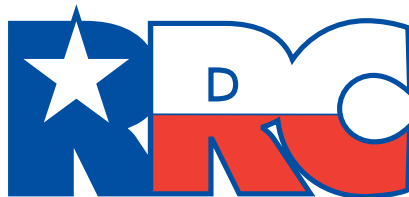


TEXAS LP-GAS EXAMINATION STUDY GUIDE

On-Road Motor Fuel



RAILROAD COMMISSION OF TEXAS

October 2008

NOTICE

This publication is intended for use in its entirety as a guide for persons preparing to take Railroad Commission LP-gas qualifying examinations. Any other use or distribution of this publication or use or distribution of any portion of this publication for any purpose whatsoever is considered by the Railroad Commission of Texas to be misuse of this publication.

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Every effort was made to ensure that this publication was accurate and up-to-date as of the date of publication. The reader is cautioned, however, about reliance on this publication or any portion thereof at any time thereafter, particularly because changes in technology are likely to occur that might make portions of this publication inaccurate and out-of-date. The Railroad Commission of Texas assumes no liability, under any circumstances, for any actions taken or omissions made in reliance of the contents of this publication, from whatever source, or any other consequences of any such reliance.

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Exam administration

Taking an examination in Austin

You may take any LP-gas qualifying examination in Austin without pre-registering (“walk-in”) on any business day, excluding holidays, from 8:00 a.m. to 12:00 noon at the AFRED Training Center. The Training Center is located at 6506 Bolm Road, at the intersection of U.S. Highway 183.

Tuesdays and Thursdays are the preferred days for walk-in examinations.

(See map to Training Center on page 16)

Taking an examination outside of Austin

You may also take any LP-gas qualifying examination at more than two dozen other locations statewide. Exam dates, times and locations are listed three months in advance on the Railroad Commission’s web site. To view a complete schedule, go to www.rrc.state.tx.us, click on “Propane/LP-Gas, Training & Certification” and select “Class/Exam Schedule.” The online schedule has links to maps showing each class and exam location.

You must register at least two business days in advance to take an examination outside of Austin. From the RRC home page at www.rrc.state.tx.us, click on “Propane/LP-Gas Training & Certification” and select “Register Now.” The web site allows you to register up to four people for an examination, a training class, or both.

When you register online, you will receive a return e-mail confirming the registration and the dates and locations of the exams. You will also receive advance notification of any changes in the examination date, time or location.

Payment for exams; LPG Form 16; ID required

You may pay your examination fee online by any major credit card. To charge to a credit card, go to www.propane.tx.gov and click on the “Pay Online” shopping cart. Be sure to print out the confirmation page in Step 6. Make a copy of the confirmation page for your records and bring a copy to the examination site. You may also pay by credit card for exams taken at the Railroad Commission’s Training Center in Austin.

For exams taken outside of Austin, you must pay the required examination fee by credit card, check or money order. Cash is not accepted at the Austin Training Center or for exams taken outside of Austin. The fee is \$40.00 for each employee-level exam. LPG Form 16, “Application For Examination,” may also be completed at the examination site. Fees are non-refundable by state law.

Examinees must also present an official state-issued driver’s license or photo ID at the exam site.

Open-book examinations

All Railroad Commission LP-gas employee-level qualifying examinations are open book.

Examinees may use a copy of NFPA 58, 2008 edition, and the Railroad Commission’s *LP-Gas Safety Rules* to take their on-road motor fuel examination.

The questions on the on-road motor fuel examination are not organized by topic as they are in this study guide.

Examination time limit

The on-road motor fuel examination must be completed within two hours after the examination is given to you, including any breaks you elect to take. The examination proctor is the official timekeeper. You must submit your examination and your answer sheet to the proctor within the two-hour limit.

Grades, reports and retakes

The minimum passing grade is 75 percent on all LP-gas examinations.

All examinations administered at the Training Center in Austin are graded on-site, and examinees are immediately informed of the results. If you fail an examination that you took in Austin, you may retake that same examination only one additional time during a business day. Any subsequent examination must be taken on another business day, unless approved by the Commission.

Exams taken at a remote site are graded as soon as possible, and the results of the examination are reported within 10 working days.

If you pass an examination, the Railroad Commission will issue you a blue certification card within 10 working days. You will be notified by letter if you fail an examination.

Contacts

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LP-GAS EXAMINATION STUDY GUIDE: EMPLOYEE-LEVEL ON-ROAD MOTOR FUEL

Who should use this guide?

You should use this guide if you plan to take the Railroad Commission's employee-level qualifying examination to perform LP-gas on-road motor-fuel activities. The on-road motor fuel examination qualifies you to install LP-gas motor-fuel containers, cylinders, and LP-gas motor fuel systems and to replace container valves on motorized vehicles licensed to operate on public roadways.

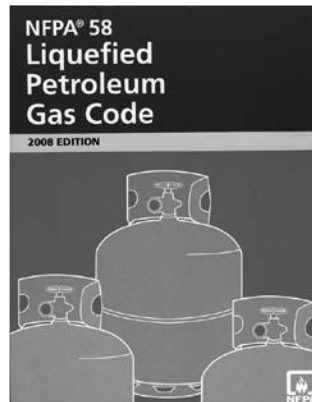
The on-road motor-fuel examination does not authorize you to fill LP-gas motor or mobile fuel containers.

What books do I need?

This examination tests your knowledge of the laws and standards that apply to LP-gas on-road motor fuel activities in Texas. These laws and standards are found in two books:

LP-Gas Safety Rules (Texas Railroad Commission, February 2008)

NFPA 58: *Liquefied Petroleum Gas Code* (National Fire Protection Association, 2008)



Where do I get these books?

You may download the Railroad Commission's *LP-Gas Safety Rules* free online at www.propane.tx.gov/publications/lpg_safetyrules.pdf. You may also buy a printed copy of the book for \$7.00, tax included, by calling the Railroad Commission's publications office at (512) 463-6747. Printed copies of NFPA 58 are available for purchase from the Texas Propane Gas Association by calling (800) 392-0023. You may also order NFPA manuals online at www.nfpa.org; click on "Codes and Standards."

Sections and topics

Before you take this examination you should know the definitions on pp. 6-7 of this study guide and the contents of the sections of the codes and standards listed below.

The actual examination questions may not cover all of the listed sections and topics.

NOTE: Section (§) 9.402(c) of the *LP-Gas Safety Rules* states, “Container capacity, piping system, and appliance exceptions. The Commission does not adopt language in any NFPA rule, chart, figure, or table pertaining to any LP-gas container having a water capacity of one gallon (4.2 pounds LP-gas capacity) or less, or to any LP-gas piping system or appliance attached or connected to such a container.”

NFPA 58 (2008)

§11.3	Containers
§11.4	Container Appurtenances
§11.5	Carburetion Equipment
§11.6	Piping, Hose and Fittings
§11.7	Installation of Containers and Container Appurtenances
§11.8	Installation in the Interior of Vehicles
§11.9	Piping and Hose Installation
§11.10	Equipment Installation
§11.11	Marking
§11.14	Engine Installation Other Than on Vehicles
§11.15	Garaging of Vehicles

Terms and definitions

As an on-toad motor-fuel technician, you need to know the terms, definitions, facts, rules and procedures relating to propane’s physical characteristics and to the operation of LP-gas equipment installed on motor vehicles.

NOTE: The list below is not exhaustive. You are responsible for knowing all the rules and standards that apply to the LP-gas activities you will perform, as well as all the rules and standards highlighted in this guide.

NFPA 58 (2008)

NOTE: Informal terms that are sometimes used in the propane industry instead of formal technical terms are given in brackets.

Container. Any vessel, including cylinders, tanks, portable tanks, and cargo tanks, used for the transporting or storage of LP-gases. §3.3.13

Container Appurtenances. Devices installed in container openings for safety, control, or operating purposes. §3.3.14

DOT. U.S. Department of Transportation. §3.3.21

Excess-Flow Valve (or Excess-Flow Check Valve) [“check valve”]. A valve designed to close when the liquid or vapor passing through it exceeds a prescribed flow rate. §3.3.74.2

Fixed Liquid Level Gauge. A liquid level indicator that uses a positive shutoff vent valve to indicate that the liquid level in a container being filled has reached the point at which the indicator communicates with the liquid level in the container. §3.3.29.1

Fixed Maximum Liquid Level Gauge [“outage gauge,” “spitter valve,” “spew gauge”]. A fixed liquid level gauge that indicates the liquid level at which the container is filled to its maximum permitted filling limit. §3.3.29.2

Liquefied Petroleum Gas [“LP-gas”]. Any material having a vapor pressure not exceeding that allowed for commercial propane, and that is composed predominantly of the following hydrocarbons, either by themselves or as mixtures: propane, propylene, butane (normal butane or isobutane), and butylenes. §3.3.36

NFPA. National Fire Protection Association. §3.3.47

Pressure Relief Device [“popoff valve”]. A device designed to open to prevent a rise of internal pressure in excess of a specified value due to emergency or abnormal conditions. §3.3.58

Sources of Ignition. Devices or equipment that, because of their modes of use or operation, are capable of providing sufficient thermal energy to ignite flammable LP-gas vapor-air mixtures when introduced into such a mixture or when such a mixture comes into contact with them, and that will permit propagation of flame away from them. §3.3.67

Water Capacity. The amount of water at 60°F required to fill a container. §3.3.79

Key topics

NOTE: The list below is not exhaustive. You are responsible for knowing all the rules or standards that apply to the LP-gas activities you will perform, as well as the rules and standards highlighted in this guide.

As you study the applicable codes and standards, pay special attention to the facts, rules and procedures related to the following key topics. Then, when you take the examination, read each question very carefully.

1. Container: Design, Capacity, Construction, Repair and Name Plate

ASME engine fuel containers constructed on or after April 1, 2001 must have a maximum allowable working pressure of 312 psig. NFPA 58, 11.3.2.1

ASME containers installed in enclosed spaces on vehicles, and all engine fuel containers for vehicles, industrial trucks, buses (including school buses), recreational vehicles, and multipurpose passenger vehicles, must be constructed with a maximum allowable working pressure of at least 312 psig. NFPA 58, §11.3.2.2

Field welding is permitted only on saddle plates, lugs, pads, or brackets that are attached to the container by the container manufacturer. NFPA 58, §11.3.3.3

The maximum water capacity of an individual LP-gas container installed on a passenger vehicle is 200 gallons. NFPA 58, §11.3.5.1

The openings on a container or valves connected to a container must be labeled to designate whether they communicate with the vapor space or with the liquid space. NFPA 58, 11.3.6.3

Labels are not required on openings for pressure relief valves and gauging devices. NFPA 58, §11.3.6.4

Engine fuel containers constructed of steel must be painted or powder coated to minimize corrosion. Stainless steel cylinders are not required to be painted or powder coated. NFPA 58, §11.3.7

SAMPLE QUESTION

Engine fuel containers constructed of steel must be _____ coated to minimize corrosion.

- A. Nickel
- B. Painted or powder
- C. Anodized
- D. Any of the above
- E. Fiberglass

Answer: B

2. Container Appurtenances (Valves and Fittings)

Container appurtenances subject to pressures in excess of 125 psig must be rated for a pressure of at least 250 psig. NFPA 58, §11.4.1.2

Manual shutoff valves must be designed to provide positive closure under service conditions and must be equipped with an internal excess-flow check valve designed to close automatically at the rated flows of vapor or liquid specified by the manufacturers. NFPA 58, §11.4.1.3

Double backflow check valves must:

- (1) Be of the spring-loaded type,
 - (2) Close when flow is either stopped or reversed, and
 - (3) Be installed in the fill opening on the container for either remote or direct filling.
- NFPA 58, §11.4.1.4

Containers must be fabricated so they can be equipped with a fixed maximum liquid level gauge as follows:

- (1) The fixed maximum liquid level gauge must be capable of indicating the maximum permitted filling level in accordance with 7.4.2.2.
 - (2) Fixed maximum liquid level gauges in the container must be designed so the bleeder valve maximum opening to the atmosphere is not larger than a No. 54 drill size.
 - (3) The container fixed maximum liquid level gauge opening and the remote bleeder valve opening must not be larger than a No. 54 drill size where the bleeder valve is installed at a location remote from the container.
- NFPA 58, §11.4.1.5

Permanently mounted ASME containers must be equipped with a valve or combination of valves in the liquid outlet connection that has automatic closure features, manual shutoff and excess-flow. NFPA 58, §11.4.1.8

SAMPLE QUESTION

Container appurtenances subject to pressures in excess of _____ psig must be rated for a pressure of at least _____ psig. NFPA 58, §11.4.1.2

- A. 125 / 250
- B. 135 / 273.1
- C. 150 / 312
- D. 165 / 415

Answer: A

3. Piping, Hose, and Fittings

Pipe must be wrought iron or steel (black or galvanized), brass, or copper and must comply with the following:

- (1) Wrought-iron: ASME B36.10M, *Welded and Seamless Wrought Steel Pipe*
- (2) Steel pipe: ASTM A 53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless*
- (3) Steel pipe: ASTM A 106, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*
- (4) Brass pipe: ASTM B 43, *Standard Specification for Seamless Red Brass Pipe, Standard Sizes*
- (5) Copper pipe: ASTM B 42, *Standard Specification for Seamless Copper Pipe, Standard Sizes*. NFPA 58, §11.6.1.1

Steel tubing may be used for a motor fuel application, if the tubing complies with ASTM A 539, *Standard Specification for Electric-Resistance-Welded Coiled Steel Tubing for Gas Fuel Oil Lines*. NFPA 58, §11.6.1.2

Copper tubing used for LP-gas motor-fuel applications must comply with Type K or L ASTM B 88, *Specification for Seamless Copper Water Tube*, or ASTM B 280, *Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*. NFPA 58, §11.6.1.2(3)(a)(b)

SAMPLE QUESTION

Which of the following pipe materials may be used in LP-gas engine fuel system installations?

- A. Wrought iron
- B. Steel
- C. Brass or copper
- D. All of the above
- E. A or C only

Answer: D

4. Installation of Containers and Container Appurtenances (Such as Valves and Fittings)

Containers located less than 18 inches from the exhaust system, the transmission, or a heat-producing component of an internal combustion engine must be shielded by a vehicle frame member or by a noncombustible baffle with an air space on both sides of the frame member or baffle. NFPA 58, §11.7.1.3

After an LP-gas motor/mobile fuel container is permanently installed on a vehicle, the container markings must be readable directly or with a portable lamp and mirror. NFPA 58, §11.7.1.4

Container valves, appurtenances, and connections must be protected in one of the following ways:

- (1) By locating the container so that parts of the vehicle furnish the necessary protection,
- (2) By the use of a fitting guard furnished by the manufacturer of the container, or
- (3) By other means to provide equivalent protection. NFPA 58, §11.7.2.2

Containers must not be mounted directly on roofs or ahead of the front axle or beyond the rear bumper of the vehicle. NFPA 58, §11.7.3.1

Containers installed behind the rear axle and extending below the frame must comply with 11.7.3.7 or shall not be lower than the lowest of the following points and surfaces:

- (1) Containers must not be lower than the lowest point of a structural component of the body, engine, transmission (including clutch housing or torque converter housing, as applicable) forward of the container.
- (2) Containers must not be lower than lines extending rearward from each wheel at the point where the wheels contact the ground directly below the center of the axle to the lowest and most rearward structural interference. NFPA 58, §11.7.3.6

An LP-gas container substituted for the fuel container installed by the original vehicle manufacturer must either fit within the original fuel container's space or must comply with other NFPA 58 installation requirements. NFPA 58, §11.7.3.7

The main liquid and vapor shutoff valves on an LP-gas motor/mobile fuel container must be readily accessible without the use of tools. NFPA 58, §11.7.4.3

The pressure relief valve discharge from fuel containers on vehicles other than industrial and forklift trucks must:

- (1) Be directed upward or downward within 45 degrees of vertical.
- (2) Not directly impinge on the vehicle fuel container(s), the exhaust system, or any other part of the vehicle.
- (3) Not be directed into the interior of the vehicle. NFPA 58, §11.7.5.1

Where the pressure relief valve discharge must be piped away, the pipeaway system must have a breakaway adapter.

- (A) The breakaway adapter must have a melting point of not less than 1500°F.
- (B) The adapter either must be an integral part of the pressure relief valve or must be a separate adapter attached directly to the pressure relief valve.

- (C) The pipeaway system must have a length of nonmetallic hose.
- (D) Hose that is used to pipe away the relief valve discharge must be as short as practical and able to withstand the downstream pressure from the relief valve in the full open position and be fabricated of materials resistant to the actions of LP-gas.
- (E) When hose is used to pipe away the relief valve discharge on containers installed on the outside of a vehicle, the breakaway adapted and attached fitting must deflect the discharge upward or downward within 45° of vertical and must meet the other requirements of 11.7.5.1 without the hose attached. If an additional fitting is necessary, the fitting must have a melting point not less than 1500°F.
- (F) The pipeaway system must have a protective cover to minimize the possibility of introducing water or dirt into either the relief valve or into the discharge system.
- (G) No portion of the system may have an internal diameter less than the internal diameter of the breakaway adapter.
- (H) The breakaway adapter must be threaded for direct connection to the relief valve and must not interfere with the operation of the relief valve, or must be an integral part of the pressure relief valve and must break away without impairing the function of the relief valve.
- (I) The pressure relief valve pipeaway system connection must be mechanically secured, must not depend on adhesives or sealing compounds, and must not be routed between a bumper system and the vehicle body.
- (J) Where a pipeaway system is not required, the pressure relief valve must have a protective cover in accordance with 11.7.5.2. NFPA 58, §11.7.5.2

SAMPLE QUESTION

Containers located less than _____ inches from the exhaust system, the transmission, or a heat-producing component of an internal combustion engine must be shielded by a vehicle frame member or by a noncombustible baffle with an air space on both sides of the frame member or baffle.

- A. 16
- B. 12
- C. 10
- D. 8
- E. None of the above

Answer: E

5. Installation in the Interior of Vehicles

Fuel containers must be installed and fitted so that no gas from fueling and gauging operations can be released inside of the passenger or luggage compartments, by permanently installing a remote filling device (single or double backflow check filler valve) and a fixed maximum liquid level gauging device to the outside of the vehicle. NFPA 58, §11.8.1.4

The container and its appurtenances must be installed in an enclosure that is securely mounted to the vehicle.

(A) The enclosure must be gastight with respect to driver or passenger compartments and to any space containing radio transmitters or other spark-producing equipment.

(B) The enclosure must be vented to the outside of the vehicle. NFPA 58, §11.8.1.2

The container appurtenances and their connections must be installed in an enclosure that is securely mounted on the container.

(A) The appurtenances and their connections must be installed in an enclosure that is gas-tight with respect to the driver or passenger compartments or with any space carrying radio transmitters or other spark-producing equipment.

(B) The enclosure must be vented to the outside of the vehicle. NFPA 58, §11.8.1.3

6. Pipe and Hose Installation

The piping system must be designed, installed, supported, and secured in such a manner as to minimize damage due to expansion, contraction, vibration, strains, and wear. NFPA 58, §11.9.1.1

Piping (including hose) must be installed in a protected location. NFPA 58, §11.9.1.2

If piping is installed outside the vehicle, it must be under the vehicle and below any insulation or false bottom. NFPA 58, §11.9.1.3

Fastenings or other protection on the piping system must be installed to prevent damage due to abrasion or vibration. NFPA 58, §11.9.1.4

At each point where piping passes through sheet metal or a structural member, a rubber grommet or equivalent protection must be installed to prevent chafing. NFPA 58, §11.9.1.5

Fuel line piping that must pass through the floor of a vehicle must be installed to enter the vehicle through the floor directly beneath or adjacent to the container. NFPA 58, §11.9.1.6

Exposed parts of the piping system must be of corrosion-resistant material or must be protected to minimize exterior corrosion. NFPA 58, §11.9.1.9

A vehicle's LP-gas engine fuel piping system, including hose, must be tested and proved free of leaks at not less than the normal operating pressure. NFPA 58, §11.9.1.10

In an LP-gas engine fuel system, a hydrostatic relief valve is required to be installed in each section of piping (including hose) in which liquid LP-gas can be isolated between shutoff valves. NFPA 58, §11.9.2.1

SAMPLE QUESTION

Fastenings or other protection on the piping system must be installed to prevent damage due to _____.

- A. Collisions
- B. Corrosion
- C. Abrasion or vibration
- D. All of the above
- E. A or B

Answer: C

7. Equipment Installation

Approved automatic pressure-reducing equipment must be installed between the fuel supply container and the carburetor. NFPA 58, §11.10.1.2(2)

8. Marking

Each on-road general-purpose vehicle powered by LP-gas must be identified with a weather-resistant diamond-shaped label bearing the word "Propane" and located on the lower right rear of the vehicle (on the trunk lid of a vehicle so equipped). NFPA 58 §11.11.1

9. Garaging of Vehicles

Where vehicles with LP-gas engine fuel systems mounted on them, and general-purpose vehicles propelled by LP-gas engines, are stored or serviced inside garages, the following conditions must apply:

- (1) The fuel system must be leak-free.
- (2) The container must not be filled beyond the limits specified in Chapter 7.
- (3) The container shutoff valve must be closed when the vehicle or the engine is being repaired, except when the engine is required to operate. Containers equipped with an automatic shutoff valve as specified in 11.4.1.8 satisfy this requirement.
- (4) The vehicle must not be parked near sources of heat, open flames, or similar sources of ignition, or near inadequately ventilated pits. NFPA 58, §11.15

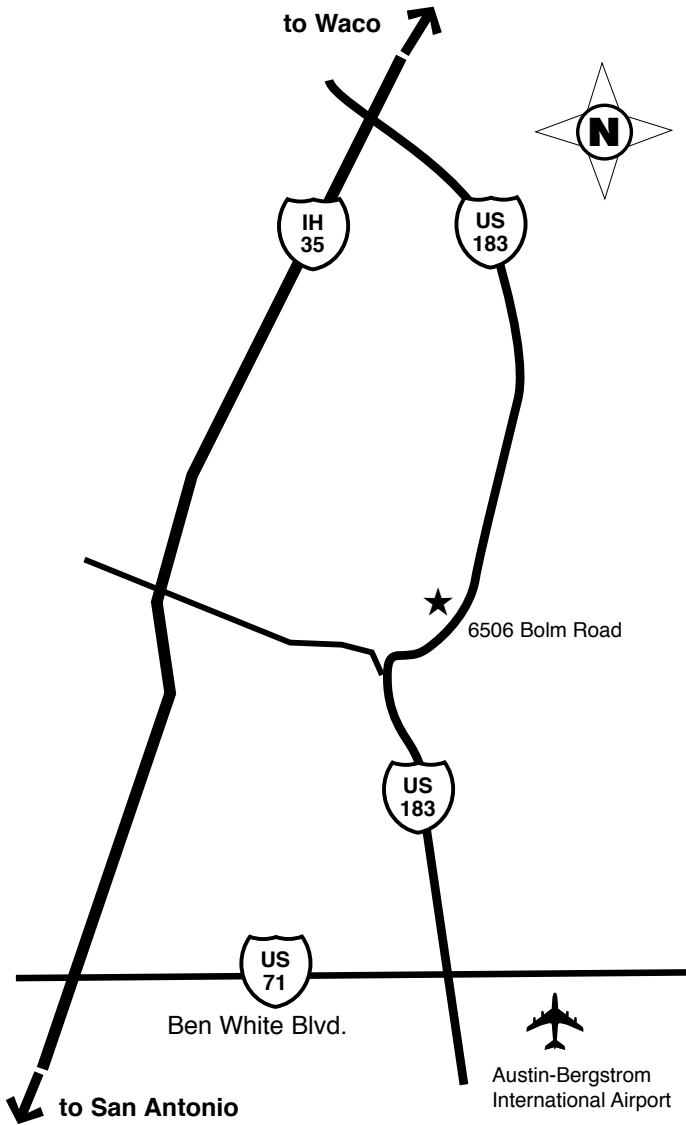
SAMPLE QUESTION

A vehicle propelled by LP-gas must not be parked near which of the following?

- A. Sources of heat, open flames, or similar sources of ignition
- B. Near unventilated pits.
- C. Trees
- D. All of the above
- E. A and B only

Answer: E

RRC/AFRED TRAINING CENTER 6506 BOLM RD., AUSTIN



DIRECTIONS TO RRC ALTERNATIVE FUELS TRAINING CENTER, AUSTIN

Entering Austin on I-35 going south:

Take exit 239/240 for Hwy 183 South/ Austin-Bergstrom International Airport. Stay on 183 past Cameron Road, U.S. 290, Manor Road, Loyola Lane, and Techni-Center Drive. Proceed down the hill on 183 and take the Bolm Road exit. At the light, turn right onto Bolm Road. The Training Center is on the northwest corner of 183 and Bolm Road. Enter through the double glass doors on the south side of the building.

Entering Austin on I-35 going north:

Take exit 230 for Texas Hwy. 71/Ben White Blvd. Turn right toward Bastrop. Stay on 71 for approximately 4.3 miles. Exit onto U.S. 183 North. Stay on 183 past the Colorado River bridge. Stay in the right lane and take the Bolm Road exit. Turn left at the light onto Bolm Road and go under the overpass. The Training Center is on the northwest corner of 183 and Bolm Road. Enter through the double glass doors on the south side of the building.