

Generator Placement

Before installing the generator, consult with the owner and convey the following requirements, which must be satisfied before the installation is complete.

There are two equally important safety concerns in regards to carbon monoxide poisoning and fire. There are also several general location guidelines that must be met before the installation is considered complete.

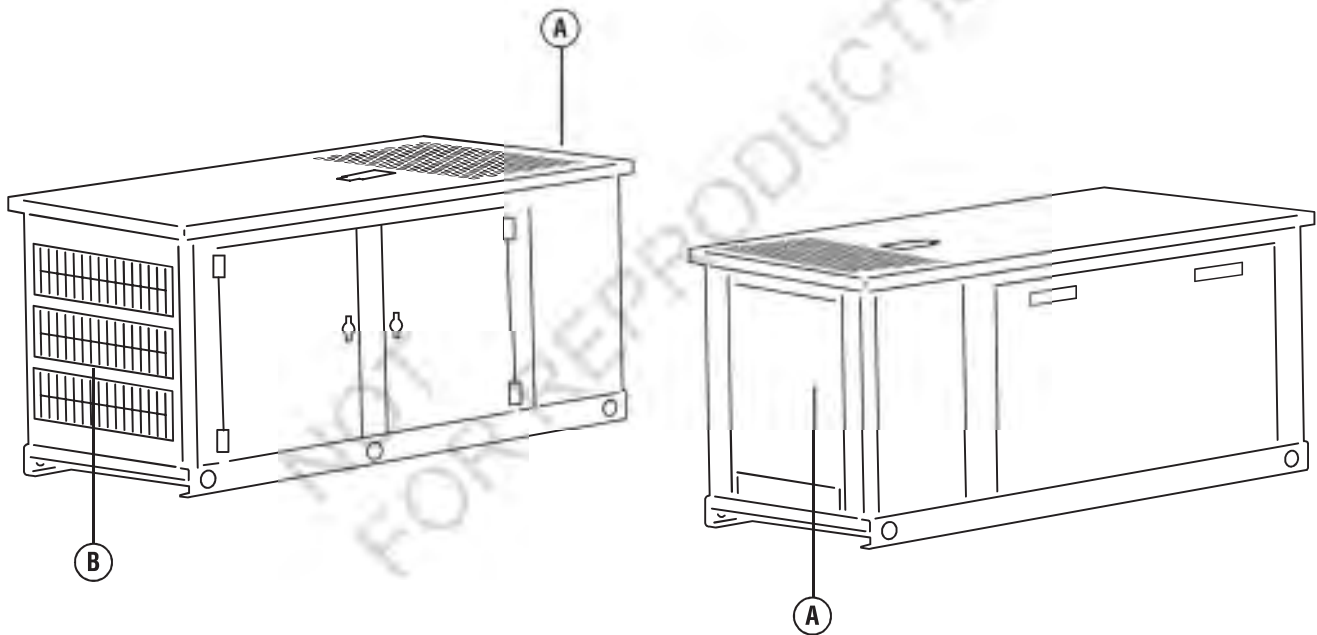
⚠ WARNING Running engine gives off carbon monoxide, an odorless, colorless, poison gas.



Breathing carbon monoxide could result in death, serious injury, headache, fatigue, dizziness, vomiting, confusion, seizures, nausea or fainting.

- Operate this product **ONLY** outdoors in an area that will not accumulate deadly exhaust gas.
- Keep exhaust gas away from any windows, doors, ventilation intakes, soffit vents, crawl spaces, open garage doors or other openings that can allow exhaust gas to enter inside or be drawn into a potentially occupied building or structure.
- Carbon monoxide detector(s) **MUST** be installed and maintained indoors according to the manufacturer's instructions/recommendations. Smoke alarms cannot detect carbon monoxide gas.

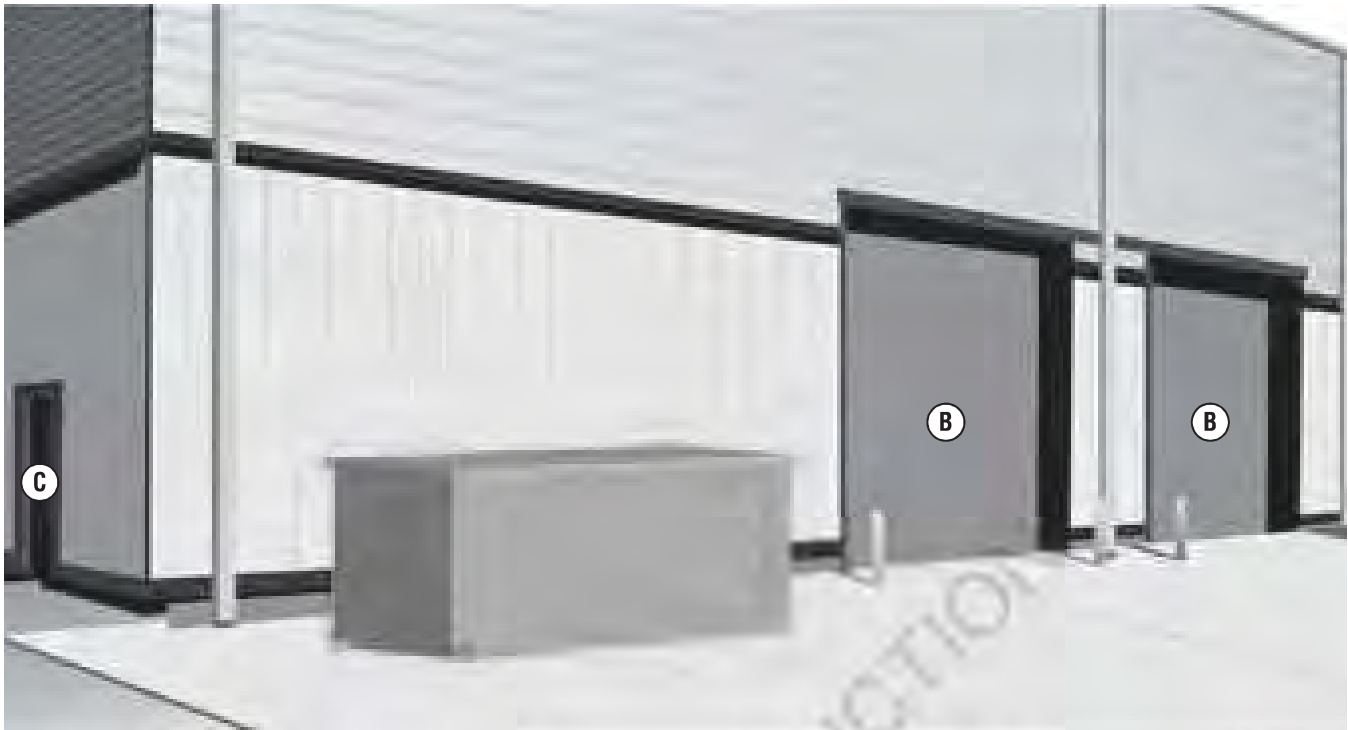
Exhaust Side of Generator



- Ⓐ Exhaust outlet side of weatherproof enclosure
- Ⓑ Weatherproof enclosure opposite exhaust side

Placement of Standby Generator to REDUCE THE RISK OF CARBON MONOXIDE POISONING

The arrows in the figure below point to **POTENTIAL** points of entry for Carbon Monoxide Gas.

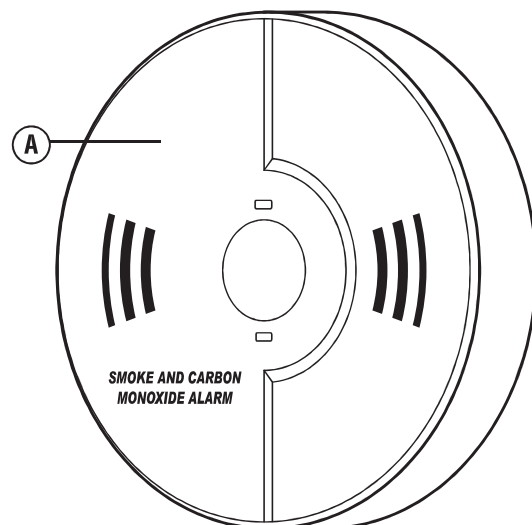


All fossil fuel burning equipment, such as standby generators, contains carbon monoxide (CO) gas in the engine exhaust. CO gas is odorless, colorless and tasteless and is unlikely to be noticed until a person is overcome. CO gas can kill you so it is required that the following is included as part of the installation:

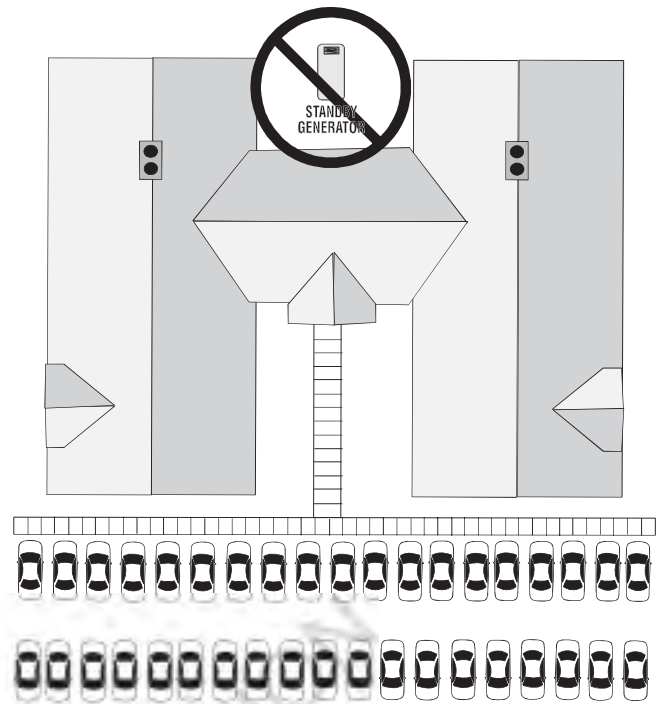
- Install generator outdoors in an area that will not accumulate deadly exhaust gas.
- DO NOT install generator where exhaust gas could accumulate and enter inside or be drawn into a potentially occupied building or structure.
- By law it is required in many states to have a Carbon Monoxide (CO) detector in operating condition in homes and other structures occupied by people. Carbon monoxide detector(s) **(A)** MUST be installed and maintained indoors according to the manufacturer's instructions / recommendations. A CO monitor is an electric device that detects hazardous levels of CO. When there is a buildup of CO, the monitor will alert the occupants by flashing visual indicator light and alarm. Smoke alarms cannot detect CO gas.
- Nearby structures may be exposed to the engine exhaust from your standby generator and must be considered when installing your standby generator.

• Ensure exhaust gas is kept away from:

- (B)** overhead doors
- (C)** doors
- (D)** windows (not shown)
- (E)** other openings that can allow exhaust gas to enter inside or be drawn into a potentially occupied building or structure.



- Direct the standby generator exhaust away from or parallel to the building or structure. DO NOT direct the generator exhaust towards a potentially occupied building, structure, windows, doors, ventilation intakes, soffit vents, crawl spaces, open garage doors or other openings where exhaust gas could accumulate and enter inside or be drawn into a potentially occupied building or structure.
- DO NOT place standby generator in any area where leaves or debris normally accumulates. Position standby generator in an area where winds will carry the exhaust gas away from any potentially occupied building or structure.



Placement of Standby Generator to REDUCE THE RISK OF FIRE

The National Fire Protection Association (NFPA) standard NFPA 37 establishes criteria for minimizing the hazard of fire during the installation and operation of stationary combustion engines. NFPA 37 limits the spacing of an enclosed generator from openings in walls, structures and combustible materials outside the enclosure.

The placement requirements provided are based on compliance to NFPA 37 2010 section 4.1.4.



WARNING Exhaust heat/gases could ignite combustibles or structures resulting in death or serious injury.

- Exhaust outlet side of weatherproof enclosure must have at least 5 ft (1.5 m) minimum clearance from any structure, shrubs, trees or any kind of vegetation.
- Standby generator weatherproof enclosure must be at least 5 ft (1.5 m) from windows, doors, any wall opening, shrubs or vegetation over 12 inches (30.5 cm) in height.
- Standby generator weatherproof enclosure must have a minimum of 5 feet (1.5 m) overhead clearance from any structure, overhang or trees.
- DO NOT place weatherproof enclosure under a deck or other type of structure that may confine airflow.
- USE ONLY flexible steel fuel line provided. Connect provided fuel line to generator, DO NOT use with or substitute any other flexible fuel line.
- Smoke detector(s) MUST be installed and maintained indoors according to the manufacturer's instructions/ recommendations. Carbon monoxide alarms cannot detect smoke.
- DO NOT place weatherproof enclosure in manner other than shown in illustrations.

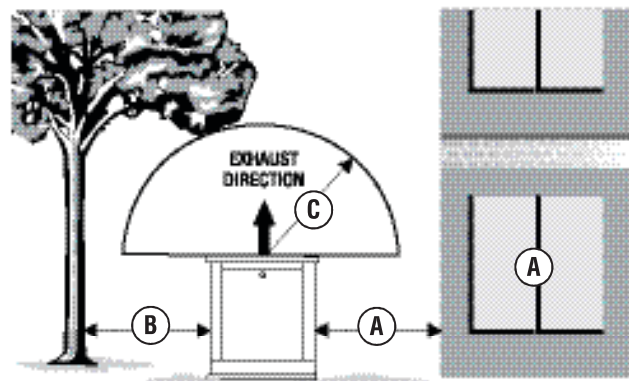
Examples of standby generator locations to reduce the risk of fire:

Legend for Generator Locations to reduce the risk of fire:

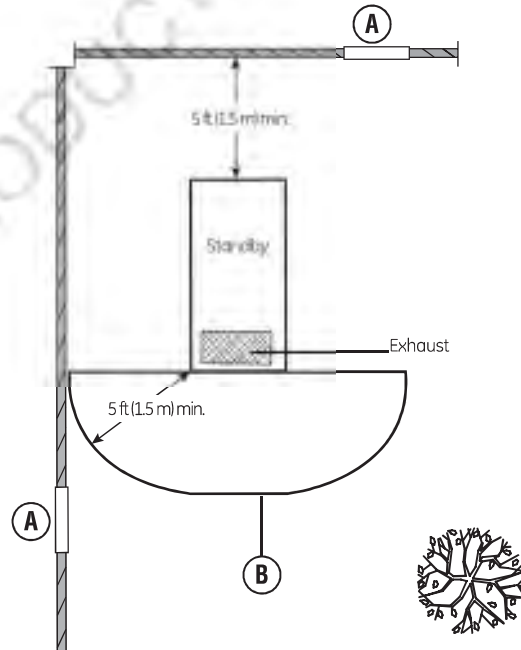
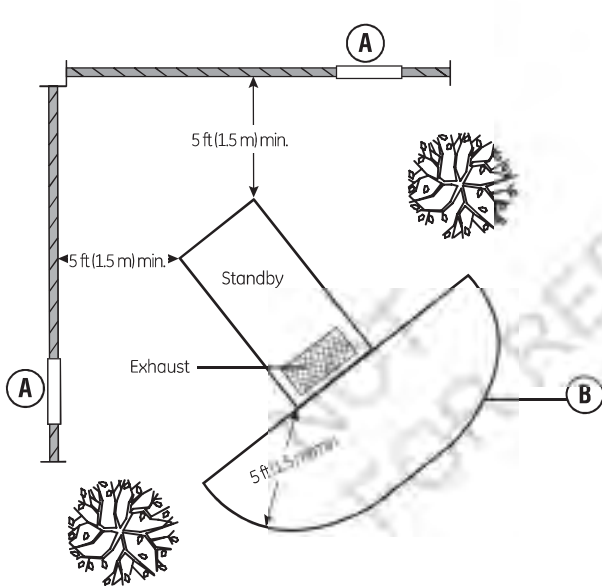
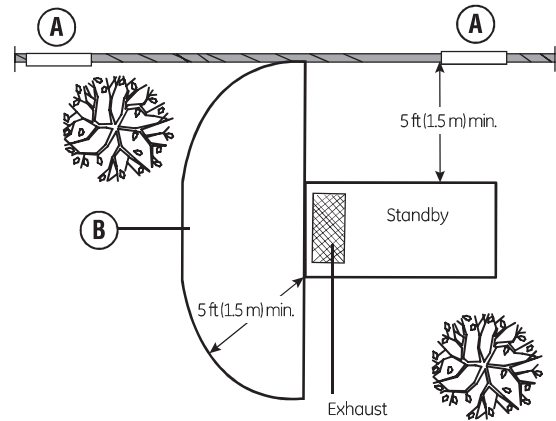
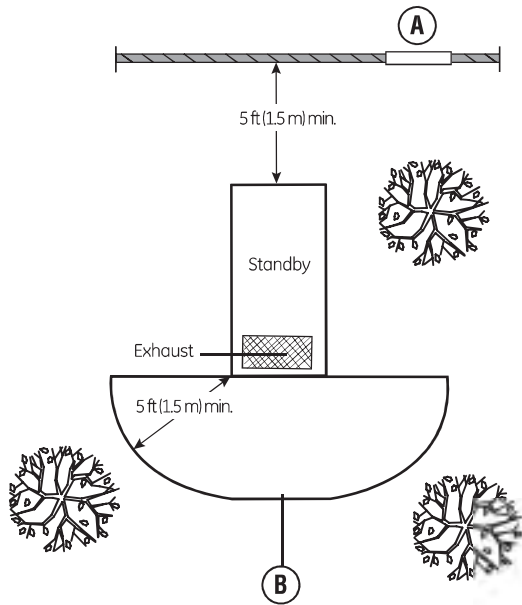
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- (B)** Exhaust outlet side of weatherproof enclosure must have at least 5 ft (1.5 m) minimum clearance from any structure, shrubs, trees or any kind of vegetation.
- (C)** Standby weatherproof enclosure must have a minimum of 5 feet (1.5 m) overhead clearance from any structure, overhang or trees.

NOTICE DO NOT place weatherproof enclosure under a deck or other type of covered structure that may confine airflow.

Vertical Clearances



Typical Installations with Structure Without a Fire Rating



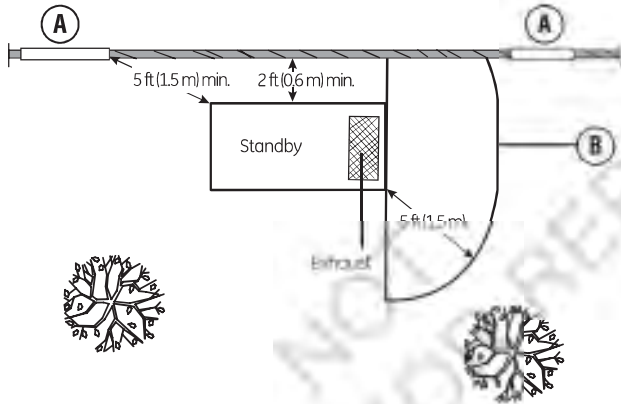
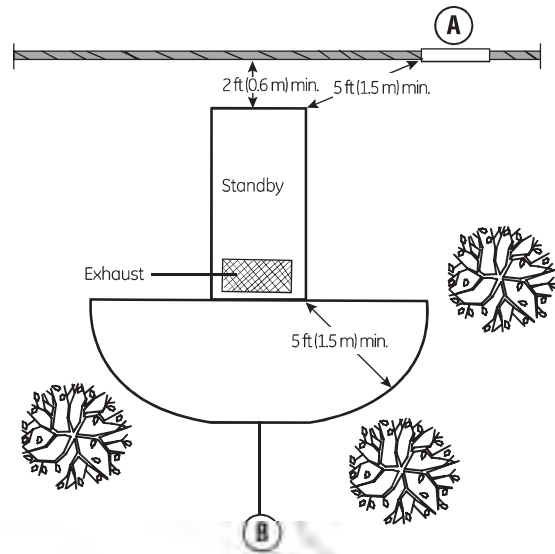
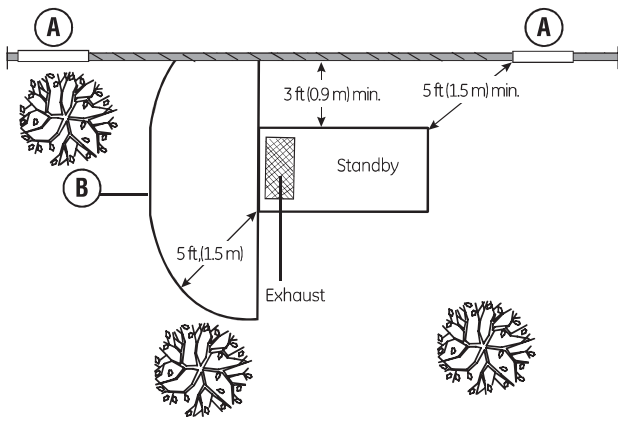
Legend for Generator Locations to reduce the risk of fire.

- A** Standby weatherproof enclosure must be at least 5 ft (1.5 m) from windows, doors, any wall opening, shrubs or vegetation over 12 inches (30.5 cm) in height.
- B** Exhaust outlet side of weatherproof enclosure must have at least 5 ft (1.5 m) minimum clearance from any structure, shrubs, trees or any kind of vegetation.

- C** Standby weatherproof enclosure must have a minimum of 5 feet (1.5 m) overhead clearance from any structure, overhang or trees.

NOTICE DO NOT place weatherproof enclosure under a deck or other type of covered structure that may confine airflow.

Typical Installation with Single Structure Having a Fire Resistance Rating of at Least 1 Hour.

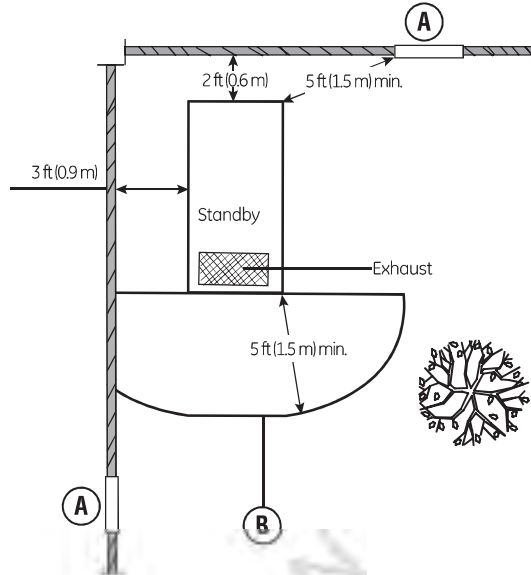
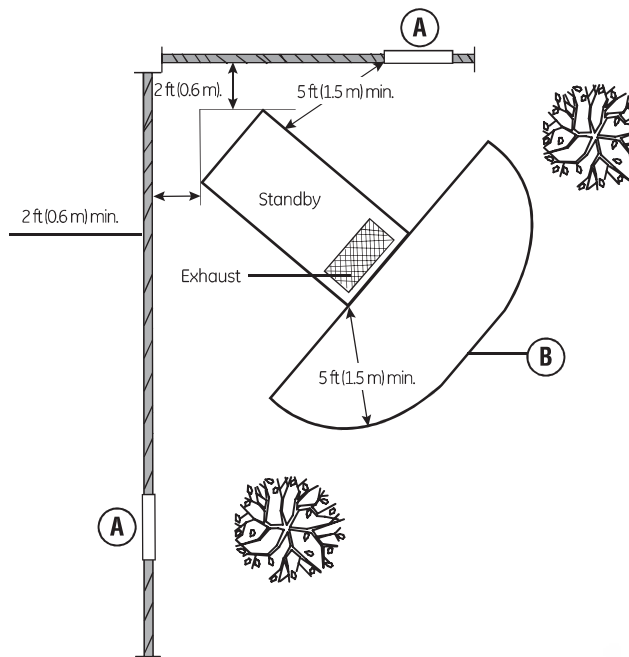


Legend for Generator Locations to reduce the risk of fire:

- Ⓐ - Standby weatherproof enclosure must be at least 5 ft. (1.5 m) from windows, doors, any wall opening, shrubs, or vegetation over 12 inches (30.5 cm) in height.
- Ⓑ - Exhaust outlet side of weatherproof enclosure must have at least 5 ft. (1.5 m) minimum clearance from any structure, overhang or trees.
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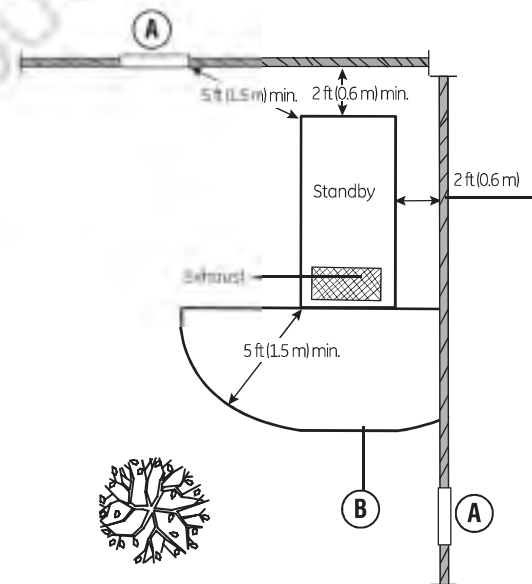
Typical Installation with Dual Structure Having a Fire Resistance Rating of at Least 1 Hour



Legend for Generator Locations to reduce the risk of fire:

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- (C)** - Standby weatherproof enclosure must have a minimum of 5 ft. (1.5 m) overhead clearance from any structure, overhang, or trees.

NOTICE DO NOT place weatherproof enclosure under a deck or other type of covered structure that may confine airflow.



Other General Location Guidelines

- Place the standby generator in a prepared location that is flat and has provisions for water drainage.
- Install the standby generator in a location where sump pump discharge, rain gutter down spouts, roof run-off, landscape irrigation, or water sprinklers will not flood the unit or spray the enclosure and enter any air inlet or outlet openings.
- Install the standby generator where it will not affect or obstruct any services (including covered, concealed and underground), such as telephone, electric, fuel (natural gas / LPG vapor), irrigation, air conditioning, cable, septic, sewer, well and so forth.
- Install the standby generator where leaves, grass, snow, etc will not obstruct air inlet and outlet openings. If prevailing winds will cause blowing or drifting, you may need to construct a windbreak to protect the unit.

Concrete Slab

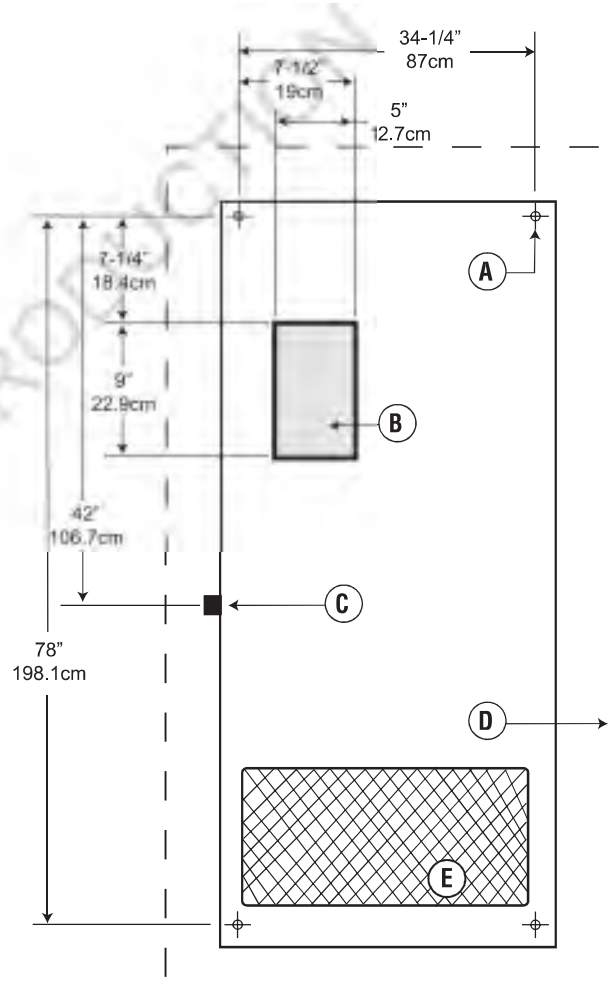
At the appropriate location, construct a concrete slab:

- 28 day compression strength of 3000 psi (200 MPa)
- Minimum 5" (13cm) thick
- Minimum 6" (15cm) wider than enclosure on all sides (shown as D in figure)
- Strengthen slab with No. 6 reinforcing bars (on 12" (30.5cm) centers) or 8 ga. steel wire fabric (6" (15cm) centers).

Avoid placing reinforcement in entrance stub up area (B).

Attach unit to slab at four corner locations (A) with minimum 5/16" (8mm) diameter masonry anchor bolts long enough to secure the unit.

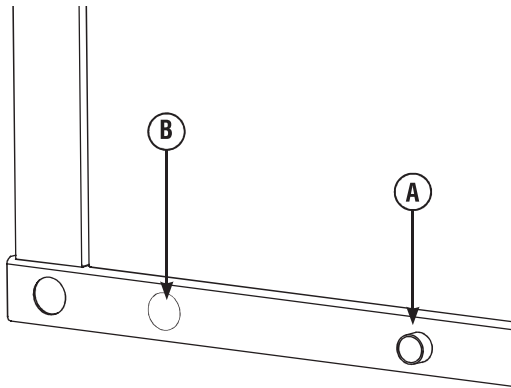
The fuel inlet location (C), the concrete slab (D), and the exhaust outlet (E) are shown for reference.



- (A) Holes located in base to anchor to pad
- (B) Stub up Area
- (C) Fuel Inlet
- (D) Concrete slab
- (E) Exhaust Outlet

Electrical and Fuel Inlet Locations

A through-slab power cable stub-up is preferred. If stub-up's are not used, (B) indicates the recommended location for punching holes for attaching power conduit. The 1 inch N.P.T. fuel inlet connector (A) is shown for reference.



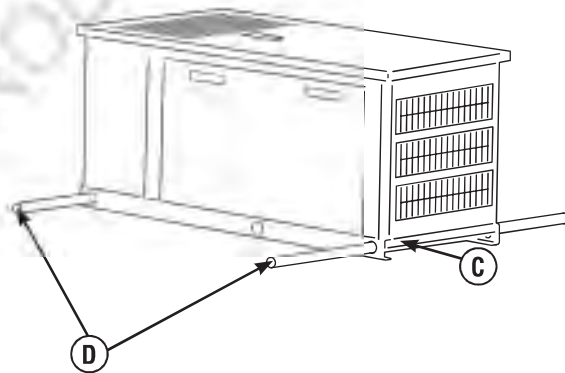
Lifting the Generator

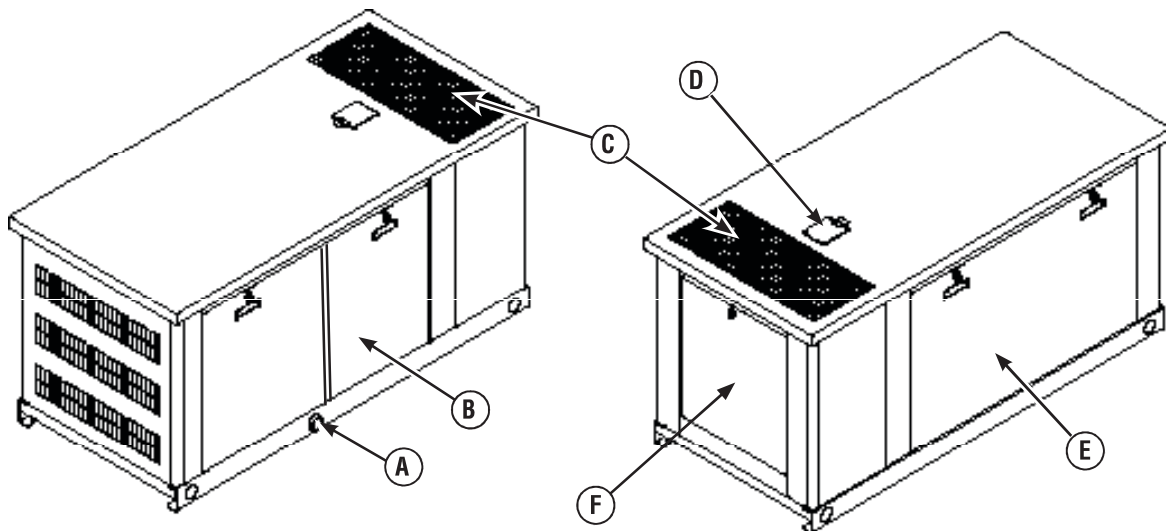
WARNING Hazardous Voltage - Contact with power lines could cause electric shock or burns, resulting in death or serious injury.
Lifting Hazard / Heavy Object - Could result in serious injury.

- If lifting or hoisting equipment is used, DO NOT contact any power lines.
- DO NOT lift or move generator without assistance.
- Use lifting pipes as described in *Lifting the Generator*.
- DO NOT lift unit by roof as damage to generator will occur.

The generator weighs more than 1,500 pounds (682 kg). Proper tools, equipment and qualified personnel should be used in all phases of handling and moving the generator.

Remove circuit breaker box bottom plate prior to positioning generator. Two 60" (1.5m) lengths of 2" Schedule 40 pipe (C), supplied by the installer, are required to lift the generator onto cement pad. Insert pipes through the lifting holes (D) located near the unit's base. Use a spreader bar to ensure that the chains, straps or cables DO NOT touch the generator's roof. Retouch any chipped paint with supplied touch-up paint.





Access Ports

The generator is equipped with an enclosure that has several access doors, as shown above. The doors are named for a significant component located behind them, as follows:

- (A) Fuel Inlet port (shown for reference)
- (B) Control Panel door (may be two doors)
- (C) Exhaust opening (shown for reference)
- (D) Coolant/Oil Fill door
- (E) Battery door
- (F) Muffler door

To close access door:

1. Close door and turn door's handle one quarter turn clockwise.
2. Insert key into lock of door handle and turn key one quarter turn clockwise. Remove key.

WARNING Contact with muffler area could cause burns resulting in serious injury.



- DO NOT touch hot parts and AVOID hot exhaust gases.
- Allow equipment to cool before touching.

The Coolant Fill, Battery and Control Panel doors must be installed whenever the unit is running to assure proper cooling, reduce noise and for added safety. The enclosure also includes muffler and radiator access panels, used only for cleaning those components. Those panels should remain closed at all other times.

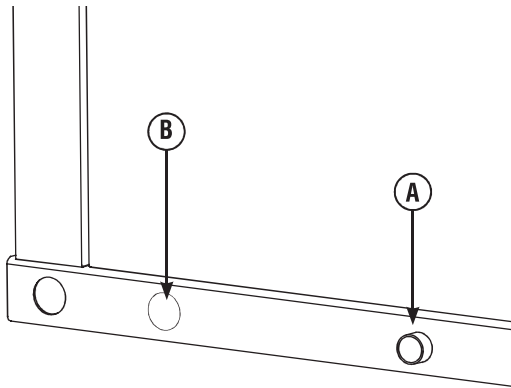
Each generator is shipped with a set of identical keys. These keys fit the locks that secure the access ports.

To open access door:

1. Insert key into lock of access door handle and turn key one quarter turn counterclockwise.
2. Grasp door's handle and turn one quarter turn counterclockwise to open. Remove key.
3. Coolant Fill door is unlocked in the same manner. It can be used for adding coolant or oil.

Electrical and Fuel Inlet Locations

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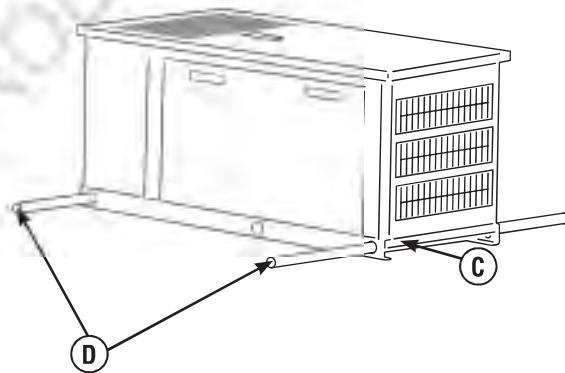
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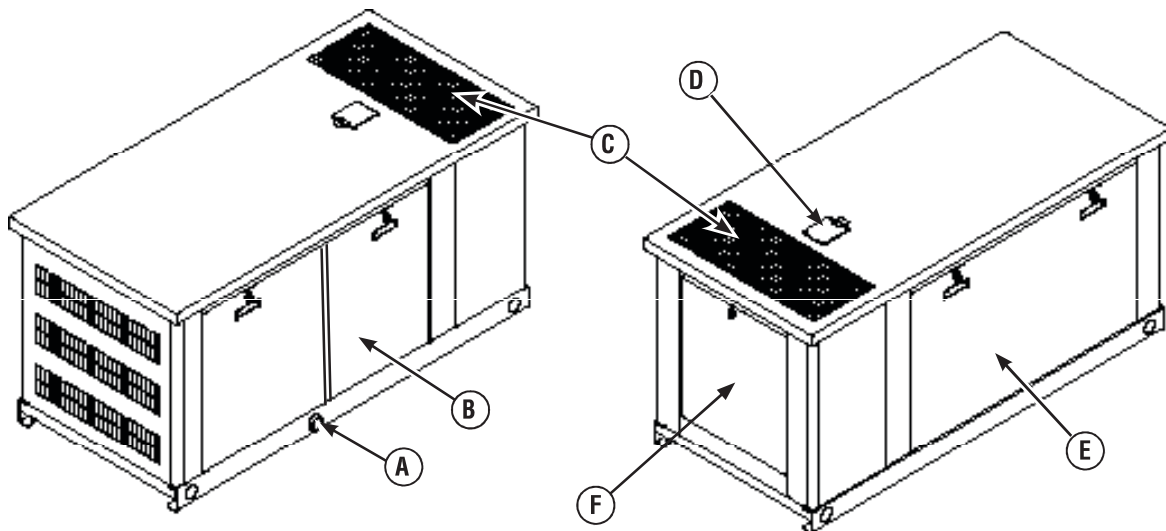
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NOTICE The supplied flexible gaseous pipe is not to be installed underground or in contact with the ground.

- The entire flexible gaseous pipe must be visible for periodic inspection and must not be concealed within nor contact nor run through any wall, floor, or partition.

The Gaseous Fuel System

The information below is provided to assist gaseous fuel system technicians in planning installations. In no way should this information be interpreted to conflict with applicable fuel gas codes. Consult with your local fuel supplier or Fire Marshall if questions or problems arise.

WARNING Propane and Natural Gas are extremely flammable and explosive, which could cause burns, fire or explosion resulting in death or serious injury.

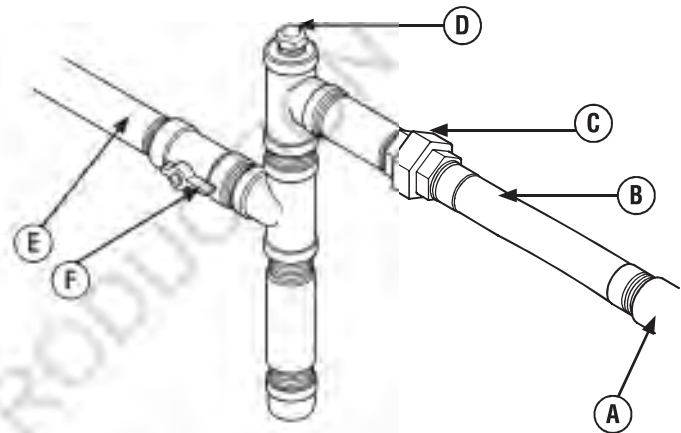
- LP gas is heavier than air and will settle in low areas.
- Natural gas is lighter than air and will collect in high areas.
- The slightest spark could ignite these fuels and cause an explosion.
- DO NOT light a cigarette or smoke.

TO THE INSTALLER: Consult with the generator owner(s) and convey any technical considerations that might affect their installation plans before applying these general guidelines.

The following general rules apply to gaseous fuel system piping:

- The piping should be of a material that conforms to federal and local codes, rigidly mounted and protected against vibration.
- Piping should be protected from physical damage where it passes through flower beds, shrub beds, and other cultivated areas where damage could occur.
- Install the flexible, gaseous hose (B) (supplied) between the generator fuel inlet port (A) and rigid piping to prevent thermal expansion or contraction from causing excessive stress on the piping material.
- A union (C) or flanged connection shall be provided downstream to permit removal of controls.
- A manometer port should be provided (D). A digital manometer, P/N 19495, is available at your Briggs & Stratton service center. When the initial test runs are completed, the manometer is removed and the port is plugged. The manometer port permits temporary installation of a manometer to ensure that the engine receives the correct fuel pressure to operate efficiently throughout its operating range.
- Where the formation of hydrates or ice is known to occur, piping should be protected against freezing. The termination of hard piping should include a sediment trap (E) where condensate is not likely to freeze.
- A minimum of one accessible, approved manual shutoff valve (F) shall be installed in the fuel supply line within 6 ft (180 cm) of the generator.

- A manual fuel shut-off valve located in the interior of the building.
- Where local conditions include earthquake, tornado, unstable ground, or flood hazards, special consideration shall be given to increase strength and flexibility of piping supports and connections.
- Piping must be of the correct size to maintain the required supply pressures and volume flow under varying generator load conditions with all gas appliances connected to the fuel system turned on and operating.
- Use a pipe sealant or joint compound approved for use with NG/LPG on all threaded fittings to reduce the possibility of leakage.
- Installed piping must be properly purged and leak tested, in accordance with applicable codes and standards.



- (A) Generator Fuel Inlet
- (B) Flexible Fuel Hose
- (C) Union Fitting
- (D) Manometer Test Port
- (E) Sediment Trap
- (F) Manual Shut-off Valve

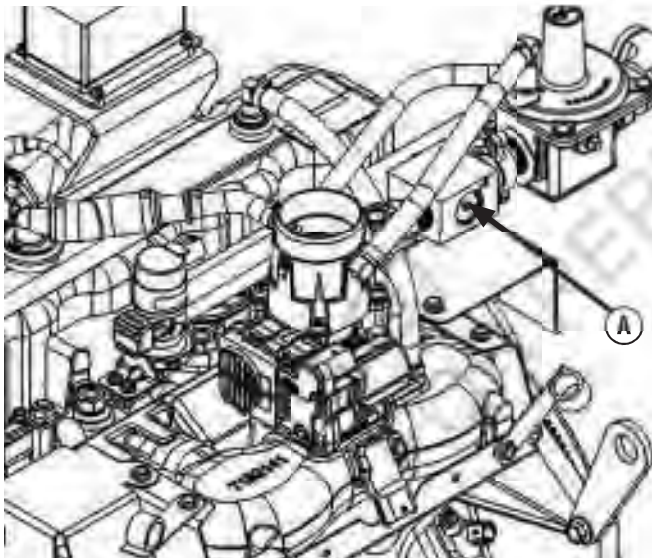
Fuel Pipe Sizing

There are numerous on-line or otherwise-published references for fuel pipe sizing. For example, NFPA 54 - National Fuel Gas Code, 2006 (Item #: 320-6031-06) is a common resource. The installer should consider the specific gravity of gas, compensate for a nominal amount of restriction from bends and fittings, and refer to federal and local codes for guidance.

Fuel Conversion

The unit is shipped from the factory calibrated for NG operation. To convert the engine from NG to LP vapor, follow these steps:

1. Set generator circuit breaker to OFF.
2. Set control panel system switch to OFF.
3. Remove 15 Amp fuse from system control panel.
4. Locate the fuel selector switch (A). Using a 6 mm Allen wrench, turn the selector switch to either LP or NG.
5. Reinstall 15 Amp fuse in system control panel.
6. Set exercise timer.



Fuel Pressure

Both LP vapor and natural gas fuel supply pressure at the generator's fuel inlet port should be between 7 to 11 inches (18 to 28 cm) of water (in. W.C.) at full load with all gas appliances turned on and operating. *Maximum pressure with engine OFF at No Load is 13.85 in. W.C.*

Power Loss

Air density is less at high altitudes, resulting in less available engine power. Specifically, engine power will decrease 3% for each 1,000 feet (300 m) above sea level and 1% for each 10° F (5.6°C) above 77°F (25°C). Generators located in these conditions, that use power management technology must have their transfer switch programmed appropriately for this power decrease.

Fuel Consumption

Estimated fuel supply requirements at half and full load for natural gas and LP vapor fuels are shown here.

	Natural Gas		LP Vapor	
	1/2 Load	Full Load	1/2 Load	Full Load
33kW	282 C	458 C	N/A	N/A
	282,000 B	458,000 B	N/A	N/A
35kW	N/A	N/A	117 C	186 C
	N/A	N/A	292,900 B	465,100 B

C = Cubic feet per hour
B = BTU's per hour.

Physical Properties	LP Vapor	Natural Gas
Normal Atmospheric State	Gas	Gas
Boiling Point (in °F):		
Initial	-44	-259
End	-44	-259
Heating Value:		
BTU per gallon (Net LHV*)	33,340	63,310
BTU per gallon (gross**)	91,547	
Cubic feet (gas)	2,500	1,000
Density***	36.39	57.75
Weight†	4.24	2.65
Octane Number:		
Research	110+	110+
Motor	97	

* LHV (Low Heat Value) is the more realistic rating.
** Gross heat value does not consider heat lost in the form of water during combustion.
*** Density is given in "Cubic Feet of Gas per Gallon of Liquid".
† Weight is given in "Pounds per Gallon of Liquid".