# Natural Gas >> >> A Clean, Safe and Smart Choice for the Waste and Recycling Industry

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Co-Located With: StormCon

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Natural Gas Vehicles for America

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## SWANA WASTECON

## August 24, 2016

# Who is NGVAmerica?

# Corners of NGVAmerica's Mission

- Lead ***advocacy efforts*** with federal and state regulators and policymakers to advance the marketplace and level the playing field with other transportation fuels
- Through ***education & communications*** be the most credible voice on NGVs and to support information sharing within the industry
- Serve as forum for collaboration, discussion, & debate in the interest of ***developing common standards and best practices*** for safety and excellence in the NGV marketplace
- Be the ***convening authority*** for NGV industry leaders to gather and discuss strategies with business peers, customers, technology experts, and thought leaders

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Natural Gas Vehicles for America

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SOLID WASTE ASSOCIATION of North America

# Natural Gas »»

## A Clean, Safe and Smart Choice for the Waste and Recycling Industry

# Natural Gas for Use in Transportation

NG Vehicles are serving close to **40 major airports**

**Over 20%** of transit buses operate on NG

**Over 60%** new refuse trucks orders are NG

Heavy-duty truck market **continues to transition**

Rail industry piloting **LNG locomotives**

Major marine companies deploying **LNG-powered vessels**

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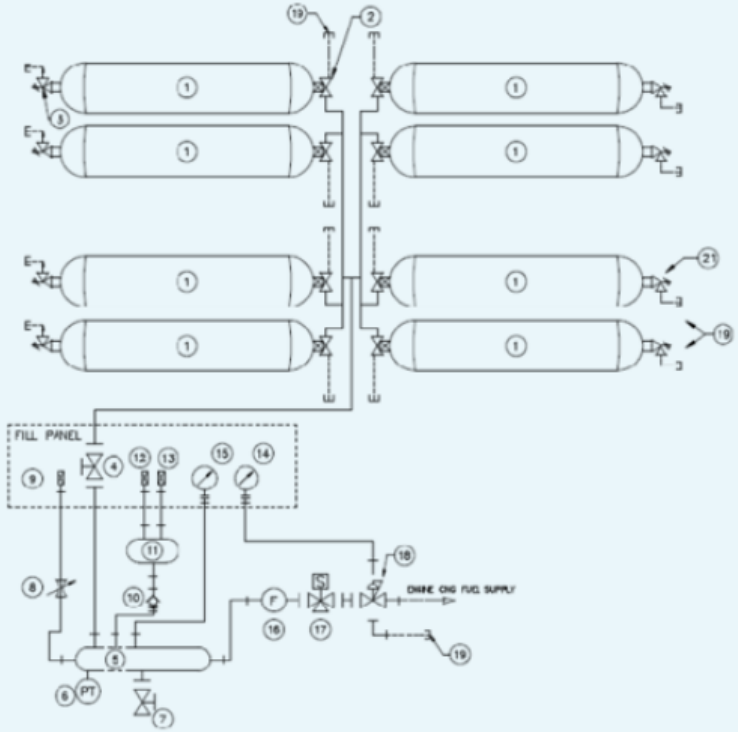
# Operation


## Typical Agility CNG System P&ID

Agility fuel solutions

1. CNG Cylinders
2. Manual Tank Valve
3. Pressure Relief Device (PRD)
4. Ball Valve (Emergency Shutoff Valve)
5. Manifold
6. Pressure Transducer
7. Bleed Valve
8. Defuel Control Valve
9. Defuel Port
10. Check Valve
11. Fill Manifold
12. Fill Receptacle
13. Fill Receptacle
14. Low Pressure Gauge
15. High Pressure Gauge
16. Filter
17. Solenoid
18. Regulator
19. Regulator PRV Vent
20. Tubing
21. Pressure Relief Device

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# Maintenance

| Code or Standard | Section | Requirement |
|---|---|---|
| FMVSS 304 | 7.4 Labeling | Each fuel container shall have a label that states: "*This container should be visually inspected after a motor vehicle accident or fire and at least every 36 months or 36,000 miles; whichever comes first, for damage and deterioration*" |
| CSA ANSI NGV 2-2007 (R2012) | 2.1.3 Periodic In-Service Inspections | Each container shall be visually inspected at least every 36 months, or at the time of any re-installation, for external damage and deterioration. |

**Recommended Three Levels of Visual Inspection:**

1. **Cursory Visual Inspection**
   - Observe for damage or leakage. No removal of panels
   - Pre-trip and post-trip conducted by the driver
2. **General Visual Inspection**
   - Close examination of system shielding and accessible system components
   - Preventative maintenance procedures by a technician
3. **Detailed Visual Inspection**
   - Thorough inspection of the complete high pressure CNG fuel system
   - Conducted annually by a certified or qualified inspector

## Typical CNG Fueling Facility Maintenance Requirements

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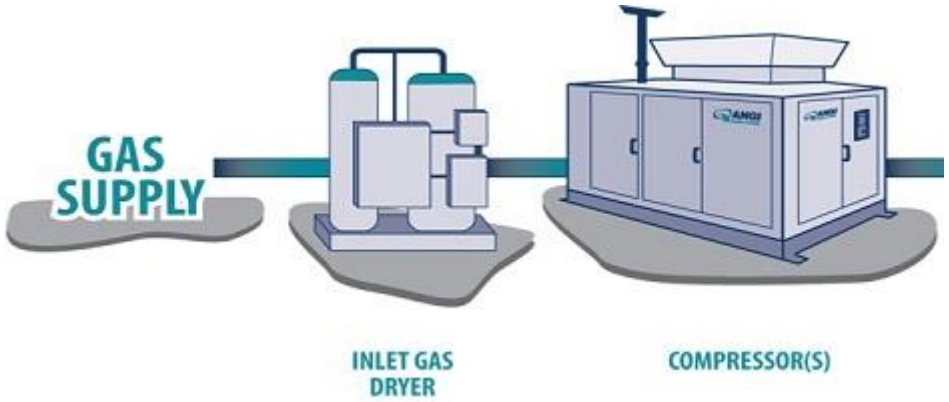
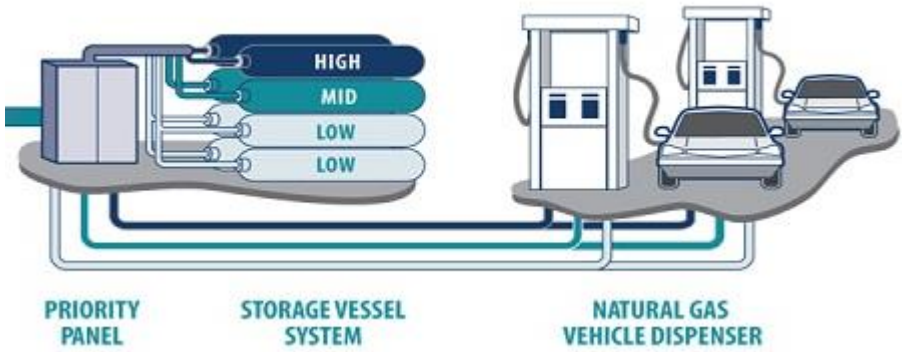
| Item | Service Item | Daily | Monthly | Every 2000 Hours of Operation or Annually | Every 4000 Hours of Operation |
|---|---|---|---|---|---|
| | **Compressor — Based on a 4 Stage ANGI-Ariel Package** | | | | |
| 1 | Monitor & Record Working Pressures and Temperatures | ▼ | | | |
| 2 | Check Compressor Piping and Tubing for Obvious Leaks, Loose Connections or Loose Clamps | ▼ | | | |
| 3 | Check for Rough or Unusual Noises | ▼ | | | |
| 4 | Check Compressor Oil Level | ▼ | | | |
| 5 | Drain Receiver Tank | | ▼ | | |
| 6 | Drain Condensate Pot | | ▼ | | |
| 7 | Change Compressor Oil & Filter and Clean Strainer | | | ▼ | |
| 8 | Clean Interstage Filter Elements and Replace Inlet & Final Discharge Filter Elements | | | ▼ | |
| 9 | Inspect Safety Relief Valves | | | ▼ | |
| 10 | Inspect Compressor Valves | | | ▼ | |
| 11 | Check/Calibrate Gas Detector | | | ▼ | |
| 12 | Inspect Compressor Rings and Seals | | | | ▼ |
| 13 | Verify Driver / Compressor Alignment | | | | ▼ |
| 14 | Inspect Compressor Crankshaft Main & Rod Bearings | | | | ▼ |
| 15 | Inspect Compressor Lube Drive Chain | | | | ▼ |
| 16 | Drain & Clean Heat Exchanger Cores | | | | ▼ |
| | **Dryer** | | | | |
| 17 | Check Dryer Piping and Tubing for Obvious Leaks, Loose Connections or Loose Clamps | ▼ | | | |
| 18 | Check & Record Dew Point Monitor | | ▼ | | |
| 19 | Replace Inlet & Discharge Filter Elements | | | ▼ | |
| 20 | Inspect Safety Relief Valves | | | ▼ | |
| | **Valve Panels** | | | | |
| 21 | Check Panel Tubing for Obvious Leaks, Loose Connections or Loose Clamps | ▼ | | | |
| 22 | Inspect Safety Relief Valves (If Installed) | | | ▼ | |
| | **ASME Storage Vessels** | | | | |
| 23 | Check Valve Connections and Tubing for Obvious Leaks, Loose Coonections or Loose Clamps | ▼ | | | |
| 24 | Inspect Safety Relief Valves | | | ▼ | |
| 25 | Drain Vessels If Required | | | ▼ | |
| | **Dispensers / Hose Posts** | | | | |
| 26 | Check Tubing for Obvious Leaks, Loose Connections or Loose Clamps | ▼ | | | |
| 27 | Visually Check Hose Assemblies for Cracks, Wear, Damage and Leakage | ▼ | | | |
| 28 | Check Hose Conductivity | | | ▼ | |
| 29 | Replace Filter Elements | | | ▼ | |
| 30 | Inspect Safety Relief Valves | | | ▼ | |
| | **General** | | | | |
| 31 | Check Operation of ESD System | | ▼ | | |
| 32 | Check/Drain System Relief Valve Vent Stacks | | ▼ | | |




http://www.angienergy.com/applications/standard.php

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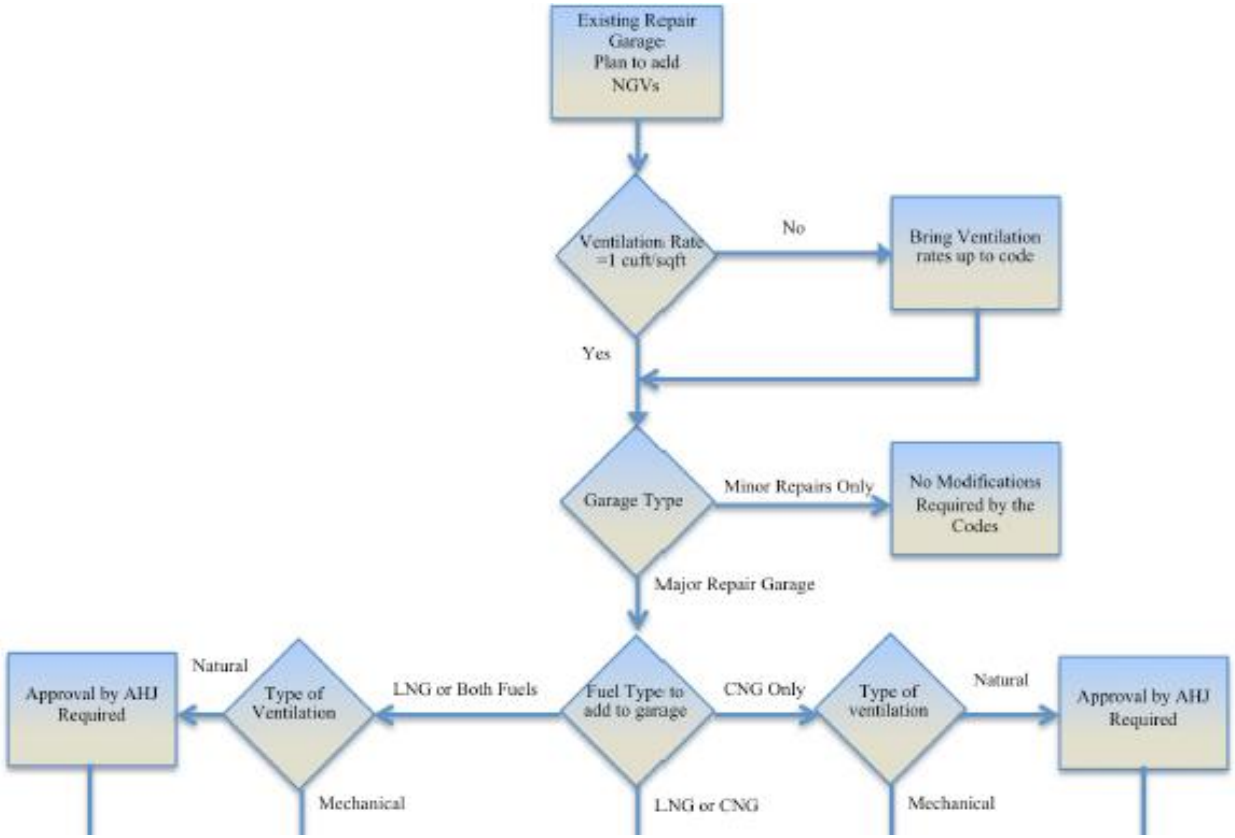
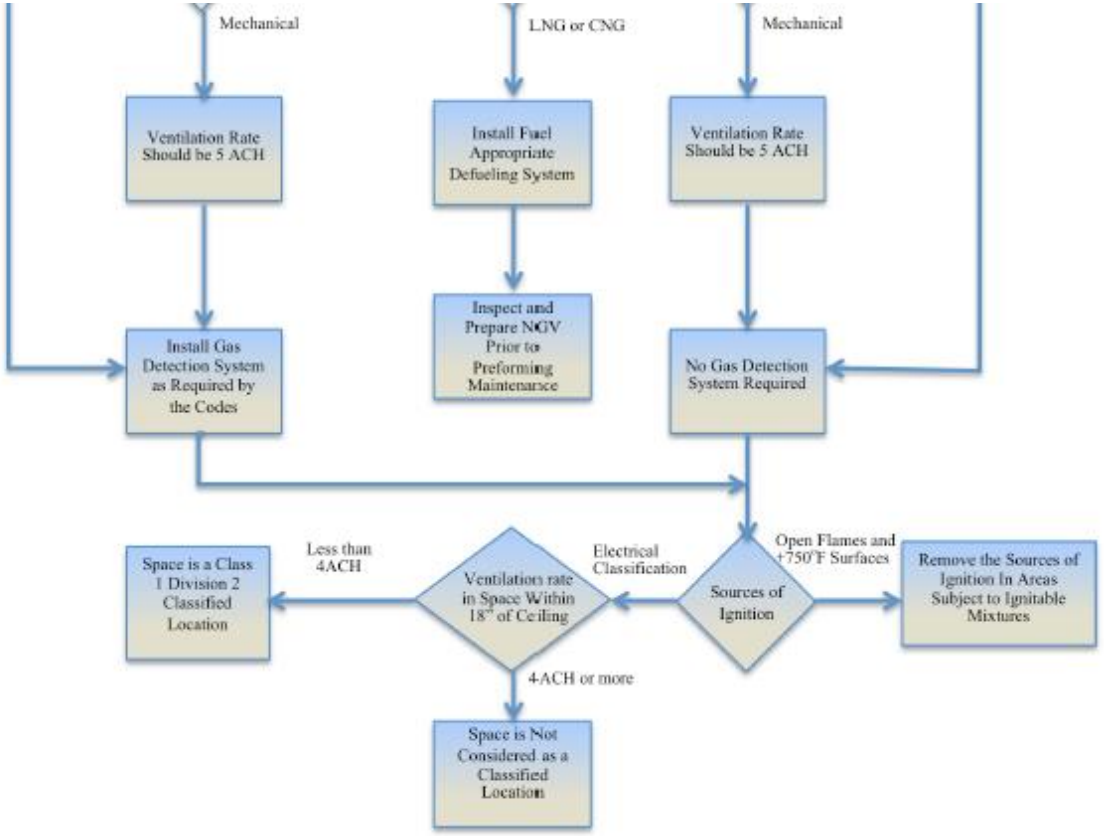
# Maintenance Facilities

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# Recommendations to First Responders

- Receive available training, i.e. www.evsafetytraining.org
- For refuse vehicles, attempt to dump cargo as soon as possible
- Clear a safe perimeter, and try not to fight any fire near the CNG cylinders
- Do not spray water on cylinders or cylinder enclosures, as this may cool the PRDs
- Approach the vehicle on a 45-degree angle
- Assume that cylinders are NOT empty

# Training

A basic natural gas safety and awareness training should employ the following learning objectives:

- Describe natural gas origin, supply, and distribution techniques
- Understand the properties and hazards of compressed/liquefied natural gas
- Identify the differences as compared to liquid fuels
- Describe emissions from natural gas vehicles compared to liquid fueled internal combustion vehicles
- Describe the advantages and disadvantages of natural gas as a motor fuel
- Understand an overview of the components and operation of the fuel system on board natural gas powered vehicles
- Understand an overview of the equipment and operation of a natural gas fueling station
- Understand site specific emergency action plans

# Conclusion & Recommendations

- Natural gas powered refuse trucks are a growing component of the fleet in the United States and Canada, due to their environmental, energy security, and economic benefits.

- Natural gas refuse trucks are helping lead the way in the transition away from diesel and gasoline fuels.

- While natural gas vehicles are as safe as diesel or gasoline powered vehicles, proper training and maintenance of the vehicles, including all CNG components and fueling facilities, is required.

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