

# BUILD WITH PROPANE GUIDE

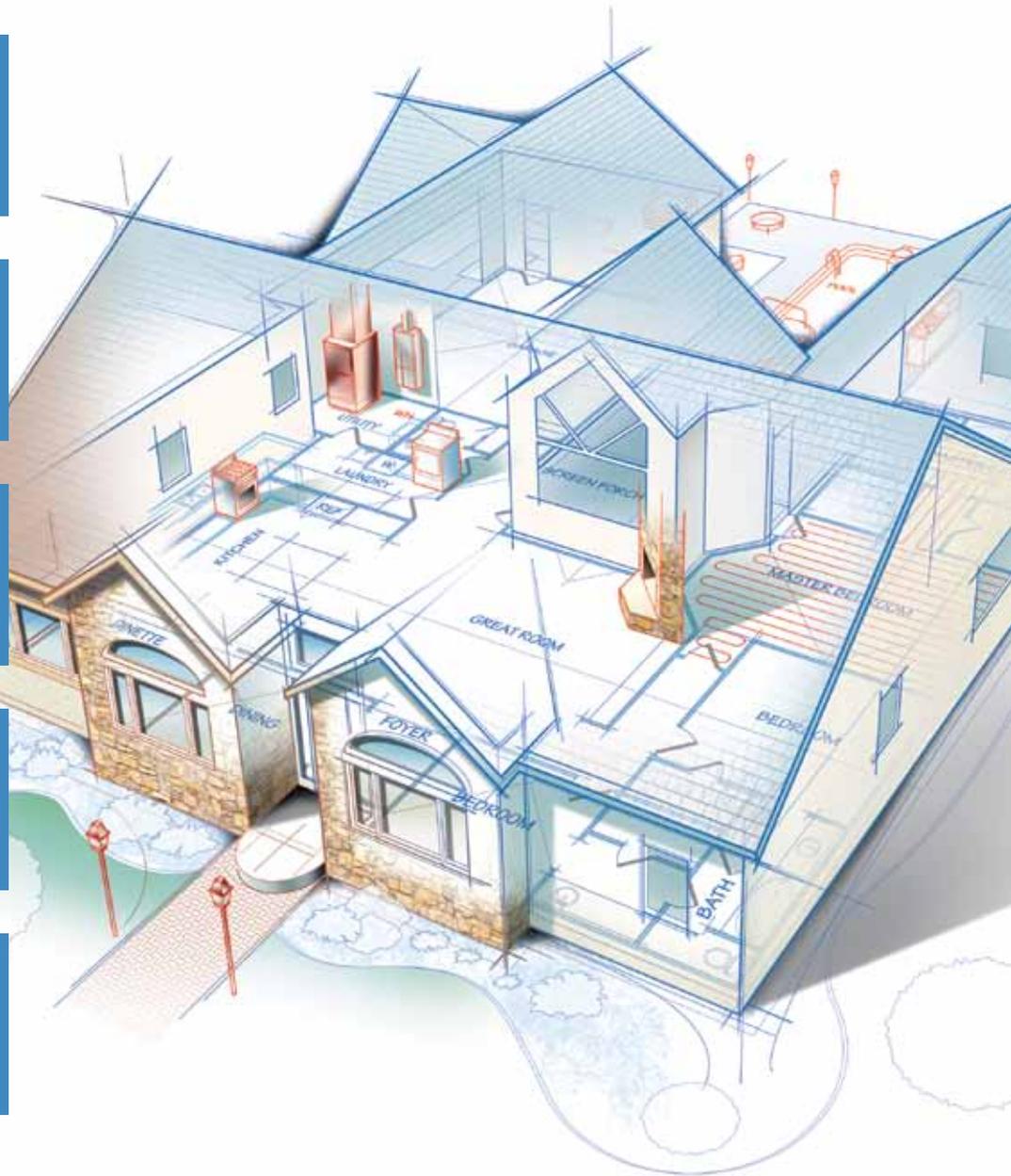
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**PROPANE**  
EXCEPTIONAL ENERGY®



My father spent part of his career as a labor manager at an engineering firm that specialized in construction support for oil and natural gas development expanding at that time all along the Gulf Coast. On my 16th birthday, Dad gave me a hard hat, work gloves, and a pair of steel-toed boots. The following weekend, he put me to work on a labor crew building a gathering line from a recently completed well to a natural gas processing plant.

That was my first experience working in the energy sector. I've been thinking about energy ever since — that's 45 years now, and counting.

Today, as CEO of the Propane Education & Research Council (PERC), I've been proud to oversee propane's growing footprint as a safe, clean, and domestically produced energy source. While PERC is an umbrella organization that funds research on propane applications in agriculture, industry, and transportation, we're also fully invested in driving innovative propane applications for new home construction, remodeling, and green building projects. The Propane Energy Pod, an integrated and energy-efficient approach to new home construction, is one of PERC's latest innovations, and you can read more about it on pages 4-5 of this guide.

Over the last several years, PERC has invested millions of dollars in research, videos, training courses, and guides such as this that focus on propane applications, including new technologies, installation, maintenance, servicing, and safety. Our goal is to provide the most current propane information to construction professionals like you. We hope this investment will go a long way toward helping you continue to break new ground and incorporate clean, efficient propane into your projects.

Roy Willis  
President and Chief Executive Officer



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# Exceptional Builders Deserve Exceptional Energy

Congratulations on considering propane for your next new home construction, remodeling, or green building project. The information in this book is designed to help you learn more about propane's versatility in fueling both traditional appliances and innovative applications. Additionally, this guide provides a wide range of information on the environmental and energy-efficiency benefits that propane delivers.

# Exceptional Energy, Exceptionally Safe



## The Basics

There are a few fundamentals you and your clients should know about propane:

**It's clean energy.** Propane gives off less than half of the greenhouse gas emissions that electricity does, considering that most of the nation's electric power is fueled by coal-fired power plants. In fact, by using propane, you can earn points under green building programs, such as the National Green Building Standard™ and Leadership in Energy and Environmental Design (LEED) for Homes.

**It reduces energy costs.** Propane appliances are typically far more efficient than their electric counterparts. For example, an Energy Star-qualified propane tankless water heater can save your customers up to 50 percent on their energy bills, when compared with the costs of operating a standard electric tank-style heater.

**It supports modern lifestyles.** Propane provides your customers with the ability to choose first-rate amenities regardless of where they live. Propane space heating is available in both forced-air and hydronic forms, and it doesn't depend on the availability of natural gas or electricity. And, propane generators can provide peace of mind for customers in locations that experience rolling blackouts or frequent storm-related power outages.

**It's builder-friendly.** With propane, you're not at the mercy of a public utility. And with the option of aboveground or underground storage tanks, propane professionals can install and connect home appliances and other applications on your schedule. Propane also provides job-site flexibility by providing gas energy for portable generators and temporary construction heaters.

Each year, some 12 million U.S. households tap propane's exceptional energy to handle everyday tasks, such as heating homes, cooking meals, and drying clothes. Why are more of your new home construction and remodeling peers talking up the benefits of propane with customers? Consider the following:

**It's domestically produced.** Propane is an efficient, clean byproduct of oil refining and natural gas processing. Over 95 percent of domestic propane supplies used in the United States are produced in North America, and a transportation network that includes pipelines, rail, and trucks distributes it to more than 6,000 propane retailers across the country. That makes it a readily available fuel that contributes to U.S. jobs and economic growth.

**It's designed for safety.** Typically used in gas form, propane is stored and transported as a liquid under pressure. Propane is nontoxic and odorless so processors add a chemical odorant (ethyl mercaptan) to propane to help users detect leaks via an easy-to-identify "rotten egg" smell.

**It's installed by pros with top-quality training.** The propane industry's Certified Employee Training Program (CETP) ensures that propane installation and service personnel are well qualified to handle even the most challenging tasks. In addition, propane is a well-regulated industry that follows the codes and standards set by the National Fire Protection Association (NFPA), Department of Transportation (DOT), Department of Energy (DOE), and various state and local regulatory bodies. For more information, go to [propanesafety.com](http://propanesafety.com).



## CO<sub>2</sub> Emissions National Average

(metric tons per billion Btu consumed)

Propane	Heating Oil	Electricity
63	73	175

Source: Developed from U.S. EPA data, taken as average of 50 states and Washington, D.C.

## Typical Propane Consumption (Gallons/Year)

Climate Region	High Efficiency Space Heating	High Efficiency Water Heating	Cooking	Clothes Dryer	High Efficiency Direct-Vent Fireplace	TOTAL
Warm	22-79	112-119	~17	~28	~16	194-258
Moderate	71-433	124-153	~17	~28	24-31	268-662
Cold	620-790	490-620	~17	~28	39-55	991-1844

Source: Newport Partners 2011 Energy and Environmental Analysis of Propane Energy Pod Homes. Complete study available at [buildwithpropane.com](http://buildwithpropane.com) > Resources > Propane Energy Pod. Findings are based on climate averages across 16 locations developed through building energy simulations. Assumptions include a 2,400-square-foot home built to the 2009 IECC, and the use of high-efficiency propane heating and water heating equipment, moderate efficiency propane direct-vent fireplace, and standard efficiency propane cooktop, oven, and clothes dryer. Warm and moderate climates were assumed to use hybrid air source heat pumps with propane furnace back-ups for space heating.

# The Propane Energy Pod — It's a Whole New Bundle of Energy

## Key Benefits of the Propane Energy Pod

**Efficient Systems.** The Propane Energy Pod uses highly efficient appliances for a home's most important energy applications. This means you can meet your most demanding customers' expectations with style and ease.

**Green Profile.** When chosen in place of oil or electricity, the Propane Energy Pod lowers a home's overall carbon footprint — often as much as removing the emissions of one car for a year.

**Energy Rebates.** The Propane Energy Pod enables your customers to reap maximum benefits from federal, state, and local energy rebate programs. In addition, it can help you qualify for a federal energy-efficiency tax credit of up to \$2,000. See **page 23** for additional rebate information.

**On-Site Energy.** When your customers tap into the Propane Energy Pod, they can claim a unique feature: Clean, reliable energy that's on site. That's especially true if a customer chooses to add a propane standby generator, which protects them from unexpected power outages.

You'd like to grow sales, and your customers want to reduce their energy bills. The Propane Energy Pod's integrated, research-based solution demonstrates propane's exceptional ability to do both.

Tailored for each major U.S. climate zone, the Propane Energy Pod incorporates five vital applications — space heating, water heating, cooking, fireplaces, and clothes drying — into an energy-efficient new home package. When chosen as the primary energy source, the Propane Energy Pod delivers measurable value to new home construction packages via top-quality mechanical systems and appliances.



## Keeping Score: The Propane Energy Pod vs. Standard Homes

Newport Partners LLC, an independent third-party research firm, conducted careful modeling analysis of home energy consumption and CO<sub>2</sub> emissions for two homes — one built following the Propane Energy Pod model and one built with standard appliances and systems. The results suggest that Propane Energy Pod homes achieve measurable energy and carbon savings over those built with conventional systems. Below is a sample result comparing the Propane Energy Pod home with a standard home with applications that run on electricity.

**The Propane Energy Pod vs. Standard Homes**

3,600-Square-Foot Home (cold climate)	Propane Energy Pod Home	Standard Home	Annual Savings
Energy Costs	\$4,943	\$5,409	\$466
Annual Emissions (metric tons CO <sub>2</sub> )	22.5	33.8	11.3
Home Energy Rating System (HERS) Index	65	83	The lower the score, the more efficient the home.

Source: Newport Partners LLC

## Put the Propane Energy Pod to Work for You

By incorporating the Propane Energy Pod solution in your plans, you can clearly demonstrate the cost, efficiency, and environmental benefits propane delivers over other energy sources. For more information on the research study results, go to [buildwithpropane.com/energypod](http://buildwithpropane.com/energypod). You'll find relevant training courses, as well as an Interactive Propane Energy Pod Tool.

## Use the Home Energy Rating System (HERS) to Gain Referrals

If you're looking for a new way to showcase the value of your home construction over competitors', consider applying the Home Energy Rating System (HERS) to your projects. Developed by the Residential Energy Services Network (RESNET), the HERS Index contrasts a Propane Energy Pod home against a built-to-code reference home. The index also allows comparisons of different home designs and specifications. The HERS measure works across various climate zones and is used by builders to differentiate their high-performance homes from new and existing home competition.

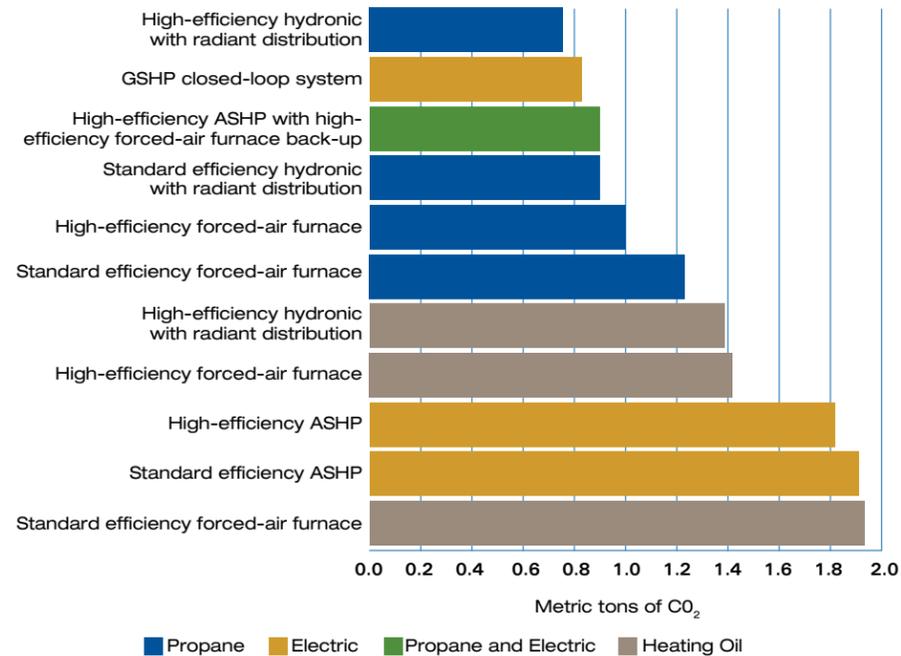
To try the Interactive Propane Energy Pod Tool, which shows HERS Index ratings of different homes, go to [buildwithpropane.com/energypod](http://buildwithpropane.com/energypod).

# Creating Exceptional Comfort and Efficiency



If you're a builder or remodeler, here's a hot marketing message: Propane is one of the most versatile space-heating fuels on the market. Propane home-heating systems can be configured as central or zone, forced air or radiant. Plus, propane zone heaters, fireplaces, and hearth stoves provide your customers with plenty of choices for their supplemental space-heating needs. Best of all, propane systems can help slash energy costs and greenhouse gas emissions in both new construction and remodeling applications.

## Greenhouse Gas Emissions: Residential Space Heating



Source: Newport Partners 2010 Heating Study. Complete study available at [buildwithpropane.com](http://buildwithpropane.com) > Resources > Comparative Heating Study. For comparison purposes, greenhouse gas emissions results are normalized based on the emissions of a high-efficiency propane forced-air furnace. Lower numbers represent lower greenhouse gas emissions. Findings are national averages based on computer energy simulations of a typical new home across 16 locations in warm, moderate, and cold climate zones.

### FREE ONLINE TRAINING: A Comparative Analysis of Residential Heating Systems

**Propane. Train Right. Build Better.** Learn how to compare heating systems in terms of initial costs, operating costs, carbon emissions, and payback periods. Go to [buildwithpropane.com/training](http://buildwithpropane.com/training) or download the complete Comparative Heating Systems Study at [buildwithpropane.com](http://buildwithpropane.com) > Resources > Comparative Heating Study.

Consider the following propane applications for your next project. Many are manufactured as Energy Star-qualified models:

**Propane furnaces.** These high-performing furnaces heat air to 120 degrees Fahrenheit — 25 degrees hotter than typical electric heat pumps for maximum comfort. Like natural gas units, a propane furnace uses a fan or blower to move heated air through a home's ductwork. Energy Star-rated models incorporate DC-current motors and multistage burners, making them up to 25 percent more efficient than standard gas furnaces. With a typical operating life of 15 years or more, a high-efficiency propane furnace can pay for its total installed cost through energy and operating savings (when compared with a standard gas furnace).

**Radiant floor hydronic heating.** Here, a propane water heater or boiler heats the water that a pump forces through an underfloor tubing system. Since water retains heat far longer than air, the hot-water boiler fires less frequently than a forced-air furnace, making radiant systems a highly efficient heating choice. And, you can zone in-floor radiant heat with great precision.

**Fireplaces and hearth stoves.** Propane fireplaces are an effective complement to home heating. They can be nearly 90 percent efficient and enable homeowners to heat larger areas within a home. On the other hand, traditional wood-burning open fireplaces can lose as much as 90 percent of their heat right up the chimney — robbing a home of its already-heated air.

Propane fireplaces offer flexible design and cost-effective installation. The ability to direct-vent propane fireplaces means no chimney is needed. They're comfortable, convenient, and produce ambience and comfort within seconds without the ash, soot, or smoke of a wood-burning fireplace. These are major environmental problems in some parts of the country.

**Ductless zone heaters.** Propane zone heaters, which can be used in homes, garages, and outbuildings, come freestanding or wall-mounted. You can fit these units with thermostats and blowers, providing reliable spot heat even during electrical outages.

### Key Benefits of Propane Fireplaces

**Flexible design and cost-effective installation.** The ability to direct-vent propane fireplaces (no chimney needed) and their low clearance requirements offer design flexibility and installation simplicity.

**Energy efficient and budget-friendly.** Vented propane fireplaces have efficiency levels approaching 90 percent. On the other hand, traditional wood-burning open fireplaces can lose as much as 90 percent of their heat from the chimney — robbing a home of its already-heated air.

**An effective complement to home heating.** Propane fireplaces are available in high efficiencies (nearly 90 percent) that let them heat larger areas within a home, making them an effective complement to a home's main heating system. There's little or no drop-off in efficiency when using the fireplace. Plus, there's the added benefit of fireplace ambience.

**Easy on the environment.** Unlike a wood-burning fireplace, a propane fireplace doesn't produce ash, soot, or smoke — which are major environmental problems in some parts of the country.

**Comfortable and convenient.** Whenever a homeowner wants the ambience, comfort, and heating from a propane fireplace, it is just seconds away.

# Water Heating That Won't Drain the Pocketbook

While most new construction or remodeling customers are likely concerned about rising utility costs, most may not realize how much water heating affects the total bill.

According to the U.S. Department of Energy, about 20 percent of home energy costs result from heating water for showers, dishwashers, and other basic tasks.

How can you help customers combat rising hot-water costs? In a word: Propane. When it comes to water heaters, electricity simply can't compete with propane. In fact, over 350 models of propane tankless water heaters qualify for the federal Energy Star program, while most electric models do not qualify. Looking for more selling points? Propane tankless models cost up to 50 percent less to operate and can save up to one ton of greenhouse gas emissions each year when compared with standard electric-tank-type water heaters. That's a win for customer pocketbooks and for the environment.

Because a tankless water heater is so compact, it fits easily near existing hot-water distribution points, which saves both water and energy. Or you can install a hot-water distribution system — such as Metlund® D'MAND®. Find out more at [gothotwater.com](http://gothotwater.com).

## Fixture Flow Rate

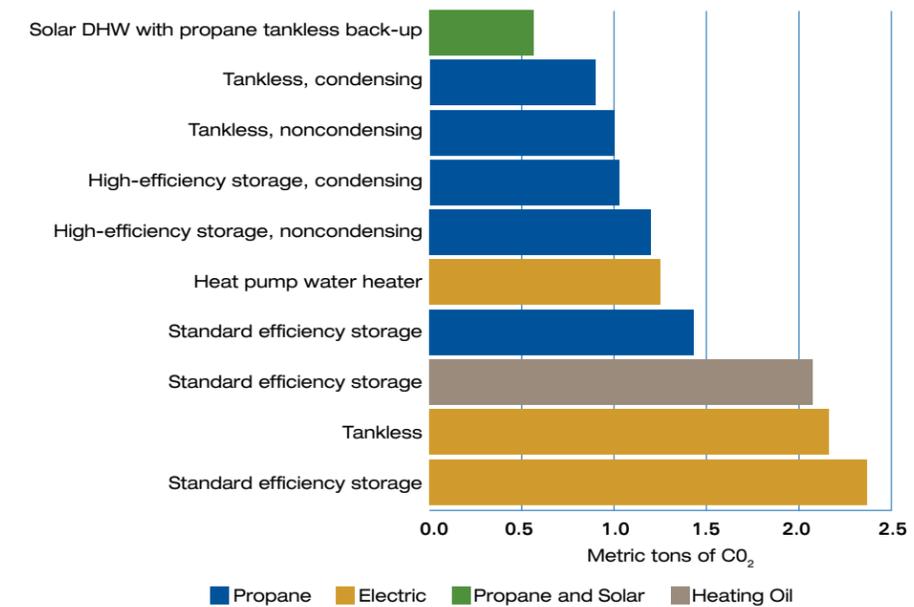
To select the right tankless unit, add up the gallons per minute estimated for the customer's household during peak demand. Then, match it to the EnergyGuide label on the water heater.

Fixture	Gallons Per Minute
Bathroom Sink	1.0
Bathtub	4.0–5.0
Shower	2.5
Multiple Showerheads	2.5–12.0
Kitchen Sink	1.5
Dishwasher	1.5
Washing Machine	2.0

Source: [tanklesswaterheatersdirect.com](http://tanklesswaterheatersdirect.com). Flow rate for customers' appliances and fixtures will vary due to differences in local water pressure, as well as appliance and fixture performance.

Propane meets or exceeds the performance of other energy choices for residential water heating.

## Greenhouse Gas Emissions: Residential Water Heating



Source: Newport Partners 2011 Water Heating Study. Complete study available at [buildwithpropane.com](http://buildwithpropane.com) > Resources > Research and Insights > Residential Water Heating Systems. For comparison purposes, greenhouse gas emissions results are normalized based on the emissions of a propane tankless, noncondensing water heater. Lower numbers represent lower greenhouse gas emissions. Findings are national averages based on computer energy simulations of hot water use in a typical new home across 10 locations in warm, moderate, and cold climate zones.

## Key Benefits of Propane Tankless Water Heaters

**Reduces energy costs.** Propane tankless water heaters can reduce energy costs by up to 50 percent and eliminate standby energy loss.

**Lowers annual cost of ownership.** According to a 2011 Newport Partners study of residential water-heating systems, propane tankless water heaters offer the lowest annual cost of ownership in four out of five U.S. climate zones and far better performance than other models tested.

**Better for the environment.** Propane is cleaner than electricity, considering that most electrical power is generated by coal-fired power plants. In fact, a standard electric heat pump water heater generates about one-third more CO<sub>2</sub> emissions than a propane tankless water heater.

**Saves space.** A propane tankless water heater can save up to 16 square feet of floor space over a standard tank-style model.

**Lasts longer.** Because propane tankless water heaters are less vulnerable to corrosion, they can last twice as long as most tank-style units.



### Installation and Maintenance Tips

Propane tankless water heaters are less labor-intensive to install than tank-style units, and they use the same plumbing as natural gas heaters. Most tankless units use a fan to power-vent exhaust vertically or horizontally (the fan may require a minimal electrical connection). Some models can be installed outside of the home.

For both tankless and standard propane water heaters, proper installation depends on a number of factors, such as unit placement, climate, and local building codes. To ensure the unit vents and operates properly, be sure to follow the manufacturer's instruction guide.

Both propane tankless and tank-style water heaters require minimal maintenance beyond annual checkups. Since a tankless unit doesn't maintain a stored water supply, it's less subject to corrosion. In fact, tankless water heaters can last twice as long as tank-style units. Just as important: Most of its parts are recyclable, so when the heater reaches the end of its operating life, little of it needs to go to a landfill.

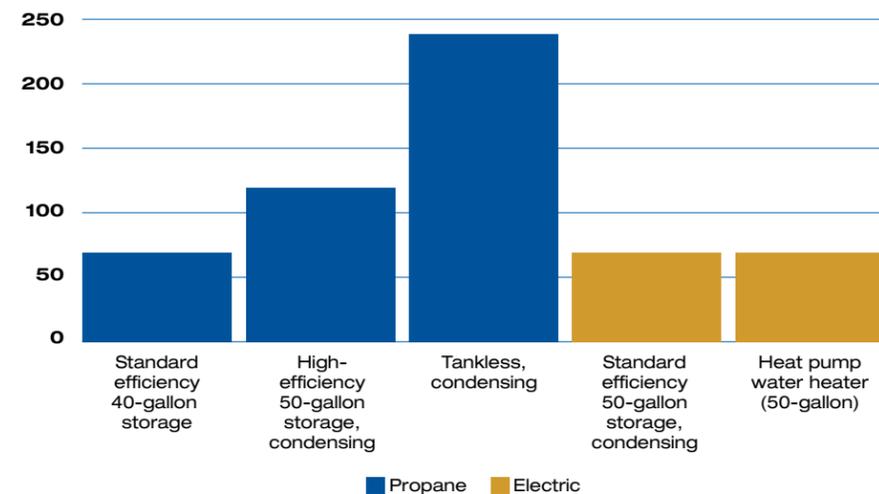
Propane meets or exceeds the performance of other energy choices for residential water heating.

**FREE ONLINE TRAINING:**  
**Propane Tankless Water Heating**

**Propane. Train Right. Build Better.** Ready to learn more about how tankless water heaters can help your customers maximize environmental retrofits and efficiency-driven upgrades? Go to [buildwithpropane.com/training](http://buildwithpropane.com/training).

#### Hot-Water Flow Rates

Based on First-Hour Rating (for Storage Units) and Gallons-per-Minute Rating (for Tankless Units)



Source: *Comparing Residential Water Heaters for Energy Use, Economics, and Emissions*, Newport Partners LLC, September 2011.

## Exceptional Cooking and Clothing Care

While propane's advantages for space and water heating are well known, this exceptional energy draws customers seeking exceptional energy solutions for kitchen and laundry appliances. Consider the benefits:

**Cooktops and ovens.** In a survey of 100 professional chefs specializing in international cuisines, 96 percent said they preferred cooking with gas heat over electric. That appeals to discriminating customers, since propane stoves allow for greater heat control and instant flame turn-off capabilities, while propane ovens help retain more moisture in food than electric units. Adding further appeal, propane cooktops, ranges, and ovens are available in the most sophisticated styles, including commercial-grade stainless steel.

**Clothes dryers.** When it comes to laundry appliances, it's no secret that consumers prize cost-effective dryers that won't harm their clothing. Propane delivers on both counts. Propane units can dry clothes faster than electric dryers, which saves homeowners valuable time. Additionally, propane clothes dryers produce a moist heat, which relaxes wrinkles, reduces static cling, and is gentler on fabrics.

When building or remodeling homes, consider piping both the kitchen and laundry areas to accommodate gas appliances. Why? Even if the initial customer chooses electric products, the future option of gas cooking and drying appliances may well help the property's resale value.



## Add Value by Upgrading Outdoor Spaces



Whether you're an architect, builder, or remodeler, it's smart business to consider how propane can help you create competitive advantage. Thanks to an array of new appliances, propane can fuel a wide range of outdoor living amenities that can meet the needs of your most discerning customers. These include:

**Grills.** It's a fact: About 60 percent of home grillers prefer propane for outdoor cooking, largely because of its instant-heat precise temperature control. Another selling point: Propane grills release far less carbon monoxide, particulates, and soot.

**Outdoor kitchens.** For customers who want only the best in an outdoor kitchen, propane delivers. A premium built-in cooking area — complete with large grilling surface, cooktop, oven, and rotisserie — can easily be set up to operate on a propane cylinder or on a home's main supply tank.

**Outdoor fireplaces, firepits, and heaters.** Chilly weather is no match for a portable propane patio heater or outdoor fireplace. From small tabletop heaters that can help warm up an intimate outdoor dining area to floor-standing models that can deliver a circle of radiant heat up to 20 feet in diameter, propane's clean, versatile energy can raise the outdoor air temperature by between 10 and 30 degrees Fahrenheit. And propane outdoor fireplaces are clean, producing no smoke, soot, or ashes.

**In-floor heating.** A perfect alternative for customers who don't want a fireplace but want to enjoy a more useable patio space during the colder months.

**Pool and spa heaters.** Propane is an excellent choice to help your customers enjoy a warm pool and spa experience, regardless of the weather. Propane pool heaters can reduce customer energy bills, since they warm pools faster than electric units while maintaining heat better in cold conditions.

**Lighting.** Today's propane lighting manufacturers create a wide range of styles and options, including a selection of tabletop lamps, many of which can operate on a standard camp-style propane cylinder. Tiki and pedestal propane lamps can create a great visual statement in outdoor entertaining spaces. These lamps eliminate the smell and residue that oil-burning torches can create, and many can burn for 10 hours or more on portable propane. Propane lights can also accent landscaping and maintain home security — without the risk of going dark during power outages.

**Mosquito control.** Nothing can ruin an evening on the patio quite like mosquitoes. Propane-fueled mosquito traps can keep the party going. With an acre radius, the trap uses propane gas, air, blue LED lights, and octenol (a byproduct of human respiration) to lure mosquitoes to the unit, while a high-powered vacuum sucks the pests into a removable catch tray. Flameless technology makes this product a must-have for well-used outdoor living areas.

New PLUG1 gas outlets make connecting propane appliances as safe and easy as plugging in an electrical appliance. For more information, visit [www.plug1.com](http://www.plug1.com).

### 5 Benefits of Propane for Outdoor Living

**Flexible.** From outdoor kitchens to fireplaces to consistently warm pools, propane helps you meet the full range of customer needs.

**Reliable.** Propane heats grills faster than charcoal and swimming pools faster than electricity. And, outdoor propane lighting stays on when electric-powered lighting goes dark.

**Simple.** With few or no connections required to municipal utilities, propane makes it easy and cost effective for you to enhance a homeowner's outdoor living spaces.

**Safe.** Propane is nontoxic, colorless, and virtually odorless. As with natural gas, an identifying odor is added to propane so it can be readily detected.

**Clean.** Grilling with propane emits 99 percent less carbon monoxide per unit of energy than grilling with charcoal.

#### FREE ONLINE TRAINING: Outdoor Living

**Propane. Train Right. Build Better.** Ready to learn more about how you can use propane's exceptional energy to fuel the best in outdoor living for your customers? For full course details, go to [buildwithpropane.com/training](http://buildwithpropane.com/training). Enroll today to learn more about the economic, environmental, and efficiency benefits of building and remodeling with propane while fulfilling your professional training requirements.

## On Tap: Quiet and Reliable Power



One of the strongest selling points for residential generators may not be the unpredictable weather, but the growing number of non-emergency electrical blackouts in the U.S. In fact, according to research at the University of Minnesota, outages affecting at least 50,000 customers increased fivefold in the past two decades. That's why it makes sense for you to show customers how propane standby generators can help maintain their quality of life.

A propane standby generator is ideal for customers who live in storm-prone areas or for those who just want the reassurance of never worrying about power loss. When coupled with an automatic transfer switch, home standby generators can deliver up to 125 kW of power within seconds after an outage takes place. To increase safety and convenience, many whole-home generators also feature remote monitoring systems that can alert customers to any potential operating problems. Emerging technology in generators also includes micro combined heat and power systems (microCHP) for residential and commercial use. (See page 17.)

For customers who want an “off-the-grid” lifestyle — without sacrificing modern conveniences — propane generators are the perfect solution. An increasing number of manufacturers now build propane generators warranted for off-grid use when used as part of an alternative-energy system. This may include, for example, residential systems where solar photovoltaic panels or wind generators supply electricity. When stored battery voltage cannot meet demand, the propane generator kicks in to recharge the batteries to ensure uninterrupted power.

### Installation

Propane standby and off-grid generator systems are housed outside, usually adjacent to a garage, shed, or other non-living space. These units draw propane from the home's main storage tank.

### 5 Benefits of Propane Generators

**Quiet.** Many standby generator units produce less than 60 decibels of noise — as quiet as a normal conversation.

**Quick.** When equipped with an automatic transfer switch, a propane standby generator can produce supplemental electricity, often in as little as 10 seconds after primary power failure.

**Safe.** The American Red Cross recommends permanent standby generators over portable units as a safer means to provide back-up power.

**Dependable.** A 7 kW standby generator drawing fuel from a 250-gallon propane tank can provide enough electricity to power a home for up to five days. Unlike diesel or gasoline, propane won't deteriorate while stored in the tank.

**Reassuring.** With a propane standby generator, your customers can be assured that basic lifestyle needs — such as heating, cooling, cooking, food storage, or computer use — will continue under virtually any circumstances.

## Exceptional Ideas for Exceptional Energy



Since its formation in 1998, the Propane Education & Research Council (PERC) has awarded more than \$81.3 million for research and development of groundbreaking propane technologies through dozens of partnerships with top companies, universities, and national laboratories. The overriding goal of this support is to help manufacturers develop, test, and bring to market a steady stream of propane-fueled innovations. Some of the most recent residential accomplishments include the following:

### Micro Combined Heat and Power Systems (microCHP)

Advanced research in cogeneration technologies has resulted in new microCHP systems that improve on-demand performance and conserve energy. For example, PERC provided research support to ECR International to develop the Freewatt Plus microCHP system that provides 1.2 kW of electricity through a propane-fueled generator and supplemental heat through an advanced warm-air or hydronic furnace. This technology is being demonstrated at 10 light commercial and residential sites in the Northeast and Midwest, and data collected during the field test will help drive a commercialization strategy. Further, Marathon Engine has developed a propane-fueled microCHP unit in which an engine drives a standby generator to deliver on-demand electrical power. At the same time, waste heat from the liquid-cooled engine is circulated through an exchanger and used for supplemental home heating. A key side benefit for both units: The microCHP technology virtually eliminates power loss from transmission and distribution of electricity generated by a central utility.



### FREE ONLINE TRAINING: Propane-Enhanced Renewable Energy Systems

**Propane.  
Train Right.  
Build Better.** Ready to learn more about how the latest propane innovations can dovetail with customer demands for alternative or renewable energy? Go to [buildwithpropane.com/training](https://buildwithpropane.com/training).

### Generators That Integrate with Alternative-Energy Systems

In another area of PERC research partnerships, many manufacturers are testing new propane generator systems that can be integrated with other alternative-energy sources. For example, PERC awarded Generac a significant research grant to develop and test its EcoGen technology, a low-cost, long-life propane generator that provides supplemental power to homes that rely on renewable energy sources. The EcoGen technology was successfully commercialized, and the generators officially went on the market in October 2010.

# Four Steps to a Custom Fit



When it comes to job-site planning for propane, building professionals can follow four simple steps to ensure the right tank sizing, location, and regulator placement:

## 1. Determine Tank Type and Size

There are two main types of propane tanks. Tanks with a Department of Transportation (DOT) certification are generally used aboveground and have a maximum capacity of 125 gallons. Commonly used horizontal tanks certified by the American Society of Mechanical Engineers (ASME) are sized up to 1,000 gallons and, under normal conditions, can be filled with propane up to 80 percent of the rated capacity.

Overview of Tank Type and Size Guidelines

Project Size	Tank Type	Capacity	Dimensions
Single appliance	DOT or ASME Horizontal DOT or ASME Vertical	125 gallons 125 gallons	24" diameter 5'6" length 30" diameter 4'5" height
Small home or warmer climate with limited gas applications	ASME Horizontal ASME Horizontal	250 gallons 320 gallons	32" diameter 7'3" length 30" diameter 9'6" length
Standard four-bedroom home	ASME Horizontal	500 gallons	38" diameter 9'10" length
Large home with multiple gas applications	ASME Horizontal	1000 gallons	41" diameter 15'11" length

Source: American Society of Mechanical Engineers (ASME) and Department of Transportation (DOT)

In addition to the guidelines noted above, other factors influencing tank size include total square footage of the home, total Btu load of installed propane appliances, and the climate zone. See the "Typical Propane Consumption" chart on page 3 for more details.

## 2. Place the Aboveground Tank or Cylinder Properly

When selecting an aboveground location for a propane tank, the first priority is to choose an accessible, safety-approved site. Key considerations in that decision-making process include:

**Building and safety codes.** These regulations vary by state and local municipality. In addition to observing local codes, most states require that propane retailers follow the National Fire Protection Association (NFPA) 58: Liquefied Petroleum Gas Code (available at [nfpa.org](http://nfpa.org)). In most cases, propane tanks must have at least 10 feet of clearance from the home, other structures, and property lines.

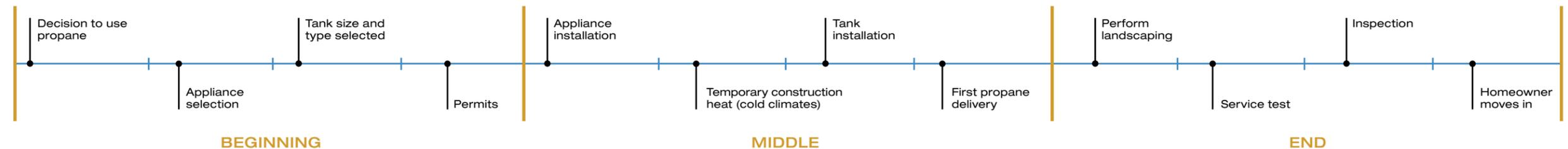
**Ease of access.** When siting the tank, it's important to choose a location that allows for easy access for filling and maintenance. For example, in colder climates, consider how the location will allow propane delivery trucks to reach the tank during heavy snow conditions. Your propane supplier will give you tank location options.

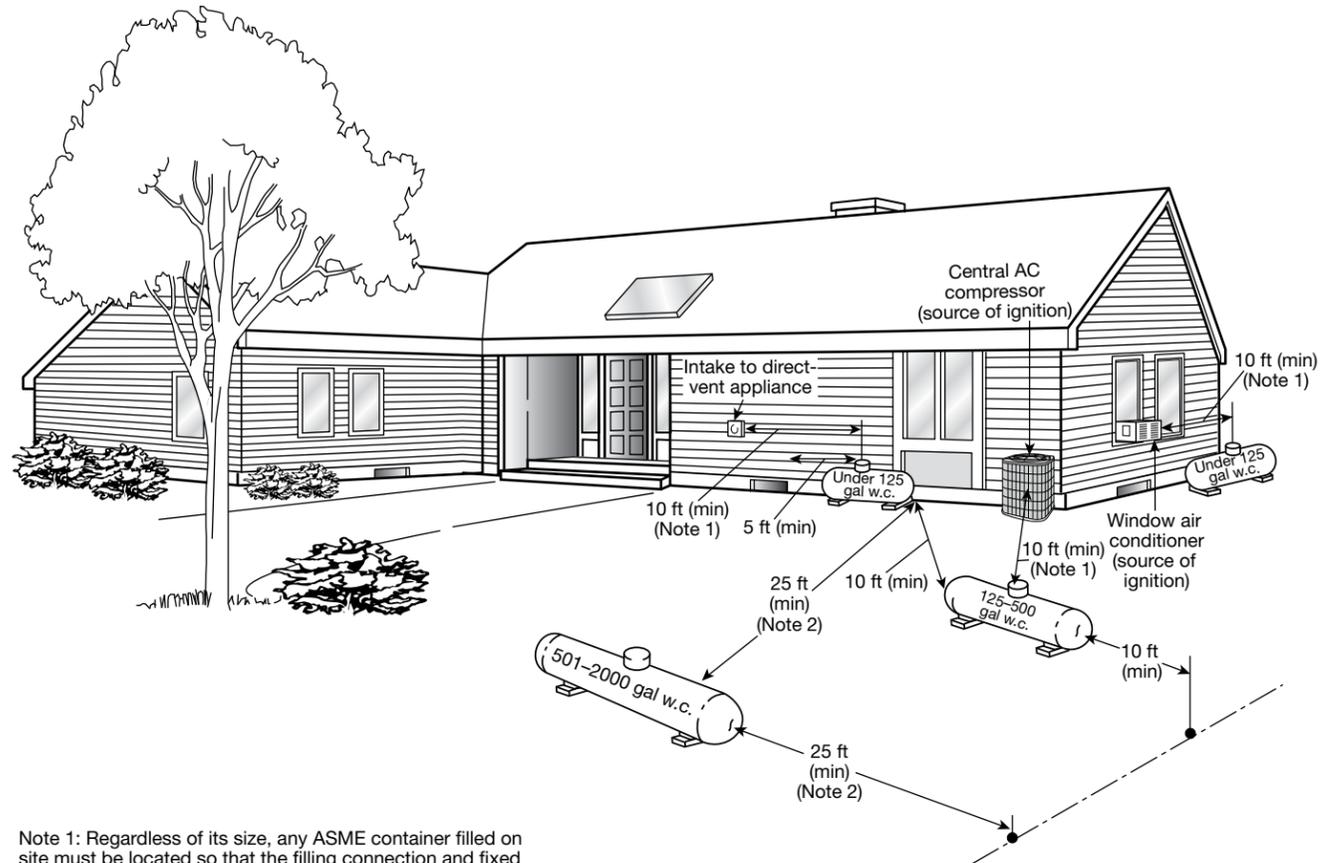
**Customer input.** In addition to safety and accessibility, aesthetics play an important role in project success. Be sure to review all tank location options with your customer, taking into account their feedback for landscaping and overall site design.



### TIMELINE

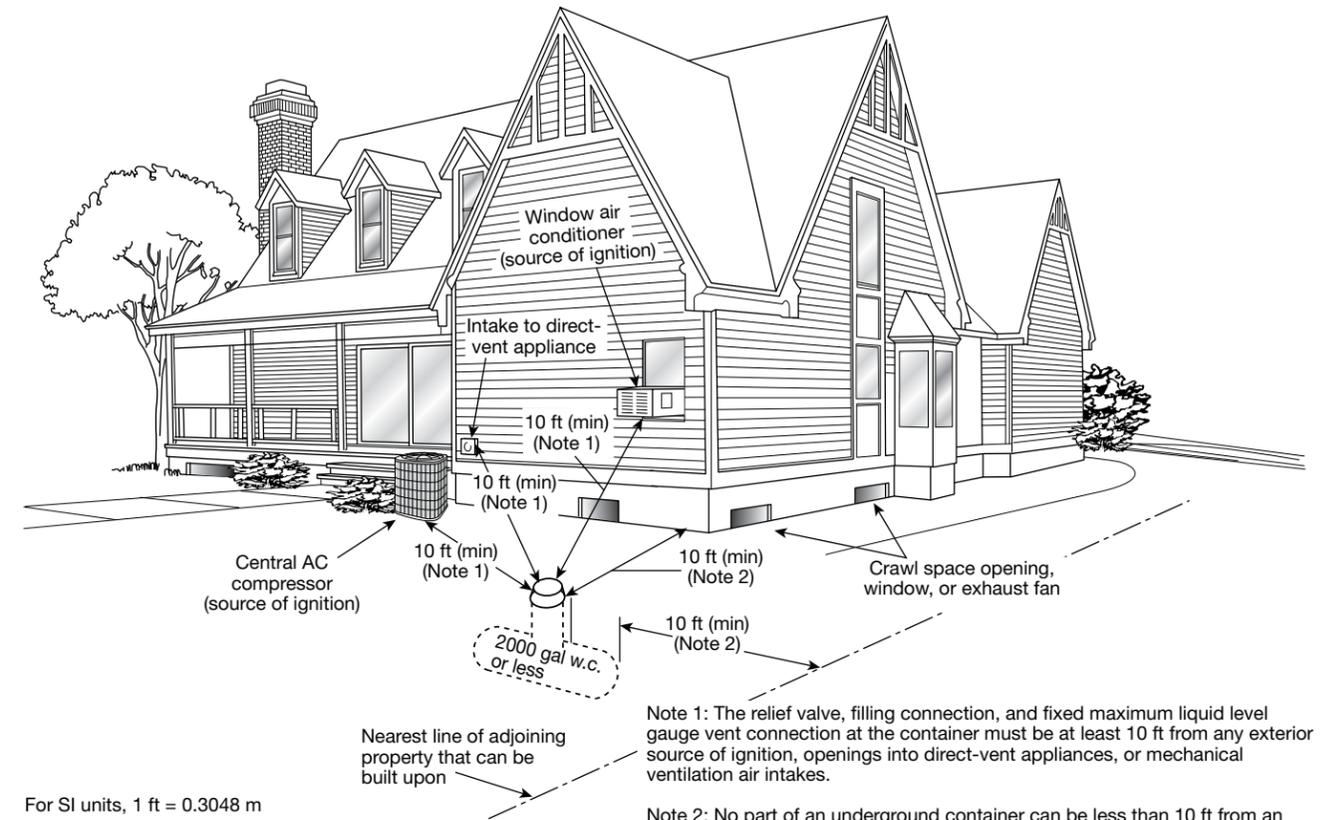
While the timing on projects is rarely exactly the same, here's where propane would typically fit into your overall build schedule.





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 AC, compressor), intake to direct-vented gas appliance, or intake to a mechanical ventilation system.

Note 2: This distance can be reduced to no less than 10 ft for a single container of 1200 gal (4.5 m<sup>3</sup>) 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<sup>3</sup>) water capacity.



For SI units, 1 ft = 0.3048 m

Note 1: The relief valve, filling connection, and fixed maximum liquid level gauge vent connection at the container must be at least 10 ft from any exterior source of ignition, openings into direct-vented appliances, or mechanical ventilation air intakes.

Note 2: No part of an underground container can be less than 10 ft from an important building or line of adjoining property that can be built upon.

### 3. Choose Underground Tank Site Carefully and Follow the Permitting Process

With a nearly invisible profile, underground propane storage tanks have become an increasingly popular choice for new construction customers, as well as homeowners seeking to upgrade their existing energy systems. For builders considering large-scale exurban or other “off-the-main” housing projects, an underground community tank system is an efficient, aesthetically pleasing way to deliver propane’s exceptional energy to customers.

As with aboveground tanks, installation permits and regulations for underground tanks will vary by location. In many cases where septic systems are part of the overall site plan, it’s possible to coordinate excavation for underground propane storage tanks at the same time. When finalizing a location, choose a site that can easily accommodate propane delivery under all weather conditions.



### 4. Place the Propane Regulators Properly

Like storage tanks, propane regulators come with pipe-size and installation distance requirements. For example, regulators cannot be placed closer than three feet horizontally from any building opening (such as a window well) lower than the regulator. Additionally, a regulator installed on the gas piping inlet to the home cannot be placed closer than five feet from any potential ignition source, such as a compressor for central air conditioning. For complete compliance details, contact your nearest propane retailer.



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## Earn Points Toward Green



Propane can earn you more than 100 points toward the National Association of Home Builders (NAHB) National Green Building Standard™. This standard incorporates environmental considerations into every phase of the home building process — from lot design and preparation to final construction and homeowner education. In fact, building with propane can get your new construction projects nearly halfway to qualifying for NAHB’s Bronze-level green building standard. Since propane performs well by a wide range of “clean and green” measurements, it’s also a smart choice for remodelers who want to help customers maximize efficiency upgrades or environmental retrofit projects.

**Propane and the National Green Building Standard™**  
Learn more about the National Green Building Standard™ at [nahbgreen.org](http://nahbgreen.org).

Project Size	Maximum Points from Propane	Bronze	Silver	Gold	Emerald
Lot Design, Preparation, and Development	10	39	66	93	119
Resource Efficiency	8	45	79	113	146
Energy Efficiency	53	30	60	100	120
Water Efficiency	3	14	26	41	60
Indoor Environmental Quality	20	36	65	100	140
Operation, Maintenance, and Building Owner Education	7	8	10	11	12
Additional Points (from any section)	n/a	50	100	100	100
<b>Total Points</b>	<b>101</b>	<b>222</b>	<b>406</b>	<b>558</b>	<b>697</b>

Source: Points and categories based on the National Green Building Standard™, ICC700-2008, approved by the American National Standards Institute on Jan. 29, 2009.

## Propane Pays in More Ways Than One

Energy rebates are one of the most compelling sales pitches to prospective customers, and propane appliances qualify for a number of federal, state, local, and cooperative incentives. As a builder, remodeler, or HVAC professional, you should understand the full range of credits or rebates you can use to help homeowners get the most from their energy dollars. In some cases, both you and the homeowner can qualify for multiple rebates on a single project.

Type of Rebate or Credit	Learn More
<b>Federal, state, and local government incentives</b> The federal government, along with some states and localities, provides tax credits, rebates, grants, and other incentives for propane projects.	<a href="http://dsireusa.org">dsireusa.org</a>
<b>State, regional, and local propane association rebates</b> may also be available for energy-saving propane appliances.	<a href="http://buildwithpropane.com">buildwithpropane.com</a>

### 5 Ways to Further Boost Your Propane Smarts

**Get free online training.** The Propane Education & Research Council (PERC) provides an online Propane Training Academy full of free courses that can help enhance your new construction or remodeling projects with propane applications. Learn more at [propanetrainingacademy.com](http://propanetrainingacademy.com).

**Earn continuing education credits.** Many PERC-sponsored online courses are approved for CEU credit with leading trade organizations, including the American Institute of Architects (AIA), the National Association of Home Builders (NAHB), the National Association of the Remodeling Industry (NARI), and the U.S. Green Building Council (USGBC). For more information, go to [buildwithpropane.com/training](http://buildwithpropane.com/training).

**Sign up for e-newsletters.** Stay up-to-date with the latest propane news, including available rebate and incentive programs. To receive the Propane Energy Update each month, go to [buildwithpropane.com](http://buildwithpropane.com) > **Resources**.

**Access new research.** Get breaking news in energy research, new technology updates, and business-building thought leadership. Go to [buildwithpropane.com](http://buildwithpropane.com) > **Resources**.

**Use The Propane Technical Pocket Guide.** As a more detailed companion to this brochure, The Propane Technical Pocket Guide provides added technical and performance-related information on propane.

# Training and Safety: An Ideal Combination

The Propane Education & Research Council (PERC) promotes the safe, efficient use of propane as a preferred energy source. Since its creation in 1998, PERC has invested millions of dollars in an ongoing effort to enhance propane safety with building professionals and consumers. A key factor in the success of these programs has been the development of the Propane Training Academy, which provides builders, remodelers, and other skilled construction professionals with practical, straightforward online courses. These training modules, which cover everything from topic overviews to specific installation tips, are designed to help you expand your use of propane applications in safe and efficient ways. Learn more at [propanetrainingacademy.com](http://propanetrainingacademy.com).

## Available Certifications



**American Institute of Architects (AIA)** The Propane Training Academy currently offers over 20 courses that are approved by the AIA Continuing Education System. All active, registered AIA members must successfully complete 18 learning unit (LU) hours each year, with at least eight of the 18 LU hours relating to health, safety, welfare, or all three (HSW). Of the eight HSW credits, at least four must be in sustainable design (SD) topics. Learn more at [aia.org](http://aia.org).



**National Association of Home Builders (NAHB)** The Propane Training Academy currently offers over 15 courses approved by the NAHB's University of Housing. Each of the NAHB's designations has its own unique requirements, including years of experience, required courses, and exams. The same is true for maintaining previously earned designations. Learn more at [nahb.com](http://nahb.com).



**National Association of the Remodeling Industry** The Propane Training Academy currently offers over 15 courses approved for NARI continuing education units. Each NARI-approved module at the Propane Training Academy qualifies for 0.1 NARI CEUs. Learn more at [nari.org](http://nari.org).



**U.S. Green Building Council** The Propane Training Academy currently offers over 10 courses approved for USGBC continuing education and training credits. Each USGBC-approved module at the Propane Training Academy qualifies for 1 GBCI CE credit hour. Learn more at [usgbc.org](http://usgbc.org).

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The Propane Education & Research Council was authorized by the U.S. Congress with the passage of Public Law 104-284, the Propane Education and Research Act (PERA), signed into law on October 11, 1996. The mission of the Propane Education & Research Council is to promote the safe, efficient use of odorized propane gas as a preferred energy source.