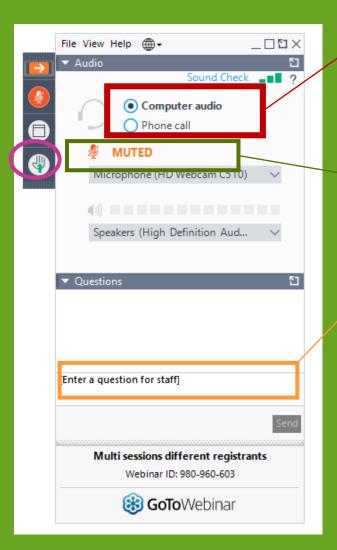
#### **USING GOTOWEBINAR**



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#### **TANKS PROGRAM**

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### EMERGENCY POWER GENERATOR UST SYSTEMS

7/22/2020

TODAY'S SPEAKERS Carolyn Hoskinson, Director | EPA OUST

Tim Smith, Environmental Protection Specialist | US EPA

Seth Hendrix, Environmental Science Specialist | Montana DEQ

John Cignatta, Vice President | Datanet Engineering, Inc.



#### NEIWPCC's Emergency Power Generator UST Systems Webinar July 22, 2020

**Tim Smith** 

**EPA Office of Underground Storage Tanks** 



#### This Is What I Will Cover Today

- 1. No longer deferred from release detection requirements.
- 2. Determining if emergency power generator systems must comply with federal UST regulation.
- 3. Meeting the release detection (RD) requirements.
- 4. Features of these systems that present a challenge to meeting federal UST RD requirements.
- 5. Resources available and on the way.



#### No Longer Deferred From Meeting Release Detection Requirements

- Original UST regulation became effective December 22, 1988.
- Did not have to meet release detection requirements.
- November 2011 EPA published proposed changes to the regulation.
- EPA adopted the revised regulation on July 15, 2015 with an effective date of October 13, 2015.



#### No Longer Deferred From Meeting Release Detection Requirements (Cont.)

Removed the 1988 deferral and requires release detection for all emergency generator tanks

- Required at installation for UST systems installed after October 13, 2015.
- By October 13, 2018 required for systems installed on or before October 13, 2015.





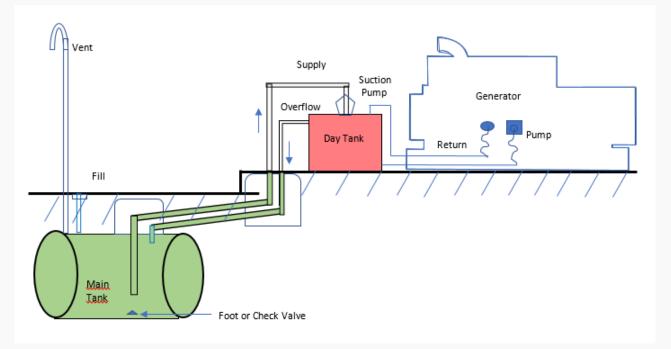
#### Does The Power Generator System Have To Comply With UST Regs.?

 "Underground storage tank or UST means any one or combination of tanks (including underground pipes connected thereto) that is used to contain an accumulation of regulated substances, and the volume of which (including the volume of underground pipes connected thereto) is 10 percent or more beneath the surface of the ground."



#### Does The Power Generator System Have To Comply With UST Regs.?

• Is 10 percent or more of "total system" beneath the surface of the ground?





#### Does the Power Generator System Have To Comply? (Cont.)

- Does any federal UST regulatory exclusion apply?
- Most are unlikely to apply:
  - Farm or residential tank of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes.
  - Septic tank.
  - Surface impoundment, pit, pond, or lagoon.
  - Storm water or wastewater collection system.
  - Flow-through process tank.
  - Liquid trap or associated gathering lines directly related to oil or gas production and gathering operations.



#### Does the Power Generator System Have To Comply? (Cont.)

- Does any federal UST regulatory exclusion apply?
- These are most likely to apply:

#### Heating oil exclusion

Storage systems used for storing heating oil for consumptive use on the premises where stored.

See <a href="https://www.epa.gov/ust/frequent-questions-about-underground-storage-tanks">www.epa.gov/ust/frequent-questions-about-underground-storage-tanks</a>

#### Underground exclusions areas

Storage systems situated in an underground area—such as a basement, cellar, mineworking, drift, shaft, or tunnel—if the tank or combination of tanks is situated on or above the surface of the floor. <u>No portion of any tank can be beneath the surface of the ground or otherwise covered with earthen material.</u>



#### Meeting The Release Detection Requirements

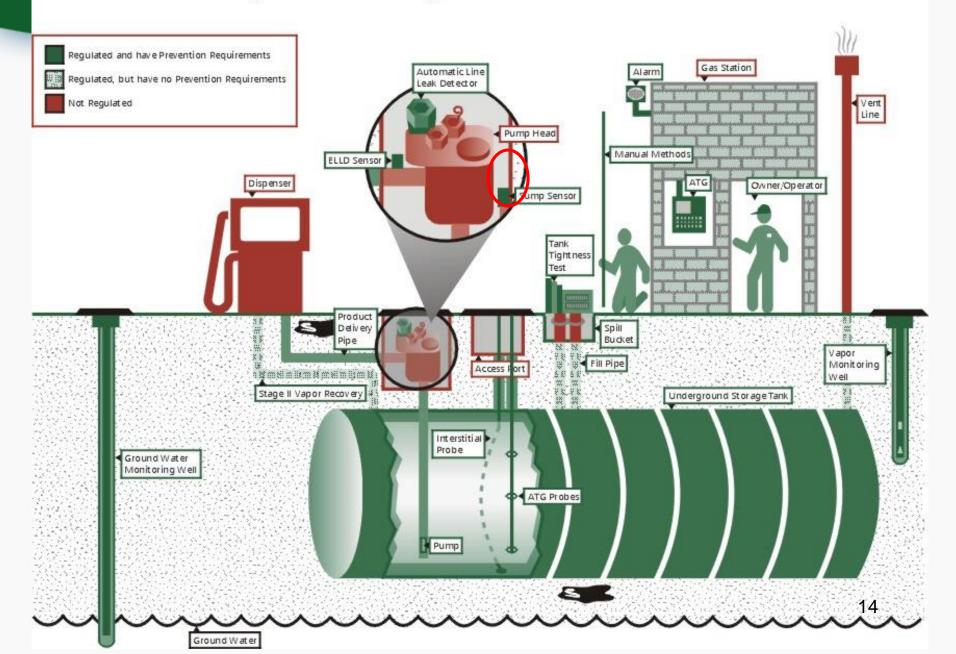
#### Subpart D

#### April 11, 2016

- Installed on or before All method options available.
- Installed after Secondary containment and interstitial monitoring.
- Tank
- Piping
  - Suction systems.
  - Pressurized systems.

#### Underground Storage Tank Release Detection

UNITED STATED





#### Meeting the Release Detection Requirements (Cont.)

#### **Tank Options**

- Interstitial monit.
- ATG
- SIR, CITLD
- Manual tank gauge
- Groundwater or vapor monitoring
- Other method

#### **Piping Options**

- Suction piping
  - Safe, LTT or 30-day
- Pressurized piping
  - ALLD, plus
  - Interstitial monit. or
  - Annual LTT
  - or tank method
     applicable to piping.<sup>15</sup>



#### Meeting the Release Detection Requirements (Cont.)

## 2015 Operational Requirements: Annual release detection equipment testing

- Ensure release detection equipment is operating properly.
- Completed by October 13, 2018.
- Keep records for 3 years.

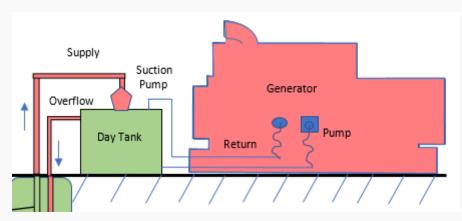






#### Features Of These Systems That Present A Challenge To Meeting RD Requirements.

- The power generator and other components regulated beyond UST regs
  - NFPA language about no valves in supply and return lines.
- Day tanks and other connected aboveground tanks
  - Regulated per definition of UST.
- Product return piping
  - Nonoperational components





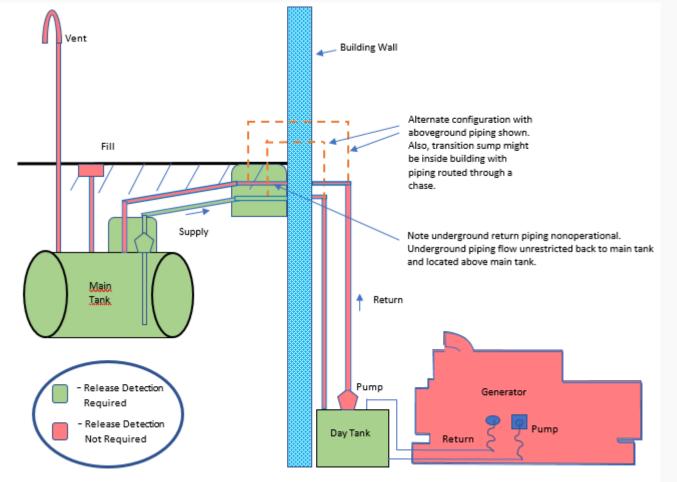
#### Features Of These Systems That Present A Challenge To Meeting RD Requirements (Cont.)

- NFPA 110
  - Section 7.9.13
    - No valves in return or supply lines.
  - Section 5.6.3.2
    - Solenoid valves, where used, must have nonelectric operator or manual bypass valve.
- Comply for UST program purposes, if governed by NFPA 110, by using a solenoid valve as indicated in Section 5.6.3.2.



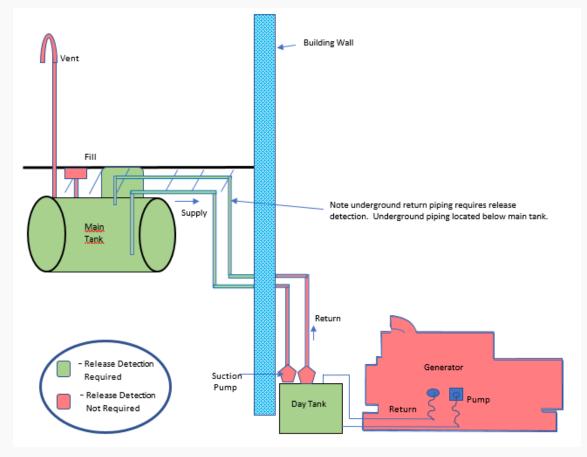
19

#### Features Of These Systems That Present A Challenge To Meeting RD Requirements (Cont.)





#### Features Of These Systems That Present A Challenge To Meeting RD Requirements (Cont.)





# Available Resources And What's On The Way

- Straight Talk On Tanks.
- UST Technical Compendium.
  - <u>https://www.epa.gov/ust/underground-storage-tank-ust-technical-</u> <u>compendium-about-2015-ust-regulation#generators</u>
- AIM (Automated Interstitial Monitoring) Systems Guidance.
- Specific guidance on meeting tank and piping release detection requirements.
- Broad guidance covering other applicable federal UST requirements.



#### **Contact Info**

- Tim Smith
  - (202) 564-0643
  - <u>smith.timr@epa.gov</u>

#### **Question & Answer**

#### Please address all questions to a speaker



### EMERGENCY POWER GENERATOR TANKS



Seth Hendrix Montana DEQ Underground Storage Tank Program July 22, 2020

### Montana DEQ UST program regulations – start of program 11/23/1989



# MT DEQ UST program vs EPA: a few differences

- MT DEQ UST program started regulating Emergency Power Generator Tanks (including tank and piping leak detection) on 11/23/1989 EPA deferral 1988.
- MT DEQ UST program regulates all underground regulated product piping runs (vs EPA 10 percent rule)- including ASTs with underground piping
- MT DEQ UST program (after December 31, 2010) incorporated Shut-down requirements for tank and piping leak detection methods to ensure the UST operator is alerted immediately and is forced to address all possible leak alarms.
- MT DEQ UST program phased out <u>all out of tank</u> leak detection methods in the 2018 regulations- 5 year phase out ends October 13, 2023.

#### Differences continued



- MT DEQ Issues UST installation, modification construction, and closure permits to licensed individuals
- MT DEQ does not have an SPCC program at this time, but covers eligible ASTs for FR
- Montana has the State Petroleum Tank Cleanup Fund (with Board members) which is the most common method of FR for UST facility owners.

### Differences Continued

#### 17.56.205 ANTI-SIPHON REQUIREMENT

- (1) The owner or operator of an UST system that is located at an elevation that produces a gravity head on an underground piping system shall ensure that the product pipe is equipped with one of the following devices:
- (a) a department-approved anti-siphon valve;
- (b) a department-approved normally closed solenoid valve; or
- (c) any other department-approved device designed to prevent siphoning.
- Effective 2/11/11.

# Anti-Siphon examples from PEI

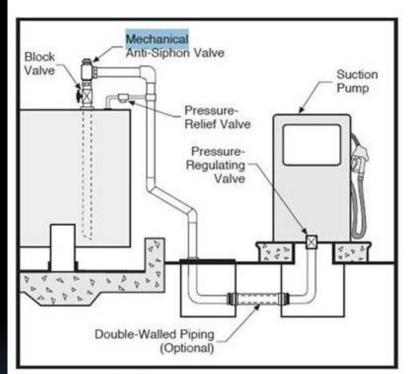
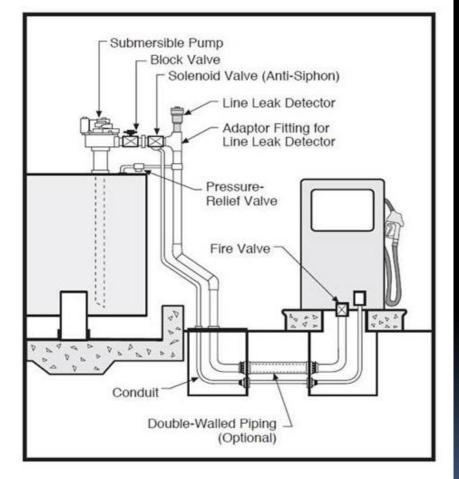


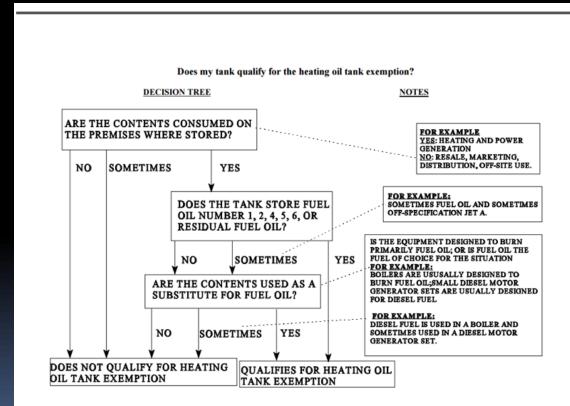
FIGURE 7-2. Suction System. Typical piping and valve arrangement for product piping exiting the tank top. Aboveground portions of the piping must be securely supported. Supports are not shown in the diagram for clarity.



Note: More than atmospheric pressure. Double walled piping required for both of these systems: MT DEQ considers both "pressurized" piping.

# MT DEQ SB 386: Farm Tank exemption- 5/10/1995

MT DEQ UST program exempts underground farm and residential noncommercial motor fuel and heating oil storage tanks of 1,100 gallons or less which were installed before April 27, 1995, but allows these tanks to opt in to the program for the State Cleanup Fund



# EPG tank regulations- Mental Health and other "unusual" facilities



### Time to check in.... US Suction piping systems



## What are the regulatory requirements for Suction Piping?

- No leak detection is required if the suction piping has the following characteristics (i.e. <u>Safe Suction Piping</u>):
  - the piping has enough slope so that the product in the pipe can drain back into the tank when suction is released, and
  - the piping has only one check valve, which is as close as possible beneath the pump in the dispensing unit.
  - if a suction line is to be considered exempt based on these design elements, there
    must be some way to check that the line was actually installed according to these
    plans, that is those elements of #1 and #2 must be easily discernable.
- If a suction line does not meet all of the design criteria noted above, one of the following leak detection methods must be used:
  - A line tightness test at least every 3 years; or
  - Monthly interstitial monitoring; or

- Monthly statistical inventory reconciliation. Vapor and Ground Water no longer valid methods.
- The line tightness test must be able to detect a leak at least as small as o.1 gallon per hour with certain probabilities of detection and of false alarm.

Each <u>Pressurized Piping</u> run must have one leak detection method from each set below:

An Automatic Line Leak Detector:

- Automatic flow restrictor; or
- Automatic flow shutoff; or
- Continuous alarm system. (MT DEQ Auto-dialer)

#### And One Other Method:

- Monthly interstitial monitoring; or
- Monthly statistical inventory reconciliation; or
- Annual tightness test.







# Pressurized Piping requirements continued

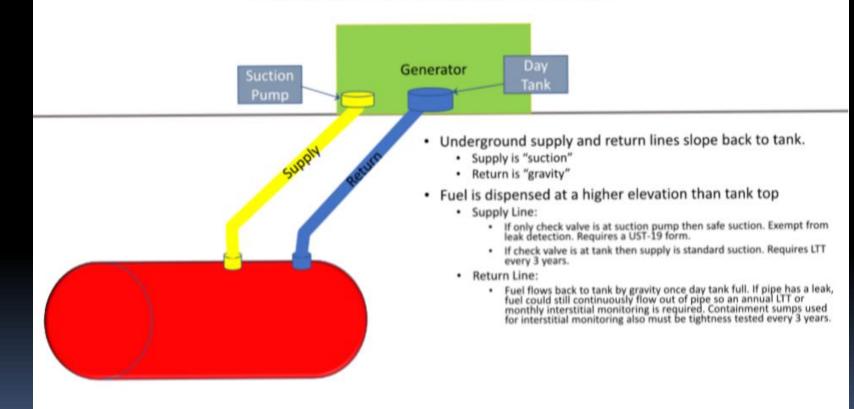
- The automatic line leak detector (ALLD) must be designed to detect a leak at least as small as 3 gallons per hour at a line pressure of 10 pounds per square inch within 1 hour by shutting off the product flow, restricting the product flow, or triggering an audible or visual alarm.
- The line tightness test must be able to detect a leak at least as small as 0.1 gallon per hour when the line pressure is 1.5 times its normal operating pressure. The test must be conducted each year. If the test is performed at pressures lower than 1.5 times operating pressure, the leak rate to be detected must be correspondingly lower.
- Automatic LLDs and line tightness tests must also be able to meet the federal regulatory requirements regarding probabilities of detection and false alarm. (95/5)
- Interstitial monitoring, and statistical inventory reconciliation have the same regulatory requirements for piping as they do for tanks.

# How do the release detection methods for pressurized piping work?

#### Automatic line leak detectors (ALLDs):

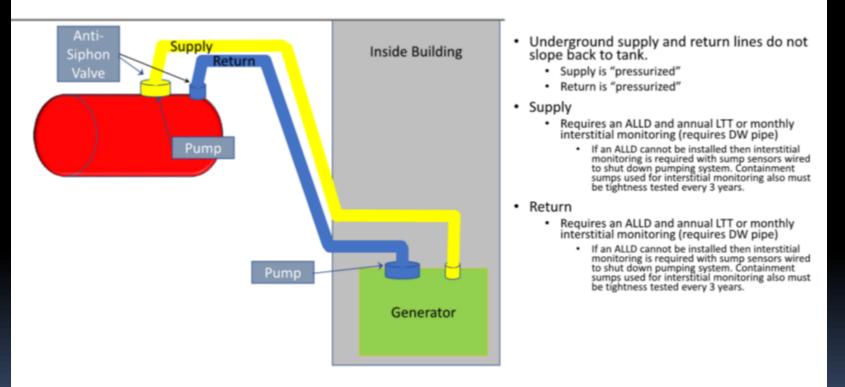
- Flow restrictors and flow shutoffs can monitor the pressure within the line in a variety of ways: whether the
  pressure decreases over time; how long it takes for a line to reach operating pressure; and combinations of
  increases and decreases in pressure.
- If a suspected leak is detected, a flow restricter keeps the product flow through the line well below the usual flow
  rate. If a suspected leak is detected, a flow shutoff completely cuts off product flow in the line or shuts down the
  pump.
- A continuous alarm system constantly monitors line conditions and immediately triggers an audible or visual alarm if a leak is suspected. Automated interstitial line monitoring system can be set to operate continuously and sound an alarm, flash a signal on the console, or even ring a telephone in a manager's office when a leak is suspected.
- Both automatic flow restrictors and shutoffs are permanently installed directly into the pipe or the pump housing.
- An automated interstitial monitoring system can be combined with an automatic shutoff system so that whenever the system detects a suspected release, the product flow in the piping is completely shut down. Under other methods in 40 CFR § 280.43(i)(2), EPA recognizes such a setup would meet the monthly monitoring requirement as well as the automatic line leak detector requirement. The following conditions must be met:
  - Sump sensors used for piping interstitial monitoring must remain as close as practicable to the bottom of interstitial spaces being monitored.
  - Monthly monitoring records must be maintained for at least one year.
  - Electronic and mechanical components of the system, including shutoff devices, sensors, pressure or vacuum monitors, must be tested annually for proper operation Records of the test must be maintained for three years.
  - Containment sumps that are part of the piping interstitial monitoring system must be tested at least once every three years for liquid tightness.

#### **Generator UST Piping Version 1**



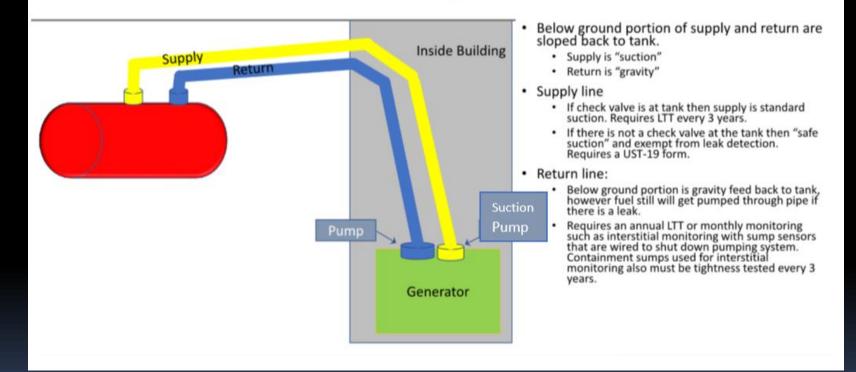
No UST- 19 form for exempt safe suction piping in Montana

#### **Generator UST Piping Version 2**



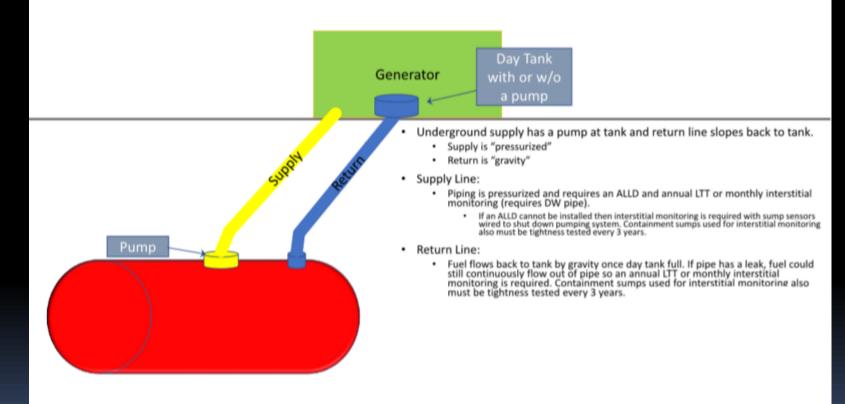
MT DEQ Allows auto-dialer for ALLD requirement in lieu of shutdown unless the system has an STP, then ELLD required

#### **Generator UST Piping Version 3**



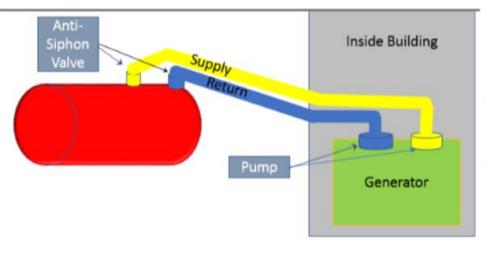
No UST- 19 form for exempt safe suction piping in Montana. MT DEQ Allows auto-dialer for ALLD requirement in lieu of shutdown unless the system has an STP, then ELLD required

#### **Generator UST Piping Version 4**



MT DEQ: ELLD required for STPs

#### **Generator UST Piping Version 5**



- Underground supply and return lines do not slope back to tank.
  - · Supply is "standard suction"
  - · Return is "pressurized"
- Supply
  - Requires a LTT every three years or monthly interstitial monitoring (requires DW pipe)
- Return
  - Requires an ALLD and annual LTT or monthly interstitial monitoring (requires DW pipe)
    - If an ALLD cannot be installed then interstitial monitoring is required with sump sensors wired to shut down pumping system. Containment sumps used for interstitial monitoring also must be tightness tested every 3 years.

MT DEQ Allows auto-dialer for ALLD requirement in lieu of shutdown unless the system has an STP, then ELLD required

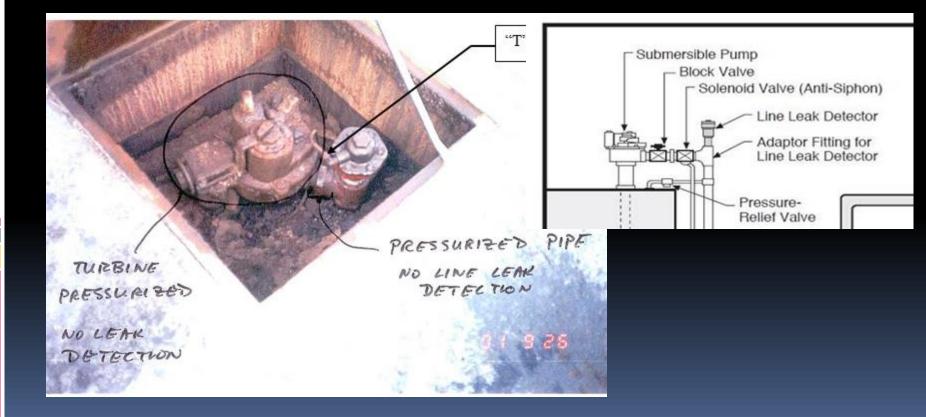
### Auto-dialer



- MT DEQ allows auto-dialers to be installed to existing leak detection panels/ATGs for U.S. suction systems that are "pressurized" but do not have STPs.
- Auto-dialer communication will send all alarms to the consieur station for 24-hour notification and response.

## For EPGs that have STP

 <u>The STP must have a leak detector port with a department approved</u> <u>leak detector installed in the port (unless Anti-siphon device required).-</u> <u>then t- housing with ELLD.</u>



## Contact Information:

Seth Hendrix MT DEQ 406-444-1416 <u>Shendrix@mt.gov</u>

Link to MT DEQ UST program regulations: <u>http://mtrules.org/gateway/ChapterHome.asp?Chap</u> <u>ter=17%2E56</u>

#### **Question & Answer**

#### Please address all questions to a speaker





# Emergency Power Generator UST Systems

#### Presenter: John V. Cignatta, PhD, PE 410-654-1800

jcignatta@datanetengineering.com

For Information on fuel tank courses go to National Petroleum Training Institute at: <u>https://www.nptinstitute.com/</u>

# Most E-Gen Problems are from Piping & Day Tanks

- Details of UST installation, inspection and testing are very well known
- Established cadre of UST inspectors and installers across the country
- For little E-Gen day tanks and their fuel piping, it is the Wild West



# E-Gen Environment—Wild West



**Minimal enforcement** No certified installers **Engineers crank out** plans/specs pieced from items off internet **Aboveground fuel** components ignored



# E-Gen. Fuel System Problems

- Life Safety Risks to Bldg.
   Occupants (1 fire/5 days)
- Compromises to Environment
- Degradation of Back-Up Power Reliability





On October 30, 2012 at Mt. **Sinai Hospital after** Hurricane Sandy, the bucket brigade hauling diesel fuel to roof mounted generators only worked for a few hours. All 725 patients in the hospital then had to be evacuated.

datanetengineering.com

50



Sloan-Kettering Cancer Center evacuating patients after Hurricane Sandy took out power and generators failed.<sup>51</sup>

# Hospital E-Gen Fuel Releases:

- Caldwell Memorial Hospital spill in basement 2/16/2010
- Vibra Hospital 5/29/2017
- Norton Sound Hospital 1,000-gal. spill 6/24/2014
- Carilion Roanoke Hospital 12/19/2016
- Troy Children's Hospital 9/19/2017
- Latrobe Hospital 3/9/2014
- Edward Hospital 3/2/2017
- Goodrich Hospital 6/15/2014
- Shriners Hospital for Children 2/17/2015
- Southend University Hospital 12/15/2016
- Warringal Hospital 200-gal. spill from roof into 4<sup>th</sup> floor and eventually into basement 10/23/2017



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#### **Overfilling of roof mounted E-Gen day tank in process.** 53



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# Why are E-Gen Day Tanks inside?



Drawing from NFPA

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# E-Gen Fuel System Releases Avoidable <u>IF</u>:



## IF ALL COMPONENTS ARE:

- Designed
- Installed
- Tested, and
- Maintained

per applicable regs, codes and industry standards



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# **Unqualified Personnel Problems**

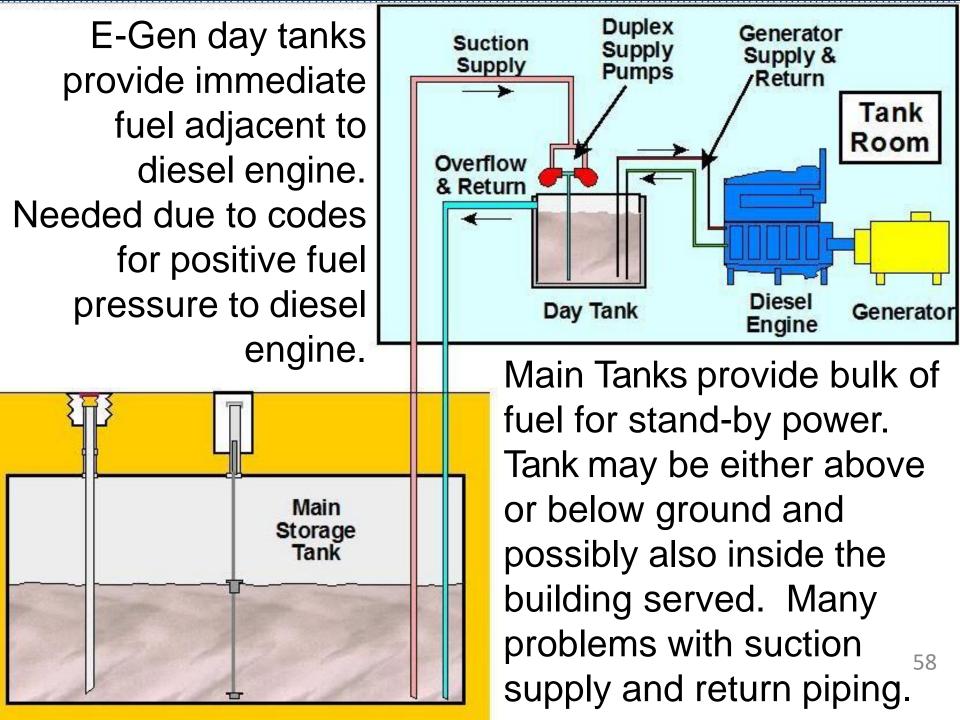
- Engineers preparing plans & specs
- Reviewers approving plans & specs
  - **Contractors installing/testing systems** 
    - Bldg. Inspectors signing off installation
  - Fire Marshalls checking systems
  - Environmental Compliance Officials inspecting systems



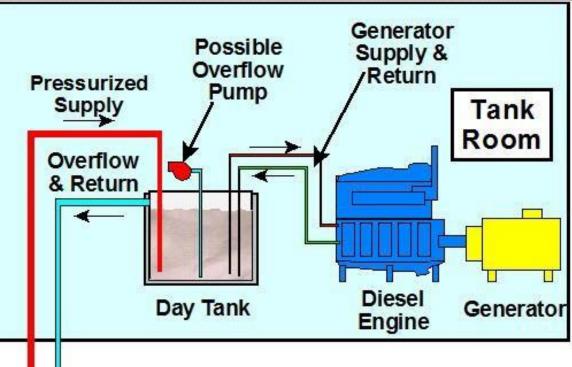
# Major Problems from Piping Between Main Tank → Day Tank

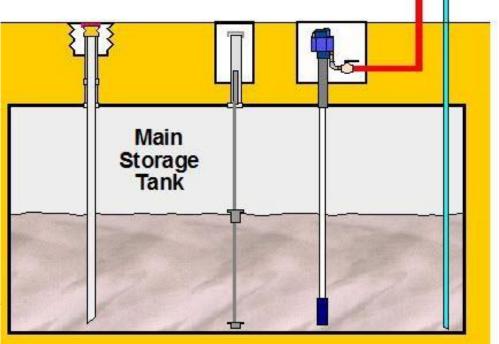
- Suction Piping:
  - Pump at E-Gen
  - Is it safe-suction
  - Is return line pressurized
- Pressurized Piping:
  - Could be an STP in UST
  - Could be pump above UST
- Overflow and Return Piping



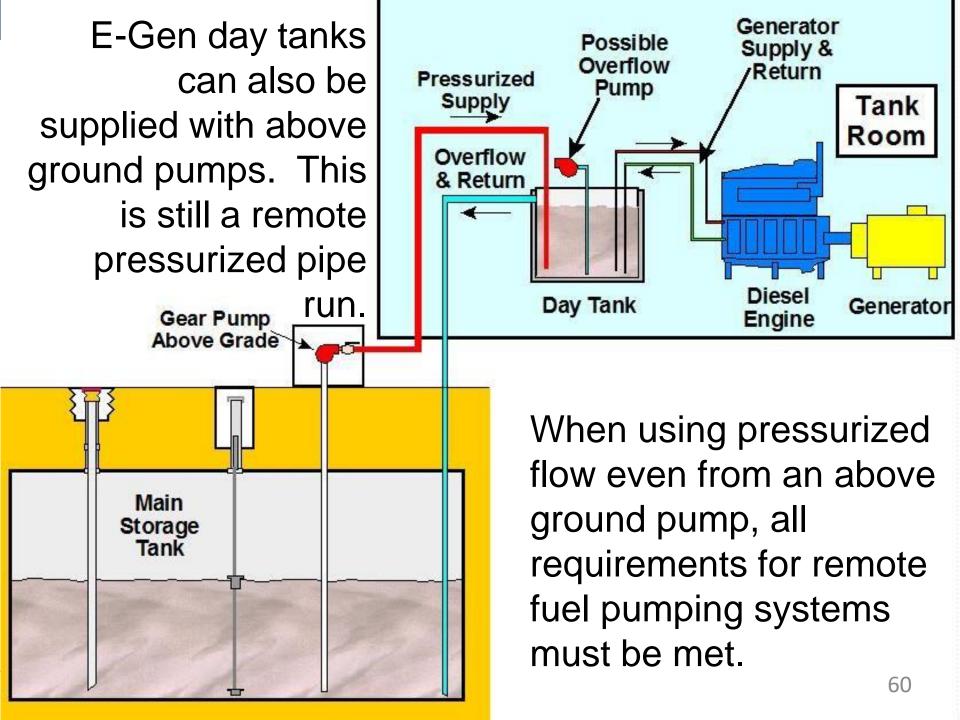


E-Gen day tanks can also be supplied from USTs with STPs. More common with larger sites (i.e. higher fuel flow requirements).





When using pressurized flow (i.e. STP), all requirements for remote fuel pumping systems must be met.



# What Codes Affect Installation of Day Tanks Inside Buildings?

- NFPA 30, Flammable & Combustible Liquids Code
- NFPA 37, Installation and Use of Stationary Combustion Engines and Gas Turbines
- NFPA 80, Fire Doors & Other Opening Protectives
- NFPA 110, Emergency and Standby Power Systems
- NFPA 704, System for ID of Hazards of Materials for Emergency Response



# Let's Review Applicable Codes Under Following Headings:

- Tank
- Fuel Piping
- Tank Room
- Tank Venting
- Controls
- Maintenance



# Tank Code Issues:

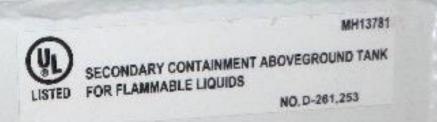
- Acceptable tanks
- Clearance around tank
- Tightness testing
- Inspection requirements



# Tank Codes: Acceptable Tanks

NFPA 30-21.4.2, NFPA 1-66.21.4, IFC-5704.2.9.6.1.1

- Built in conformance with nationally recognized standard & > 60 gal. capacity
- Must bear permanent label of standard, IFC
- Must normally operate ≤ 1 psig
- Emergency operation ≤ 2.5 psig



# Tank Codes: Clearances



NFPA 30-24.5.6, NFPA 1-66.24.5.6, IFC-5704.2.9.5

- Need 3' access aisle to tank
- Must extend from exterior of storage tank building into building and around all tanks

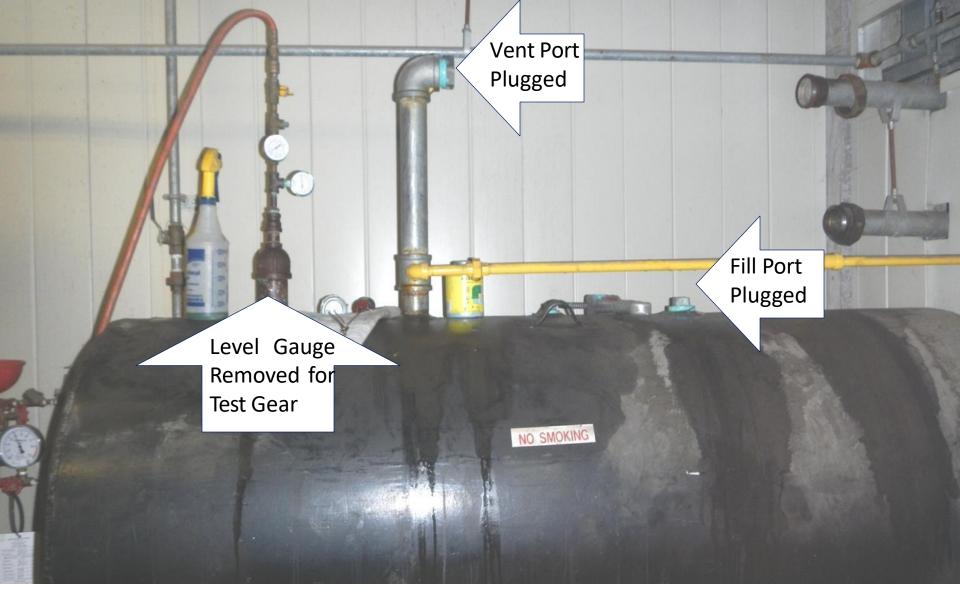


Day tank crammed inside corner surrounded by equipment and *combustible* items stored in basement mechanical room. 66

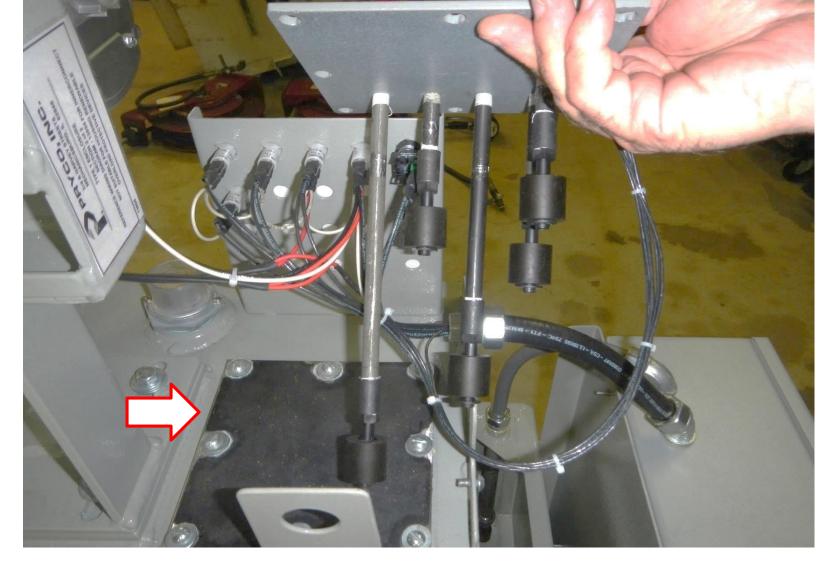
# Tank Codes: Tightness Testing

NFPA 30-21.5.2, NFPA 1-66.21.5.2, IFC-5704.2.12

- Pressure test required before tank place in service despite factory tests
- If vacuum was maintained on interstice after tank was set, pressure test requirement might be waived
- Test pressure is a function of tank configuration



Accomplishing pressure test requires plugging all tank ports. Note the use of two pressure gauges on this testing set up for a single wall tank along with a PRV set at the correct pressure.



Day tank controller removed/replaced with blank. Float switches are not sealed. 1/8" sheet stock or larger needed for making temporary blank.<sup>69</sup>

# Tank Codes: Inspection Req'ts

#### NFPA 30-21.8.1, NFPA 1-66.21.8.1

## Regular Inspections mandated IAW: – STI SP001

- -API 653
- -PEI RP 20
- -NFPA 30
- STI RP 912 (Free at www.steeltank.com) - 40 CFR 112

# Piping Code Issues:

- Acceptable pipes
- Connections
- Low melting point restrictions
- Installation
- Physical protection
- Labeling
- Galvanized pipe problems



# Piping Codes: Acceptable Pipes

# NFPA 30-27.3, NFPA 37-6.6.3, NFPA 1-66.27.3, IFC-5703.6.2

- Must be ASME B31 rated pressure piping
- Valves, faucets, couplings, flex connectors, fittings & other pressure containing parts shall meet ASME/ANSI B31 except for:
  - Ductile iron rated for high temp (ASTM A395)
  - > Valves shall be ductile iron or steel except:
    - Where valve are internal to tank
    - Melting point/ductility comparable to steel/DI



ASME B31 Power Piping means Schedule 40 steel. This includes all fittings, elbows, tees and other piping components.

# **Piping Codes: Connections**

#### NFPA 30-27.5, NFPA 1-66.27.5, IFC-5703.6

- Welded
- Threaded
- Flanged
- No sweat fittings
- Class I pipe joints inside buildings must be welded

# Piping Codes: Low Melting Point

NFPA 30-27.4.4 & .6, NFPA 1-66.27.4.4, IFC-5703.6.2

- No copper, brass, bronze or aluminum fittings for piping or valving
- Possible to use brass/bronze valves if protected from fire exposure
- Class IIIB liquid storage also exempt under certain conditions



Regardless how often it happens, you cannot use low melting point piping and valving components inside a building for a day tank connected to a diesel generator.

76

# Piping Codes: Low Melting Point

#### When can Brass/Bronze valves be used? See NFPA 30-27.4.4.5



- When underground; or,
- When valving inside building and protected from fire by a 2-hour rated enclosure; or,
- Small heating systems under NFPA 31, NFPA 1-11 or IFC 600

# Piping Codes: Installation

NFPA 30-27.6, NFPA 1-66.27.6, IFC-5703.6.8

- Substantially Supported
- Protected Against Physical Damage From:
  - Settlement
  - Vibration
  - Contraction/Expansion



# Providing physical protection of piping is not difficult.



There are many excellent and cost-effective ways to keep sidewalk and aisleway traffic (including movement of equipment) from damaging fuel piping.

# Piping Codes: Proper Support

NFPA 30-27.4 and .6, NFPA 1-66.27.6, IFC-5703.6.8

- Proper and Continuous Support
- Physical Damage Protection:

Flex Connectors

Pressure/Thermal Relief Valves

Oil Safety Valves

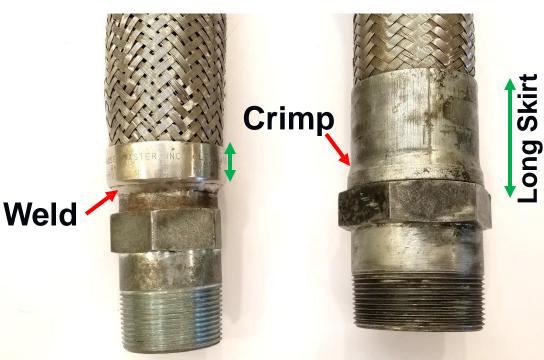
Bollards

MSS-SP-69 Supports



#### Aboveground Flex Connector

Underground Flex Connector



Aboveground flex connector in left photos is fire rated. Note all welded construction.

Underground flex connector in right photos is not fire rated. Interior is a plastic hose that is crimped together.

Easy to tell apart due to difference in skirt lengths.

Contact point with other flex connector underground usage

Read UL Labell

Intended for

ADAPTOR FOR UNDERGROU 150 PSI MAK

PLY WRENCH ON COLLA

ONLY

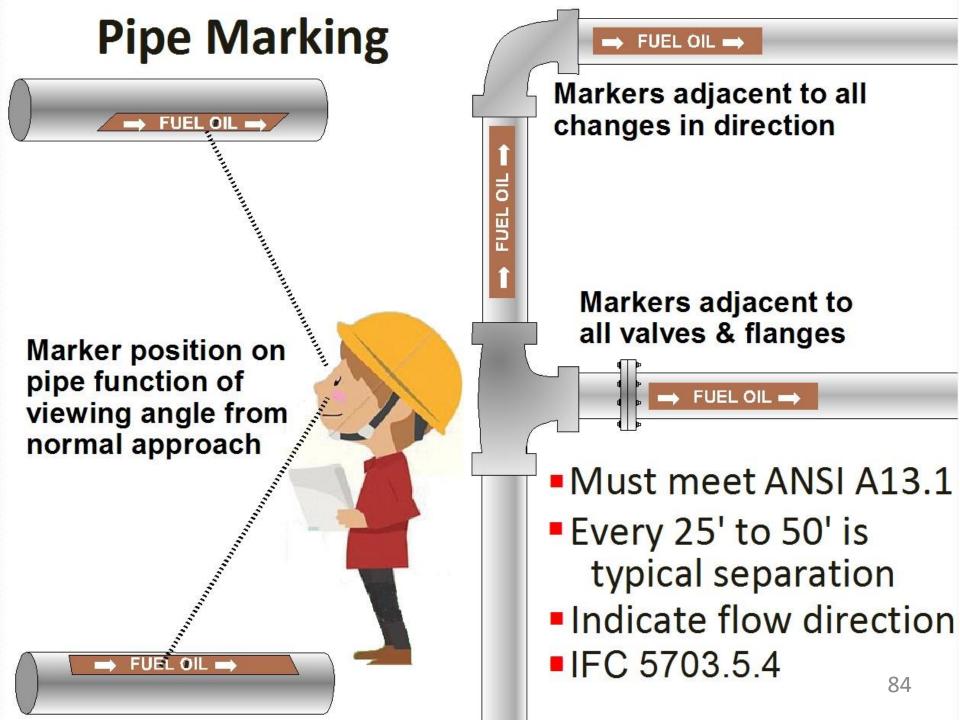
ON HEX

60-10437

LISTED 1813



MSS-SP-69 supports are designed to minimize crevic corrosion and faying damag to pipes. Note the white pads beneath U-bolt and between the bottom of the pipe and the angle iron. Thi spacing allows inspection of the pipe by removal of the support as well as replacement of the pads.



#### **Pipe Marking**

#### → FUEL OIL →

Combustibles are White Letters on Brown Field

 $\rightarrow$  GASOLINE  $\rightarrow$ 

Flammables are Black Letters on Yellow Field

Pipe Marking Size Chart		
Pipe OD with Cover	Min. Length Field Color	Min. Ht. Letters
.75"– 1.25"	8"	.5"
1.5"-2"	8"	.75"
2.5"-6"	12"	1.25"
8"-10"	24"	2.5"
>10"	32"	3.5"



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# Diesel Piping: Galvanized Ban

#### NFPA 1-11.7.3.1, IFC-604.1.2

- No galvanized piping, fittings or valving in any diesel fuel system per:
  - NFPA 110-7.9.3.1
  - EGSA 100T Section 6.15
  - EM 1110-2-4305 8.7
  - ASTM D975
- No galvanized diesel fuel tanks per 46 CFR § 182.440

# Tank Room Code Issues:

- Fire extinguishers
- Curbs and sealed floors
- 1-, 2- or 3-hour wall ratings
- Wall openings auto-shut
- Fire diamonds



## Tank Room Codes: Fire Extinguisher

NFPA 30-24.6.1, NFPA 37-11.2, IFC-5706.2.7

- Must meet min. rating of 20-B:C (IFC)
- Minimum rating of 40:B (NFPA)
- Located < 10' outside tank storage room door
- Number of extinguishers could be increased by local fire code official

### Tank Room Codes: Curbs & Floors

NFPA 30-24.9.3, NFPA 37-6.3.2.4

- Floors must be liquid tight except for drains
- Connection to wall must be liquid tight up 4"
- Use curbs around doors for 4" rule
- Open trench can be used to drain to safe location



Must have liquid-tight floor in room with day tank. Floor must seal to the walls as shown at the left.

Fuel releases from day
tank must be controlled
and kept from flowing
out into building. A 4"
curb is commonly used
to achieve this.



## Tank Room Codes: 1-3 Hour Walls

NFPA 30-24.5.2, NFPA 37-4.4.2, NFPA 37-6.3.6.2, NFPA 110-7.2.1.1, IFC-63.2.7.2

- Minimum 1-hr rating rooms ≤1,320 gal.
- Minimum 3-hr rating if >1,320 gal.
- Compromises to walls, floor and/or ceiling addressed with auto-shut structures
- Differences for some sprinklered buildings



HVAC system in room with AST requires auto-closing fire dampeners on wall penetrations which are missing in top photo.

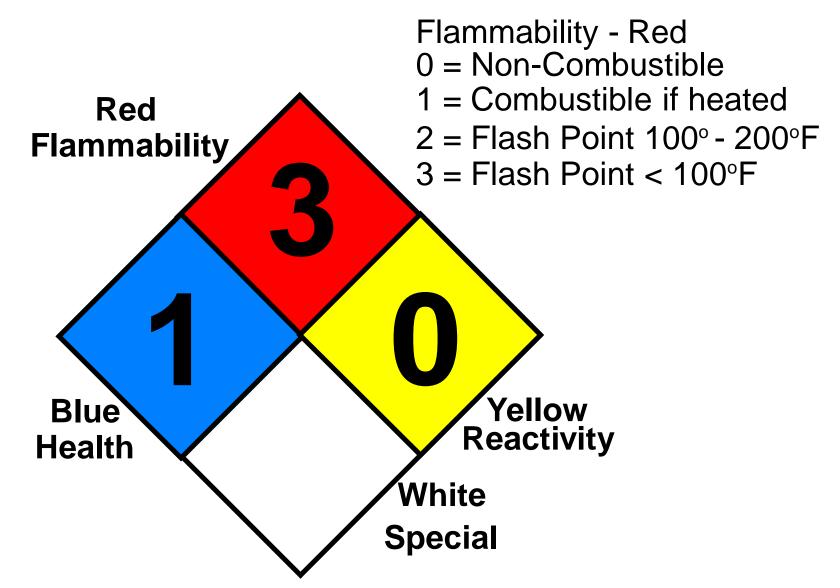


Bottom photo shows auto-closing dampers in place at wall penetration of a day tank room.

## Tank Room Codes: Fire Diamonds

NFPA 30-21.7.2, NFPA 1-66.21.7.2, IFC-5704.2.12

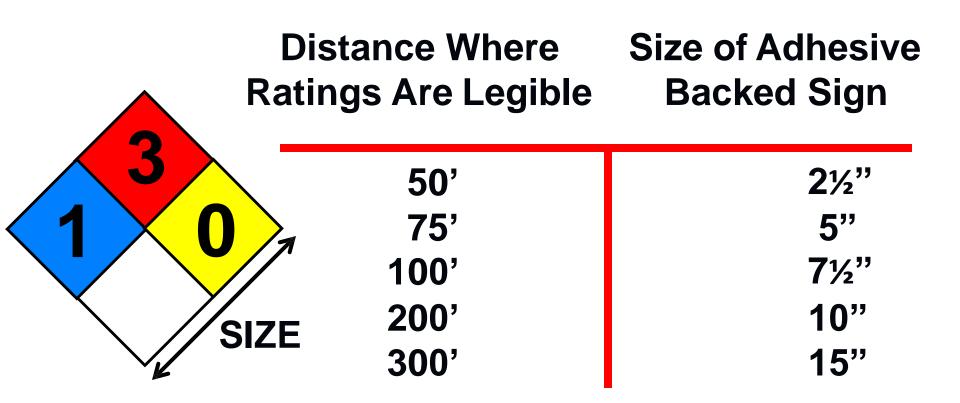
- Need emergency response diamond per NFPA 704
- Sign must be where it can be seen
- Sign does not have to be on tank
- Markings must be clear for each tank





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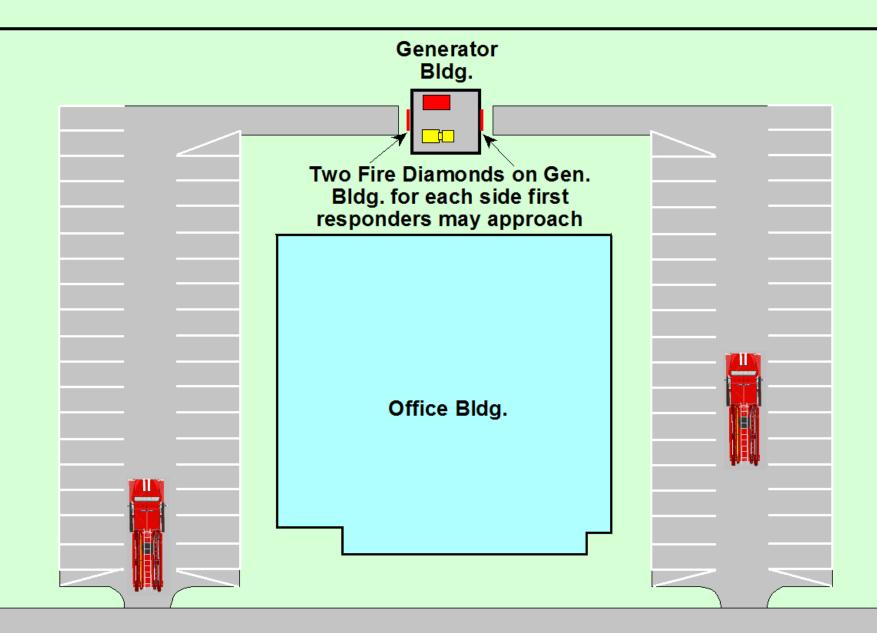
## Tank Room Codes: Fire Diamonds



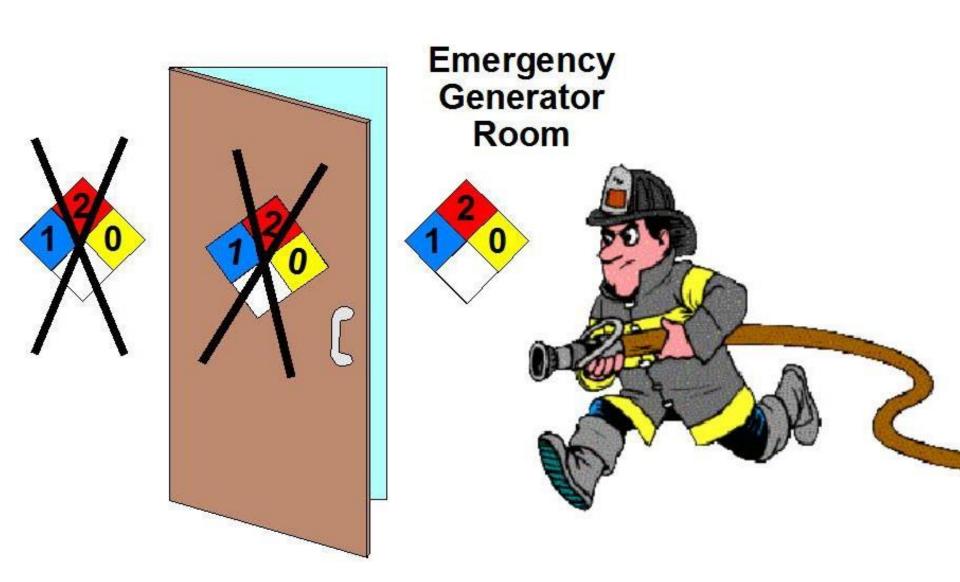
Fire Diamonds are required to be located where first responders will see them when approaching the site. May be on side of building or other location. 95



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Fire Diamonds must be positioned on the side(s) of the generator building from which first responders will approach the building with the fuel tank. 96



Fire Diamonds must be positioned outside doorway of room which contains a fuel tank. Do not put sign where it can be covered by an open door. 97

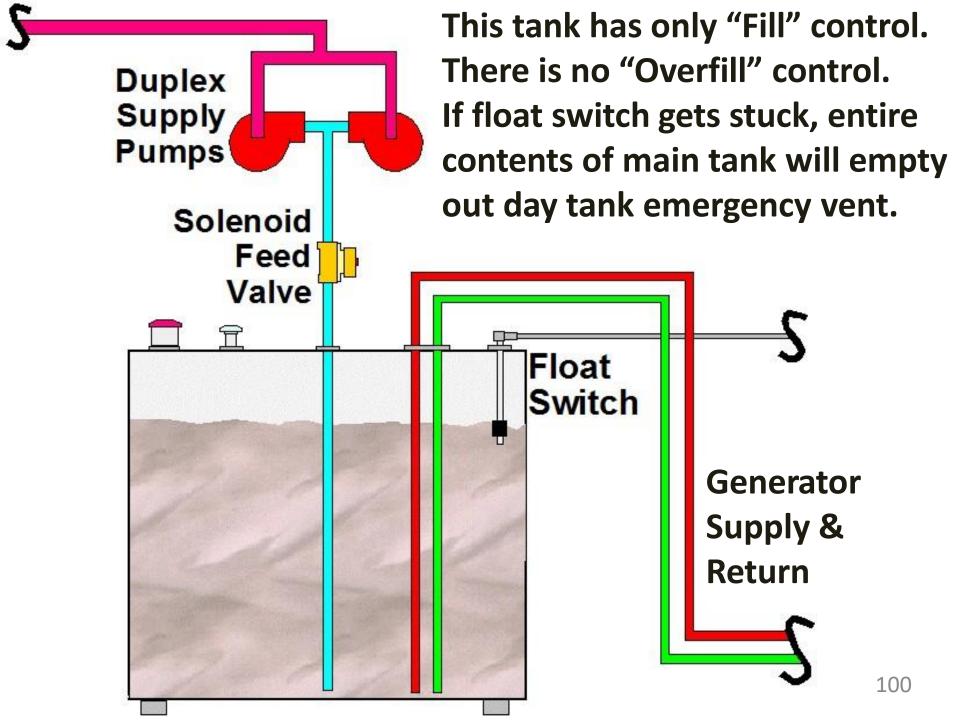
# Fuel Control Code Issues:

- Overfill control
- Manual stop
- Remote alarms
- Tanks filled by pump
- Valving release control
- Maximum tank sizing





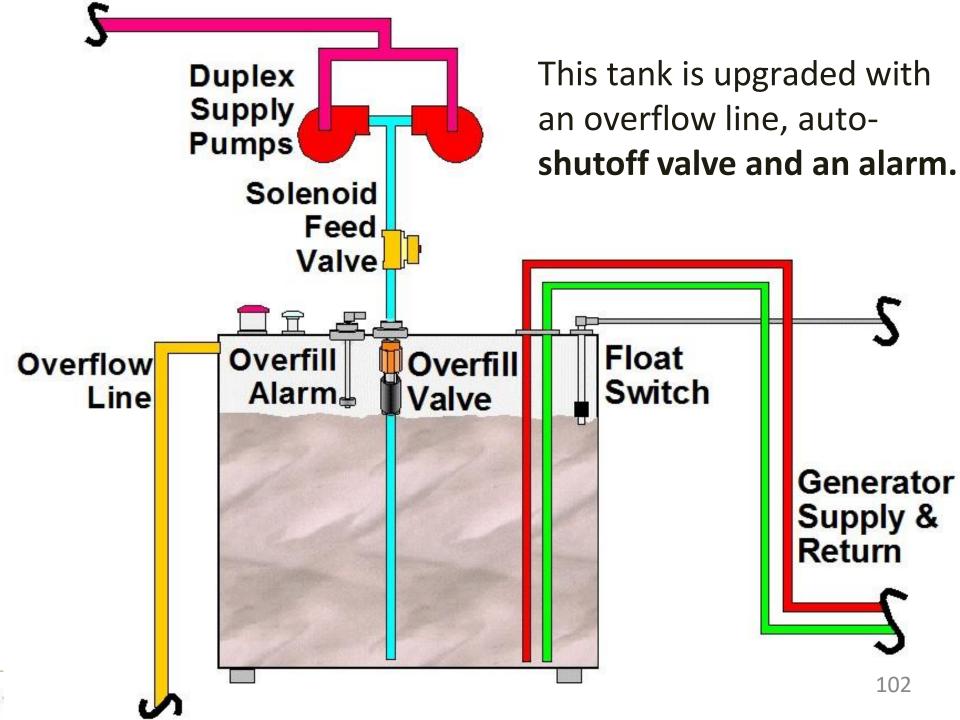
Don't forget to look on roofs for day tanks. Note wooden supports and other code violations. This tank has only "fill" control. When float switch got stuck, pump overfilled it with several thousand gallons of No. 2 diesel.



# Tank Room Codes: Pump Filling

NFPA 37-6.5.4, NFPA 1-11-7.1, IFC-5704.2.12

- Day tank must have <u>ALL</u> the following:
  - -High level alarm
  - -High level auto-shutoff valve
  - -Overflow line
- Overflow line must drain to main tank
- Pumps supplying fuel tanks shall have "STOP" controls sensitive to tank's liquid level 101



# Day Tank Overflow Req'ts

NFPA 37-6.5.4, NFPA 1-11-7.1, IFC-5704.2.12

- Day tank above the UST: Gravity return possible depending on port size and pump flow rate
- Day tank below UST elevation: Nongravity return required with overflow pump system > capacity than supply pump
- **NEVER** have shut off valve in return line

# Tank Room Codes: Manual Stop

N110-5.6, N1-11.7.3.1, N37-5.4.1.3, IFC 604.1.2, N70-445.18B

- <u>ALL</u> installations shall have remote manual stop station for generators > 15kW rating
- Must prevent inadvertent/unintentional operation
- Located outside room with prime mover
- Located <u>near</u> outdoor generators
- Must be clearly labeled in weatherproof enclosure



Manual Stop Emergency Shut Off switch is just outside door of generator room and properly labeled.



Emergency Shut Off switch for this outdoor generator is properly labeled on nearby outdoor wall.



## Roof E-Gen Tanks:

NFPA 37-6.3.4 and NFPA 110-7.9

- Must be atop non-combustible supports
- Secondary containment required
- Double Wall separate tank or base tank satisfy secondary requirements
- Maximum 660 gal. total storage atop roof
- >36" clearance on all sides of tank

## Roof Mounted E-Generators:

#### NFPA 37-4.1 and NFPA 110-7.9

- Cabinet >5' from bldg.
   openings
- Cabinet >5' from combustible walls (<1 hr rating)
  - Non-Combustible support for E-Gen must extend >12" outward from footprint



#### Tank Room Codes: Max Tank Sizes

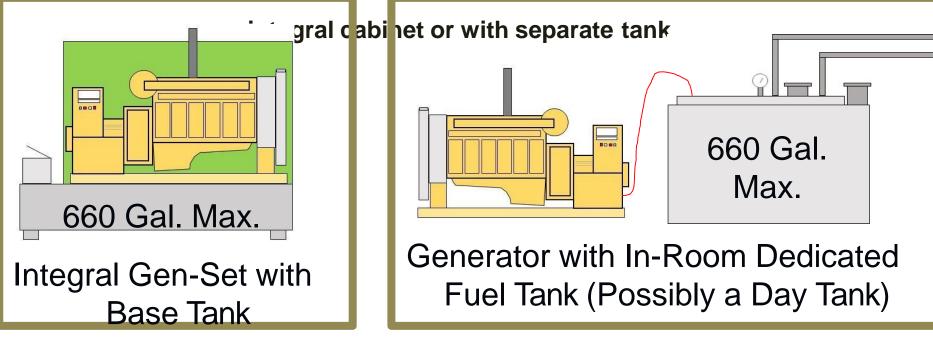
NFPA 37-6.3.2.2 and NFPA 110-7.9.5

- Gen. Room with 1 E-Gen: 660 gal.
- Gen. Room with >1 E-Gen: 1,320 gal.
- In Dedicated Tank Room: Per Local Codes

#### E-Gen Room: One Generator

NFPA 37-6.3.2.2, NFPA 110-7.9.12.1

Maximum of 660 gal. of stored diesel fuel whether in room. in





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### E-Gen Room: 2 or More Generators

#### NFPA 37-6.3.2.2, NFPA 110-7.9.12.1

Mandates maximum of 1,320 gal. of stored diesel fuel in room whether in integral cabinets or with separate tanks with no more than 660 gallons per generator or per tank





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#### Tank Rooms for $\leq$ 1,320 Gal:

NFPA 37-6.3.5 and NFPA 110-7.2.1.1

- 1 hr rating on all surfaces inside room
- 15" clearance on all sides of tank
- 1 hr rating on auto-close room openings (e.g. fire door but not auto-dampers)
- Spill containment (i.e. dike, wall or curbing) unless overfills to safe area
- Ventilation (natural or mechanical) to keep air < 25% LFL</li>

#### Tank Rooms for > 1,320 Gal:

NFPA 37-6.3.6 and NFPA 110-7.2.4

- 3 hr rating on all surfaces inside room
- Walls must be bonded to floor
- 15" clearance on all sides of tank
- 3 hr fire rating on auto-close fire doors and ventilation auto-dampers

### Tank Rooms for > 1,320 Gal:

NFPA 37-6.3.6 and NFPA 110-7.2.4

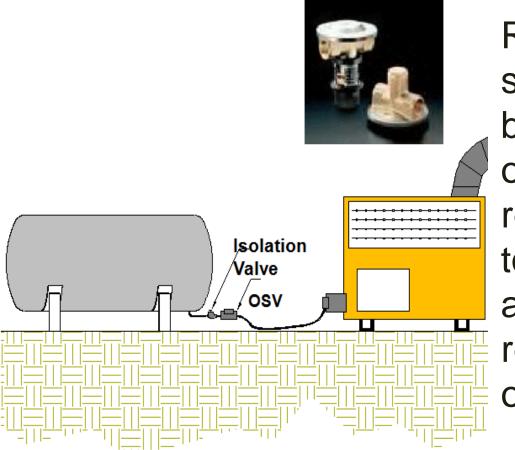
- Spill containment (i.e. dike, wall or curbing) unless overfills to safe area
- Ventilation (natural or mechanical) to keep air < 25% LFL</li>
- Floor openings protected by ramps or curbing
- Max. storage per local codes

#### Tank Room Codes: Valve Controls

NFPA 30-24.14.8, NFPA 1-66.24.14.8, IFC-5704.2.9.5.1

- Need values to control fuel in event of a pipe break to include:
  - -Solenoid valves
  - -Fire valve
  - -Oil Safety Valve (OSV)

## Oil Safety Valves (OSV)



**Requires minimum fuel** suction pump vacuum before opening and staying open. Any leak in pipe that releases vacuum causes it to stay closed. OSV can also function as a pressure regulator if there is booster or supply pump at the tank



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## Venting Code Issues:

- Discharge Outdoors
- Emergency Vent Req'ts
- Emergency Vent Extensions



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### Venting Codes: Outdoor Discharge

NFPA 30-24.1.3, NFPA 1-24.1.3, NFPA 37-6.7, IFC-5704.2.7.3.3

- All vents must discharge outdoors
- Vent lines must have no sags/traps
- Discharge 5' from building opening
- Discharge 15' from air makeup louvers
- Discharge 2' above roof line

©2013 Datanet Engineering, Inc. All rights reserved www.datanetengineering.com OSHA 29 CFR 1910.106 Flammable & Combustible Liquids Standard

 1910.106(b)(3)(iv)(c) Location and arrangement of vents for Class II or Class III liquids. Vent pipes from tanks storing Class II or Class III flammable liquids shall terminate outside of the building and higher than the fill pipe opening. Vent outlets shall be above normal snow level. They may be fitted with return bends, coarse screens or other devices to minimize ingress of foreign material.





Here the day tank **Emergency Vents** highlighted in red discharge directly into the building. Any problem with the filling will result in fuel flowing out the E-vents and down the corridor

## Venting Codes: E-Vent Req'ts

NFPA 30-22.7, NFPA 1-66.22.7, IFC-5704.2.7.4

- Must be sized per NFPA 30 & API 2000
- No frangible tank roofs inside building
- E-Vent device must be:
  - UL Listed
  - Proper opening pressure
  - Proper airflow listing
- Protected tank (i.e. UL 2085) E-vents can discharge in building if allowed by local code



This is <u>not</u> how the normal and emergency vents should discharge from the basement day tank. There are hidden traps in inaccessible ceilings inside building.



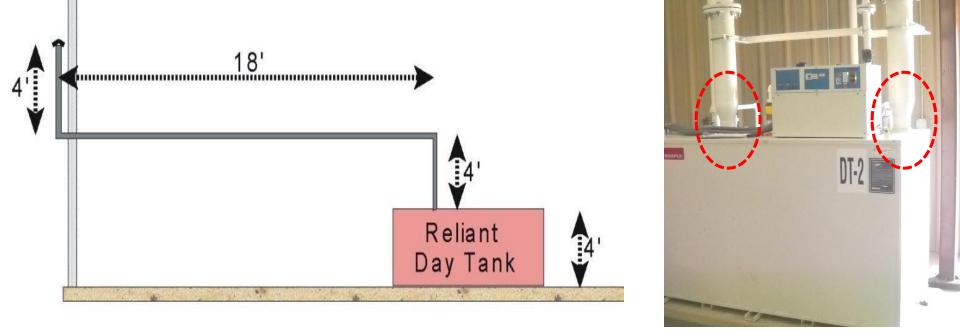


Neither of these E-vents are UL listed. There is no grandfathering of these devices. If they are not the proper size and UL-listed, they cannot be used.

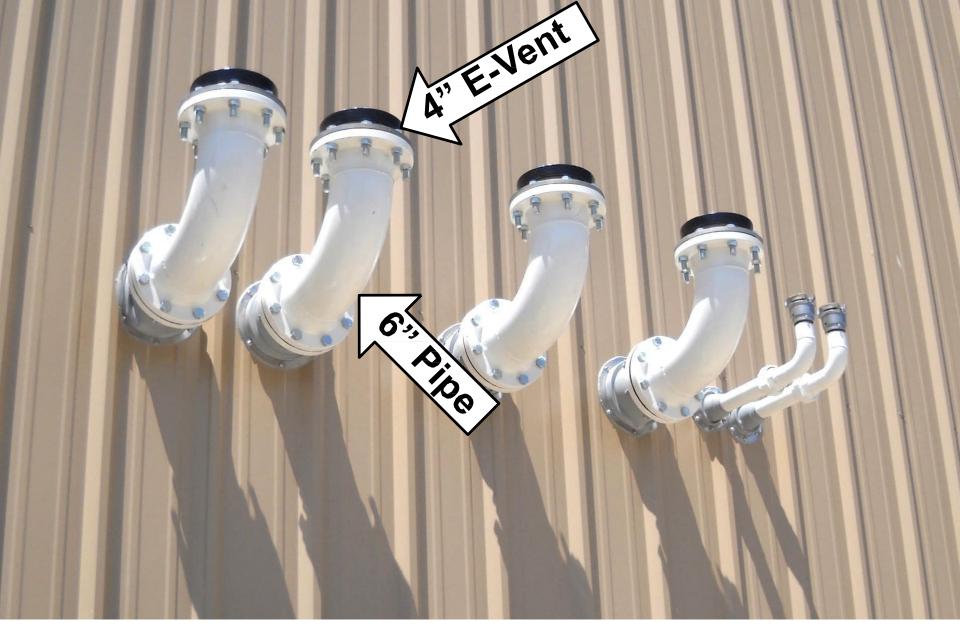
#### Venting Codes: E-Vent Extensions

NFPA 30-22.7.4, NFPA 1-66.22.7.4, IFC-5704.2.7.4

- Calculations for flow/pressure based on E-vent being ≤ 12" above tank
- Discharging outdoors requires extension of E-vent piping
- Airflow pressure drop calcs mandated to establish if larger pipe sizes are needed



At this site, the length of run for the emergency vent was a total of 26' of 4" piping with two 90° elbows. This is added to the initial nozzle discharge from the tank and the discharge into the atmosphere. The pressure drop calculations showed that at minimum required air flow, the pressure in the tank exceeded 2.5 lbs/in<sup>2</sup>. By merely switching to 6" piping, the pressure dropped below 2.5 lbs/in<sup>2</sup> at the required air flow. Thus, no modifications were needed on the tank nozzles.



This is how the vents should discharge from two in-door day tanks outside at a location where they can be checked. 126

### Maintenance Code Issues:

- Clean fuel requirement
- Fuel aging
- Mandatory maintenance
- Annual fuel testing



- Water Condensation, leaks and from deliveries
- Microbial Growth Spores from air or water but has to have water to proliferate
- Particulate Matter Vent location, tank corrosion, fuel deliveries
- Fuel Breakdown Natural deterioration accelerated by heat, temperature changes and water



Options for Addressing Aging of Emergency Generator Fuels:

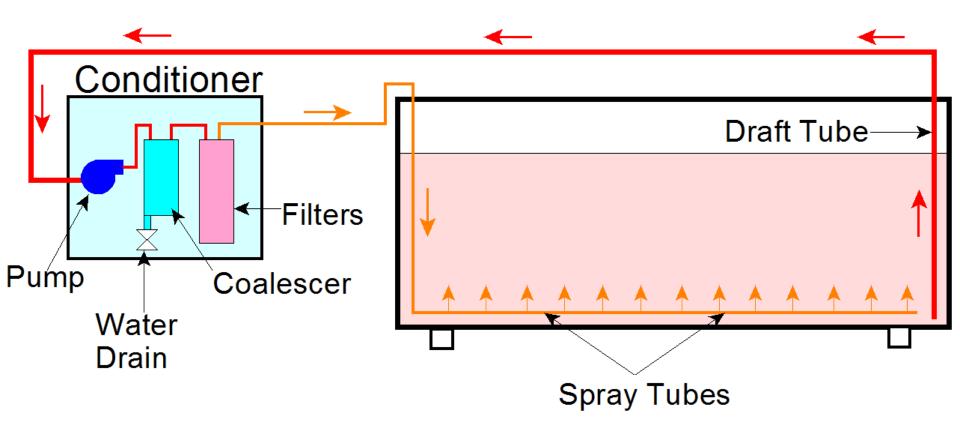
- Avoid using biodiesel blends > 5%
- Connect generator day tank to large heating oil tanks used by boiler plant (fuel will always be fresh)
- Convert generators to burn natural gas
- Or—Install Fuel Conditioning System



#### Examples of Fuel Conditioners



#### Fuel Conditioning System Lay Out



#### Tank Codes: Maintenance

NFPA 30-21.8, NFPA 1-66.21.8, IFC-5704.2.7.4

- Each day-tank must be inspected and tested per STI SP001
- All vents, E-vents, overfill & other control devices recertified annually to assure functionality
- Follow STI SP001 and NFPA 110 checklists for periodic inspection requirements

#### SP001 Periodic Inspections Annual

- Accomplish annual check AND document
- Include all monthly inspection requirements
- Exterior -- clean & repaint as necessary
- Check operability of:
  - All vents,
  - Grounding, electrical & CP systems,
  - Spill Containers, insulation & level gauges
  - Settlement & Tank Damage
  - Overfill and Leak Detection Systems



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### Maintenance Codes: Fuel Testing

NFPA 110-8.3.7, NFPA 1-11.7.3.1, IFC-604.1.2

- Sample/test fuel annually
- Ensure fuel meets ASTM D 975 especially for:
  - -Water
  - -Sediment
  - -Microbial growths

	E	PSS Mair	Frequency W—Weekly S—Semiannually											
			Performed by						M — Monthly A — Annually Q — Quarterly Nos. indicate hours					
	Service Frequency													
			Date											
Component	Level 1	Level 2	Fill	in Aj	pprop	riate	Read	lings						
1. Fuel														
(a) Main supply tank level	W	М												
(b) Day tank level	W	M												
(c) Day tank float switch	W	Q												
(d) Supply or transfer pump operation	W	Q												
(e) Solenoid valve operation	W	Q												
(f) Strainer, filter, dirt leg, or combination	Q	Q												
(g) Water in system	W	Q												
(h) Flexible hose and connectors	Α	Α												
(i) Tank vents and overflow piping unobstructed	A	Α												
(j) Piping	Α	Α												
(k) Gasoline in main tank (when used)	Α	Α												
2. Lubrication System														
(a) Oil level	W	М												
(b) Oil change	50 or A	50 or A												
(c) Oil filter(s)	50 or A	50 or A												
(d) Lube oil heater	W	М												
(e) Crankcase breather	Q	S												
3. Cooling System														
(a) Level	W	М												
(b) Antifreeze protection level	S	Α												
(c) Antifreeze	Α	Α												
(d) Adequate cooling water to heat exchanger	w	М												
(e) Rod out heat exchanger	Α	Α												
(f) Adequate fresh air through radiator	W	M												
(g) Clean exterior of radiator	Α	Α												
(h) Fan and alternator belt	М	Q												
(i) Water pump(s)	W	Q												
(j) Condition of flexible hoses and connection	w	М												
(k) Jacket water heater	W	М												
(l) Inspect duct work, clean louvers	Α	A												
(m) Louver motors and controls	Α	Α												
4. Exhaust System														
(a) Leakage	w	М												
(b) Drain condensate tran	w	м	1											

Critical maintenance tool is the EPSS Log in NFPA 110. It is three pages long and has detailed steps weekly, monthly, quarterly, semi-annually and annually.

\*71 components checked annually

\*21 components checked weekly



**Checking with a** vacuum sampler can provide far more information on contaminants inside a tank. The vacuum hose can be pulled up after sampling floor and show what is in different strata within tank.

PEI/RP1400-14

Recommended Practices for the Design and Installation of Fueling Systems for Emergency Generators, Stationary Diesel Engines and Oil Burner Systems Good source on proper installation of day tanks and other fuel systems for E-gens and heating systems: *PEI RP 1400* 

#### **Available at PEI.org**

# Things Are Changing with E-Gens



Feds & States have been learning from E-Gen fuel releases New regs are here nationally/locally **Insurance companies** are demanding AST inspections or else



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## Before You Run Off:



**Big difference between** heating oil USTs and **E-Gen fuel systems E-Gens far more** complicated **Releases from E-Gens** can make national news when they light off or leak badly



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## **Enforcement for E-Gen Fuel Systems**



- E-Gen fire every 5 days
  - Most compliance officers not trained on any aspect of system except UST
  - Most of the releases and causes of releases/fires are <u>NOT</u> the UST Solution is Education



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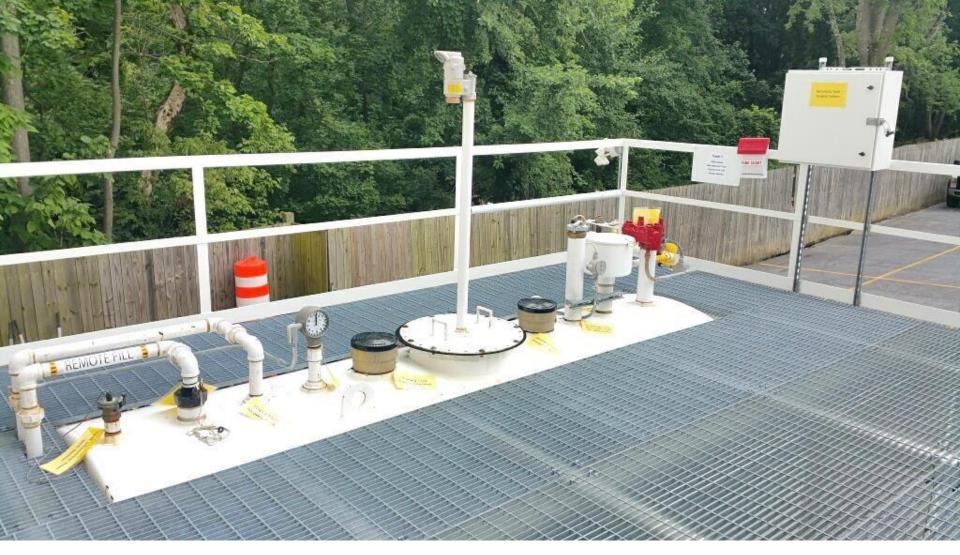
Classroom activities must address realworld fuel system problems 141



Classroom work must then be underpinned and reinforced with real-world demonstrations and hands-on practice with actual fuel system equipment



#### Each student removes ATG probe as part of test of overfill alarm test 143



Certification of tank inspectors is critical Next STI Inspector Course is Aug 17-21 in Atlanta and October 19-23 at NPTI Training Center 144

# **For Course Information on Upcoming UST and AST Classes, Contact the National Petroleum Training Institute** at 855-955-NPTI **Or** www.NPTInstitute.com 145 NATIONAL PETROLEUM TRAINING INSTITUTE

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#### **Question & Answer**

#### Please address all questions to a speaker



UST Inspector Training Series: <a href="https://neiwpcc.org/our-programs/underground-storage-tanks/ust-training-resources-inspection-leak-prevention/webinar-archive-inspector-training/">https://neiwpcc.org/our-programs/underground-storage-tanks/ust-training-resources-inspector-training/</a>

LUST Corrective Action Series: <u>https://neiwpcc.org/our-programs/underground-storage-tanks/lust-training-resources-</u> <u>corrective-action/webinar-archive-corrective-action/</u>

LUST Line: <u>https://neiwpcc.org/our-programs/underground-</u> storage-tanks/l-u-s-t-line/

#### THANK YOU FOR YOUR PARTICIPATION





# EMERGENCY POWER GENERATOR UST SYSTEMS

Thank you for your participation!

7/22/2020