SPECTRUM®
DETROIT DIESEL

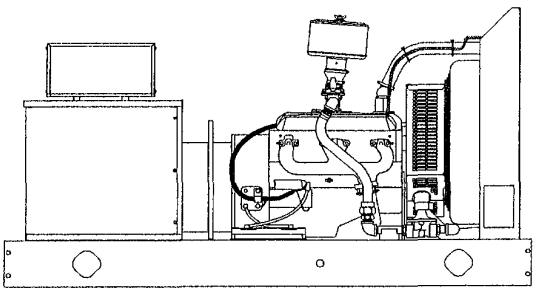
Model: 50GSGB

190-600 V **Gas**

ISO 9001 INTERNATIONALLY REGISTERED SPECTRUM®

Ratings Range

		60 Hz	50 Hz
Standby:	**kW**	48-55	39-45
	kVA	48-69	39-56
Prime:	**kW**	44-50	35-41
	kVA	44-63	36-51



Standard Features

- Your Spectrum® product distributor provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL-2200 listing.
- The generator set accepts rated load in one step.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Generator features:
  - The brushless, rotating-field generator has broadrange reconnectability.
  - The permanent magnet-excited generator (PMG) provides superior short-circuit capability.
- Other features:
  - A rugged industrial gas engine delivers rated power at 1800 rpm (60 Hz) and 1500 rpm (50 Hz).
  - Controllers are available for all applications. See controller features inside.
  - The electronic, isochronous governor incorporates an integrated drive-by-wire throttle body actuator delivering precise frequency regulation.

Generator Ratings

				Natural Gas				LP Gas			
				130°C Rise Standby Rating		105°C Rise Prime Rating		130°C Rise Standby Rating		105°C Rise Prime Rating	
Generator	Voltage	Ph	Hz	kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps
4P8	120/208	3	60	50/63	173	46/58	160	55/69	191	50/63	173
	127/220	3	60	50/63	164	46/58	151	55/69	180	50/63	164
	120/240	3	60	50/63	150	46/58	138	55/69	165	50/63	150
	120/240	1	60	48/48	200	44/44	183	49/49	204	45/45	188
	139/240	3	60	50/63	150	46/58	138	55/69	165	50/63	150
	220/380	3	60	50/63	95	46/58	87	55/69	104	50/63	95
	277/480	3	60	50/63	75	46/58	69	55/69	83	50/63	75
	347/600	3	60	50/63	60	45/56	54	50/63	60	45/56	54
	110/190	3	50	40/50	152	38/47	143	45/56	170	41/51	155
	115/200	3	50	40/50	144	37/46	133	41/51	147	37/46	133
	120/208	3	50	40/50	139	35/44	122	40/50	139	35/44	122
	110/220	3	50	40/50	131	38/47	123	45/56	147	41/51	134
	110/220	1	50	39/39	177	36/36	164	40/40	182	38/38	173
	220/380	3	50	40/50	76	38/47	71	45/56	85	41/51	77
	230/400	3	50	40/50	72	37/46	66	41/51	74	37/46	66
	240/416	3	50	40/50	69	35/44	61	40/50	69	35/44	61
4Q10	120/240	1	60	50/50	208	45/45	188	54/54	225	49/49	204
	110/220	1	50	41/41	186	37/37	168	45/45	205	41/41	186

RATINGS: All three-phase units are rated at 0.8 power factor. All single-phase units are rated at 1.0 power factor. *Standby Ratings:* Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. *Prime Power Ratings:* Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIS-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. GENERAL GUIDELINES FOR DERATION: *Altitude:* Derate 1.3% per 100 m (328 ft.) elevation above 200 m (656 ft.). *Temperature:* Derate 3.0% per 10°C (18°F) temperature above 25°C (77°F). For units having a weather housing with roof-mounted silencer or an enclosure with enclosed silencer, add 5°C (9°F) to the ambient temperature.

Alternator Specifications

Specifications	Generator
Type	4-Pole, Rotating-Field
Exciter type	Brushless, Permanent-Magnet
Leads: quantity, type	
4P8	12, Reconnectable
4Q10	4, 110-120/220-240
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H
Temperature rise	130°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Voltage regulation, no-load to full-load	±2%
Unbalanced load capability	100% of Rated Standby Current
One-step load acceptance	100% of Rating
Peak motor starting kVA:	(35% dip for voltages below)
480 V, 380 V 4P8 (12 lead)	210 (60Hz), 145 (50Hz)
240 V, 220 V 4Q10 (4 lead)	— (60Hz), — (50Hz)

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the generator field.
- Self-ventilated and dripproof construction.
- Vacuum-impregnated windings with fungus-resistant epoxy varnish for dependability and long life.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Solid-state, volts-per-hertz voltage regulator with ±2% no-load to full-load regulation.
- Brushless alternator with brushless exciter for excellent load response.

Application Data

Engine

Engine Specifications	60 Hz	50 Hz
Manufacturer	General Motors	
Engine: model, type	Industrial Powertrain Vortec 5.0 L, 4-Cycle Natural Aspiration	
Cylinder arrangement	V-8	
Displacement, L (cu. in.)	5.0 (305)	
Bore and stroke, mm (in.)	94.9 x 88.4 (3.74 x 3.48)	
Compression ratio	9.4:1	
Piston speed, m/min. (ft./min.)	318 (1044)	265 (870)
Main bearings: quantity, type	5, M400 Copper Lead	
Rated rpm	1800	1500
Max. power at rated rpm, kW (HP)	66.4 (89)	54.5 (73)
Cylinder head material	Cast Iron	
Piston type and material	High Silicon Aluminum	
Crankshaft material	Nodular Iron	
Valve (exhaust) material	Forged Steel	
Governor: type, make/model	Electronic, Woodward	
Frequency regulation, no-load to full-load	Isochronous	
Frequency regulation, steady state	±0.5%	
Frequency	Field-Convertible	
Air cleaner type, all models	Dry	

Exhaust

Exhaust System	60 Hz	50 Hz
Exhaust flow at rated kW, m^3/min. (cfm)	15.6 (550)	12.2 (430)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	593 (1100)	
Maximum allowable back pressure, kPa (in. Hg)	10.2 (3.0)	
Exhaust outlet size at engine hookup, mm (in.)	76 (3.0) OD	

Engine Electrical

Engine Electrical System	60 Hz	50 Hz
Ignition system	Electronic, Distributor	
Battery charging alternator:		
Ground (negative/positive)	Negative	
Volts (DC)	12	
Ampere rating	70	
Starter motor rated voltage (DC)	12	
Battery, recommended cold cranking amps (CCA):		
Qty., rating for -18°C (0°F)	1, 630	
Battery voltage (DC)	12	

Fuel

Fuel System	60 Hz	50 Hz
Fuel type	LP Gas or Natural Gas	
Fuel supply line inlet	1 NPTF	
Natural gas/LPG fuel supply pressure, kPa (in. H_2O)	1.74-2.74 (7.0-11.0)	

Lubrication

Lubricating System	60 Hz	50 Hz
Type	Full Pressure	
Oil pan capacity, L (qt.)	4.7 (5.0)	
Oil pan capacity with filter, L (qt.)	6.2 (6.5)	
Oil filter: quantity, type	1, Cartridge	

Application Data

Cooling (Standard Radiator)

Cooling System	60 Hz	50 Hz
Ambient temperature, °C (°F)	50 (122)	
Engine jacket water capacity, L (gal.)	6.8 (1.8)	
Radiator system capacity, including engine, L (gal.)	24.6 (6.5)	
Engine jacket water flow, Lpm (gpm)	117.3 (31)	98.4 (26)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	51.5 (2930)	42.9 (2440)
Water pump type	Centrifugal	
Fan diameter, including blades, mm (in.)	533.4 (21)	
Fan, kWm (HP)	4.5 (6.0)	2.6 (3.5)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)	

Remote Radiator System*	60 Hz	50 Hz
Exhaust manifold type	Dry	
Connection sizes:		
Water inlet, ID hose, mm (in.)	44.45 (1.75)	
Water outlet, ID hose, mm (in.) ...	38.10 (1.50)	
Static head allowable above engine, kPa (ft. H_2O)	4.32 (17.0)	

* Contact your local distributor for cooling system options and specifications based on your specific requirements.

City Water Cooling (CWC) System	60 Hz	50 Hz
Exhaust manifold type	Dry	
System capacity, L (gal.)	—	
City water consumption at 10°C (50°F), Lpm (gpm)	—	
Connection sizes:		
Water inlet, mm (in.)	—	
Water outlet, mm (in.)	—	

Operation Requirements

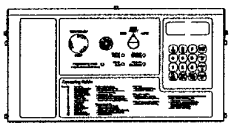
Air Requirements	60 Hz	50 Hz
Radiator-cooled cooling air, m^3/min. (scfm)†	238 (8400)	193 (6800)
Cooling air required for generator set when equipped with CWC or remote radiator, based on 14°C (25°F) rise and ambient temperature of 29°C (85°F), m^3/min. (cfm)	135.9 (4800)	110.4 (3900)
Combustion air, m^3/min. (cfm)	5.0 (175)	4.0 (140)
Heat rejected to ambient air:		
Engine, kW (Btu/min.)	29.5 (1680)	23.6 (1340)
Generator, kW (Btu/min.)	7.6 (430)	6.5 (370)

† Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

Fuel Consumption	60 Hz	50 Hz
Natural Gas, m^3/hr. (cfh) at % load‡	Standby Rating	
100%	21.1 (744)	17.0 (600)
75%	17.9 (631)	14.3 (505)
50%	13.7 (483)	10.9 (384)
25%	9.4 (333)	7.4 (262)
Natural Gas, m^3/hr. (cfh) at % load‡	Prime Rating	
100%	19.8 (699)	15.9 (562)
75%	16.6 (587)	13.3 (469)
50%	12.8 (453)	10.2 (360)
25%	9.1 (320)	7.1 (252)
LP Gas, m^3/hr. (cfh) at % load	Standby Rating	
100%	8.4 (295)	7.2 (254)
75%	6.5 (230)	5.7 (202)
50%	5.0 (178)	4.3 (153)
25%	3.7 (129)	3.0 (105)
LP Gas, m^3/hr. (cfh) at % load	Prime Rating	
100%	7.6 (269)	6.6 (233)
75%	6.1 (214)	5.3 (187)
50%	4.8 (168)	4.0 (143)
25%	3.5 (124)	2.9 (101)

‡ Fuel consumption is based on 1015 Btu/standard cu. ft. natural gas.

Controllers



Available Controllers

Digital 550 Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Programmable microprocessor logic and digital display features.
Safeguard circuit protection standard.
12- or 24-volt engine electrical system capability.
Remote start, remote annunciation, and remote communication options.
Refer to M6-46 for additional controller features and accessories.

Microprocessor-Plus, 16-Light Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Microprocessor logic, AC meters, and engine gauge features.
12- or 24-volt engine electrical system capability.
Remote start, prime power, and remote annunciation options.
Refer to M6-30 for additional controller features and accessories.

Basic Controller
Single-light annunciation and basic controls with NFPA capability.
Relay logic features included with three controller options: standard Basic, standard Basic with engine gauges, and expanded with AC meters and engine gauges.
12-volt engine electrical system capability only.
Remote or automatic start options.
Refer to M6-29 for additional controller features and accessories.

SPECTRUM®
DETROIT DIESEL

SPECTRUM, N7650 County Trunk LS, Sheboygan, Wisconsin 53083 U.S.A.
Phone 920-459-1877
Fax 920-459-1825 (U.S.A. Sales), Fax 920-459-1614 (International)

Standard Features and Accessories

Additional Standard Features

- Alternator Protection (standard with Digital 550)
- Battery Rack and Cables
- Electronic, Isochronous Governor
- Integral Vibration Isolation
- Oil Drain Extension
- Operation and Installation Literature
- Pilot-Excited, Permanent-Magnet Generator (PMG)

Accessories

Enclosed Unit

- ☐ Weather Housing (includes critical silencer, mounting, tailpipe, and skid end caps)
- ☐ Sound Enclosure

Open Unit

- ☐ Exhaust Silencer, Critical (kits: PA-324468, PA-352663)
- ☐ Flexible Exhaust Connector, Stainless Steel

Cooling System

- ☐ Block Heater
- ☐ City Water Cooling
- ☐ Radiator Duct Flange
- ☐ Remote Radiator Cooling

Fuel System

- ☐ Conversion Kit (natural gas to LP gas)
- ☐ Flexible Fuel Lines
- ☐ Gas Strainer
- ☐ LP Gas Liquid Withdrawal
- ☐ Manual Valve and Gas Solenoid Bypass
- ☐ Secondary Gas Solenoid Valve

Electrical System

- ☐ Battery
- ☐ Battery Charger, Equalize/Float Type
- ☐ Battery Heater

Engine and Generator

- ☐ Air Cleaner Restrictor Indicator
- ☐ Bus Bar Kits
- ☐ CSA Certification
- ☐ Generator Strip Heater
- ☐ Line Circuit Breaker (NEMA1 enclosure)
- ☐ Line Circuit Breaker with Shunt Trip (NEMA1 enclosure)
- ☐ Optional Generators
- ☐ Rated Power Factor Testing
- ☐ Rodent Guards
- ☐ Safeguard Breaker (not available with Digital 550)
- ☐ Skid End Caps
- ☐ Voltage Regulation, 1%
- ☐ Voltage Regulator Sensing, Three-Phase

Literature and Maintenance

- ☐ General Maintenance Literature Kit
- ☐ Maintenance Kit (includes standard air, oil, and fuel filters)
- ☐ NFPA 110 Literature
- ☐ Overhaul Literature Kit
- ☐ Production Literature Kit

Controller (Digital 550 and Microprocessor-Plus)

- ☐ Common Failure Relay Kit
- ☐ Communication Products and PC Software (Digital 550 controller only)
- ☐ Customer Connection Kit
- ☐ Dry Contact Kit (isolated alarm)
- ☐ Engine Prealarm Sender Kit
- ☐ Local Emergency Stop Kit
- ☐ Prime Power Switch (Digital 550 controller only)
- ☐ Remote Annunciator Panel
- ☐ Remote Audiovisual Alarm Panel
- ☐ Remote Emergency Stop Kit
- ☐ Remote Mounting Cables
- ☐ Run Relay Kit

Miscellaneous Accessories

- ☐ _____
- ☐ _____
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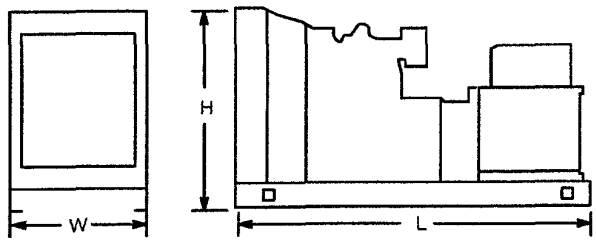
Weights and Dimensions

Overall Size, L x W x H, mm (in.):

Wide Skid	2200 x 1040 x 1172 (86.6 x 40.9 x 46.1)
Narrow Skid	2200 x 865 x 1172 (86.6 x 34.0 x 46.1)

Weight (radiator model), wet, kg (lb.): 712 (1570)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

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DETROIT DIESEL SPECTRUM®

GENERATOR ACCESSORIES
Weather Housings

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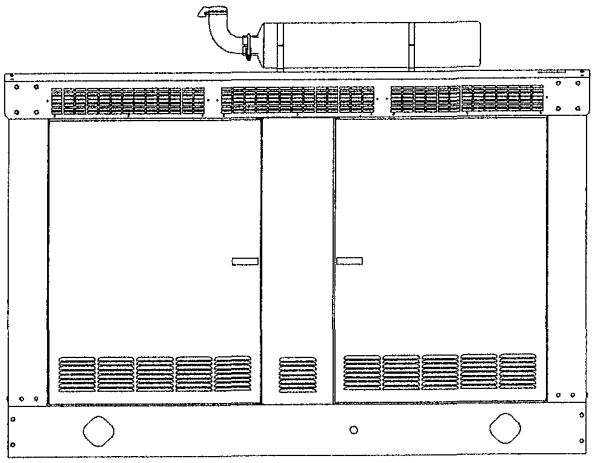
DETROIT DIESEL SPECTRUM



Applicable to the following:
30-125GSG

Detroit Diesel Spectrum® weather housings protect stationary generator sets from the elements, animal intrusion, and unwanted entry. The weather housing design allows ample air flow ensuring full generator set performance.

Standard Features

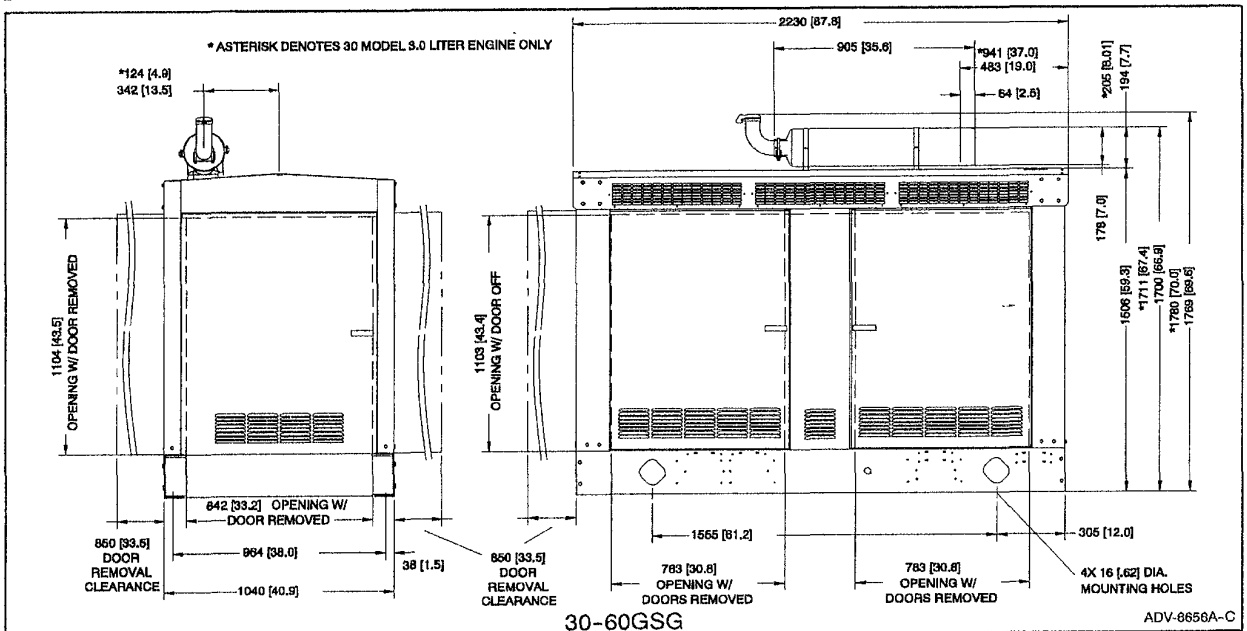
- Critical silencer with mounting, tailpipe and rain cap, and skid end caps.
- Skid-mounted, corrosion-resistant housing and doors.
- Corrosion-resistant doors with stainless steel hinges for easy removal.
- Fade, scratch, and corrosion-resistant Detroit Diesel Spectrum® gray housing with black doors.
- Lockable, flush-mounted door latches.
- Louvers on air inlets prevent rain and snow entry.
- Prototype testing of generator set with weather housing ensures no loss of generator set performance.

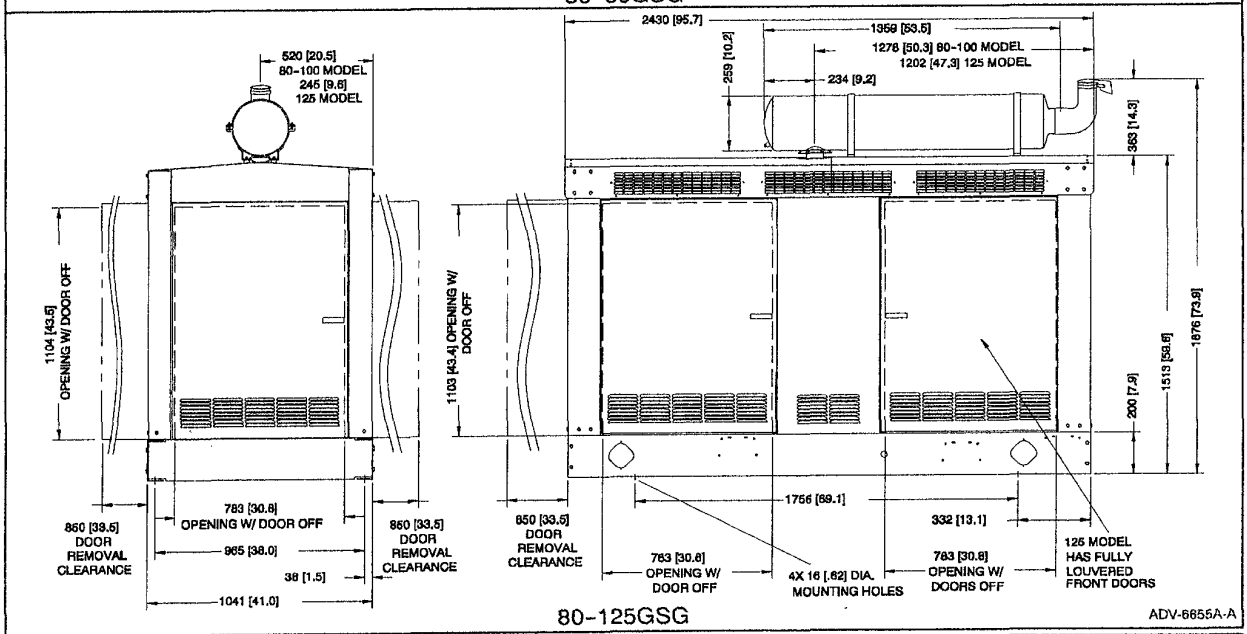
Weather Housing Weights

Model	Generator Set Weight (Wet) with Housing, kg (lb.)	Housing Only Weight, kg (lb.)
30 4P5	900 (1984)	340 (750)
35 4P5B/4Q5	910 (2006)	340 (750)
45 4P7B	940 (2072)	340 (750)
45 4P8/4Q10	960 (2116)	340 (750)
50 4P8/4Q10	1050 (2315)	340 (750)
60 4P10	1100 (2425)	340 (750)
60 4S7/4V7	1150 (2535)	340 (750)
80/100	1480 (3263)	380 (838)
125	1510 (3330)	380 (838)

DETROIT DIESEL SPECTRUM®

Detroit Diesel Spectrum
N7650 County Trunk LS
Sheboygan, Wisconsin 53083 USA
Phone 920-459-1877, Fax 920-459-1825
DetroitDieselSpectrum.com





Dimensions: mm [in.]

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Availability is subject to change without notice. The manufacturer of Detroit Diesel Spectrum® products reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Detroit Diesel Spectrum® products distributor for availability.

LIQUID PROPANE TANK INSTALLATION SPECIFICATIONS

THE FOLLOWING SPECIFICATIONS APPLY TO TANKS UP TO
2000 GALLON (WATER CAPACITY) ONLY

GENERAL

1) LP-Gas tanks shall be located in accordance with Uniform Fire Code Table 8204-A and/or NFPA 58. Verify with local jurisdictions.
2) Containers must be designed, fabricated, tested, and marked with:
   A) DOT regulations
   B) ASME Code
3) Containers shall be equipped with one or more pressure relief devices to relieve vapor per Appendix E (DOT) or Table E 2.2.2 (ASME).
4) Containers must not be filled, refilled, continued in service, or transported unless they are properly qualified, re-qualified, or tested.
5) Containers showing serious denting, bulging, gouging or excessive corrosion shall be removed from service.

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PRESSURE RELIEF DEVICES

1) Each Pressure release valve shall be plainly and permanently marked with:
   A) The start-to-leak pressure in psi
   B) Relieving capacity in cfm of gas
   C) Manufacturers name and ID Number
2) Pressure relief devices on ASME containers of 125 gallon or greater, shall be vented away from the container in an upward direction and be unobstructed to the open air.
3) Interior LP regulator vents must be piped to the exterior of the building.
4) Rain Caps shall be provided to minimize the possibility of the entrance of water or other extraneous matter into the relief valve.

VAPOR AND LIQUID WITHDRAWL OPENINGS

1) An internal valve with an integral excess-flow valve or excess-flow protection.
2) A positive shutoff valve that is located as close to the tank as practical in combination with an excess-flow valve installed in the tank.

VAPOR AND LIQUID INLET OPENINGS

3) An internal valve with an integral excess-flow valve or excess-flow protection.
4) A positive shutoff valve that is located as close to the tank as practical in combination with a back-flow valve installed in the tank.

VOLUME AND PRESSURE GAUGES

1) All tanks shall be fitted with volume and pressure gauges that comply with DOT and/or ASME.

REGULATORS

1) A two-stage regulator system or an integral two-stage regulator shall be required on all fixed piping systems.

INSTALLATION OF SYSTEMS

GENERAL PROVISIONS

1) Refer to the Uniform Fire Code section 82 and NFPA 58 regulations for criteria regarding the location of containers and liquid transfer systems. The following items are discussed in detail in the code sections listed above:
   A) Permits, Plans, and Records
   B) Installation and Location
   C) Separation distances
   D) Distance from building openings
   E) Distance from Combustible storage
   F) Distance from sources of ignition
   G) Fire Protection
2) See Exhibit A & B (copied from NFPA 58 Appendix).

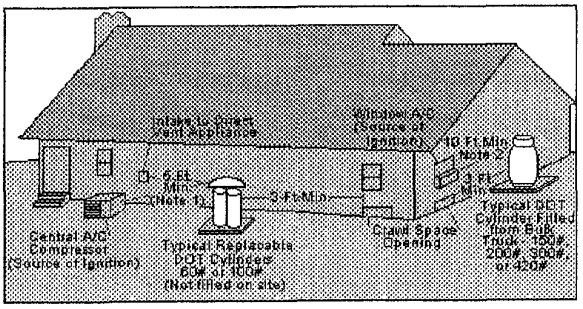
CONTAINER PROTECTION

1) LP-Gas equipment shall be adequately secured and protected from physical damage by vehicular traffic by means of fencing and/or bollards as required.
2) DOT cylinders must be adequately secured to prevent tipping.

EXHIBIT A

Location of DOT Cylinders

From NFPA 58, Appendix G
Federal, state, and local ordinances and regulations should be observed at all times.



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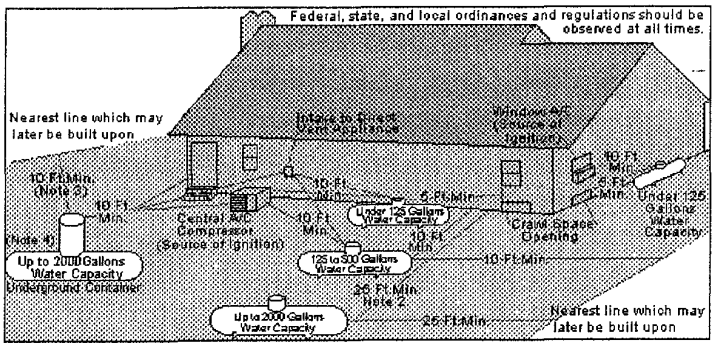
1) 5 foot minimum between relief valve discharge and external source of ignition (air conditioner), direct vent, or mechanical ventilation system (attic fan).

2) If the DOT cylinder is filled on-site from a bulk truck, the filling connection and vent valve must be at least 10 feet from any external source of ignition, direct vent, or mechanical ventilation system.

EXHIBIT B

Location of ASME Cylinder

From NFPA 58, Appendix G
Federal, state, and local ordinances and regulations should be observed at all times.



1) Regardless of its size, any ASME tank filled on-site must be located so that the filling connection and fixed liquid level gauge are at least 10 feet from external source of ignition (i.e. open flame, window A/C, compressor, etc.), intake to direct vented gas appliance or intake to a mechanical ventilation system.

2) May be reduced to 10 feet minimum for a single container of 1200 gallons water capacity or less if it is located at least 25 feet from any other LP-Gas container of more than 125 gallons water capacity.

3) Minimum distances from underground containers shall be measured from the relief valve and filling or level gauge vent connection a t the container, except that no part of an underground container shall be less than 10 feet from a building or line of adjoining property which may be built upon.

4) Where the container may be subject to abrasive action or physical damage due to vehicular traffic or other causes it must be either (a) placed not less than 2 feet below grade; (b) otherwise protected against such physical damage.

ARTICLE 82 — LIQUEFIED PETROLEUM GASES

SECTION 8201 — SCOPE

Storage, handling and transportation of LP-gas and the installation of equipment pertinent to systems for such uses shall be in accordance with Article 82. For determining properties of LP-gases, see UFC Standard 82-1, Appendix B.

SECTION 8202 — PERMITS, PLANS AND RECORDS

8202.1 Permits and Plans. For a permit to store, use, handle or dispense LP-gas, or to install or maintain an LP-gas container see Section 105, Permit 1.1.

> **EXCEPTION:** A permit is not required to install or maintain portable containers of less than 125-gallon (473.2 L) aggregate water capacity.

Distributors shall not fill an LP-gas container for which a permit is required unless a permit for installation has been issued for that location by the chief.

Where a single container is over 2,000-gallon (7571 L) water capacity or the aggregate capacity of containers is over 4,000-gallon (15 142 L) water capacity, the installer shall submit plans for such installation.

8202.2 Records. Installers shall maintain a record of installations for which a permit is not required by Section 105 and have such record available for inspection by the chief.

> **EXCEPTION:** Installation of gas-burning appliances and replacement of portable cylinders.

SECTION 8203 — INSTALLATION OF EQUIPMENT

8203.1 General. Liquefied petroleum gas equipment shall be installed in accordance with UFC Standard 82-1, except as otherwise provided in Article 82 and in other laws or regulations.

8203.2 Use of LP-gas Containers in Buildings.

8203.2.1 Portable containers.

8203.2.1.1 General. Portable LP-gas containers, as defined in UFC Standard 82-1, shall not be used in buildings except as specified in UFC Standard 82-1 and Section 8203.2.1.

8203.2.1.2 Use in basement, pit or similar location. LP-gas containers shall not be used in a basement, pit or similar location where heavier-than-air gas might collect. LP-gas containers shall not be used in an above-grade underfloor space or basement unless such location is provided with an approved means of ventilation.

> **EXCEPTION:** Use with self-contained torch assemblies in accordance with Section 8203.2.1.7.

8203.2.1.3 Construction and temporary heating. Portable containers are allowed to be used in buildings or areas of buildings undergoing construction or for temporary heating as set forth in UFC Standard 82-1, Sections 3-4.3, 3-4.4, 3-4.5 and 3-4.7.

8203.2.1.4 Industrial uses. In occupancies used for industrial purposes, portable LP-gas containers are allowed to be used to supply quantities necessary for processing, research or experimentation. When manifolded, the aggregate water capacity of such containers shall not exceed 735 pounds (333.4 kg) per manifold. When multiple manifolds of such containers are present in the same room, each manifold shall be separated from other manifolds by a distance of not less than 20 feet (6096 mm).

8203.2.1.5 Educational and institutional uses. In occupancies used for educational and institutional purposes, portable LP-gas containers are allowed to be used for research and experimentation. Such containers shall not be used in classrooms. Such containers shall not exceed a 50-pound (22.7 kg) water capacity in occupancies used for educational purposes and shall not exceed a 12-pound (5.4 kg) water capacity in occupancies used for institutional purposes. When more than one such container is present in the same room, each container shall be separated from other containers by a distance of not less than 20 feet (6096 mm).

8203.2.1.6 Demonstration uses. Portable LP-gas containers are allowed to be used temporarily for demonstrations and public exhibitions. Such containers shall not exceed a 12-pound (5.4 kg) water capacity. When more than one such container is present in the same room, each container shall be separated from other containers by a distance of not less than 20 feet (6096 mm).

8203.2.1.7 Use with self-contained torch assemblies. Portable LP-gas containers are allowed to be used to supply approved self-contained torch assemblies or similar appliances. Such containers shall not exceed a $2^1/_2$-pound (1.13 kg) water capacity.

8203.2.1.8 Use for food preparation. When approved, listed LP-gas commercial food service appliances are allowed to be used for food preparation within restaurants and in attended commercial food catering operations. See UFC Standard 82-1, Sections 3-4.8.4 and 5-3.1.1, Exception 1.

8203.2.2 Industrial vehicles and floor maintenance machines. Containers on industrial vehicles and floor maintenance machines shall be in accordance with UFC Standard 82-1, Section 3-6.

8203.3 Location of Equipment and Piping. Equipment and piping shall not be installed in locations where such equipment and piping is prohibited by the Mechanical Code.

SECTION 8204 — LOCATION OF CONTAINERS

8204.1 General. The storage and transportation of LP-gas and the installation and maintenance of pertinent equipment shall be in accordance with UFC Standard 82-1 and subject to the approval of the chief, except as provided in Article 82.

8204.2 Maximum Capacity within Established Limits. Within the limits established by law restricting the storage of LP-gas for the protection of heavily populated or congested commercial areas, the aggregate capacity of any one installation shall not exceed a 2,000-gallon (7571 L) water capacity (see sample adoption ordinance, Section 5).

8204.3 Container Location. Containers shall be located with respect to buildings, public ways, and lines of adjoining property which can be built on in accordance with Table 8204-A.

Containers shall also be located with respect to special hazards such as aboveground flammable or combustible liquid tanks, oxygen or gaseous hydrogen containers, flooding or electric power lines as specified in UFC Standard 82-1, Section 3-2.2.6.

8204.4 Multiple Container Installation. Multiple container installations with a total water storage capacity of more than 180,000 gallons (681 374 L) [150,000-gallon (567 811 L) LP-gas capacity] shall be subdivided into groups containing not more than 180,000 gallons (681 374 L) in each group. Such groups shall be separated by a distance of not less than 50 feet (15 240 mm), unless the containers are:

1. Mounded in an approved manner,

2. Protected with approved insulation on areas that are subject to impingement of ignited gas from pipelines or other leakage,

3. Protected by firewalls of approved construction,

4. Protected by an approved system for application of water as specified in UFC Standard 82-1, Table 3-2.2.4, or

5. Protected by other approved means.

Where one of these forms of protection is provided, the separation shall not be less than 25 feet (7620 mm) between container groups.

SECTION 8205 — PROHIBITED USE OF LP-GAS

8205.1 Nonapproved Equipment. Liquefied petroleum gas shall not be used for the purpose of operating devices or equipment unless such device or equipment is approved for use with LP-gas.

8205.2 Release to the Atmosphere. Liquefied petroleum gas shall not be released to the atmosphere, except through an approved liquid-level gauge or other approved device.

SECTION 8206 — DISPENSING AND OVERFILLING

8206.1 Attendants. Dispensing of LP-gases shall be performed by a qualified attendant.

8206.2 Overfilling. Liquefied petroleum gas containers shall not be filled or maintained with LP-gas in excess of the fixed outage gauge installed by the manufacturer or the weight stamped on the tank.

8206.3 Dispensing Locations. The point of transfer of LP-gas from one container to another shall be separated from exposures as specified in UFC Standard 82-1, Section 4-3.

SECTION 8207 — SAFETY DEVICES

Safety devices on LP-gas containers, equipment and systems shall not be tampered with or made ineffective.

SECTION 8208 — SMOKING AND OTHER SOURCES OF IGNITION

NO SMOKING signs shall be posted when required by the chief. Smoking within 15 feet (4572 mm) of a point of transfer, while filling operations are in progress at containers or vehicles, shall be prohibited.

For control of other sources of ignition, refer to UFC Standard 82-1, Section 3-8.

SECTION 8209 — CLEARANCE TO COMBUSTIBLES

Weeds, grass, brush, trash and other combustible materials shall be kept not less than 10 feet (3048 mm) from LP-gas tanks or containers.

SECTION 8210 — PROTECTING CONTAINERS FROM VEHICLES

When exposed to probable vehicular damage due to proximity to alleys, driveways or parking areas, LP-gas containers, regulators and piping shall be suitably protected.

SECTION 8211 — FIRE PROTECTION

8211.1 General. Fire protection shall be provided for installations having storage containers of more than a 4,000-gallon (15 141 L) water capacity, as required by UFC Standard 82-1, Section 3-10.

8211.2 Fire Extinguishers. Fire extinguishers shall be provided as specified in UFC Standard 82-1, and in accordance with UFC Standard 10-1.

SECTION 8212 — STORAGE OF PORTABLE CONTAINERS AWAITING USE OR RESALE

8212.1 General. Storage of portable containers of 1,000 pounds (453.6 kg) or less, whether filled, partially filled or empty, at consumer sites or distributing points, and for resale by dealers or resellers shall be in accordance with Section 8212.

EXCEPTIONS: 1. Containers which have not previously been in LP-gas service.

2. Containers at distributing plants.

3. Containers at consumer sites or distributing points, which are connected for use.

8212.2 Exposure hazards. Containers in storage shall be located in a manner which minimizes exposure to excessive temperature rise, physical damage or tampering.

8212.3 Position. Containers in storage having individual water capacity greater than $2\frac{1}{2}$ pounds (1.3 kg) [nominal 1-pound (0.45 kg) LP-gas capacity] shall be positioned with the pressure-relief valve in direct communication with the vapor space of the container.

8212.4 Separation from means of egress. Containers stored in buildings in accordance with Sections 8212.9 and 8212.11 shall not be located near exit-access doors, exits, stairways, or in areas normally used, or intended to be used, for the safe egress of people.

8212.5 Quantity. Empty containers which have been in LP-gas service shall be considered as full containers for the purpose of determining the maximum quantities of LP-gas allowed in Sections 8212.9 and 8212.11.

8212.6 Storage on roofs. Containers which are not connected for use shall not be stored on roofs.

8212.7 Storage in basement, pit or similar location. Liquefied petroleum gas containers shall not be stored in a basement, pit or similar location where heavier-than-air gas might collect. Liquefied petroleum gas containers shall not be stored in above-grade underfloor spaces or basements unless such location is provided with an approved means of ventilation.

EXCEPTION: Department of Transportation (DOT) specification cylinders with a maximum water capacity of $2\frac{1}{2}$ pounds (1.13 kg) for use in completely self-contained hand torches and similar applications. The quantity of LP-gas shall not exceed 20 pounds (9.07 kg).

8212.8 Protection of Valves on Containers in Storage. Container valves shall be protected by screw-on-type caps or collars which shall be securely in place on all containers stored regardless of whether they are full, partially full or empty. Container outlet valves shall be closed or plugged.

8212.9 Storage within Buildings Accessible to the Public. Department of Transportation (DOT) specification cylinders with maximum water capacity of $2\frac{1}{2}$ pounds (1.13 kg) used in completely self-contained hand torches and similar applications are allowed to be stored or displayed in a building accessible to the public. The quantity of LP-gas shall not exceed 200 pounds (90.7 kg) except as provided in Section 8212.11.

8212.10 Storage within Buildings not Accessible to the Public.

8212.10.1 Maximum quantity. The maximum quantity allowed in one storage location in buildings not accessible to the public, such as industrial buildings, shall not exceed 735-pound (333.4 kg) water capacity [nominal 300 pounds (136 kg) of LP-gas]. If additional storage locations are required on the same floor within the same building, they shall be separated by a minimum of 300 feet (91.4 m). Storage beyond these limitations shall be in accordance with Section 8212.11.

8212.10.2 Quantities on equipment and vehicles. Containers carried as part of service equipment on highway mobile vehicles need not be considered in the total storage capacity in Section 8212.10.1, provided such vehicles are stored in private garages and do not carry more than three LP-gas containers with a total aggregate LP-gas capacity not exceeding 100 pounds (45.4 kg) per vehicle. Container valves shall be closed.

8212.11 Storage within Rooms Used for Gas Manufacturing.

8212.11.1 General. Storage within buildings or rooms used for gas manufacturing, gas storage, gas-air mixing and vaporization, and compressors not associated with liquid transfer shall be in accordance with Section 8212.11.

8212.11.2 Quantity limits. The maximum quantity of LP-gas shall be 10,000 pounds (4536 kg).

8212.11.3 Construction. The construction of such buildings and rooms shall comply with requirements for Group H Occupancies in the Building Code; UFC Standard 82-1, Chapter 7; and the following:

1. Adequate vents shall be provided to the outside at both top and bottom, located at least 5 feet (1524 mm) from building openings, and

2. The entire area shall be classified for the purposes of ignition source control in accordance with UFC Standard 82-1, Section 3-8.

8212.12 Location of Storage outside of Buildings. Storage outside of buildings, for containers awaiting use or resale, shall be located in accordance with Table 8212-A.

8212.13 Protection of Containers. Containers shall be stored within a suitable enclosure or otherwise protected against tampering.

8212.14 Alternate Location and Protection of Storage. When the provisions of Sections 8212.12 and 8212.13 are impractical at construction sites, or at buildings or structures undergoing major renovation or repairs, the storage of containers shall be as required by the chief.

SECTION 8213 — CONTAINERS NOT IN SERVICE

8213.1 Temporarily Out of Service. Containers whose normal use has been temporarily discontinued shall:

1. Be disconnected from appliance piping,

2. Have container outlets, except relief valves, closed or plugged, and

3. Be positioned with the relief valve in direct communication with container vapor space.

8213.2 Permanently Out of Service. Containers to be placed permanently out of service shall be removed from the site.

SECTION 8214 — PARKING AND GARAGING

8214.1 General. Parking of LP-gas tank vehicles shall be in accordance with Section 8214.

> **EXCEPTION:** In cases of accident, breakdown or other emergencies, tank vehicles are allowed to be parked and left unattended at any location while the operator is obtaining assistance.

8214.2 Unattended Parking.

8214.2.1 Near residential, educational and institutional occupancies and other high risk areas. Liquefied petroleum gas tank vehicles shall not be left unattended at any time on residential streets or within 500 feet (152.4 mm) of a residential area, apartment or hotel complex, educational facility, hospital, or care facility. Tank vehicles shall not be left unattended at any other place that would, in the opinion of the chief, present an extreme life hazard.

8214.2.2 Durations exceeding one hour. Liquefied petroleum gas tank vehicles parked at any one point for longer than one hour shall be located as follows:

1. Off of streets, highways, avenues or alleys, and

2. Inside of a bulk plant, or

3. At other approved locations not less than 50 feet (15 240 mm) from buildings other than those approved for the storage or servicing of such vehicles.

8214.3 Garaging. Garaging of tank vehicles used for the transportation of LP-gases shall be as specified in UFC Standard 82-1. Vehicles with LP-gas fuel systems are allowed to be stored or serviced in garages as specified in UFC Standard 82-1, Section 3-6.6.

TABLE 8204-A—LOCATION OF CONTAINERS

CONTAINER CAPACITY (water gallons)	MINIMUM SEPARATION BETWEEN CONTAINERS AND BUILDINGS, PUBLIC WAYS, OR LINES OF ADJOINING PROPERTY THAT CAN BE BUILT UPON		MINIMUM SEPARATION BETWEEN CONTAINERS[2,3] (feet)
	Mounded or Underground Containers[1] (feet)	Aboveground Containers[2] (feet)	
× 3.785 for L	× 304.8 for mm		
Less than 125[3, 4]	10	5[5]	None
125 to 250	10	10	None
251 to 500	10	10	3
501 to 2,000	10	25[5, 6]	3
2,001 to 30,000	50	50	5
30,001 to 70,000	50	75	(1/4 of sum of
70,001 to 90,000	50	100	diameters of
90,001 to 120,000	50	125	adjacent containers)

[1]Minimum distance for underground containers shall be measured from the pressure-relief device and the filling or liquid-level gauge vent connection at the container, except that all parts of an underground container shall be 10 feet (3048 mm) or more from a building or line of adjoining property which can be built upon.

[2]In applying the distance between buildings and ASME containers of a 125-gallon (473.2 L) or more water capacity, a minimum of 50 percent of this horizontal distance shall also apply to all portions of the building which project more than 5 feet (1524 mm) from the building wall and which are higher than the relief valve discharge outlet. This horizontal distance shall be measured from a point determined by projecting the outside edge of such overhanging structure vertically downward to grade or other level upon which the container is installed. Distances to the building wall shall not be less than those prescribed in Table 8204-A.

EXCEPTION: Installations in which the overhanging structure is 50 feet (15 240 mm) or more above the relief-valve discharge outlet.

[3]When underground multicontainer installations are comprised of individual containers having a water capacity of 125 gallons (473.2 L) or more, such containers shall be installed so as to provide access at their ends or sides to facilitate working with cranes or hoists.

[4]At a consumer site, if the aggregate water capacity of a multicontainer installation, comprised of individual containers having a water capacity of less than 125 gallons (473.2 L), is 500 gallons (1892.7 L) or more, the minimum distance shall comply with the appropriate portion of Table 8204-A, applying the aggregate capacity rather than the capacity per container. If more than one such installation is made, each installation shall be separated from other installations by at least 25 feet (7620 mm). Minimum distances between containers need not be applied.

[5]The following shall apply to aboveground containers installed alongside buildings:

1. Containers of less than a 125-gallon (473.2 L) water capacity are allowed next to the building they serve when in compliance with Items 2, 3 and 4.
2. Department of Transportation specification containers shall be located and installed so that the discharge from the container pressure-relief device is at least 3 feet (914 mm) horizontally from building openings below the level of such discharge and shall not be beneath buildings unless the space is well ventilated to the outside and is not enclosed for more than 50 percent of its perimeter. The discharge from container pressure-relief devices shall be located not less than 5 feet (1524 mm) from exterior sources of ignition, openings into direct-vent (sealed combustion system) appliances or mechanical ventilation air intakes.
3. ASME containers of less than a 125-gallon (473.2 L) water capacity shall be located and installed such that the discharge from pressure-relief devices shall not terminate in or beneath buildings and shall be located at least 5 feet (1524 mm) horizontally from building openings below the level of such discharge and not less than 5 feet (1524 mm) from exterior sources of ignition, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes.
4. The filling connection and the vent from liquid level gauges on either DOT or ASME containers filled at the point of installation shall not be less than 10 feet (3048 mm) from exterior sources of ignition, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes.

[6]This distance is allowed to be reduced to not less than 10 feet (3048 mm) for a single container of 1,200-gallon (4542 L) water capacity or less, provided such container is at least 25 feet (7620 mm) from other LP-gas containers of more than 125-gallon (473.2 L) water capacity.

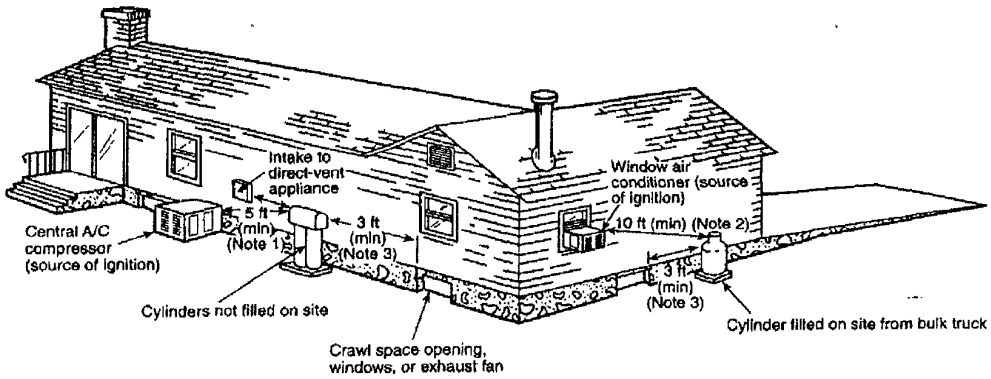
TABLE 8212-A—LOCATION OF CONTAINERS AWAITING USE OR RESALE STORED OUTSIDE OF BUILDINGS

QUANTITY OF LP-GAS STORED	DISTANCES TO A BUILDING OR GROUP OF BUILDINGS, PUBLIC WAY, OR LINE OF PROPERTY THAT CAN BE BUILT UPON (feet)
× 0.45 for kg	× 304.8 for mm
500 lb. or less	0
501 to 2,500 lb.	10[1]
2,501 to 6,000 lb.	15
6,001 to 10,000 lb.	20
Over 10,000 lb.	25

[1]Containers may be located a lesser distance to buildings when approved.

Appendix I Container Spacing

This appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.



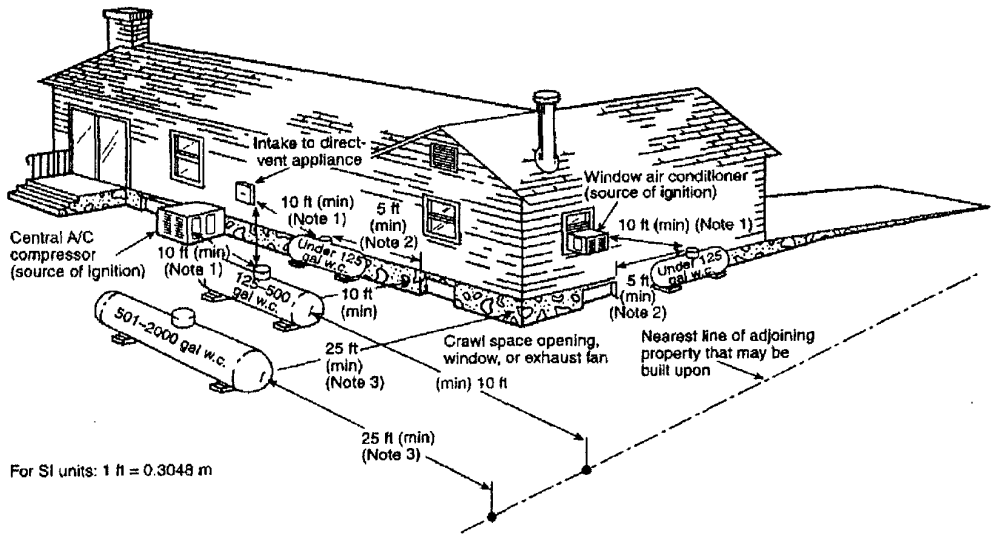
For SI units: 1 ft = 0.3048 m

Note 1: 5-ft minimum from relief valve in any direction away from any exterior source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes. Refer to 3-2.2.2(b).

Note 2: If the cylinder is filled on site from a bulk truck, the filling connection and vent valve must be at least 10 ft from any exterior source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes. Refer to 3-2.2.2(d).

Note 3: Refer to 3-2.2.2(b).

Figure I-1 Cylinders.
(This figure for illustrative purposes only; text shall govern.)



For SI units: 1 ft = 0.3048 m

Note 1: Regardless of its size, any ASME container filled on site must be located so that the filling connection and fixed maximum liquid level gauge are at least 10 ft from any external source of ignition (e.g., open flame, window A/C, compressor), intake to direct-vented gas appliance, or intake to a mechanical ventilation system. Refer to 3-2.2.2(d).

Note 2: Refer to 3-2.2.2(c)

Note 3: This distance may be reduced to no less than 10 ft for a single container of 1200 gal (4.5 m^3) water capacity or less, provided such container is at least 25 ft from any other LP-Gas container of more than 125 gal (0.5 m^3) water capacity. Refer to 3-2.2.2(e).

Figure I-2 Aboveground ASME containers.
(This figure for illustrative purposes only; text shall govern.)

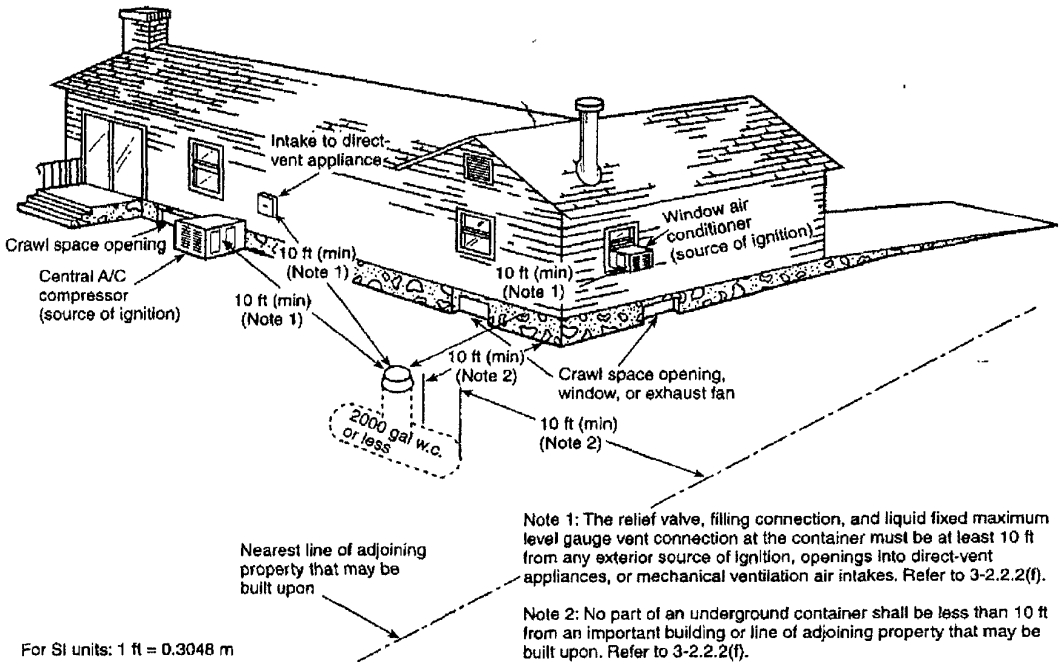


Figure I-3 Underground ASME containers.
(This figure for illustrative purposes only; text shall govern.)

Appendix J Referenced Publications

J-1 The following documents or portions thereof are referenced within this code for informational purposes only and are thus not considered part of the requirements of this code unless also listed in Chapter 12. The edition indicated here for each reference is the current edition as of the date of the NFPA issuance of this code.

J-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers,* 1998 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 1996 edition.

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines,* 1998 edition.

NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites,* 1996 edition.

NFPA 50A, *Standard for Gaseous Hydrogen Systems at Consumer Sites,* 1994 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes,* 1997 edition.

NFPA 54, *National Fuel Gas Code,* 1996 edition.

NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities,* 1995 edition.

NFPA 68, *Guide for Venting of Deflagrations,* 1994 edition.

NFPA 77, *Recommended Practice on Static Electricity,* 1993 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows,* 1995 edition.

NFPA 220, *Standard on Types of Building Construction,* 1995 edition.

NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials,* 1995 edition.

NFPA 252, *Standard Methods of Fire Tests of Door Assemblies,* 1995 edition.

NFPA 321, *Standard on Basic Classification of Flammable and Combustible Liquids,* 1991 edition.

NFPA 501C, *Standard on Recreational Vehicles,* 1996 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems,* 1997 edition.

J-1.2 API Publications. American Petroleum Institute, 2101 L St., NW, Washington, DC 20037.

API 620, *Design and Construction of Large, Welded, Low-Pressure Storage Tanks,* 1990.

API 1632, *Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems,* 1983.