

GUIDE TO

HOME BUILDING IN SILICON VALLEY



CLARUM HOMES

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HIGH-PERFORMANCE

The new standard in custom home building.

Today, anyone planning a new custom home should think high-performance from the start. With all of the new technology available, you have an incredible array of options including eco-friendly construction materials, solar electric power systems, energy-efficient windows, and on-demand tankless water heaters. Making these choices means that your new home will **greatly reduce your energy and water use**. Plus, high-performance homes are healthier, smarter for the environment, and a great long-term investment.

Where high-performance houses are concerned, Clarum Homes believes the entire approach is important: this includes everything from the design details to the choice of materials and the installation methods. All of these aspects must work in concert to deliver a highly efficient home that lives up to the high-performance label.

To help prepare you for some of the decisions you'll be making, we've put together this step-by-step High-Performance Home Building Guide. We want to aid you in understanding your different choices and how they all come together.

**THIS INFORMATION WILL MAKE YOUR JOURNEY EASIER & HELP YOU
PREPARE FOR SUCCESS**

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WHAT IS IMPORTANT TO YOU?

Deciding between a high-performance home and a home built to code.

BUILDING BEYOND CODE

In California, CalGreen is the baseline building code that all new home construction must follow. In terms of energy efficiency, air quality, and sustainability, there is a lot of room for improved performance by building beyond this code. And, as we will detail, the cost difference is not that great.

In high-performance design and construction, everyone involved in the building process takes into account energy and water efficiency, resource efficient building design and materials, indoor environmental quality, homeowner maintenance, and the home's overall impact on the environment.

In this first section, we'll highlight some of the key areas in which a high-performance home excels. You'll be able to explore these key areas and decide which are most important to you. In addition, you'll gain a fuller understanding of the direct benefits to you as the owner of a high-performance home vs. a conventional home.



HEALTH:

Ensuring your environment is a healthy one.



COMFORT:

Consistent year-round air temperature and quiet interiors.



CARBON FOOTPRINT:

Using less energy without compromising comfort or lifestyle.



SUSTAINABLE MATERIALS:

Durability, building it to last, and building it beautifully.



COSTS TO OPERATE:

Far less cost to operate and a better quality of living.



HEALTH

Creating and maintaining a healthy environment inside your new home.

INDOOR AIR QUALITY

The CalGreen building code does not directly address indoor air quality. However, it is a special consideration that needs to be at the forefront of your contractor's decision-making process, from the design phase up through construction.

The average American **spends 90% of their time indoors**, and air pollution levels inside the average new home are **2 to 5 times worse** than the air pollution levels outside.

Immediate effects of exposure to indoor pollutants include irritation of the eyes, nose and throat, headaches, dizziness, and fatigue. Other health effects including respiratory diseases, heart disease and cancer may show up after years of repeated exposure.

The most common chemical in building materials is formaldehyde, which is found in most plywood, particle board, and other pressed wood products used to make furniture, cabinets, shelves, and counter tops. Other big offenders are solvents, which are oil-based paints, stains, wood preservatives, carpet glue, and other adhesives. These release dangerous fumes that contain volatile organic compounds (VOCs). Other dangerous compounds commonly found in conventional building materials include pesticides, mildewcides, urea formaldehyde, vinyl chloride, and chromated copper arsenate.

BUILDING A HEALTHY HOME

The good news is that there are many healthy alternatives. A high-performance home should have zero added formaldehyde to any of its building materials. Ask your designer and contractor to look at all of the glues, caulks, paints, and carpets that go into your new home. **They should review the Green Guard rating to ensure you are getting the healthiest choice for each construction element.**

To achieve superior indoor air quality, as well as avoiding issues such as mold, carbon monoxide, and radon, you should also ask your designer and contractor to pay very close attention to your home's moisture control systems, pest management, heating, ventilating, air conditioning (HVAC) and combustion venting systems. Attention to these details means a home that has less dust, lower pollutants, and is more comfortable and healthier for you and your family.

Common Indoor Air Pollutants

Lead

(Homes built before 1978)

FORM FOUND: Paint, household pipes, and plumbing fixtures.

HEALTH RISKS: Nervous system and kidney damage; learning disabilities; attention deficit disorder; decreased intelligence; speech, language, and behavior problems; poor muscle coordination; decreased muscle and bone growth; hearing damage; fertility problems; high blood pressure; digestive problems; memory problems; nerve disorders.

Formaldehyde

FORM FOUND: Frequently used in plywood, fiberboard, pressed wood, resins, glues, and several other construction components.

HEALTH RISKS: Irritation of the throat, nose, eyes, and skin; exacerbates asthma; respiratory symptoms including chronic runny nose, chronic bronchitis, and obstructive lung disease; nasopharyngeal cancer.

Volatile Organic Compounds (VOCs)

FORM FOUND: Glues, paints, solvents, some furniture, carpets, cleaning products, air fresheners, molds, mildew.

HEALTH RISKS: Eye, nose, throat irritation; headaches; loss of coordination; nausea; damage to liver, kidney, central nervous system.

Biological Contaminants

FORM FOUND: Fungi, mold, dust mites, bacteria.

HEALTH RISKS: Triggers allergic reactions; asthma; influenza; shortness of breath; dizziness; lethargy; digestive problems.

Asbestos

(Homes built before 1960)

FORM FOUND: Floor tiles, heating pipe/duct insulation, mastic, siding, ceiling tiles, joint compound, plaster.

HEALTH RISKS: Lung scarring and inflammation; difficulty breathing; lung cancer; mesothelioma.

Chlordane

(Homes built before 1980)

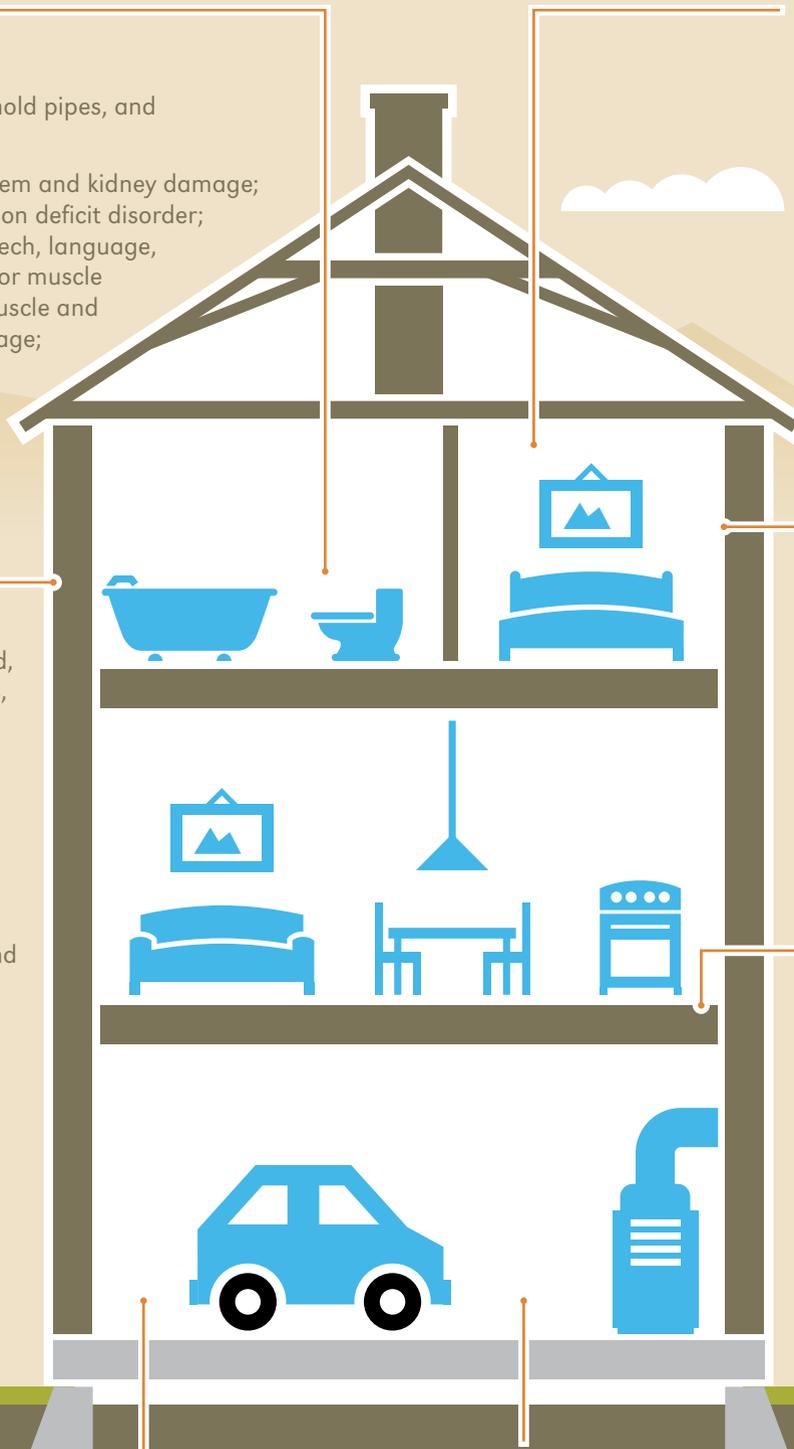
FORM FOUND: Highly toxic indoor pesticide chlordane sprayed throughout homes. Diffusion through concrete flooring, ceiling, and drywall.

HEALTH RISKS: Child cancers; neuroblastoma; leukemia; chronic infections; bronchitis; asthma; sinusitis; infertility; neurological disorders; aggression; depression.

Carbon Monoxide

FORM FOUND: Produced by combustion sources like gas appliances, fireplaces and automobiles. Especially common in homes with attached garages. The CO leaks into the home due to pressure differentials.

HEALTH RISKS: Nausea; headaches; dizziness; long term exposure leads to death.





COMFORT

Comfort starts with fresh air, abundant natural light, and protection from noise.

DEFINING COMFORT

Comfort is all too often taken for granted in conventional home building, but becomes a big deal after moving in and discovering that your beautiful new home is drafty, poorly lit, noisy, and/or stuffy. Problems like air stratification, drafts, and poorly installed or selected HVAC equipment can all be at the root of an uncomfortable home. Low quality windows, doors, and insufficient insulation are also common culprits.

Your home should make you feel good—comfort is important. In a high-performance home, comfort means an interior environment that maintains a consistent desired temperature throughout the house, free from drafts and hot/cold spots. It's about controlling environmental noise, both from internal and external sources. **The air feels fresh at all times—even when the windows are closed.**

ACHIEVING THE OPTIMAL HOME ENVIRONMENT

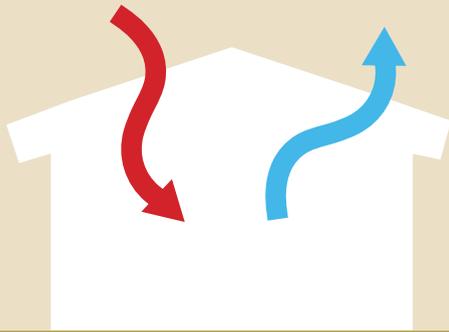
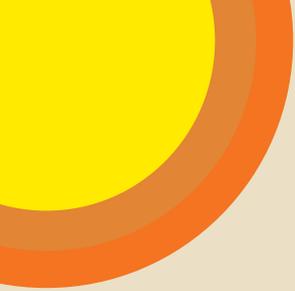
Good comfort is the offspring of good design and quality decisions.

The best level of comfort isn't achieved through any one single measure, but a **holistic approach** to design, equipment and materials.

Consistent temperature, fresh air, and a quiet interior are hallmarks of a passive home. Even in a high-performance home, you can realize most of the same benefits.

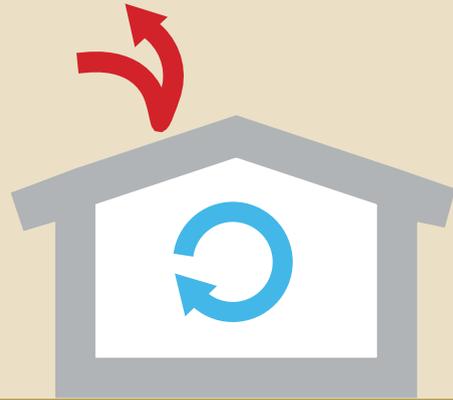
The following elements can help your home always feel comfortable:

- **Super-insulation.** Create a super-insulated building envelope around the roof, walls, windows, and foundations to provide acoustic privacy and prevent drafty convection currents.
- **Airtight house.** Keeps the drafts out, ensuring a constant, pleasant airflow.
- **Mechanical ventilation.** Continually introduce fresh air to your living space with a heat recovery ventilation system (HRV), while piping stale air out and also controlling humidity.
- **Heat recovery.** Before removing old air, an HRV transfers its heat to the new, so the temperature inside your house remains stable from room to room.
- **Solar gain.** With lots of south-facing windows and calculated shading, a high-performance home will brim with abundant, natural daylight—without glares or overheating.



TRADITIONAL

In warm months, conventional homes experience unwanted solar heat gain. Hot air infiltrates through cracks and crevices.



PASSIVE

High-performance homes minimize solar exposure through proper orientation and shading. A tight building envelope prevents heat infiltration, keeping the home cool.



TRADITIONAL

In the winter, a traditional heating system loses a large percentage of heated air due to leaks, holes, and poorly connected ducts.



PASSIVE

High-performance homes maximize solar gain to heat a home. Very low levels of air leakage keep heat inside.



CARBON FOOTPRINT

A high-performance home can slash energy consumption by up to 90% over conventional construction.



THE COST OF ENERGY

The cost of energy is rising rapidly—and not just in dollars. Our environment is also paying the price: non-renewable energy consumption, carbon emissions, and pollution. In the U.S., **48% of all greenhouse gas emissions** come from buildings.

We use energy—electricity, gas, and water—to keep our houses at a comfortable temperature, our showers hot, our lights on, and our gardens green, all of which generates carbon dioxide (CO₂). Your carbon footprint is the sum of all emissions of CO₂, which are induced by your activities in a given time frame.

High-performance homes support the health of our environment by consuming less energy, conserving non-renewable resources, and reducing our carbon footprint while maintaining a high quality of living and lowering your monthly utility bills.



POWER

A conventional home often wastes energy, is inefficient, has thoughtless design, and poor construction. In contrast, passive homes represent today's highest energy standard, **slashing energy consumption by up to 90%**.

Extreme efficiency does two things. First, it minimizes energy loss, such as leaking less heat out of windows. Second, it optimizes internal gains—any heat you generate indoors, whether from your own body or by running a hair dryer, is all you need to heat your home (eliminating the need for a furnace or other conventional heating mechanisms). With careful window orientation and shading, passive homes also minimize your need for air conditioning.



WATER

High efficiency appliances, tankless on-demand water heaters, and low-flow plumbing fixtures are turnkey water-saving solutions for any home and are always part of a high-performance home. Often times one of the largest water uses in a home is outside—maintaining a lush, green lawn and vegetation. Alternatives include drought-resistant landscape design and rainwater collection systems.

California's Residential Greenhouse gas emissions make up 14% of the state's total emissions.

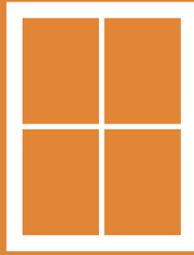
Buildings account for approximately 48% of greenhouse gas emissions in the U.S.

New technologies make it possible to reduce a commercial building's carbon footprint by over 70%.

Passive homes use up to 90% less energy than conventionally-built homes.

About 50% of energy consumption is for moving people and goods. The vast majority is for personal transport.

An electric car reduces vehicle emissions by 30%.



SUSTAINABLE MATERIALS

A home is only as sustainable as the materials used in its construction.

YOUR HOME: THE SUM OF ITS PARTS

While energy-efficiency is vital, there are other factors to sustainability. It's crucial to discuss the selection of ecologically-friendly building materials with your designer and contractor. The source of your home's materials is critical, as well as the manufacturing methods of the products.

When you select home-building materials, consider questions such as:

- Are the materials harvested in a way that endangers species or threatens communities?
- Do they require large amounts of non-renewable energy to manufacture?
- Are they non-toxic for the occupants?
- Are the materials ecologically friendly and recycled?
- Is the planning approach to build my new home ecologically sensitive?



Gaulhofer Windows combines high-performance with remarkable quality and design.

HEALTHY AND SUSTAINABLE

Approach all material decisions with an emphasis on durability, longevity and environmental responsibility before price. The value of a material has less to do with how much it costs and more to do with how much use you'll get out of it. If your budget is limited, **it's smarter to build small with better materials** rather than to build big, compromising the quality.

High-performance homes are healthy and sustainable due to:

- Engineered lumber
- Solar-power system: makes electricity from sun, reduces carbon footprint
- Recycled decking material
- Eco-flooring: sustainably-harvested and reclaimed wood floors
- Eco-cabinets: Formaldehyde-free construction
- Drought tolerant landscaping: Conserves water
- High-quality windows and doors

HIGH-PERFORMANCE WINDOWS

REDUCE

SPACE HEATING COSTS BY

18%



**KEEP YOUR HOUSE
OUT OF THE LANDFILL**

THE AVERAGE SINGLE-FAMILY
HOME IN THE U.S. GENERATES

**BETWEEN 6,960
& 12,064 LBS.**

OF CONSTRUCTION WASTE



COSTS TO OPERATE

Higher energy efficiencies leads to higher home values.

MEET THE AVERAGE FAMILY

Mr. and Mrs. Average built a conventional 3,500 square-foot home in a northern California neighborhood where they pay about \$83/month for their electricity, which is the average for California residents. The cost to build their home, which conforms to CA Title 24, was \$315/SF.

After paying off their 30-year mortgage, the Average family will have spent \$29,880 on electricity, assuming the average kWh cost remains at 2009 levels of \$0.131. (Unfortunately, we've just seen 5 consecutive years in which the annual increase of electricity spending was actually higher than the rate of inflation.)

MEET THEIR NEIGHBORS, THE SMARTS

The Smarts also built a 3,500 square-foot home—it's right next door to the Averages. However, they built a high-performance home—specifically, a Passive-Certified Home. They only paid 7% more to have their home built, making it \$337/SF. In contrast to the Averages, the Smarts only average \$30/month on electricity. When the Smarts finish paying their 30-year mortgage, they'll have spent only \$10,800 on electricity.

ROI OF A HIGH-PERFORMANCE PASSIVE HOME

The Smart's savings above only relates to their power bill; it does not take into consideration other efficiencies such as water conservation. In addition, costs are offset by rebates such as the California Solar Initiative, as well as state and federal tax credits.

A high-performance home is a sound investment, with an annual rate of return of 7%. Furthermore, energy efficiency components add to a home's value. According to a recent study, a 4.5-kW solar system increases a home's property value by \$30,000 on average.*

*Hoen, B., R. Wiser, P. Cappers and M. Thayer. *An Analysis of the Effects of Residential Photovoltaic Energy Systems on Home Sales Prices in California*. LBNL-4476E. April 2011.

MEET THE AVERAGES

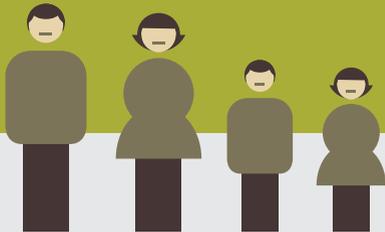
\$83/month
ELECTRIC BILL

Based on an average 3,500 SF home in an average neighborhood in northern California.

MEET THEIR NEIGHBORS

\$30/month
ELECTRIC BILL

The Smarts built a performance 3,500 SF home right next door to the Averages and pay less.



HIGH-PERFORMANCE: WHAT IS IT?

Understanding the differences in high-performance homes.

HIGH-PERFORMANCE IN YOUR HOME

At Clarum Homes, we believe high-performing homes incorporate the following principles:

- Lighter environmental impact (smaller carbon footprint, eco-friendly materials, longevity of construction, reducing waste, recycling)
- A better experience for the homeowner (greater comfort, healthy air)
- Smaller bills, greater value (extreme energy efficiency; quality of design, materials, construction)
- Consumes fewer resources at construction and throughout its life

In this section, you'll gain a deeper understanding of the different approaches to high-performance home building and their unique advantages. You'll learn more about each type, which will help you to choose the best-fit designer and contractor for your project.

The great thing about designing and building a high-performance home is that you can design a house that incorporates different elements from all the above to meet your own benchmarks of efficiency, comfort, and style.

	PASSIVE CERTIFIED: Curbing energy consumption through efficiencies envelope.
	PASSIVE INSPIRED: The best of passive on a budget.
	LEED: The standard in green certification.
	NET-ZERO: Producing as much if not more energy than the house consumes.
	COST TO BUILD: Finding the right ROI.



WHAT IS A PASSIVE-CERTIFIED HOME?

A Passive-Certified home is one that employs a set of advanced building technologies to achieve extreme energy efficiency. Energy consumption is reduced by up to 90% compared to a conventionally-built home.

UP TO 90% REDUCTION IN ENERGY USE?

Passive homes are very well-insulated and virtually air-tight, which greatly minimizes the loss of heat. This means no furnace (you read that right) and extreme energy efficiency. This is primarily due to an incredibly tight and highly-insulated building envelope, solar-conscious design and a Heat Recovery Ventilation system (see box below).

All of the heating in a typical passive home can be met by a single 1000-watt heater. Heat from people, lights, appliances and the sun does the rest. And in the hotter months, the home stays delightfully cool without the need for air conditioning. Shading and well-planned window orientation helps to keep the house at a comfortable temperature.

A diagram showing a cross-section of a house with a central HRV unit. Blue lines represent fresh air being pulled in from outside, and red lines represent stale air being exhausted. The HRV unit is shown as a small box with two vertical ducts. Arrows indicate the direction of air flow: blue arrows pointing up into the HRV unit from outside, and red arrows pointing up into the HRV unit from inside the house. The HRV unit is labeled 'HRV' in a white box.

BECAUSE PASSIVE HOMES ARE SO airtight they require an HRV system. Heat Recovery Ventilation systems cycle air throughout the home, pulling in fresh air, filtering and tempering it with the native air, and moving it throughout the house.



A Heat Recovery Ventilator provides a constant, balanced fresh air supply and helps maintain even air temperatures throughout the house. The resulting system not only saves up to 90% of space heating costs, but also provides healthy indoor air quality. Additionally, passive homes are extremely quiet—a great solution for eliminating street noise. The passive home is a tranquil sanctuary with its nearly silent ventilation system (no blasts from vents), super-sealed joints, and maximized insulation.

FUNCTION FOLLOWING FORM

The design considerations and building science required to achieve passive-home standards can be integrated into any style of architecture and any type of aesthetic. The passive house standard is an opportunity rather than a limitation. It opens a multitude of doors to reshape our approach to construction in order to create homes that are friendlier for their occupants and the environment.

THE SCIENCE OF PASSIVE

Unlike “point accumulation” green building standards, Passive home certification is based on actual performance results that requires homes to use less than 1.4kWh per square foot for annual heating demand, and total annual source energy cannot exceed 11 kWh per square foot. In addition, the building shell must be airtight with less than 0.6 air changes per hour at 50 pascals. To become a certified Passive Home, a home must meet very specific standards set by the non-profit organization, Passive House Institute United States (PHIUS).

It is not mandatory to work with a trained consultant when building a passive house, but in the long run, it'll be quicker, easier, and less expensive than doing it on your own.

GERMAN ENGINEERING THE AMERICAN DREAM

THE PASSIVHAUS HOUSE concept originated in 1988 with a conversation between Professors Bo Adamson of Lund University, Sweden and Wolfgang Feist of the Institute for Housing and the Environment, Germany.

The first passive homes were constructed in 1990, a set of 4 row houses in Darmstadt, Germany.

In September 1996 the Passivhaus-Institute was founded in Darmstadt to promote and control the standards. Since then, thousands of Passivhaus structures have been built, to an estimated 25,000+ as of 2010. Most are located in Germany and Austria.



WHAT IS A PASSIVE- INSPIRED HOME?

Passive-inspired incorporates many if not all of the same building techniques and materials to achieve a passive home without the certification.

FREEDOM OF CHOICE

You may choose to have a passive-inspired home built instead of a passive-certified home. This means that you can have a home with all of the same features, technology, and performance goals (or just some of them) while choosing not to pay for the extra costs and rigors of having third-party certification of your structure (see chart on page 22 for cost difference).

For example, many of the high-performance, passive-inspired homes that Clarum builds include triple-paned windows and high-performance doors, a Heat Recover Ventilation system, Structural Insulated Panels roof and walls, solar power system, and high-performance framing. Inside, the homes feature tankless, on-demand hot water, energy-efficient appliances, and water-conserving plumbing fixtures. This approach results in the same energy-efficiency, comfort, sustainability, and health benefits of a passive-certified home.

COMMUNICATE YOUR GOALS

Keep in mind, passive-inspired **does not mean** sacrificing performance or quality.

Designing and building a high-performance home takes planning and communication—and knowing where to spend money and where to save it, as well as how to create a highly-efficient building process with low embodied energy. Before the first shovelful of dirt is turned, sit down and communicate with your architect, builder, and suppliers to review the plans and ensure your new home meets all of your sustainability, efficiency, comfort, and air-quality goals.



LEED: Leadership in Energy and Environmental Design.

WHAT IS A LEED HOME?

A LEED-certified home is a high-performance green building designed and built to achieve the highest point rating possible as defined by the U.S. Green Building Council.

WHAT IS LEED FOR HOMES?

LEED for Homes is a system developed by the U.S. Green Building Council (USGBC) for the purpose of rating and recognizing homes built to a more sustainable standard than conventional homes built to code. LEED was originally developed for the purpose of transforming the mainstream building industry by promoting and encouraging best practices for environmental design and construction.

The LEED system rates the environmental performance of a building. It is based on accepted energy and environmental principles and strikes a balance between known established practices and emerging concepts. The rating system evaluates environmental performance from a whole building perspective over a building's life cycle, providing a definitive standard for what constitutes a "green building."

What makes a LEED Certified home such a good investment?

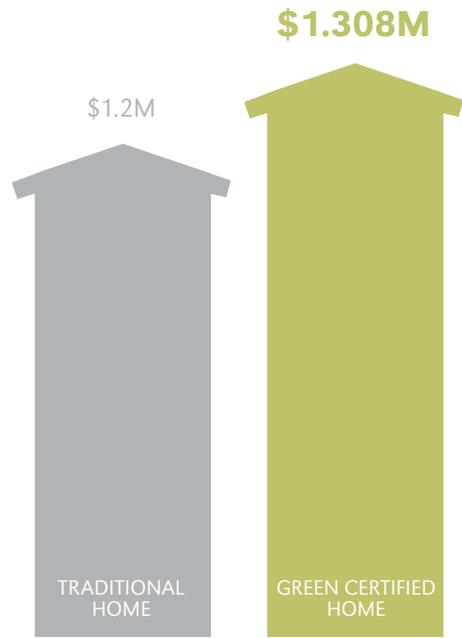
- Lower utility bills
- Government tax incentives and rebates for energy and water savings
- A healthier, more comfortable environment for occupants
- Reductions in landfill waste
- Increased building durability for lower maintenance costs
- Decreased carbon footprint, which means a better green image
- Increased property and resale value

Learn more about LEED for homes at [USGBC.ORG/HOMES](https://www.usgbc.org/homes).

A GREEN CERTIFICATE
ADDS AN AVERAGE

9%

PRICE PREMIUM
TO THE SALE PRICE
AGAINST OTHER COMPARABLE HOMES



Average Home Sale Price in California

FOUR LEED CERTIFICATION LEVELS

When a home or community is LEED-certified, it means its design strategies have attained a certain number of points for high-performance and health (of both people and the environment). There are four levels of certification with 136 total available points.



CERTIFIED
45-59



SILVER
60-74



GOLD
75-89



PLATINUM
90-136

PROUD MEMBER = BIG SAVINGS

Clarum Homes is a member of the USGBC. We believe in designing and building homes that are healthy and comfortable. The extraordinary energy-efficiency of our LEED-certified homes are cost-effective, saving you tens of thousands of dollars in lifetime costs. It's a win for the homeowner and demonstrates environmental stewardship and social responsibility.



WHAT IS A NET-ZERO HOME?

Net-Zero homes generate the same energy they consume, through renewable sources like sun, wind, or water.

LIGHTEN THE POWER WORKLOAD

Your house is a series of systems: ventilation, heating, lighting, insulation, etc. These structures are complex and interconnected. Therefore, they require your careful planning and design decisions to minimizing your overall need for energy.

Two key areas have the largest impact on how hard your systems must work:

- **PASSIVE DESIGN.** Incorporate the principles of passive design (see page 15) to reduce the external forces your home has to resist, creating a comfortable interior and providing plenty of daylight.
- **BUILDING ENVELOPE.** This is the barrier between inside and out: walls, roof, foundation, windows, doors, etc. With an efficient envelope, less heat leaks in and out, your HVAC does less work and your home consumes less energy.

AIM FOR EFFICIENCY

To achieve a Net-Zero home, you must also create efficiencies in the energy you consume.

- **HVAC.** With passive design and a good envelope, your needs for heating, ventilation and cooling will be minimal. The payoff? Less costly ventilation systems that operate at a fraction of the cost of traditional systems.
- **LIGHTING AND APPLIANCES.** Your home will be bright and airy already with passive design, but alternative lighting is still important. Appliances and electronics represent your remaining energy needs. Trade-off higher up-front costs for long-term efficiency and savings.

CHOOSE YOUR SOURCE

Finally, to achieve true Net-Zero, create an on-site energy source. Solar panels, for example, can offset some or all of your energy use. A grid-tied system can help offset for cloudy days and night-time use.

NET-ZERO IS AN INVESTMENT

Net-Zero homes don't have to be *connected* to the grid—but that doesn't mean they can't be *on* the grid. In fact, there are tangible benefits to being connected. When on-site energy is abundant, you can harvest the excess and sell it to the city. Your link to the grid becomes a channel to export the surplus. This means that on sunny days, a Net-Zero home can actually earn an income—helping to pay its own bills!

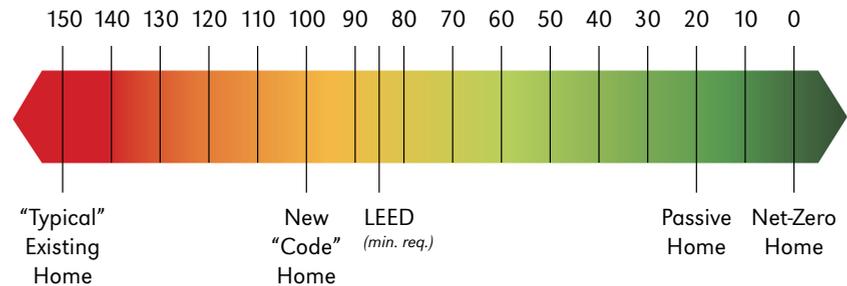
In addition, resale values of high-performance homes are higher, and you'll qualify for rebates and tax credits. In fact, it's possible for a Net-Zero homeowner to earn back their investment after as little as two years

How much will you save in the long run?

THOUSANDS, AT LEAST.

HOME ENERGY RATING SYSTEM (HERS) INDEX

The HERS Index is a scoring system used to measure the energy efficiency of a home. This score gives an indication of how energy efficient a home is in comparison to other similar homes. A lower HERS Index score means a more energy-efficient home.





COST TO BUILD

High-performance homes result in a remarkable return on investment.

PUTTING A PRICE ON GREEN

Building a green, high-performance home will typically always cost more than the same home built to standard building codes. The advantage is the long-term energy savings over the life of the home and the improved quality of life—which for many is priceless.

Using California Code as a baseline of construction standards, the table below shows the costs differences in initial construction costs, as well as the energy-efficiency gains and ROI potential.

New Construction Comparison

	 CODE BUILT CALIFORNIA TITLE 24	 ENERGY STAR	 PASSIVE HOUSE INSPIRED	 PASSIVE HOUSE CERTIFIED	 LEED GOLD
COST DIFFERENCE	Base	2%	5%	7%	7.5%
INCREASED ENERGY EFFICIENCY	Base	15%	Up to 90%	Up to 90%	30%
POTENTIAL INCREASED VALUE	Base	5%	10%	10%	10%

Estimates are approximate and are based on a 3,500SF custom home with Building Costs of \$315 per SF.

COSTS AND RETURN ON INVESTMENT

People are often surprised to learn that a high-performance home **only costs 5-10% more** than a conventionally-built home. After several years, the high-performance home catches up, offsetting the difference in initial construction costs (this doesn't include rebates and tax credits), and begins to pay for itself. High-performance homes cost remarkably less over time, because their efficiency simply soars off the charts. Plus, your family enjoys a home that is beautiful, healthier, more comfortable, and better for the environment.

HOW DO I GET THERE?

Navigating custom home building in Silicon Valley.

TAKE THE LONG VIEW

Deciding to build a custom home in Silicon Valley is an involved process. It's important to start off on the right foot by:

- Understanding the progression of a construction project;
- Choosing the right team of professionals; and,
- Having a clear vision of what you need from a home.

This section will help you set a course of action and understand what potential challenges lay ahead of you.

BE PATIENT

Throughout this process, keep in mind that it takes time. In an area that's known for being on the cutting edge of technology, you may find this process outdated in many ways. You may be surprised at how much work has to happen before construction. Pre-construction components include budgeting, financing, property selection, topographical surveying, permitting, planning and design.

Well-designed, well-built, beautiful custom homes take time from start to finish, but are worth it when you have a home that meets your needs for comfort, lifestyle, and beauty.



BUILDING IN SILICON VALLEY

It's technical.



PLANNING YOUR PROJECT

A prescriptive path.



QUESTIONS TO ASK YOUR BUILDER

The answers might surprise you.



DESIGN/BUILD VS. INDEPENDENT ARCHITECT

Two approaches to design.



BUILDING IN SILICON VALLEY

When it comes to permits, plan for things to not go as planned.

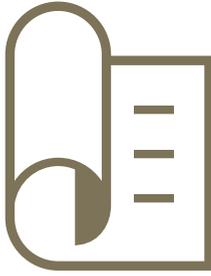
LOCATION, LOCATION, LOCATION

The process of designing and building a home begins with finding the right piece of land. In Silicon Valley, this can prove to be a challenging task. High demand and limited availability often limits an owner to purchasing a property with an existing home and then tearing it down or doing a major renovation. If a vacant lot can be found, you must bring in all the utilities.

SEEKING APPROVAL

The right neighborhood, school district and proximity to work are all considerations when searching for a lot. Once you find the right location, it will be subject to restrictions based on whichever municipality oversees it. These restrictions involve property line setbacks, floor-area ratio (FAR), height limitations and more.

Although getting a building permit can seem daunting, having a design professional and a contractor who are familiar with the local planning and building departments can make a big difference. Each Residential Building Permit is assigned a weighty 350-plus page residential Inspection Guidelines manual, which outlines inspection requirements that are unique to the City in which you are building.

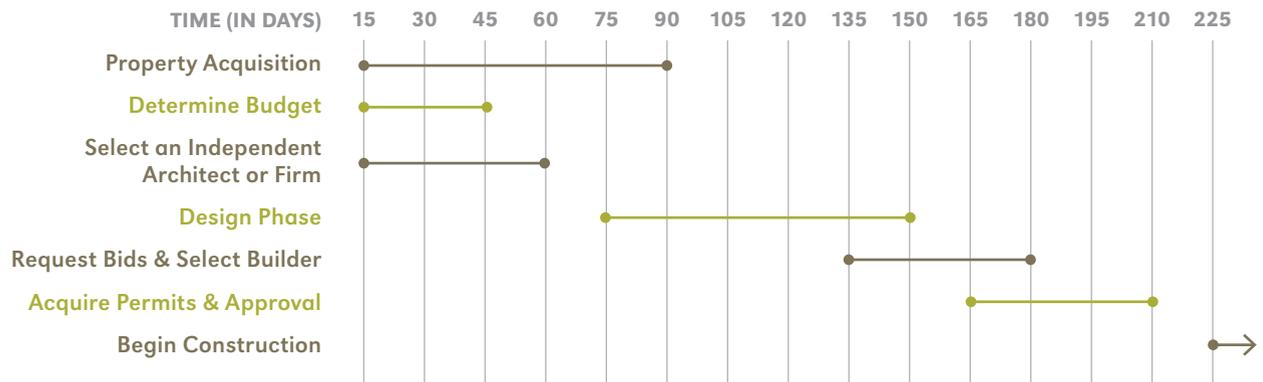


PLANNING

Careful preparation will expedite the construction phase.

DETERMINE YOUR BUDGET

The cost of building a new home varies greatly, depending on the choices you make throughout the building process. By determining how much you can/want to spend, you will know what your options are in terms of the size and style of your home. It will also allow for a certain level of finishings and extras that may not be included in the building contract (furniture, appliances, landscaping, etc.). When determining your overall budget, be sure to include a percentage for unexpected expenses. Figure in at least 10% to cover unforeseen items.



PREPARING FOR CONSTRUCTION

As you can see, there are a lot of steps to building a home before the foundation is poured. Below is a typical timeline for the days leading up to the actual construction phase. Keep in mind that every project is unique and subject to its own set of challenges.

HOW TO SPEED UP THINGS FROM YOUR END

Throughout the design and build process, you'll find that there are many facets outside of your control: multiple government agencies, lending institutions, material lead times, weather conditions and so on. This makes it very important to stay on top of the decisions that you can control, namely keeping on schedule with material selection deadlines that your builder sets and being cautious about design changes mid-construction.



QUESTIONS TO ASK YOUR BUILDER

You know you want to build a new custom home and you know where you want to build it. Now it's time to pick a builder. What to look for exactly? These questions will help you better understand their operation, level of experience, and history in the market place.

1. HOW LONG HAVE YOU BEEN BUILDING IN SILICON VALLEY?

Hiring a custom home builder is similar to hiring a team of long-term employees. You should review their work history, skills, and years of experience. A deep understanding of the local area can make a big difference in moving your project forward.

2. CAN YOU GIVE ME A TIMELINE OF THE PROJECT?

Ask if the builder can provide you with a fixed start date and a completion date — including major milestones along the way. It's also a good idea to ask how the contractor plans on keeping you up-to-date, and how you can communicate questions or concerns along the way.

3. HOW ARE CHANGE ORDERS HANDLED AND PROCESSED?

Change orders are any revisions made to the initial construction specifications. It's important to ask about a contractor's change order process, as they can add to the time and expense of building a house.

4. HOW ARE YOUR PROJECTS MANAGED DURING CONSTRUCTION?

Ascertain how the home builder plans on handling site supervision and subcontractors. How much time will the contractor spend on your project each week versus other jobs? How often will the contractor be on-site and who will be supervising during other times?

5. WHAT SETS YOU APART FROM OTHER BUILDERS?

Ask up front what makes a home builder's company different and unique. Why choose one over another? Each home builder has a philosophy when it comes to building homes—make sure you are in alignment with the company you hire.

6. WHAT TYPES OF PROJECTS DO YOU COMPLETE?

There are many different types of residential construction—from large luxury homes to small cottages. A mismatch to your needs may mean headaches for you down the road. The custom home builder you are considering should have a portfolio of recent projects. Ask to see some floor plans, as well as both interior and exterior photos of the project, both in progress and at completion.

7. WHAT ARE MY OPTIONS FOR PERSONALIZATION AND CUSTOMIZATION OF MY HOME'S FEATURES?

Some home builders will try to cut costs by offering only select “cookie-cutter” designs and limited choices for personalization. While this approach may save you money, it greatly limits your options. If you want flexibility, be sure you select a custom home builder that offers you options to customize your architectural styles, footprint, and finishings.

8. HOW DO YOU ENSURE MY NEW HOME IS HEALTHY AND ECO-FRIENDLY?

Construction today is rife with chemicals that pollute indoor air quality and negatively impacts our short- and long-term health. If you want a healthy, eco-friendly home, clearly describe your desires. Ask if the builder has received green building training or certification.

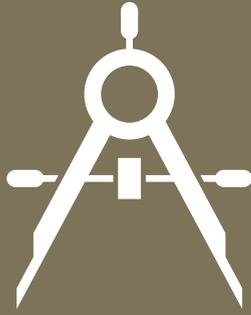
9. DO YOU HAVE A CURRENT LICENSE, BOND, AND GENERAL LIABILITY AND DAMAGE INSURANCE?

Working with an unlicensed builder is done at your own risk! And, just because a builder has a license doesn't mean that the company and its workers are insured against injuries, job site accidents, storm damage, or other hazards. Ask to see their up-to-date certificates showing they are fully covered with liability and damage insurance, as well as workers' compensation.

10. CAN YOU PROVIDE ME WITH A COMPLETE AND CLEARLY WRITTEN CONTRACT?

Simply discussing your project at length is no guarantee of your results. In the contract, have the details of the project carefully spelled out, such as when the builder will start on your new home, down payment details, and required permits.

At Clarum Homes, we can answer your all of your questions with the greatest confidence. **You can learn more about the questions to ask in our two-part series at our website: [CLARUM.COM/GUIDEBOOK](https://clarum.com/guidebook)**



DESIGN-BUILD VS. ARCHITECT

Now that you know the where, it's time to focus on the what.

PICKING A PATH

Now that you have a piece of property to develop or improve, it's time for the design phase. Choosing how to design a home can be just as important as the architect. There are two basic approaches to designing a custom home: design/build or independent architect.

DESIGN/BUILD

You've likely seen this term tacked onto quite a few residential construction companies. It implies that the firm can not only build or remodel your house, but design it as well. This usually means they have an 'in-house' architect and/or interior designer. It's a complete package that means you are picking your architect and builder with one decision.

INDEPENDENT ARCHITECT

As the name implies, you are contracting independently with an architect or architecture firm to design your house. You own your designs and have the freedom to shop them around to any builder you choose.

A NOTE ON INTERIOR DESIGN

When it comes to creating a beautiful space, an interior designer should be an integral part of your team. Early in the process, interview and choose a person to harmonize your flooring, wall colors, tiles, lighting, fixtures, and so on. They can work closely with your architect and/or builder to help keep the construction of your new home on schedule and within budget.

Once your construction process has started, your builder will want you to answer ongoing questions about everything from bathroom sinks to molding selections. Your interior designer will be your saving grace. They will help you make the best decisions based on your style and color preferences. They will save you time and money by keeping the construction process moving forward and eliminating costly mistakes.

GLOSSARY

AIR BARRIER: Building assembly components that work as a system to restrict air flow through the building envelope.

BLOWER-DOOR TEST: Test used to determine a home's airtightness: a powerful fan is mounted in an exterior door opening and used to pressurize or depressurize the house.

BUILDING ENVELOPE: Encompasses the entire exterior of a home, from the foundation and windows and doors to insulation and the roof. A vital step in making a home energy efficient is reducing uncontrolled air leakage in the home envelope.

CARBON FOOTPRINT: The impact a particular activity has on the environment in terms of the amount of climate-changing carbon dioxide and other greenhouse gases it produces.

DESIGN-BUILD FIRM: Company that handles house design and construction.

EMBODIED ENERGY: Energy that goes into making a product; includes energy required for growth, extraction, and transportation of the raw material as well as manufacture, packaging, and transportation of the finished product.

ENERGY STAR: Labeling system sponsored by the Environmental Protection Agency and the US Department of Energy for labeling the most energy-efficient products on the market; applies to a wide range of products, from computers and office equipment to refrigerators and air conditioners.

FORMALDEHYDE: A noxious gas used to manufacture many building materials and household products, including adhesives in engineered wood and in the processing of wrinkle-resistant fabrics.

HVAC: Heating, ventilating, and air conditioning. Collectively, the mechanical systems that heat, ventilate, and cool a building.

HEATING LOAD: Rate at which heat must be added to a space to maintain a desired temperature.

HEAT RECOVERY VENTILATOR (HRV): Balanced ventilation system in which most of the heat from outgoing exhaust air is transferred to incoming fresh air via an air-to-air heat exchanger; a similar device, an energy-recovery ventilator, also transfers water vapor.

LEED: Leaders in Energy and Environmental Design is a building environmental certification program developed and operated by the U.S. Green Building Council.

LOW-E (LOW-EMISSIVE): Coating applied to glass that allows light through but reflects heat, helping control seasonal interior temperature fluctuations due to solar loss and gain.

MSDS (MATERIAL DATA SAFETY SHEET): Provides information for workers and safety personnel about potentially hazardous substances.

NET-ZERO ENERGY: Producing as much energy on an annual basis as one consumes on site, usually with renewable energy sources such as photovoltaics or small-scale wind turbines.

ORIENTATION (SOLAR): Orientation of a structure for controlled solar gain is essential to the success of passive and active solar design elements.

PASSIVE DESIGN: Considering the thermal processes of convection, conduction, absorption, and radiation in a design to maintain comfort levels and reduce or eliminate the need for mechanical systems for these purposes.

PASSIVE HEATING: Channeling the heat of the sun into natural thermal processes like radiation, conduction, and convection to heat a structure instead of relying on a mechanical heating system.

PASSIVHAUS STANDARD: A residential building construction standard requiring very low levels of air leakage, very high levels of insulation, and windows with a very low U-factor.

PHOTOVOLTAIC: Generation of electricity from the energy of sunlight, using photocells.

RENEWABLE ENERGY TECHNOLOGIES: Active, passive, and photovoltaic strategies integrated into building design.

R-VALUE: Short for "resistance to heat flow." Measurement of the thermal resistance of a material, frequently referenced as a measurement for insulation. Increasing the R-value of insulation implies better thermal performance and energy efficiency.

SOLAR GAIN: Increase in temperature contributed to a space by the sun's rays.

SIP (STRUCTURAL INSULATED PANEL): Considered both a composite and modular system, SIPs are prefabricated systems used primarily for walls and roofs that achieve high insulation values.

TANKLESS WATER HEATER: An energy efficient water heater that heats water on demand (rather than traditional heaters, which expend a lot of energy continually heating stored water in a tank).

THERMAL BRIDGING: Unwanted heat loss or gain due to conduction through a material. An example of thermal bridging is heat loss that occurs with structural steel framing that is insufficiently insulated between conditioned and unconditioned space.

THERMAL MASS: Heavy, high-heat-capacity material that can absorb and store a significant amount of heat; used in passive solar heating to keep the house warm at night.

U-FACTOR: The rate of heat loss is indicated in terms of the U-factor (U-value) of a window assembly. The lower the U-value, the greater a window's resistance to heat flow and the better its insulating value.

VOC (VOLATILE ORGANIC COMPOUND): Carbon compounds that vaporize at room temperature, and often contribute to poor air quality in a space. Off-Gassing is the release of volatile, toxic chemicals by products after installation.

XERISCAPING: Type of landscaping that requires little if any irrigation; suited to dry and drought-prone climates; generally relies on regionally adapted native plants.

ADDITIONAL RESOURCES

USBGC's Green Home Guide
greenhomeguide.com

EPA: Indoor Air Quality
epa.gov/iaq

GreenGuard Certified
greenguard.org

American Lung Association Healthy Home
healthhouse.org

National Association of Homebuilders Green Home
nahbgreen.org

Passive House Institute U.S.
passivehouse.us

LEED Certification
new.usgbc.org/leed



“Each Clarum home is a hand-crafted testament to performance, sustainability, and elegant living.”

❖ JOHN SUPPES

ABOUT CLARUM HOMES

Clarum Homes is transforming the way custom homes are built.

Clarum Homes is different than other home builders. **Our difference is rooted in our core purpose: we work to transform the way you live.**

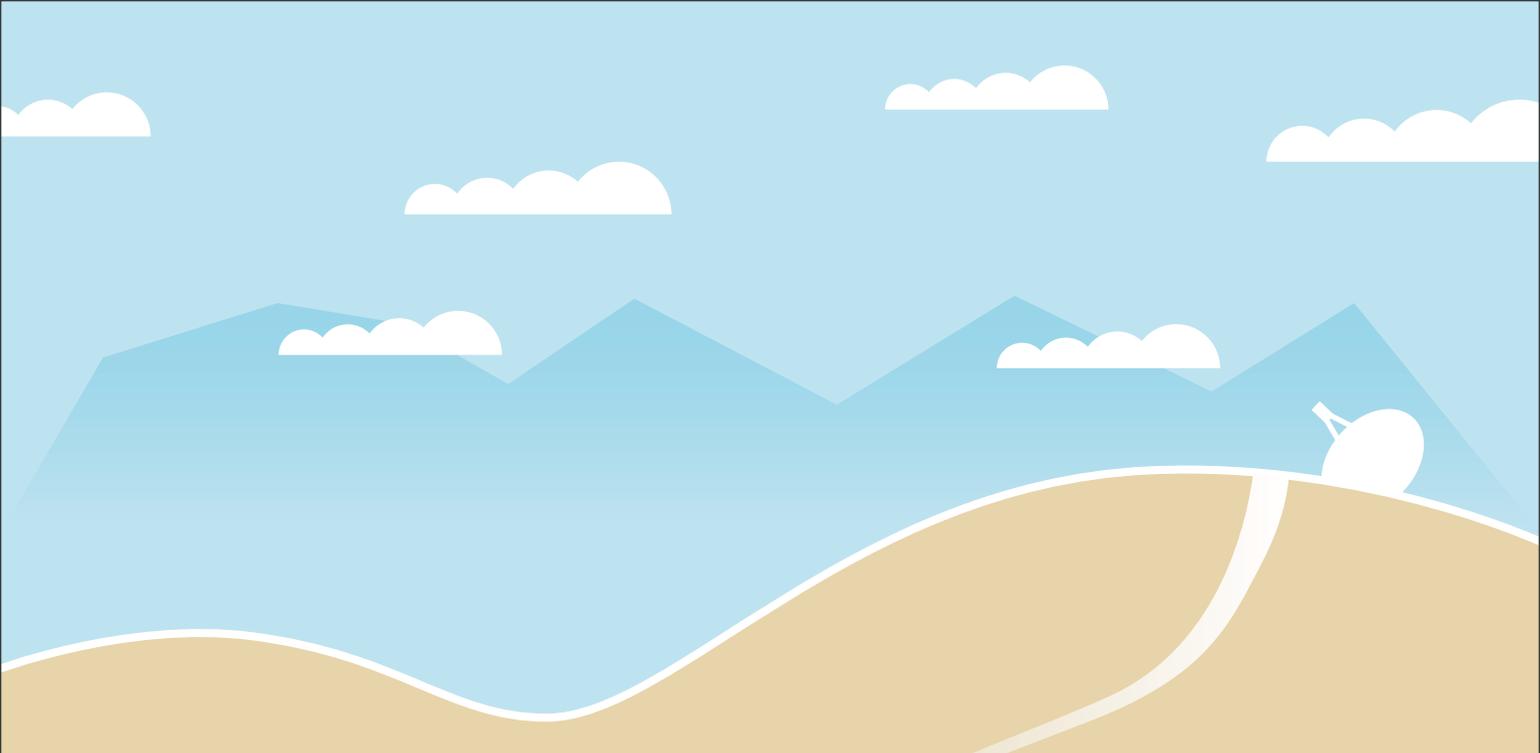
This means a relentless commitment to leading the way in home building innovation. We blend unsurpassed energy-efficient technology and sustainable building materials with homes that are gorgeously designed, healthy for occupants, and amazingly comfortable. Our high-performance custom homes provide substantial, ongoing savings on utility bills, with passive home technology resulting in up to 90% less energy consumption over conventional houses.

INTERESTED IN INTERVIEWING US?

At Clarum Homes, we can answer your all of your questions with the greatest confidence. We manage each construction project with our knowledgeable, highly qualified team of building professionals who act as stewards of your money and your new home. We promise to keep you informed and ensure ongoing communication between all team members. Throughout your project, Clarum will carefully monitor the schedule and proactively manage changes to ensure that your project is delivered on time.

We take great pride in a building process that’s enjoyable for everyone who is involved. Clarum Homes bends over backwards to provide exceptional client service, ongoing communication, and great listening skills. From our project managers to our on-site clean-up crew, our team is fully integrated in the work. This transforms the entire building experience into one of engagement, excitement, and enthusiasm.

**Ready to learn more about Clarum Homes and our process?
Call us at 650-322-7069.**



LEARN MORE

To help supplement this Home Building Guide, we've included more information on our website. We want to aid you in understanding your different choices and how they all come together. This information will make your journey easier and help you prepare for success.

Simply go to clarum.com/guidebook to learn more about energy-efficient home building topics:

- **UTILITIES ADD UP.** Passive and passive-inspired homes lower your utility bills in a big way, dramatically decreasing the lifetime costs of owning a home.
- **WHAT DOES A HIGH-PERFORMANCE HOME COST TO BUILD?** People are often surprised to learn that a high-performance home only costs 5-10% more than its conventionally-built equivalent.
- **EMBODIED ENERGY: A MEASURE OF SUSTAINABILITY.** The environmental impact of a home includes its daily energy consumption, as well as its construction and ongoing maintenance and repair.

If you have any questions, please call Clarum Homes at 650-322-7069.

