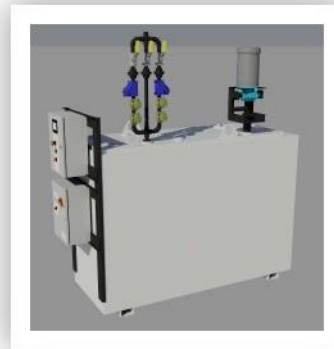


## How to Design a Life Safety Generator Fuel System

Life Safety Generator Fuel Systems can be complex. They need to operate reliably and meet applicable building codes. The configurations are often dictated by the very limited space available in the building design.

To make them easier to understand we break down the design process adding elements as needed to accomplish your design goals.

Each Step results in a functional system, so you can just stop after the step that fulfills your requirements.



### How Much Fuel is Needed

A life safety generator is a requirement of many building codes. It is meant to keep the lights on and the elevators working for a minimum of 2 hours to allow people to get out of the building. These are usually smaller generators 100-1000 KW with limited fuel storage needs. A 1000 KW generator at full load consumes about 75 Gallons (300L) per hour, so 2 hours is only 150 Gallons (600L).

The tank storage requirement is based on a 75% full tank, so you would need  $150 / 0.75 = 200$  Gallons (800L). Then add 10% because only fill to 90%, and another 10% considered unusable at bottom of tank. This would mean a 250 gallon (1000L) tank.

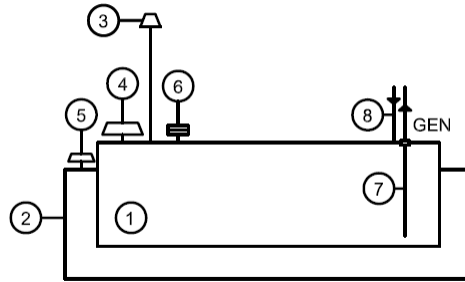
If the generator is above the lowest level in the building then the building codes will limit the amount of fuel that can be stored at that level. This is often limited to 60 gallons (240L), so the day tank capacity at the generator may be 50 gallons (200L), with the rest of the storage capacity in the tank in the basement.

**Step 1:**

**Basic Tank and Accessories**

To provide a local fuel supply for the generator. Fuel delivery directly from truck to tank.

**Sub-Base Tank:** Often the tank is a sub-base tank built into the generator. Same principles apply.

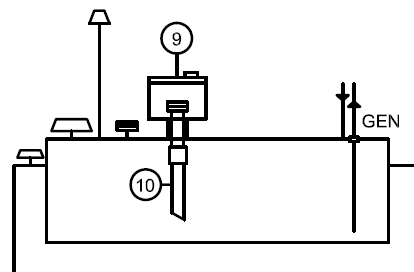


1. Steel Day Tank UL142
2. Tank Containment
3. Normal Vent Cap
4. Emergency Vent – Primary
5. Emergency Vent – Secondary
6. Inspection / Fill Port
7. Engine Suction FOS
8. Engine Return FOR

**Step 2:**

**Add Direct Fill Accessories**

If the tank is outside accessible to fuel delivery trucks, filling is simple. Add a spill container at the fill pipe and a mechanical overfill prevention valve, if the tank is deep enough.



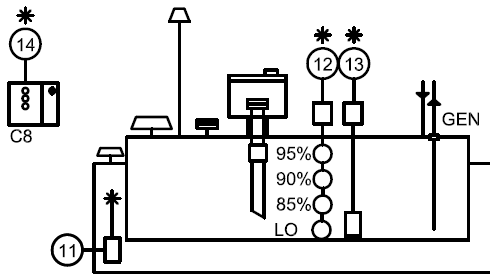
9. Spill Container at Fill Pipe
10. Mechanical Overfill Prevention

**Step 3:**

**Add Basic Sensors**

To provide high level, low level, and leak status to the generator controls and BMS System

**\*Points to Monitor**



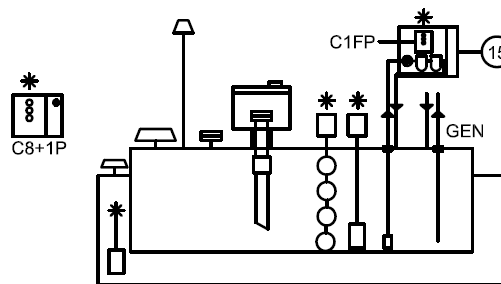
- 11. Leak Sensor
- 12. High and Low Level Sensors
- 13. Level Transmitter for GAL (L) Read
- 14. C8 Monitor and Control Panel

**Step 4:**

**Add Filter Polisher**

To assure cleanliness of fuel during storage, add a filter polisher.

**\*Points to Monitor**



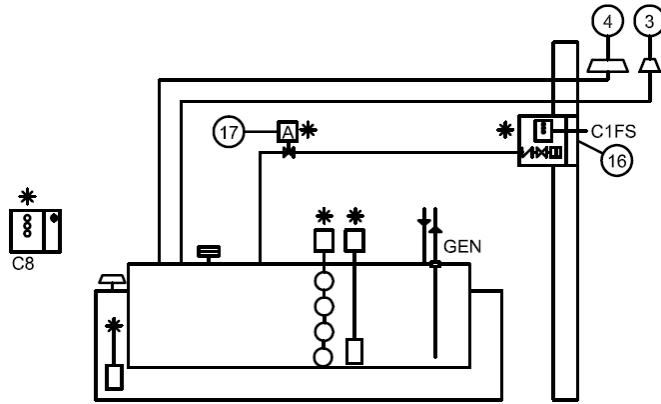
- 15. Filter Polisher

**Step 5:  
Add Remote Fill**

Generators inside buildings will require a remote fill connection to the outside.

Typically the standard, and sometimes emergency, vents are moved to the building exterior.

**\*Points to Monitor**



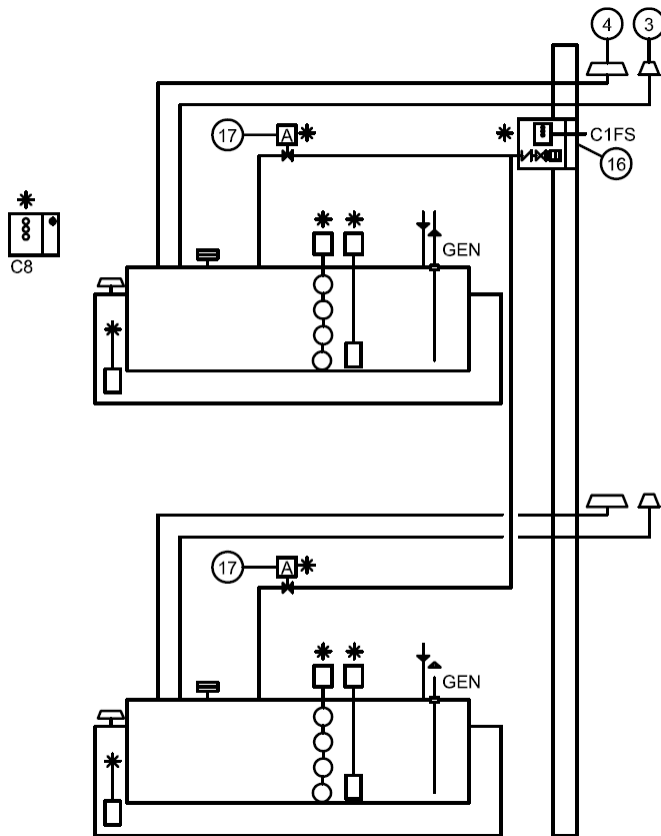
16. Remote Fill Station

17. Actuated Valve Closes on High Level

**Step 6:  
Add Remote Fill – 2 Tanks**

The fill station can be specified as multi-tank to fill more than one generator tank

**\*Points to Monitor**



**Step 7:**

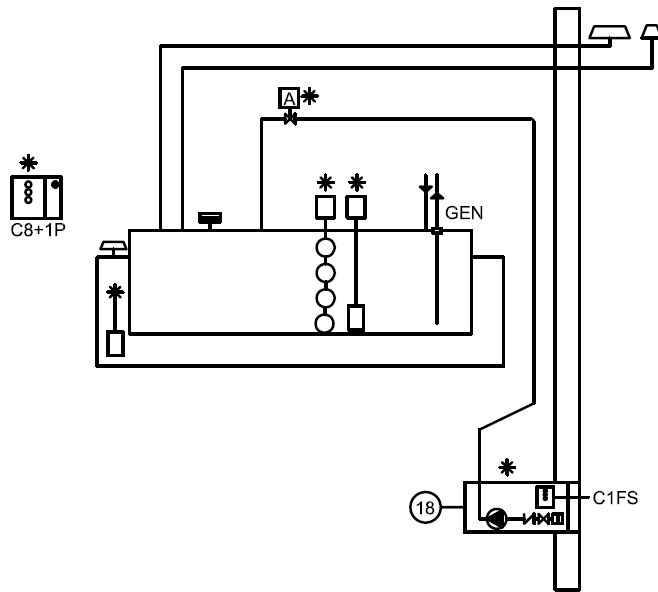
**Add Remote Fill with Pump**

Generators inside buildings may be at an upper level and a Pump Fill Station may be specified.

**Consider:**

- The pump can usually have modest flow rates, 20-25 GPL (80-100 LPM) since the life safety tank sizes are limited.
- Rooftop generators may require high pressure pumps with larger HP (KW) motors.

**\*Points to Monitor**



18. Remote Fill Station with Pump

**Step 8:  
Receive Fuel into Storage Tank,  
then Transfer to Genset Tank**

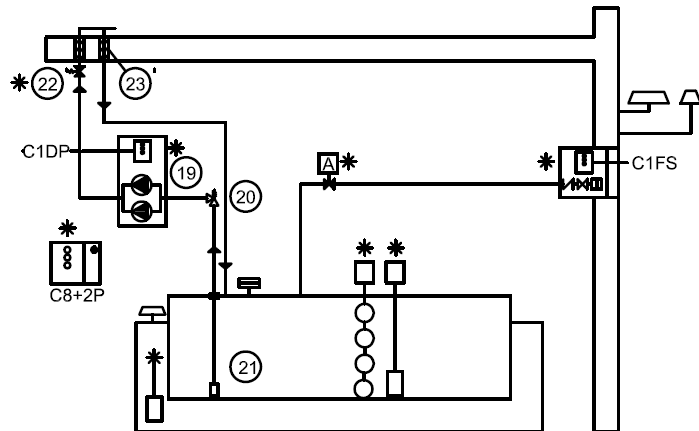
Generators inside buildings may require storage tanks in addition to day tanks.

- Run times may require fuel in excess of day tank capacities
- Fire Codes limit on fuel tank volumes above lowest building level.
- Multiple Generators in Building may need fuel from a single storage source

**Note:**

- Fire Stop and fusible link valves at floor-wall penetrations.

**\*Points to Monitor**



- 19. Duplex Fuel Transfer Pump
- 20. Anti-Siphon Valve
- 21. Suction Pipe Foot Valve
- 22. Fire Safety Fusible Link Valve
- 23. Fire Stop at Wall-Floor Penetration

**Step 9:  
Receive Fuel into Storage Tank,  
then Transfer to Genset Tank**

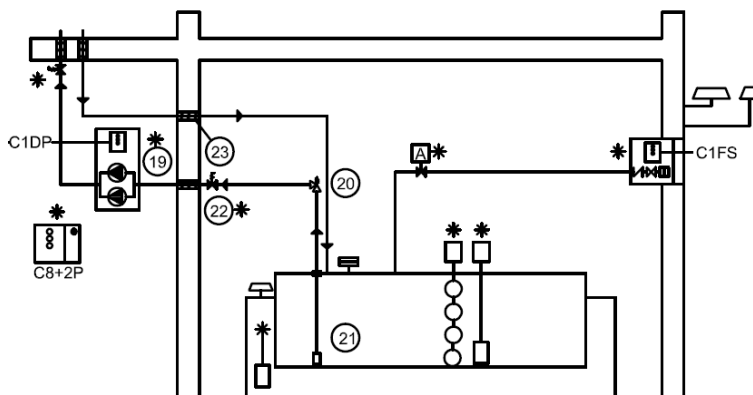
**\*\* Fuel Room Classified Area\*\***

The Fuel Room may be a classified electrical area by local code – or entry may be considered a safety hazard.

Move the pumps and controls outside the room to an (a) ordinary electrical area that (b) is accessible to users.

**Note:**

- Fire Stop and fusible link valves at floor-wall penetrations.



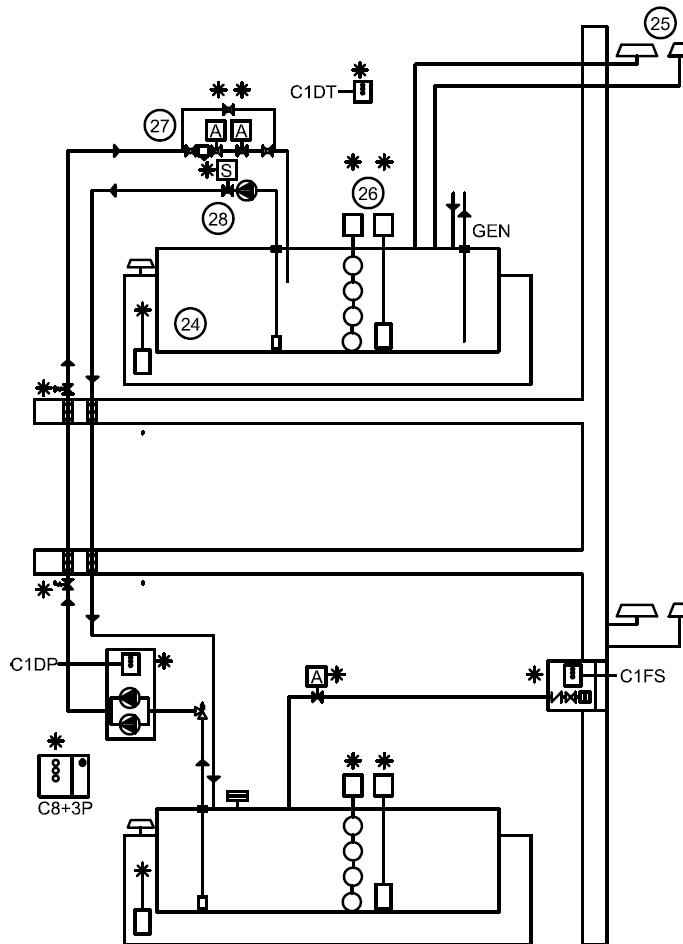
- 19. Duplex Fuel Transfer Pump
- 20. Anti-Siphon Valve
- 21. Suction Pipe Foot Valve
- 22. Fire Safety Fusible Link Valve
- 23. Fire Stop at Wall-Floor Penetration

**Step 10:  
Add the Day Tank Equipment at  
the Generator Locations**

Day Tanks, or sub-base tank refill equipment is installed at the generator locations inside the building or at rooftop.

Control can be by Local Controller or by the master controller at the storage tank.

**\*Points to Monitor**



- 24. Day Tank at Generator
- 25. Extend Vents to Exterior
- 26. Level Sensor, Level Transmitter, and Leak Sensor
- 27. Inlet Solenoid or Actuated Valves
- 28. Return Flow Pump with Anti-Siphon Solenoid Valve, If not gravity overflow back to lower level.