higher than the air inlet to allow for convection air movement.

Size the vents and ducts so they are large enough to allow the required flow rate of air. The "free area" of ducts must be as large as the exposed area of the radiator.

Wind will restrict free airflow if it blows directly into the air outlet vent. Locate the outlet vent so the effects of wind are eliminated. See Figure XX.

For outdoor installations, weather and silenced housings are available for the generator.

Louvers

Louvers are automatic ventilation doors that open when the engine engages and close while not in use. Louvers protect the genset and equipment room from the outside environment. Their operation of opening and closing should be controlled by operation of the genset.

In cooler climates movable or discharge louvers are used. These louvers allow the air to be recirculated back to the equipment room. This enables the equipment room to be heated while the genset engine is still cold, increasing the engine efficiency.

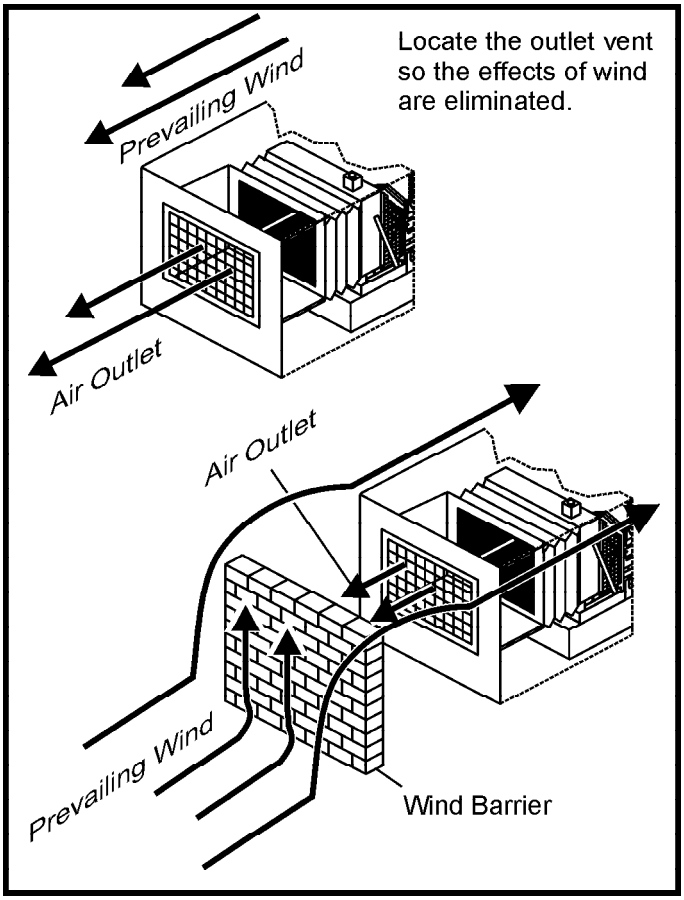


Figure XX. Wind Barrier

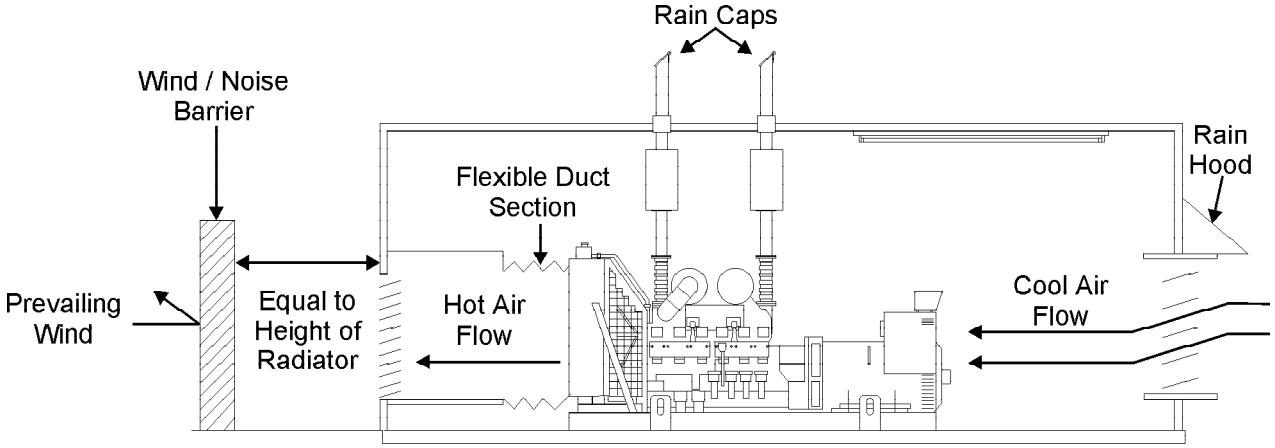


Figure XX. Wind Barrier Installation

Radiator Set Requirements

Radiator set cooling air is drawn past the rear of the set by a pusher fan that blows air through the radiator (See Figure XX). Locate the air inlet to the rear of the genset. Make the inlet vent opening 1-1/2 to 2 times larger than the radiator area to ensure proper cooling.

Locate the cooling air outlet (as close as possible) directly in front of the radiator. The outlet opening must be at least as large as the radiator area. Length and shape of the air outlet duct should offer minimum restriction to airflow.

The radiator has an air discharge duct adapter flange. Attach a canvas or sheet metal duct to the flange and the air outlet opening using screws and nuts so duct can be removed for maintenance purposes. The duct prevents circulation of heated air. Before installing the duct, remove the radiator core guard.

Genset Mounted Radiator Cooling (optional)

Genset mounted radiator cooling uses a set mounted radiator and engine pusher fan to cool engine water. Air travels from the generator end of the set, across the engine, and out through the radiator. An integral discharge duct adapter flange surrounds the radiator grill.

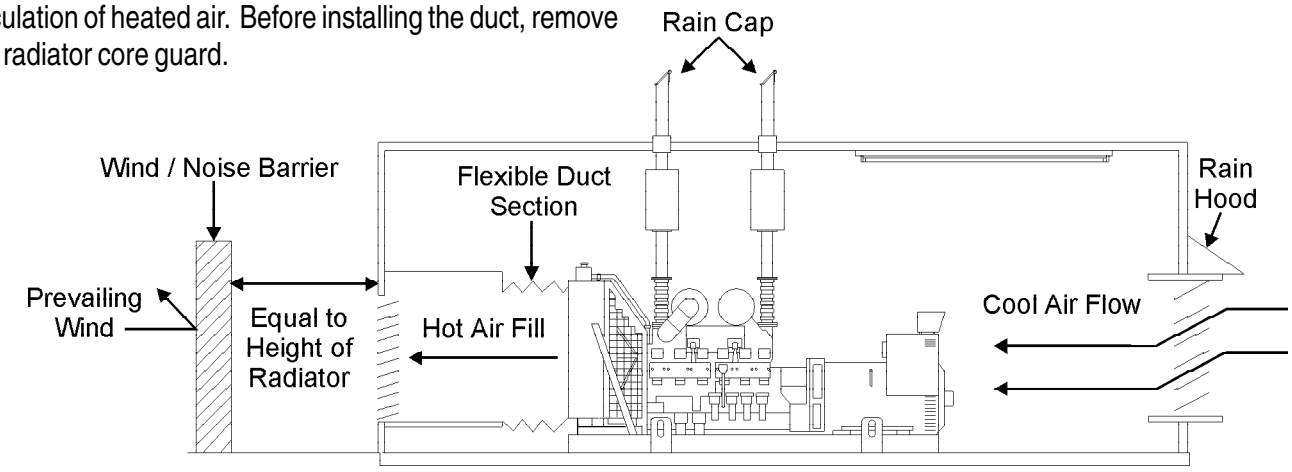


Figure XX. Mounted Radiator Installation

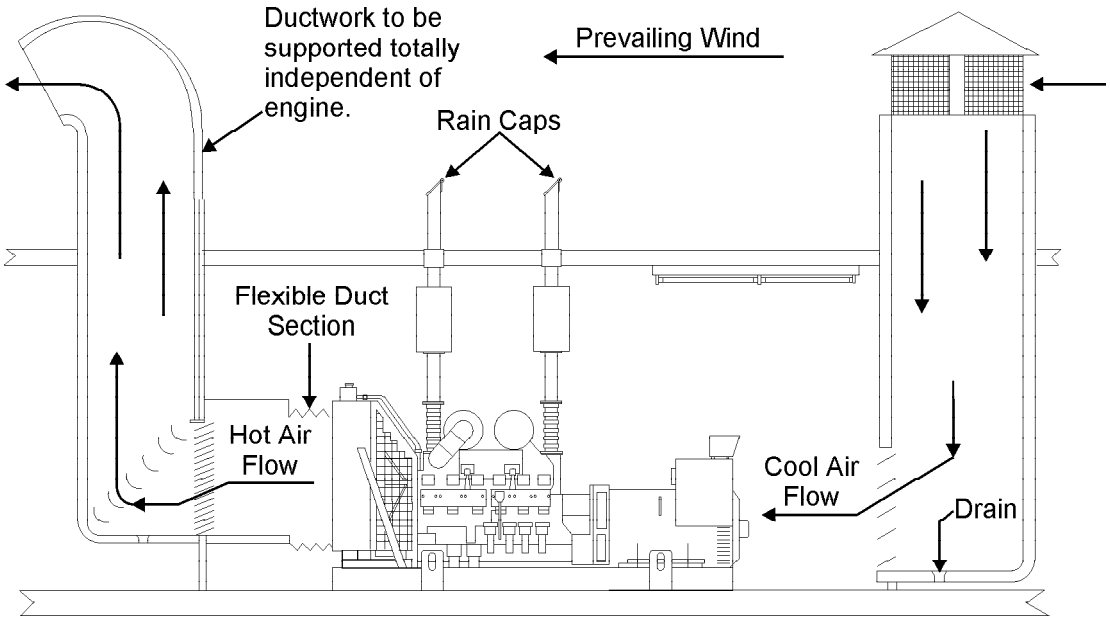


Figure XX. Duct Air Installation

Remote Radiator Cooling (optional)

Remote radiator cooling substitutes a remote mounted radiator and an electrically driven fan for the set mounted components. Removal of the radiator and the fan from the set reduces noise levels without forcing dependence on a continuous cooling water supply. The remote radiator installation must be completely protected against freezing conditions.

Water Jacket Heater (optional)

An optional water jacket heater can be installed to keep the engine warm for starting under adverse weather conditions. Connect the heater to a power source that will be on when the engine is NOT running (such as AC power or other independent powers source).

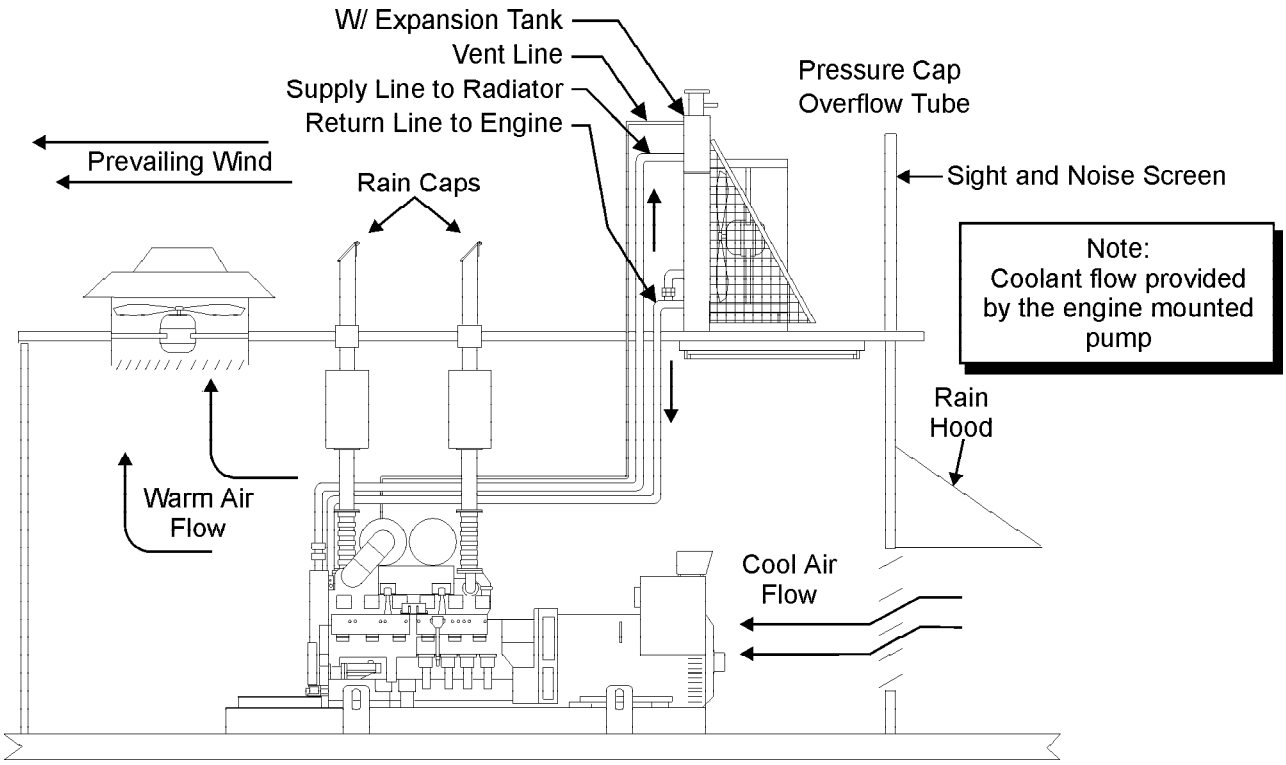


Figure XX. Remote Radiator Installation

Heat Exchanger (optional)

The optional heat exchanger uses a shell and tube type heat exchanger instead of the standard radiator and fan (see Figure XX). Engine jacket and LTA coolant circulates through the shell side of the two heat exchangers while the cooling water is pumped through the tubes. Engine coolant and raw water do not mix. This type of cooling separation is necessary because raw water can contain scale forming lime or other impurities.

This system can reduce set enclosure airflow requirements and noise levels. Proper operation depends on a constant supply of raw water for heat removal. Adjust the flow to maintain the proper engine jacket water coolant temperature and the LTA coolant temperature. The engine coolant side of the system can be protected from freezing; the rqw water side cannot be protected.

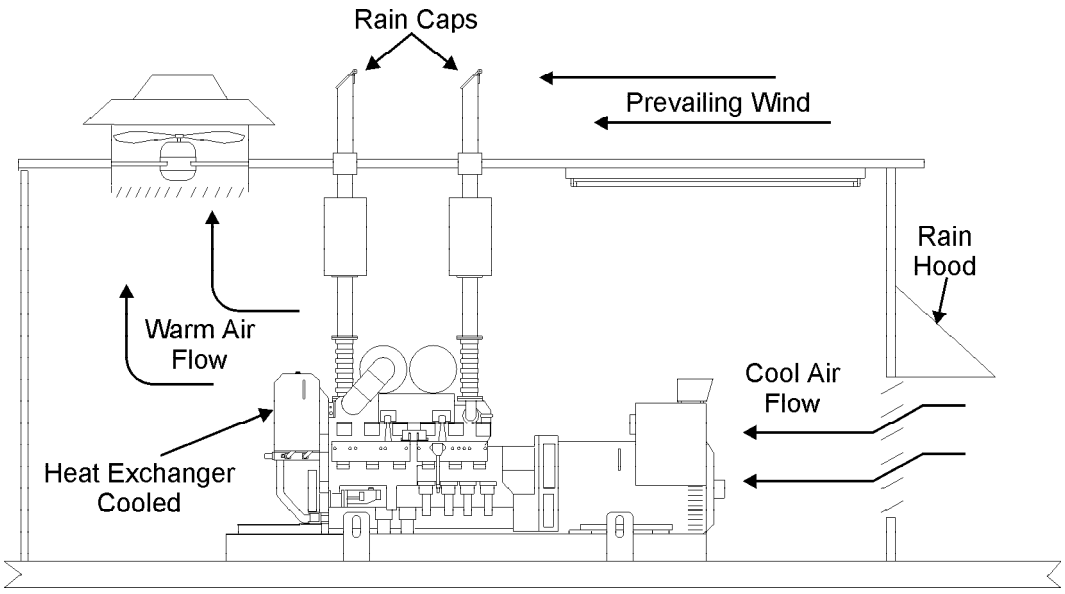


Figure XX. Heat Exchanger Installation

Hot Well Installation

The following diagram shows a typical installation of a hot well cooling system.

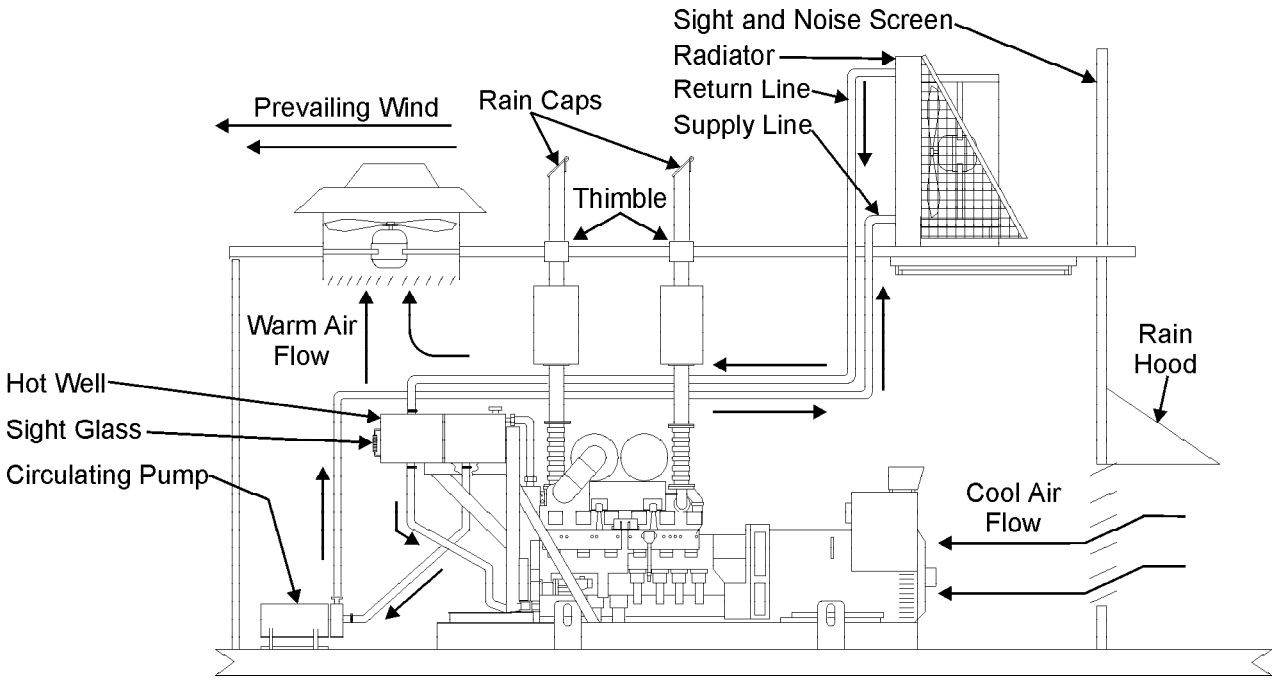


Figure XX. Hot Well Installation

PARTS AND OPERATION MANUAL

HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL NUMBER ON-HAND WHEN CALLING

PARTS DEPARTMENT
800/427-1244 or 310/537-3700
FAX: 800/672-7877 or 310/637-3284

SERVICE DEPARTMENT
800/835-2551 or 310/537-3700
FAX: 310/638-8046

WARRANTY DEPARTMENT
800/835-2551 or 310/537-3700
FAX: 310/638-8046

MAIN
800/421-1244 or 310/537-3700
FAX: 310/537-3927

MULTIQUIP INC.
POST OFFICE BOX 6254
CARSON, CA 90749
310-537-3700 • 800-421-1244
FAX: 310-537-3927
E-MAIL: mq@multiquip.com
WWW: multiquip.com