SIZING OF PROPANE TANKS FOR GENERATORS

by
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Introduction

Generators are installed that use natural gas or propane. Some use both so there is a back up source of fuel in the event that natural gas supply is interrupted. The switch over from natural gas to propane is automatic and provides seemingly uninterrupted electrical power. Many buildings are being designed this way, not only to keep the air conditioning running for occupant comfort, but more importantly to provide a stable indoor environment for the furniture, rugs, interior finishes, artwork, etc.

Assumptions

There are many factors that influence the size of the propane tank.

- Size of Generator **G** = _____[kw]
- Number of Days **N** = _____[days]
  Residences on barrier islands need more days of propane supply because of the uncertainty of trucks accessing the islands for refills.
- Tons of Air Conditioning **T** = _____[tons]
- Fuel Consumption **F** = _____[cu.ft./hr.]
- Anticipated Occupant Power Usage **P** = _____[%]
  Where **P** = 25% for Low
  50% for Medium
  75% for High
  Every occupant has different power use requirements based on individual lifestyles.

Calculation of Propane Tank Size

STEP 1: Determine the air conditioning load, **AC** [%]

$$\mathbf{AC}[\%] = \mathbf{T}[\text{tons}] \times 1\left[\frac{kw}{ton}\right] \times \frac{1}{G[kw]} \times 100$$

AC[%] = [ ] [%]

STEP 2: Determine the total power usage $\mathbf{P}_T$ [%] of air conditioning and occupant usage **P**[%] with a 75% diversity **D**[%].

$\mathbf{P}_T$ [%] = (**AC**[%] + **P**[%]) x **D**[%]

D[%] = 75%

$\mathbf{P}_T$ [%] = ☐ [%]

STEP 3: From the generator manufacturer, determine the propane fuel consumption $\mathbf{F}_C\left[\frac{cu.ft}{hr}\right]$ at the $\mathbf{P}_T$ [%].

$\mathbf{F}_C\left[\frac{cu.ft}{hr}\right]$ = ☐ $\left[\frac{cu.ft}{hr}\right]$

STEP 4: Determine the propane consumption of $\mathbf{F}_B\left[\frac{BTU}{hr}\right]$.

$\mathbf{F}_B\left[\frac{BTU}{hr}\right]$ = $\mathbf{F}_C\left[\frac{cu.ft}{hr}\right]$ x $2516\left[\frac{BTU}{cu.ft}\right]$

$\mathbf{F}_B\left[\frac{BTU}{hr}\right]$ = ☐ $\left[\frac{BTU}{hr}\right]$

STEP 5: Determine the amount of fuel, $\mathbf{F}_T$ [BTU] necessary.

$\mathbf{F}_T$ [*BTU*] = **N** [*days*] x $\mathbf{F}_B\left[\frac{BTU}{hr}\right]$ x $24\left[\frac{hr}{day}\right]$

$\mathbf{F}_T$ [*BTU*] = ☐ [*BTU*]

STEP 6: Determine the gallons **G**[*gal*] of propane storage necessary.

$$\mathbf{G}[gal] = \mathbf{F}_T\,[BTU] \div 91690\left[\frac{BTU}{gal}\right]$$

$$\mathbf{G}[gal] = \boxed{}\,[gal]$$

Standard Tank Sizes

300 gal	3'-0" ø x 6'-0" L
500 gal	3'-0" ø x 10'-0" L
500 gal	3'-6" ø x 7'-9" L
1000 gal	3'-6" ø x 16'-8" L
1990 gal	3'-10" ø x 23'-10" L

Underground Tank Locations

Since the majority of propane tanks are buried underground, the requirements for locating them on the property are outlined in NFPA 58. Local codes may be more stringent and will prevail. Buried tanks must be protected from vehicular traffic.

Distance from street	10 feet
Distance from property line	10 feet
Distance from building	10 feet
Distance from electrical equipment	10 feet
Distance between propane tanks	3 feet
Distance from gas burning appliances	10 feet

Regulators and Pipe Sizes

The propane tank is fitted with a first stage regulator that steps the tank pressure of 100 psi down to 30 psi. 30 psi piping is run from the first stage regulator to the second stage regulator. The second stage regulator is located at the generator. It steps the 30 psi pressure down to 7-11 inches of water column.

Generators running on dual fuel must be fitted with the proper regulators at the equipment for automatic changeover of fuel types. A kit must be installed that allows the changeover between fuel types based on changes in the pressure of the natural gas and propane piping.