RED BARN
ARCHITECTURE

Green Design Guide

A guide to sustainable design options for your new custom home or renovation.

WHY BUILD GREEN

The buildings and spaces where we spend our time directly impact our health and well-being. Add to that the shared responsibility we have to be good citizens of the planet, and that's why Red Barn aims to build green.

Building upon our shared responsibility to be good citizens of the planet, Red Barn aims to build green. Every project has the opportunity to be green and we respect that sustainability goals are personal choices. Your sustainability goals will not be the same as your neighbors, nor should they be. We start with a conversation and then explore what's possible.

Let's start the journey together!

RED BARN'S APPROACH TO GREEN

Ultimately, we want to design a home for you that is - walk around in your bare feet comfy - in the wintertime and filled with fresh air and cool breezes in the summertime. These five basic components will get us closer to year-round comfort while saving you money on utilities, a win-win for you and the environment! During our work together, we will guide you through each component and figure out the best decisions for your home.

Building Orientation

Starting from scratch? We can locate your new home on your property to best take advantage of the sun. We will consider things like solar orientation, daylight harvesting techniques, and solar shading techniques, all of which help limit the energy you need to operate your home.

Insulation and Building Envelope

R-value, thermal bridging, fenestration requirements, and air sealing techniques are paramount to controlling heat transfer and vapor management through the wall assembly. Don't worry; we'll explain all those terms later on, but it boils down to making sure the money you spend on heating and air conditioning doesn't fly out of your home with the drafts.

Building Systems

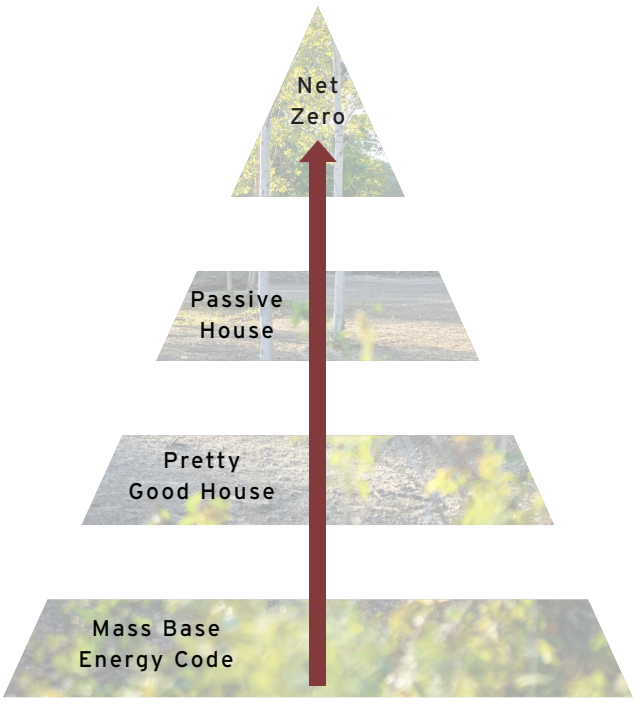
There are lots of different system choices, and we'll walk you through all of them. Systems selection and implementation, including coordinating those systems, requires careful cost-benefit analysis to ensure the technologies employed meet your goals. Progress analysis and end-of-job commissioning confirm original goals have been met and subcontractor installations are in accordance with the required standard.

Aesthetic Goals

Bottom line, green design should not compromise the aesthetics of your home. We approach projects by blending all of the elements above into a quality, energy-efficient design that reflects your values and personal aesthetics.

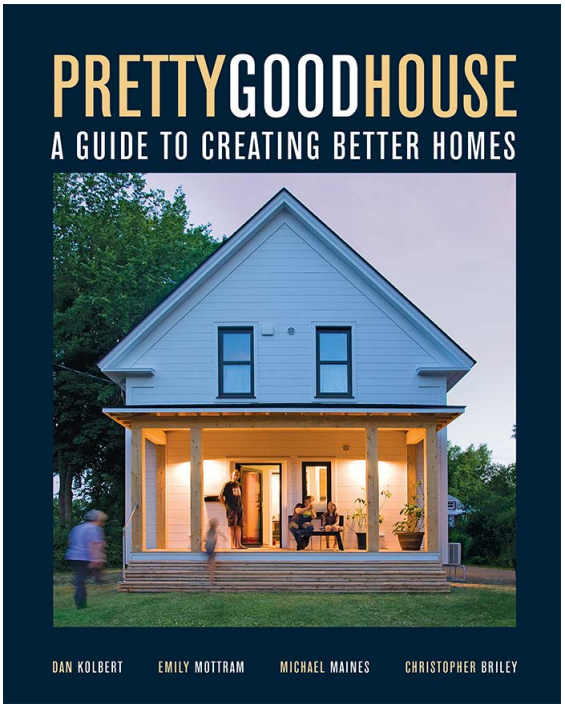
A FORMULAIC APPROACH

Some people are just more comfortable sticking to a formula. If that's you, then this section is tailor-made with your name on it. There are several paths, some with official certifications, you can pursue with your Green Build project, and understanding the difference between each will help you pick the right approach for you.



Start with the Massachusetts Base Energy Code or the Massachusetts Stretch Energy Code

Regardless of your sustainability goals, this is one program that you will have to meet for your home to be code compliant. Massachusetts adopted the 2021 International Energy Conservation Code (IECC) for residential buildings. The key updates from previous versions include stricter standards for insulation and air sealing, increased efficiency standards for heating, cooling, and hot water systems, and a focus on efficient lighting. Newly constructed homes are required to meet more stringent airtightness levels and thermal performance criteria. Additionally, provisions for renewable energy readiness are encouraged, including the pre-wiring and pre-plumbing of homes to accommodate future installation of renewable energy systems such as solar panels.

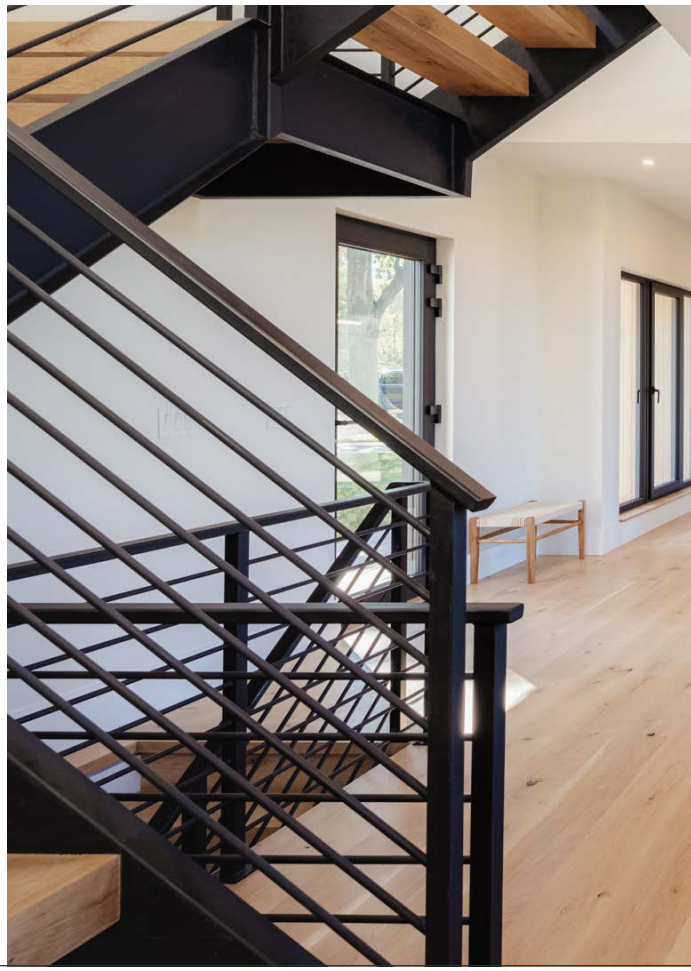


Pretty Good House

The "Pretty Good House" concept is a sustainable building philosophy emphasizing practicality, affordability, and environmental responsibility in home construction. It promotes the idea that homes should be energy-efficient, durable, and comfortable while remaining within a reasonable budget. Key principles include focusing on effective insulation, airtightness, and high-performance windows and doors to reduce energy consumption. Additionally, it encourages using responsibly sourced materials, efficient mechanical systems, and proper ventilation for indoor air quality. The "Pretty Good House" philosophy prioritizes a balance between sustainability and affordability, aiming to create homes that are both environmentally friendly and financially accessible for homeowners.

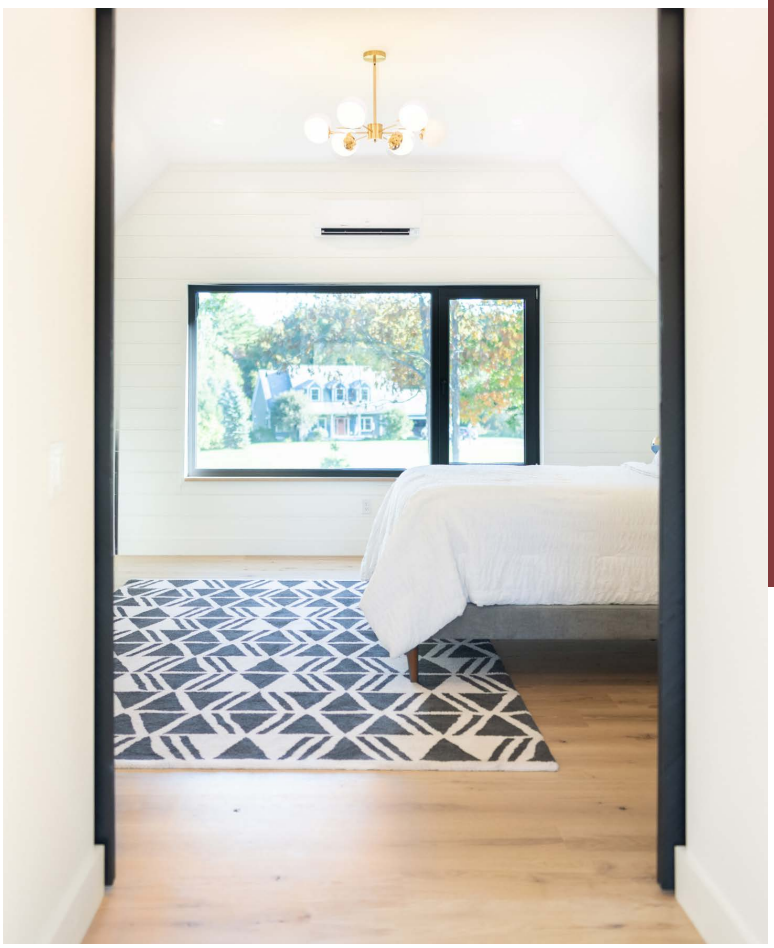
Passive House

Passive House design is a rigorous and highly energy-efficient building standard that prioritizes exceptional comfort, indoor air quality, and drastically reduced energy consumption. It's a great choice if you are building your forever home because you will save money in the long run with significantly reduced energy costs. The core principles include superior insulation and airtightness to minimize heat loss and gain, leading to minimal heating and cooling requirements. High-performance windows and doors, as well as heat-recovery ventilation, ensure a consistent and healthy indoor environment. Additionally, passive solar strategies and thermal mass are employed to optimize natural heat sources. The goal of Passive House design is to create buildings that use up to 90% less energy for heating and cooling than conventional structures, reducing both environmental impact and long-term operating costs while providing unparalleled occupant comfort and well-being. It's a great choice for our New England winters. Imagine walking through your house without socks on in the middle of winter and never hitting a cold zone. That's what a Passive House feels like.



Net Zero House

Net Zero home design focuses on creating highly energy-efficient buildings that produce as much renewable energy as they consume over the course of a year, resulting in a net-zero energy balance. Key principles include a well-insulated and airtight building envelope to minimize energy loss, energy-efficient appliances and lighting, and high-performance HVAC systems. To achieve net-zero status, these homes often incorporate solar panels or other renewable energy sources to generate clean energy on-site. Additionally, advanced technologies such as energy storage systems and smart home controls are utilized to optimize energy usage and distribution. The ultimate goal of Net Zero home design is to significantly reduce the carbon footprint of residential buildings, combat climate change, and achieve energy independence while maintaining a comfortable and sustainable living environment.



DIVING INTO THE DETAILS

Building Orientation

If you are thinking of building a new home, then you are at an advantage because you can make sure your future home is properly sited for you to take full advantage of what nature can offer. Building orientation considerations involve optimizing your home for solar orientation, daylight harvesting techniques, and solar shading methods and are crucial to creating energy-efficient structures.

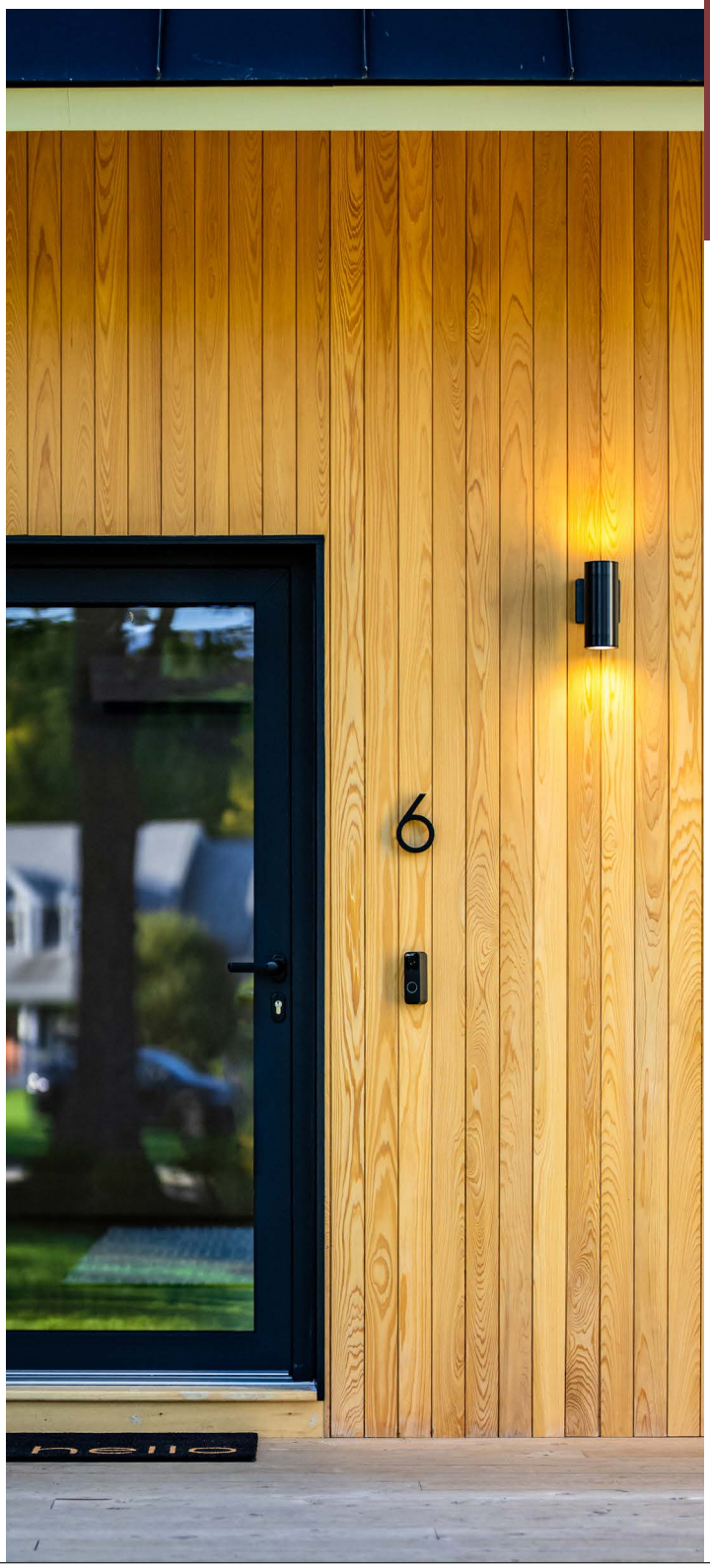
Solar orientation allows us to maximize natural light and heat, reducing the need for artificial lighting and heating. Daylight harvesting techniques harness sunlight to create well-lit spaces, enhancing occupant well-being and minimizing energy use. Think about how much happier you are with daylight pouring in your windows. That's what we want for you in your new home. Solar shading techniques regulate temperatures, balancing indoor comfort and energy consumption.

Site considerations, including optimal placement for solar arrays and geothermal systems if you go that route, require expert guidance to maximize efficiency. To harness the power of solar energy, we design roofs that accommodate solar panels, even in historically sensitive areas where solar has gained greater acceptance on alterations historic homes. Another option for historic homes is solar roof shingles, which are less visually invasive. Our firm excels in seamlessly integrating these principles, demonstrating our expertise in creating sustainable architecture that minimizes ecological impact and enhances energy efficiency.

Start with a Superinsulated Building Envelope

A pivotal principle guiding our work is beginning with a super-insulated building envelope, e.g., that part of your house that separates the outside walls from the inside walls. Think of your house as a cooler. It can be a Yeti cooler and keep your drinks chilled on ice for days at a time, or it can be your average cooler that keeps your drinks chilled on ice for a day at the beach. It's the wall construction and insulation inside the Yeti that makes it more effective.

Some of the things we do to achieve a superinsulated building envelope include designing double-depth walls, which limit drafts and energy loss because there is more room for insulation. To ensure that the building envelope is both historically sensitive (if you are living in a historic home) and high-performing, we carefully select window and door options. For new homes, we recommend triple-pane windows for exceptional insulation. However, we tailor our approach to historic homes and typically recommend double-pane windows with low U-values (u-values measure heat transfer, and low U-value = less heat loss and/or gain) for aesthetic compatibility.



Our commitment to sustainability goes beyond insulation and fenestration (i.e., windows and doors). We prioritize air sealing techniques and the efficient circulation of air within the building to maintain a healthy indoor environmental quality. Our meticulous attention extends to exterior insulation and waterproofing details, along with careful considerations of foundation insulation, ensuring a robust and energy-efficient building envelope.

Choices in Systems and Utilities

Selecting the most appropriate systems and utilities is a critical aspect of any green building project, it's also one of the most challenging because there are so many choices. One way Red Barn can help you through this process is by conducting a cost-benefit analysis to ensure that the chosen systems make sense for your sustainability goals and your financial goals.

We can also employ progress analysis and end-of-job commissioning to validate that the initial goals are met and subcontractor installations adhere to the required standards. We stay updated on the latest green building technologies, allowing us to adapt and incorporate cutting-edge sustainable solutions into our projects. This holistic approach ensures that every project we undertake is not just sustainable but also at the forefront of green building innovation.

What sustainable elements would you like to consider in your home?

- ☐ EV charger
- ☐ Geothermal heating/cooling
- ☐ No fossil fuels/all-electric home
- ☐ Induction cooktop
- ☐ Whole house batteries
- ☐ Solar panels
- ☐ Air filtration system
- ☐ Occupancy sensors
- ☐ Automatic shading systems
- ☐ Energy Star Appliances
- ☐ Wind harvesting
- ☐ Rainwater harvesting
- ☐ Grey water harvesting

NOTES

Choosing Your Building Materials

Thoughtfully sourcing building materials includes considering what goes into building your home and what finishes you choose to stylize your home. An important part of building material choice is limiting the amount of volatile organic compounds or VOCs in the products you choose. VOCs can emit harmful chemicals into the air causing adverse physical effects. To reduce this negative impact, we can specify low-VOC paint, caulking, and other adhesives, and we can help you source textiles, upholstery, and furnishings that do not contain VOCs. By paying close attention to the details, we can help significantly reduce the potential harmful chemicals in your new home.

Choosing Your Consultant Team

Selecting the right consultant team is a pivotal decision in the pursuit of building sustainably. Our approach emphasizes collaboration with key team members, such as builders, HVAC subcontractors, geothermal subcontractors, solar subcontractors, and more, ensuring a holistic and environmentally responsible project. For us, sustainability goes beyond design; it extends into the field, advocating for designing the structural skeleton of your home as small as possible and aligning structural engineers with green objectives to reduce the material footprint of the project. This not only contributes to environmental conservation but also makes economic sense, eliminating excess materials with no purpose. By working with you to conscientiously assemble a consultant team that aligns with your green building objectives, we ensure that every project we undertake benefits from the collective expertise and dedication required to achieve environmentally responsible and economically sensible architectural solutions.

FUNDING OPTIONS

In Massachusetts, we are lucky to have the Mass Saves program, which helps incentivize your energy upgrades through rebates, low-cost financing, and other incentives. There are programs for home renovations and new builds that are designed to exceed the Massachusetts building energy code. You can learn more about financial and other incentives by visiting the Mass Saves website: https://www.masssave.com

mass save®
Savings through energy efficiency

RESOURCES

- Building a Sustainable Home: Practical Green Design Choices for Your Health, Wealth, and Soul by Melissa Rappaport Schifman
- Prescriptions for a Healthy House, 4th Edition: A Practical Guide for Architects, Builders and Homeowners by Paula Baker-Laporte and John C Banta
- Green Homes: New Ideas for Sustainable Living by Sergi Costa Duran
- Pretty Good House by Michael Maines, Daniel Kolbert, Emily Mottram and Christopher Briley
- Passive House Details: Solutions for High-Performance Design 1st Edition by Donald Corner, Jan Fillinger and Alison Kwok
- The New Net Zero: Leading-Edge Design and Construction of Homes and Buildings for a Renewable Energy Future by Bill Maclay

Green Building Advisor website
https://www.greenbuildingadvisor.com/

Building Science Corporation website
https://buildingscience.com/

Building Science podcast
https://positiveenergy.pro/building-science-podcast

Unbuild It podcast
https://unbuilditpodcast.com/

Massachusetts Energy Rebates & Incentives:
https://www.mass.gov/guides/massachusetts-energy-rebates-incentives

Air-Source Heat Pumps Guide:
https://goclean.masscec.com/clean-energy-solutions/air-source-heat-pumps/

Rewiring America: Guide to Inflation Reduction Act:
https://www.rewiringamerica.org/IRAguide

Rewiring America: Inflation Reduction Calculator:
https://www.rewiringamerica.org/app/ira-calculator