INTRODUCTION

The process of green building incorporates environmental considerations into every phase of the home building process. That means that during the design, construction, and operation of a home, energy and water efficiency, lot development, resource efficient building design and materials, indoor environmental quality, homeowner maintenance, and the home's overall impact on the environment are all taken into account.

Now to answer the question, **"Why should we care about green building?"** There are many compelling reasons for changing the way we build and operate homes. Although we cannot avoid affecting the environment when we build a house, green building can work toward minimizing that environmental impact.

These guidelines were designed with the mainstream home builder in mind. We recognize that many home building companies already incorporate some elements of green building into their current practices. However, the purpose of these guidelines is to highlight ways in which a mainstream home builder can effectively and holistically weave environmental concerns into a new home and to provide a tool for local associations to create a green home building program.

At the time these guidelines were created, there were 28 green home building programs in operation throughout the United States. These programs have done a great job of spreading the word about green home building. However, there are numerous other locales that are interested in green home building but have not had the resources to create a program from scratch. These guidelines are intended to serve as a tool kit for home builder associations to create new programs and to help those programs expand and flourish.

GUIDING PRINCIPLES

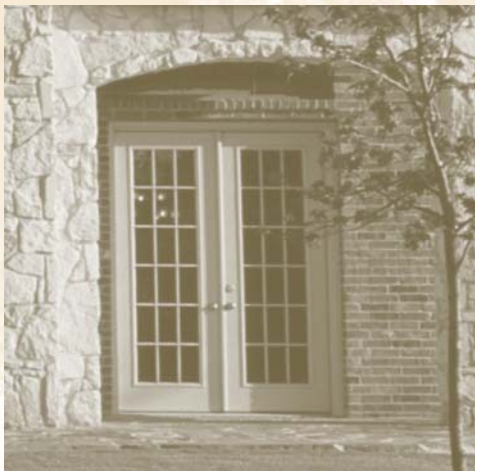
As noted above, during the process of building a green home, a builder takes numerous considerations into account simultaneously and consciously incorporates environmental issues into all decisions. These model green home building guidelines consist of a variety of distinct line items that a builder can choose from in creating a green home. For organizational purposes, we have grouped the line items into overarching sections, or guiding principles. Below are the guiding principles addressed in green home building:

Guiding Principle—LOT DESIGN, PREPARATION, AND DEVELOPMENT

Resource-efficient site design and development practices help reduce the environmental impacts and improve the energy performance of new housing. For instance, site design principles such as saving trees, constructing onsite storm water retention/infiltration features, and orienting houses to maximize passive solar heating and cooling are basic processes used in the design and construction of green homes.

Guiding Principle—RESOURCE EFFICIENCY

Most successful green homes started with the consideration of the environment at the design phase—the time at which material selection occurs. Creating resource-efficient designs and using resource efficient materials can maximize function while optimizing the use of natural resources. For instance, engineered-wood products can help optimize resources by using materials in which



more than 50% more of the log is converted into structural lumber than conventional dimensional lumber.

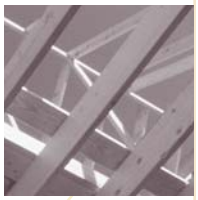
Resource efficiency is also about reducing job-site waste. Invariably, there are leftover materials from the construction process. Developing and implementing a construction waste management plan helps to reduce the quantity of landfill material. The average single-family home in the United States, at 2,320 ft^2 (NAHB, 2003), is estimated to generate between 6,960 and 12,064 lbs. of construction waste. Thus, by creating an effective construction waste management plan and taking advantage of available recycling facilities and markets for recyclable materials, construction waste can be reduced by at least two-thirds, creating potential cost savings for builders and reducing the burden on landfill space.

Lastly, basing the selection of building materials on their environmental impact can be tricky. For instance, a product might be renewable, but on the other hand it takes a relatively great amount of energy to transport the product to a project's job site. One way to compare products is to look at a product's or a home's life-cycle environmental impacts through a process called life-cycle analysis (LCA). An LCA of a building product covers its environmental impacts "cradle to grave" through six basic steps: 1) Raw material acquisition, 2) Product manufacturing process, 3) Home building process, 4) Home maintenance and operation, 5) Home demolition, and 6) Product reuse, recycling, or disposal. There are numerous reasons why building products are not commonly selected via LCAs. One of the issues is the availability of data—there is a lack of data to feed into tools that allow for an LCA on a product or system.

One such tool created by the National Institute of Standards and Technology (NIST) is the Building for Environmental and Economic Sustainability (BEES) software program. BEES has 10 impact categories: acid rain, ecological toxicity, eutrophication, global warming, human toxicity, indoor air quality, ozone depletion, resource depletion, smog, and solid waste. Since information is not available to conduct full LCAs on all available building products, we have instead included an LCA mind-set in creating the list of line items in the Resource Efficiency section. Our hope is that in the future the prescriptive line items in the guidelines will eventually be replaced with a full LCA approach for the home as a system and the components therein.

Guiding Principle—ENERGY EFFICIENCY

Energy consumption has far-reaching environmental impacts: from the mining of fossil-fuel energy sources to the environmental emissions from burning non-renewable energy sources. And each home consumes energy year after year, meaning that the environmental impacts associated with that use accrue over time. Therefore, energy efficiency is weighted heavily in a green building program.



Energy consumption occurs not only during the operation of a home but also during the construction of a home and, indirectly, in the production of the materials that go into the home. Although the energy used to heat and cool a home over its life far outweighs that to manufacture the materials and construct it, the large number of homes built (currently about 1.85 million per year) renders the energy used during the construction phase significant.

On average, a home built between 1990 and 2001 consumed about 12,800 kWh per year for space and water heating, cooling, and lights and appliances. Where natural gas is used, consumption averages 69,000 cubic feet per household annually. Total energy expenditures during a year cost these homeowners about $1,600. Energy-efficiency improvements that make a home 20% more efficient—a conservative estimate for many green homes—could significantly reduce a homeowner's annual utility expenses.

No matter what the climate, energy efficiency is considered a priority in most existing green building guidelines/programs. Moreover, as the cost to heat and cool a home becomes more unpredictable, it is advantageous to every homeowner to be "insulated" from inevitable utility bill increases. As with all aspects of these guidelines, the greatest improvements result from a "whole systems" approach. Energy performance does not end with increased R-values, the use of renewable energy, and/or more efficient HVAC equipment. Rather, there needs to be a balance between these features and careful window

selection, building envelope air sealing, duct sealing, and proper placement of air and vapor barriers from foundation to attic to create a truly high-performance, energy-efficient home that is less expensive to operate and more comfortable to live in than a conventionally constructed home.

Guiding Principle—WATER EFFICIENCY

The mean per capita indoor daily water use in today's homes is slightly over 64 gallons. Implementing water conservation measures can reduce usage to fewer than 45 gallons. For this reason, green homes are especially welcomed in areas affected by long- and short-term drought conditions.

The importance of water resources is becoming increasingly recognized, especially in the western third of the country. Choices between sending water to growing urban areas and making water available for irrigation highlight the issues surrounding the scarcity of this valuable resource.

Green homes often conserve water both indoors and out. More efficient water delivery systems indoors and native and drought-resistant landscaping choices outdoors can help prevent unnecessary waste of valuable water resources. Communities can obtain additional benefits when builders effectively use native species in landscaping. Current research and practice have shown that natural processes can be a successful means of filtering and removing contaminants from storm water and wastewater.

Guiding Principle—INDOOR ENVIRONMENTAL QUALITY

Healthy indoor environments attract many people to green building. After energy efficiency, the quality of a home's indoor air is often cited as the most important feature of green homes. Pam Sessions, president of Hedgewood Properties in Atlanta, said during the 2002 National Green Building Conference that the majority of people interested in green homes in the Atlanta market indicated that indoor air quality was their top issue of interest.

An increase in reported allergies and respiratory ailments and the use of chemicals that can off-gas from building materials have contributed to a heightened awareness of the air we breathe inside our homes. Even though there is no authoritative definition of healthy indoor air, there are measures that can mitigate the effects of potential contaminants including controlling the source, diluting the source, and capturing the source through filtration.

Guiding Principle—OPERATION, MAINTENANCE, AND HOMEOWNER EDUCATION

Improper or inadequate maintenance can defeat the designer's and builder's best efforts to create a resource-efficient home. For example, homeowners often fail to change air filters regularly or neglect to operate bath and kitchen exhaust fans to remove moist air. Many homeowners are unaware of the indoor environmental quality impact of using common substances in and around the house such as pesticides, fertilizers, and common cleaning agents. ***By providing homeowners with a manual that explains proper operation and maintenance procedures, offers alternatives to toxic cleaning substances and lawn and garden chemicals, and points out water-saving practices, a builder can help assure that the green home that was so carefully built will also be operated in an environmentally responsible manner.***

Guiding Principle—GLOBAL IMPACT

There are some issues related to home building and land development that do not fit neatly into the context of the aforementioned guiding principles. ***For these items that are a by-product of home construction, we have added a separate principle—global impact.*** One example of an issue having global impact is the selection of paints that contain relatively low or no volatile organic compounds (VOCs). Although the VOC content of paint is often considered for indoor environmental reasons, the vast majority of VOCs are released by the time the paint is dry.

However, the release of VOCs from wet paint helps form ground-level ozone pollution. Therefore, the use of low- or no-VOC paints falls under the global impact principle because the environmental impact of using paints with relatively high VOC levels is greater on the global scale than it is on the indoor environment.

Guiding Principle—SITE PLANNING AND LAND DEVELOPMENT

The process of green home building should not stop at the house. If a builder is also involved in the development of the community, site planning and land development can be part of the process. Therefore, information about low-impact site planning and land development is included in Appendix A. Considering the entire community and existing infrastructure in addition to the individual building(s) can amplify the benefits of green home building. For example, by improving a subdivision's storm water management plan and preserving natural resources through careful design and construction practices, ***a builder can influence not only the resource efficiency of each particular house but also the entire subdivision's overall environmental impact.*** Low-impact development (LID), which uses various land planning and design practices and technologies to simultaneously conserve and protect natural resources and reduce infrastructure costs, is one way to approach green development.

HOW HOMEOWNERS CAN BENEFIT FROM GREEN BUILDING

The previous section highlighted the environmental benefits of green building practices. However, green building is much more than just reducing a home's environmental footprint. Homeowners can also realize direct benefits by owning a green home. Here are some of the primary benefits that owners of green homes have experienced compared with owners of conventional homes:

- **Lower operating costs—**Homeowners receive less expensive utility bills because of energy and water efficiency measures.
- **Increased comfort—**Green homes have relatively even temperatures throughout the home, with fewer drafts and better humidity control.
- **Improved environmental quality—**By following these guidelines, builders pay extra attention to construction details that control moisture, choose materials that contain fewer chemicals, and design air exchange/filtration systems that can contribute to a healthier indoor environment.

- **Enhanced durability and less maintenance—**Green homes incorporate building materials and construction details that strive to increase the useful life of the individual components and the whole house. Longer-lasting materials not only require fewer resources for replacement but also reduce maintenance and repair costs. Green homes have lawns that require less weeding and watering, building elements that require less maintenance, and more durable building components that reduce the time needed for upkeep.

It is important to note that a builder can do only so much when it comes to how the home will perform. Homeowners play a big role in the house performance and, therefore, should be instructed on how to operate the green home as it was intended.

GUIDELINES DEVELOPMENT PROCESS

The NAHB Model Green Home Building Guidelines were developed through a public process that included the following major steps:

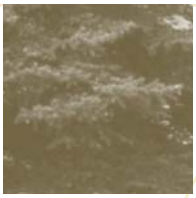
1. An extensive review of the existing local green home builder programs—primarily home builder association programs, but also including several public sector and non-profit programs. All but three of the 28 existing programs are voluntary and market-driven.
2. A review of the voluntary energy-efficiency programs endorsed by NAHB.

3. A review of the leading life-cycle analysis (LCA) tools available for use by residential design and construction professionals in North America (e.g., BEES, ATHENA).
4. Input through an open process from numerous individuals in the NAHB Advisory Group and the Stakeholder Group.
5. Applying certain criteria to each line item in order to give the line items point values.

Each line item in the guidelines has a point value attributed to it. Once the Stakeholder Group members finalized the list of line items for inclusion in the guidelines, the NAHB team looked at each line item through three different lenses: 1) environmental impact, 2) building science and best building practices, and 3) ease of Implementation. The team used publicly available information, experiential data, and other data inputs to assign each line item points via these three criteria. Each line item's final point total was calculated by weighting the criteria. Environmental impact received the greatest weight, followed by building science and best building practices, with ease of implementation receiving the least weight.

Environmental Impact—The main purpose of these guidelines is to provide a framework for builders to reduce a home's environmental impact. We assessed how each line item helped make a home more energy efficient, improved indoor environmental quality, and so on. Assigning a value to each line item is an inexact science since all of the necessary data are not available. In addition, some line items had impacts that spanned multiple principles, and, in some cases, the impact was positive for one guiding principle while negative for another. With that as background, the NAHB team took into account all of the above considerations and available data to assess the environmental impact of implementing each line item. Using qualitative and quantitative information, the team assigned value to each line item based on the positive impact to the environment.

Building Science and Best Building Practices—Certain green building practices dramatically affect how a house operates. For example, the sealing of a home's building envelope has an impact on the home's HVAC system. In addition, some measures such as proper flashing details and installation of weather barriers enhance durability, minimize the possibility of indoor environmental problems, and are considered "best building practices." Line



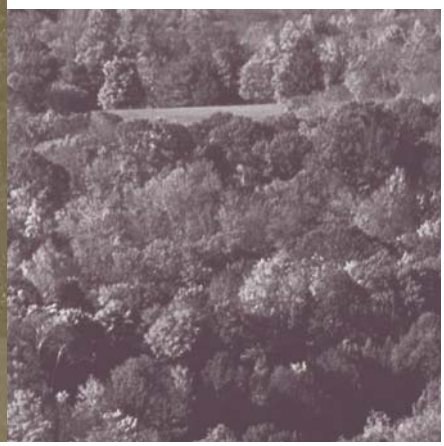
items that help a home perform effectively as a system for the long term were assigned a higher point value.

Ease of Implementation—Some line items are easier to implement than others. The NAHB team compared each line item with current home building practices and estimated how difficult it would be for a builder to implement the line item relative to cost and time. For instance, would it take longer to install a new technology? Would subcontractors need to be educated on the use of a new product? Would a new technology cost more to buy? A line item will have a positive environmental impact only if it is implemented. Line items that were relatively easy to implement (and therefore more likely to be implemented) were assigned a greater point value than the items that are more difficult to implement.

Green Programs and Homes Differ Across the Country

When assigning points to the line items, NAHB assumed the home would be built in Baltimore, which is in Zone 4 of DOE's proposed climate zone map. The map can be viewed at the following web site:
www.energycodes.gov/implement/pdfs/color_map_climate_zones_Mar03.pdf

For associations located outside of Zone 4 that are interested in creating a green building program, point values can be customized for some line items most affected by climate conditions. For example, an association in Florida will likely want to increase the point values attributed to installing an energy efficient-air conditioning



system and decrease the point value associated with installing a high-efficiency heating system. Similarly, in the southwestern United States, associations would probably place higher value on water efficiency measures. A thermometer symbol in the User Guide identifies line items that most likely will see point value changes due to climatic differences across the country.

Additional factors can lead to the decision to alter point values for a certain location, such as the availability of materials, the recycling marketplace, and the existence of rebate programs. A line item's point value is determined by consensus among the members of the green home building program's development committee. This is primarily a qualitative process, and some acknowledgment of the decision-making process should be clearly stated in the program.

Various Levels of Green

Homebuilders differ in their relative knowledge and comfort level with green building concepts. Some builders have been building green for years, while others are being introduced to the ideas for the first time. Recognizing this broad range of knowledge, the NAHB team established various thresholds to delineate different levels of green building effort.

The first step was to identify practices that should be part of any home building project. The first level of green building, Bronze, includes additional line items that in the end show that a builder paid special attention to a project's environmental impact. The next two levels of green home building, Silver and Gold, include additional line items that place increasingly greater emphasis on the home's environmental impact. The "How to Use the Guidelines" section of this document outlines how to score a home to determine if it meets or exceeds any of the green home building levels noted above.

The Uncertainties of Green Building

It should be noted that although many green building programs have been in existence for 10 years or more, the concept and practice of green building is not clearly defined and straightforward. Many gray areas remain in identifying and quantifying the precise environmental impact for each particular line item. For example, there is very little publicly available information regarding manufacturing processes that document energy consumption, impact on natural resources, or CO_2 emissions for each building material.

In addition, a particular guideline may contain trade-offs and carry with it contradictory characteristics. For example, a recirculating hot water system can help conserve water but may use a relatively large amount of energy in its operation. Although the guidelines in their current form are based on experiential evidence and the latest independent scientific research available, they still may leave many questions unanswered due to the lack of scientific and quantitative data.

Finally, assigning a particular degree of importance to different criteria undoubtedly involves a certain amount of personal or local value judgment. Life-cycle assessment (LCA) tools are beginning to sort out such questions, but the tools still remain in their infancy. Therefore, this set of green home building guidelines should be viewed as a dynamic document that will change and evolve as new information becomes available, improvements are made to existing techniques and technologies, and new research tools are developed.

HOW TO USE THE GUIDELINES

The guidelines are organized by the guiding principles listed above. However, there are two underlying ideas that everyone should keep in mind before undertaking a green home project. First, environmental considerations should be incorporated into the project from the very beginning. It is much harder to weave green home concepts into a project after the house plans are finished. Second, the house should be looked at as a whole as the builder determines which of the green home guideline items to put into the house. For example, making a home's building envelope tighter through air sealing and quality building techniques can affect the way in which the builder designs the home's ventilation system. It is through such a forward-thinking process that builders can gain cost efficiencies.

PART ONE—Green Home-Building Checklist

Part One of these guidelines contains the checklist of line items. Each entry includes the line item title, the point value, and the items that should be provided by the builder to verify that the line item was implemented. The verification column assumes there is a green building program coordinator or other third party. However, the guidelines and point system can be used independently even if a formal green building program does not exist in a particular region.

It is again recommended that a builder first become familiar with the line items prior to designing a home to help introduce concepts that a builder can incorporate into the home's design, construction, and operation.

To help a builder holistically incorporate green building into homes, the NAHB team established different point levels to achieve for each guiding principle at each level of green building. The point system is described below.

POINT SYSTEM

There are three different levels of green building available to builders wishing to use these guidelines to rate their projects—Bronze, Silver, and Gold. At all levels, there are a minimum number of points required for each of the seven guiding principles to assure that all aspects of green building are addressed and that there is a balanced, whole-systems approach. After reaching the thresholds, an additional 100 points must be achieved by implementing any of the remaining line items. The table below outlines the various green building level thresholds.

Points Required for the Three Different Levels of Green Building

	Bronze	Silver	Gold
Lot Design, Preparation, and Development	8	10	12
Resource Efficiency	44	60	77
Energy Efficiency	37	62	100
Water Efficiency	6	13	19
Indoor Environmental Quality	32	54	72
Operation, Maintenance, and Homeowner Education	7	7	9
Global Impact	3	5	6
Additional Points From Sections of Your Choice	100	100	100

** If the home does not have a ducted distribution system for space heating and cooling, deduct 15 points from the number required in the Energy Efficiency section.*

A reduction in the required points for a home without ductwork for the space heating and cooling systems reflects the fact that there are more points available for homes that do have ductwork. It is not intended as an indication of preference for one type of system over another.

To determine point values for each guiding principle, a builder simply adds the points for each line item applied to the home for each guiding principle. Comparing the project's points for the individual guiding principles with the chart above will determine whether the project is deemed a Bronze-, Silver-, or Gold-level green home.

PART TWO—User Guide

Recognizing that some of the line items need more than a one- or two-sentence explanation, the User Guide further explains each concept. For each line item, the User Guide contains an entry with the following subheadings:

Intent—Explains the general reasons for including each line item in the guidelines and the impact that implementing the line item will have on the environment.

Additional Information / How to Implement—Contains text, pictures, and formulas to help facilitate the line item's implementation.

Resources—References to books, web sites, articles, and technical guides for further in-depth information related to the line item. Please note that the URLs were active and current at the time this document was created. With the significant changes occurring on the Internet and in the home building industry products and services markets, location and availability of resources will likely change over time.

As noted earlier, Appendix A provides additional ideas to consider for builders and developers who can effect change at the subdivision level, i.e., multiple home levels.

If a local green home building program does not exist, a builder can use the checklist and User Guide to self-certify a home. However, if a local association has used this document to create a local green building program, the builder can use the checklist and system from that program to show a home's relative green value.

Final Thoughts

We hope you find this tool useful and that it helps further advance green home building practices into mainstream construction. We wish you well in your endeavors and encourage you to share this information with your friends and family, customers, and product suppliers and distributors.

SECTION 1 LOT DESIGN, PREPARATION, AND DEVELOPMENT

		PTS	HOW TO VERIFY
1.1 SELECT THE SITE			
	Select the site to minimize environmental impact.		
1.1.1	Avoid environmentally sensitive areas as identified through site footprinting process or existing third-party data.	7	Any one of the following: • Comprehensive plan • Wetland institute • Local jurisdiction's guidelines • Site footprinting process results • Set of site plans
1.1.2	Choose an infill site.	**9**	
1.1.3	Choose a greyfield site.	**7**	
1.1.4	Choose an EPA-recognized brownfield.	**7**	Confirmation from a federal, state, or local brownfields site inventory list or representative that the site is a brownfield
1.2 IDENTIFY GOALS WITH YOUR TEAM			
1.2.1	Establish a knowledgeable team. A. Identify team member roles and how they relate to various phases of green lot design, prep, and development. B. Create a mission statement that includes the project's goals and objectives.	**6**	Written project mission statement, goals, and team member roles
1.3 DESIGN THE SITE			
	Minimize environmental impacts; protect, restore, and enhance the natural features and environmental quality of the site (points for each guideline are only rewarded upon implementation of these plans).		
1.3.1	Conserve natural resources. A. Complete a natural resources inventory used to drive and create the site plan. B. Create a protection and maintenance plan for priority natural resources and areas during construction. See Section 1.4 for guidance in forming the plan. C. Participate in a natural resources conservation program, e.g., *Building With Trees.* D. Provide basic training in tree and other natural resource protection to onsite supervisor.	**6**	Pre- and post-development natural resources inventory Protection and maintenance plan Certificate or letter indicating participation in a natural resources conservation program

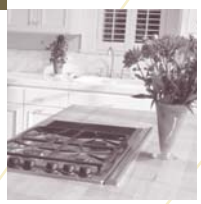
		PTS	HOW TO VERIFY
1.3.2	Site the home and other built features to optimize solar resource (refer to Energy Efficiency module for guidance on solar resource optimization).	6	House plans
1.3.3	Minimize slope disturbance. **A.** Limit development footprint on steep slopes (slopes greater than or equal to 25%). **B.** Complete a hydrological/soil stability study for steep slopes, and use this study to guide the design of all structures onsite. **C.** Align road or extended driveway with natural topography to minimize its grade and reduce cut and fill. **D.** Reduce long-term erosion effects through the design and implementation of terracing, retaining walls, landscaping, and restabilization techniques.	5	Hydrological/soil stability study results Topographical map with contour lines
1.3.4	Minimize soil disturbance and erosion. *See Section 1.4 for further guidance.* **A.** Schedule construction activities to minimize exposed soils. **B.** Use alternative means to install utilities, such as tunneling instead of trenching, use of smaller equipment, shared trenches or easements, and placement of utilities under streets instead of yards. **C.** Demarcate limits of clearing and grading.	6	Sediment and erosion control plans
1.3.5	Manage storm water using low-impact development when possible. **A.** Preserve and use natural water and drainage features. **B.** Develop and implement storm water management plans that minimize concentrated flows and seek to mimic natural hydrology. **C.** Minimize impervious surfaces, and use permeable materials for driveways, parking areas, walkways, and patios.	8	Storm water management plan
1.3.6	Devise landscape plans to limit water and energy demand while preserving or enhancing the natural environment. **A.** Formulate a plan to restore or enhance natural vegetation that is cleared during development. Within this plan, phase landscaping to ensure denuded areas are quickly vegetated. **B.** Select turf grass and other vegetation that are native or regionally appropriate species. **C.** Limit turf areas of landscaped area, selecting native and regionally appropriate trees and vegetation in a way that complements the natural setting. **D.** Group plants with similar watering needs (hydrozoning). **E.** Specify planting of trees to increase site shading and moderate temperatures (see also Energy Efficiency Guideline 3.4.1.c specifying siting of trees to reduce the energy consumption of the home). **F.** Design vegetative windbreaks or channels as appropriate to local conditions.	8	Landscape plan

		PTS	HOW TO VERIFY
	G. Require onsite tree trimmings or waste of regionally appropriate trees to be used as protective mulch during construction or as a base for walking trails. **H.** Establish an integrated pest management plan to minimize chemical use of pesticides and fertilizers.		
1.3.7	Maintain wildlife habitat.	**5**	Set of site plans (Extra points) Present a certificate or letter indicating participation in a wildlife conservation program.
1.4 DEVELOP THE SITE **Minimize environmental intrusion during onsite construction.**			
1.4.1	Provide onsite supervision and coordination during clearing, grading, trenching, paving, and installation of utilities to ensure that targeted green development practices are implemented (see 1.3.4).	**5**	Protection and maintenance plan
1.4.2	Conserve existing onsite vegetation. **A.** Minimize disturbance of and damage to trees and other vegetation designated for protection through installation of fencing and avoidance of trenching, significant changes in grade, and compaction of soil and critical root zones. **B.** Prepare designated existing trees and vegetation for the impact of construction by pruning, root pruning, fertilizing, and watering.	**5**	Protection and maintenance plan and/or set of site plans
1.4.3	Minimize onsite soil disturbance and erosion. **A.** Demarcate limits of clearing and grading. **B.** Create construction "no disturbance" zones using fencing or flagging to protect vegetation and sensitive areas from construction vehicles, material storage, and washout. **C.** Install and maintain sediment and erosion controls. **D.** Stockpile and cover good soil for later use. **E.** Reduce soil compaction from construction equipment through laying mulch, chipped wood, or plywood sheets. **F.** Stabilize disturbed areas within the EPA-recommended 14-day period. **G.** Improve the soil with organic amendments and mulch.	**6**	Sediment and erosion control plans
1.5 INNOVATIVE OPTIONS **Seek to obtain waivers or variances from local development regulations to enhance green building.**			
1.5.1	Share driveways or parking.	**6**	Waiver or variance for the plan
1.5.2	Other (specify).		Waiver or variance for the item(s)

		PTS	HOW TO VERIFY
2.1 REDUCE QUANTITY OF MATERIALS AND WASTE			
2.1.1	Create an efficient floor plan that maintains a home's functionality.	**9**	House plans
2.1.2	Use advanced framing techniques that reduce the amount of building material while maintaining the structural integrity of the home (see User Guide for examples).	**8**	House plans
2.1.3	Use building dimensions and layouts that maximize the use of the resources by minimizing material cuts.	**6**	House plans
2.1.4	Create a detailed framing plan and detailed material takeoffs. Provide an onsite cut list for all framing and sheathing material.	**7**	Framing plan Cut list
2.1.5	Use building materials that require no additional finish resources to complete application onsite.	**4**	Product literature Installer, manufacturer, or builder certified
2.1.6	Use pre-cut or pre-assembled building systems or methods.		Framing plan
	A. Provide a pre-cut (joist) or pre-manufactured (truss) floor and roof framing package—points provided for a flooring or a roof framing package—additional points provided if both packages are used.	**3** per	
	B. Provide a panelized wall framing system.	**6**	
	C. Provide a panelized roof system.	**6**	
	D. Provide modular construction for the entire house.	**7**	
2.1.7	Use a frost-protected shallow foundation (FPSF).	**4**	
2.2 ENHANCE DURABILITY AND REDUCE MAINTENANCE			
	Building design minimizes degradation, and weathering of materials and enhances life expectancy. Features and details are to be specified on architectural plans.		
2.2.1	Provide a covered entry (e.g., awning, covered porch) at exterior doors to prevent water intrusion and subsequent rotting of joists, sills, and finishes.	**6**	House plans
2.2.2	Use recommended-sized roof overhangs for the climate.	**7**	House plans
2.2.3	Install perimeter drain for all basement footings sloped to discharge to daylight, dry well, or sump pit.	**7**	House plans
2.2.4	Install drip edge at eave and gable roof edges.	**6**	House plans
2.2.5	Install gutter and downspout system to divert water five feet away from foundation and into the overall onsite drainage area.	**6**	

		PTS	HOW TO VERIFY
2.2.6	Divert surface water from all sides of building. Slope top of backfill to achieve settled slope of at least six inches of fall within 10 feet of the foundation walls.	7	Set of site plans
2.2.7	Install continuous and physical foundation termite barrier in areas where subterranean termite infestation is a problem.	7	
2.2.8	Use termite-resistant materials for walls, floor joists, trusses, exterior decks, etc., in areas known to be termite infested.	7	
2.2.9	Provide a water-resistant barrier (WRB) or a drainage plane system behind the exterior veneer system or the exterior siding.	8	
2.2.10	Install ice flashing at roofs edge.	5	
2.2.11	Install enhanced foundation waterproofing.	7	House plans
2.2.12	Employ and show on plans the following flashing details: **A.** Around windows and doors **B.** Valleys **C.** Deck/house juncture **D.** Roof/wall junctures, chimneys step flashing **E.** Drip cap above windows and doors.	9	House plans
2.3 REUSE MATERIALS			
2.3.1	Disassemble existing buildings (deconstruction) instead of demolishing.	6	
2.3.2	Reuse salvaged materials where possible.	5	List of components
2.3.3	Dedicate and provide onsite bins and/or space to facilitate the sorting and reuse of scrap building materials.	6	C & D waste management plan
2.4 USE RECYCLED CONTENT MATERIALS			
2.4.1	Use recycled-content building materials.	3	List of components used
2.5 RECYCLE WASTE MATERIALS DURING CONSTRUCTION			
2.5.1	Develop and implement a construction and demolition (C & D) waste management plan that is posted at job site.	7	Copy of C & D waste management plan
2.5.2	Conduct onsite recycling efforts, e.g., use grinder and apply materials onsite, thus reducing transportation-related costs.	5	Copy of C & D waste management plan including information on what materials are going to be ground for the project
2.5.3	Recycle construction waste offsite, e.g., wood, cardboard, metals, drywall, plastics, asphalt roofing shingles, concrete, block, other.	6	Contractual agreement between the recycling firm and the builder Documentation on materials that have been recycled List of components recycled

		PTS	HOW TO VERIFY
2.6 USE RENEWABLE MATERIALS			
2.6.1	Use materials manufactured from renewable resources or agricultural byproducts such as soy-based insulation, bamboo, or wood-based products	**3**	List of components used
2.6.2	Use certified wood for wood and wood-based materials and products from all credible third-party-certified sources, including **A.** The Sustainable Forestry Initiative® Program **B.** The American Tree Farm System® **C.** The Canadian Standards Association's Sustainable Forest Management System Standards (CAN/CSA Z809) **D.** Forest Stewardship Council (FSC) **E.** Program for the Endorsement of Forest Certification Systems (PEFC), and **F.** Other such credible programs as they are developed and implemented.	**4**	Certification document—points given per component
2.7 USE RESOURCE-EFFICIENT MATERIALS			
2.7.1	Use products that contain fewer resources than traditional products.	**3**	List of components used
2.8 INNOVATIVE OPTIONS			
2.8.1	Use locally available, indigenous materials.	**5**	List of components used
2.8.2	Use a life-cycle assessment (LCA) tool to compare the environmental burden of building materials and, based on the analysis, use the most environmentally preferable product for that building component.	**8**	Provide BEES or ATHENA output to show use of an environmentally preferable product



3.1 IMPLEMENT AN INTEGRATED AND COMPREHENSIVE APPROACH TO ENERGY-EFFICIENT DESIGN OF BUILDING SITE, BUILDING ENVELOPE, AND MECHANICAL SPACE CONDITIONING SYSTEMS

REQUIREMENTS—The home must meet the following conditions listed in 3.1.1 through 3.1.3 below.

The home must also achieve the equivalent of at least 37 points (Bronze level) from the optional guidelines in the performance path (Section 3.2) or the prescriptive path (Section 3.3).

GUIDELINE		PTS	HOW TO VERIFY
3.1.1	Home is equivalent to the IECC 2003 or local energy code, whichever is more stringent. Conformance shall be based on plan analysis using software such as ResCheck or other as approved by green building program administrator.	Req.	ResCheck Analysis (only necessary if the local energy code does not at least meet the IECC 2003 requirements)
3.1.2	Size space heating and cooling system/equipment according to building heating and cooling loads calculated using ANSI/ACCA Manual J 8th Edition or equivalent. Computerized software recognized by ACCA as being in compliance with Manual J 8th Edition may be used.	Req.	Manual J load calculations
3.1.3	Conduct third-party plan review to verify design and compliance with the Energy Efficiency section. When multiple homes of the same model are to be built by the same builder, a representative sample (15%) of homes may be reviewed subject to a sampling protocol.	Req.	Plan review may be completed by Green Building Program administrator, energy program administrators, architect/engineer, consultant, or other party outside of the builder's company and acceptable to the Green Building Program administrator.

3.2 PERFORMANCE PATH

An energy-efficiency line item with a "(PP)" preceding it is a line item likely to be used to calculate X% above IECC 2003. If a builder chooses to use the performance path—line item 3.2.1—to meet the guideline's energy-efficiency requirements, then those measures with a "(PP)" cannot be used to obtain the 100 additional points from sections of your choice.

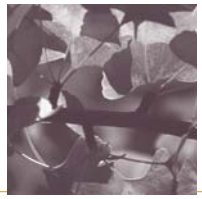
3.2.1	Home is X% above IECC 2003		ResCheck Analysis
	A. 15% (Bronze)	37	
	B. 30% (Silver)	62	
	C. 40% (Gold)	100	

GUIDELINE	PTS	HOW TO VERIFY
3.3 PRESCRIPTIVE PATH		
3.3.1 Building envelope		Builder certified
(PP)A. Increase effective R-value of building envelope using advanced framing techniques, continuous insulation, and/or, integrated structural insulating system. Measures may include but are not limited to:		Approved by local program administrator Builder spec sheet
• SIPS*, or	**8**	
• ICFS*, or	**8**	
• Advanced framing, or	**6**	
Insulated corners and interior/exterior wall intersections*		
Insulated headers on exterior walls		
• Raised heel trusses	**2**	
• Continuous insulation on exterior wall	**4**	
• Continuous insulation on cathedral ceiling	**4**	
** This line item also has a resource-efficiency benefit.*		
(PP)B. Incorporate air sealing package to reduce infiltration. *(All measures that apply to project must be performed.)*	**10**	Builder certified
1. Sill sealer between foundation and sill plate.		
2. Caulk bottom plate of exterior walls.		
3. Air seal band joist cavities between floors.		
4. Ensure air barrier continuity at all framed cavities such as air chases, soffits, coffered or dropped ceilings, and behind tub/shower units on exterior walls. Use either an interior or exterior air barrier as per local practice.		
5. Caulk/foam all electrical, plumbing, heating penetrations between floors (including attic, basement, crawl space, and garage) and to exterior		
6. Block and seal cantilevered floors and kneewalls.		
7. Weatherstrip attic hatches, kneewall doors.		
8. Insulate, caulk, or foam between window and door jambs and framing.		
9. If installing recessed lights in ceilings adjacent to unconditioned space, use rated, airtight Type IC housings.		
10. Caulk/foam HVAC register boots that penetrate the building envelope to subfloor or drywall.		
11. If a fireplace is requested, install a sealed combustion gas fireplace or a wood-burning fireplace with gasketed doors.		

GUIDELINE	PTS	HOW TO VERIFY
(PP)C. Use ENERGY STAR®—rated windows appropriate for local climate.	8	Recommendation for local climate by Energy Efficient Windows Collaborative, www.efficientwindows.org
3.3.2 HVAC design, equipment, and installation		
A. Size, design, and install duct system using ANSI/ACCA Manual D® or equivalent.	8	Manual D calculation
B. Design radiant or hydronic space heating systems using industry-approved guidelines, e.g., Guidelines for the Design and Installation of Radiant Panel Heating and Snow/Ice Melting Systems by the Radiant Panel Association, Heat Loss Guide (H-22), by the Hydronics Institute Division of GAMA or accredited design professionals and manufacturer's recommendations.	8	Documentation of design or design signed by professional
C. Use ANSI/ACCA Manual S® or equivalent to select heating and/or cooling equipment.	8	Manual S documentation
D. Verify performance of the heating/cooling system. HVAC contractor to perform the following: • Start-up procedure according to manufacturer's instructions • Refrigerant charge verified by super-heat and/or sub-cooling method • Burner set to fire at nameplate input • Air handler setting/fan speed • Total airflow within 10% of design flow • Total external system static should not exceed equipment capability at rated airflow.	8	Certification by HVAC contractor
E. Use HVAC installer and service technician certified by a nationally or regionally recognized program such as NATE, BPI, RPA, or manufacturers' training.	6	HVAC certification
(PP)F. Fuel-fired space heating equipment efficiency (AFUE):		Certification by HVAC contractor
Gas Furnace ≥81%	4	
≥88% (ENERGY STAR)	6	
≥94%	8	
Oil Furnace: ≥83%	2	
Gas or Oil Boiler: ≥85%% (ENERGY STAR)	2	
>90%	6	

Note: Add three points if Manuals S and D and start-up procedures are followed when one of the space heating units noted above is installed.

GUIDELINE	PTS	HOW TO VERIFY
(PP)G. Heat pump efficiency (cooling mode)		Certification by HVAC contractor
1. SEER 11-12*	4	
2. SEER 13-14	6	
3. SEER 15-18	6	
4. SEER 19+	7	
5. Staged air conditioning equipment	9	
Note: Split systems must be ARI-tested as a matched set.		
**SEER 13 will be federal minimum as of January 2006.*		
Note: Add three points if Manuals S and D and start-up procedures are followed when one of the ground source heat pumps noted above has been installed. Do not take these points again in 3.3.2.H.		
(PP)H. Heat pump efficiency (heating mode)		Certification by HVAC contractor
7. 2-7.9 HSPF	6	
8. 0-8.9HSPF	7	
9. 0-10.5HSPF	9	
>10.5 HSPF	10	
Note: Split systems must be ARI-tested as a matched set.		
(PP)I. Ground source heat pump installed by a certified geothermal service contractor (cooling mode).		Certification by HVAC contractor
EER = 13-14	5	
EER = 15-18	6	The equipment supplier and the contractor shall furnish, in writing, a "geothermal loop performance guarantee" stating that the heat rejection and absorption of the equipment will not exceed the geothermal loop design submitted and will consistently perform at or above specified efficiencies (taking into account water flow, airflow and entering water temperature).
EER = 19-24	8	
EER = >25	10	
Note: Add three points if Manuals S and D and start-up procedures are followed when one of the ground source heat pumps noted above has been installed. Do not take these points again in 3.3.2.J.		
(PP)J. Ground source heat pump installed by a Certified Geothermal Service Contractor (heating mode).		Certification by HVAC contractor
1. COP 2.4 - 2.6	6	
2. COP 2.7 - 2.9	8	
3. COP ≥3.0	10	
K. Seal ducts, plenums, and equipment to reduce leakage. Use UL 181 foil tapes and/or mastic.	6	Certification by HVAC contractor



GUIDELINE		PTS	HOW TO VERIFY
L.	When installing ductwork: 1. No building cavities used as ductwork, e.g., panning joist or stud cavities. 2. Install all heating and cooling ducts and mechanical equipment within the conditioned building envelope. 3. No ductwork installed in exterior walls.	**8**	Certification by HVAC contractor
M.	Install return ducts or transfer grilles in every room having a door except baths, kitchens, closets, pantries, and laundry rooms.	**6**	Certification by HVAC contractor
N.	Install ENERGY STAR ceiling fans. (Points per fan)	**1**	Builder certified
O.	Install whole-house fan with insulated louvers.	**4**	Builder certified
P.	Install ENERGY STAR-labeled mechanical exhaust in every bathroom ducted to the outside.	**8**	Builder certified
3.3.3	Water heating design, equipment, and installation		
A.	Water heater energy factor (EF) equal to or greater than those listed in the following table.	**4**	Installer certified

GAS	
Size (gallons)	**Energy Factor**
30	0.64
40	0.62
50	0.60
65	0.58
75	0.56
ELECTRIC	
30	0.95
40	0.94
50	0.92
65	0.90
80	0.88
100	0.86
OIL	
30	0.59
50	0.55

B.	Install whole-house instantaneous (tankless) water heater. (Water heater complies with DOE Standard 10CFR430)	**4**	Installer certified
C.	Insulate all hot water lines with a minimum of one inch insulation.	**4**	Installer certified

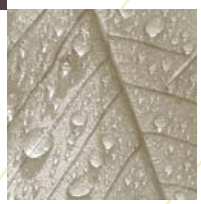
GUIDELINE		PTS	HOW TO VERIFY
D.	Install heat trap on cold and hot water lines to and from the water heater (if not integral to the water heater).	3	Installer certified
E.	Install manifold plumbing system with parallel piping configuration (aka "home run") using smallest diameter piping allowed by code.	5	Installer certified
3.3.4	Lighting and appliances		
	A. Use an ENERGY STAR Advanced Lighting Package (ALP) in home.	7	Builder certified
	B. Install all recessed lighting fixtures within the conditioned envelope of the building, e.g., housing does not penetrate insulated ceiling.	7	Builder certified
	C. Install motion sensors on outdoor lighting (if not credited under 3.3.4.a).	7	Builder certified
	D. Install tubular skylights in rooms without windows.	2	Builder certified
	E. Install ENERGY STAR-labeled appliances:		Builder certified
	• Refrigerator	3	
	• Dishwasher	3	
	• Washing machine.	5	
3.3.5	Renewable energy/solar heating and cooling	10	Builder spec sheet
	3.3.5.1 Solar space heating and cooling		
	A. Use sun-tempered design: building orientation, sizing of glazing, design of overhangs to provide shading are in accordance with guidelines below:		
	• Long side of the home faces within 30° of south		
	• Glazing area < 7% of finished floor area (FFA) on south face (Low-E)		
	• Glazing area < 2% of FFA on west face (Low-E, Low SHGC)		
	• Glazing area < 4% of FFA on east face (Low-E, Low SHGC)		
	• Glazing area < 4% of FFA on north face (Low-E)		
	• Skylights less than 2% of finished ceiling area, with shades and insulated wells		
	• Overhangs designed to provide shading on south-facing glass (at a minimum), or adjustable canopies or awnings. *(See User Guide for charts that indicate length of overhang, amount and period of shading according to latitude.)*		

GUIDELINE	PTS	HOW TO VERIFY
B. Use passive solar design: sun-tempered design as above plus additional south-facing glazing, appropriately designed thermal mass to prevent overheating, and provision for airflow to adjoining rooms. • Sun-tempered design as outlined above except additional glazing permitted on south wall *plus* • For any room with south-facing glazing > 7% of FFA, properly sized thermal mass, and • Provision for forced airflow to adjoining areas as needed • (SBIC Passive Solar Design Guidelines for your climate should be referenced to size thermal mass.) *Note: 3.3.5.1.A must also be done in order to receive points for 3.3.5.1.B.*	**10**	Builder spec sheet identifying passive solar design features Documentation of design process
C. Use passive cooling. • Exterior shading on east and west windows, e.g., shade trees, moveable awnings or louvers, covered porches • Overhangs designed to provide shading on south-facing glazing. Use supplied charts that indicate length of overhang, amount and period of shading according to latitude. (Not to be double-counted if credited in 3.3.5.1.A above.) • Windows located to facilitate cross ventilation • Solar-reflective roof or radiant barrier in hot climates. *Note: All of the above must be done in order to receive points for this line item.*	**8**	Builder spec sheet Documentation of design process Builder certified
3.3.5.2 Solar water heating		Installer certified
A. Install solar water heating system. Must use SRCC-rated system. Solar fraction:		Manufacturers' specifications
1. 0.3	**8**	
2. ≥ 0.5	**10**	
3.3.5.3 Additional renewable energy options		Installer certified
A. Supply electricity needs by onsite renewable energy source such as photovoltaics, wind, or hydro whereby the system is estimated to produce the following kWh per year:		Manufacturers' specifications
2,000 to 3,999	**8**	
4,000 to 5,999	**10**	
6,000 +	**12**	
(Equipment should carry all applicable IEEE and UL certifications. Installation shall be in accordance with local utility and electrical code requirements.)		

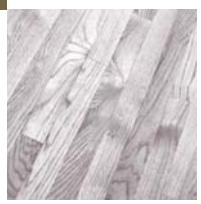
GUIDELINE	PTS	HOW TO VERIFY
B. Provide clear and unshaded roof area (+/-30°of south or flat) for future solar collector or photovoltaics. Minimum area of 200 sf. Provide a rough-in of piping from the roof to the utility area:		Builder certified
• Conduit	**3**	
• Insulated piping	**5**	
C. Provide homeowner with information and enrollment materials about options to purchase green power from the local electric utility.	**2**	Builder certified
(Not to duplicate points for homeowner manual in IEQ section below.)		
3.3.6 Verification		
3.3.6.1 Conduct onsite third-party inspection to verify installation of energy-related features such as:	**8**	Inspection may be performed by Green Building Program administrator, energy program administrator, architect, engineer, or other party outside of the builder's company and acceptable to the Green Building Program administrator.
A. Duct installation and sealing		At least two onsite inspections should be done: one after insulation is installed and the second upon completion of the project.
B. Building envelope air sealing details		
C. Proper installation of insulation including no gaps, voids, or compression		
D. Insulation cut accurately to fit cavity		
E. Windows and doors flashed, caulked, and sealed properly.		
(When at least 100 homes of the same model are to be built by the same builder, a representative sample [15%] of homes may be inspected.)		
3.3.6.2 Conduct third-party testing to verify performance, e.g., blower door, duct leakage testing, flow hood testing (per test).	**8 per test**	Report showing results of testing
A. Building envelope leakage: blower door test results < 0.35 ACHnat		Examples of those who would be qualified to perform testing include but are not limited to energy program technicians, weatherization program technicians, HVAC contractors, and energy efficiency/building science consultants.
B. Central HVAC duct leakage: duct leakage test results:		
• Leakage to unconditioned space < 5% of rated blower capacity		
• Total leakage < 10% of rated blower capacity		
C. Balanced HVAC airflows: flow hood test results:		
• Measured flow at each supply and return register within 25% of design flow.		
• Total airflow within 10% of design flow.		
(When multiple homes of the same model are to be built by the same builder, a representative sample of homes may be tested subject to the sampling protocol.)		

GUIDELINE		PTS	HOW TO VERIFY
3.3.7	Innovative options		
	A. Install drain water heat-recovery system.	2	Installer certified
	B. Install desuperheater in conjunction with ground source heat pump.	6	Installer certified
	C. Install heat pump water heater. Must be rated according to the current US DOE test standard and shall have an EF > 1.7.	6	Installer certified
	D. Install occupancy sensors for lighting control. (Points per sensor)	4	Builder certified

SECTION 4 WATER EFFICIENCY



		PTS	HOW TO VERIFY
4.1 INDOOR/OUTDOOR WATER USE			
4.1.1	Hot water delivery to remote locations aided by installation of: **A.** On-demand water heater at point of use served by cold water only. (Points per unit installed) **B.** Control-activated recirculation system.	**6**	Installer certified
4.1.2	Water heater located within 30 feet of pipe run of all bathrooms and kitchen.	**9**	Installer certified
4.1.3	ENERGY STAR® water-conserving appliances installed, e.g., dishwasher, washing machine	**7 per appl.**	Installer certified
4.1.4	Water-efficient showerhead using conventional aerator or venturi technology for flow rate < 2.5 gpm	**2 per fixture**	Installer certified
4.1.5	Water-efficient sink faucets/aerators < 2.2 gallons/minute	**2 per fixture**	Installer certified
4.1.6	Ultra low flow (< 1.6 gpm/flush) toilets installed: **A.** Power-assist **B.** Dual-flush.	 **4** **6**	Installer certified
4.1.7	Low-volume, non-spray irrigation system installed, e.g., drip irrigation, bubblers, drip emitters, soaker hose, stream-rotator spray heads	**7**	Installer certified
4.1.8	Irrigation system zoned separately for turf and bedding areas	**6**	Installer certified
4.1.9	Weather-based irrigation controllers, e.g., computer-based weather record	**7**	Installer certified
4.1.10	Collect and use rainwater as permitted by local code. (Additional credit for distribution system that uses a renewable energy source or gravity)	**9**	Builder certified
4.1.11	Innovative wastewater technology as permitted by local code, e.g., constructed wetland, sand filter, and aerobic system	**7**	Submit plan approved by local code or health department official
4.2 INNOVATIVE OPTIONS			
4.2.1	Shut-off valve, motion sensor, or pedal-activated faucet to enable intermittent on/off operation	**6**	Installer certified
4.2.2	Separate and re-use greywater as permitted by local code	**6**	Installer certified
4.2.3	Composting or waterless toilet as permitted by local code	**6**	Installer certified



		PTS	HOW TO VERIFY
5.1 MINIMIZE POTENTIAL SOURCES OF POLLUTANTS			
5.1.1	For vented space heating and water heating equipment: **A.** Install direct vent equipment or **B.** Install induced/mechanical draft combustion equipment.	**8**	Builder spec sheet
5.1.2	Install space heating and water heating equipment in isolated mechanical room or closet with an outdoor source of combustion and ventilation air.	**6**	Builder spec sheet
5.1.3	Install direct-vent, sealed-combustion gas fireplace, sealed wood fireplace, or sealed woodstove. or Do not install fireplace or woodstove.	**6**	Builder spec sheet
5.1.4	Ensure a tightly-sealed door between the garage and living area, and provide continuous air barrier between garage and living areas including air sealing penetrations, walls, ceilings, and floors.	**9**	Builder spec sheet
5.1.5	Ensure particleboard, medium-density fiberboard (MDF) and hardwood plywood substrates are certified to low formaldehyde emission standards ANSI A208.1, ANSI A208.2, and ANSI/HPVA HP1, respectively. Composite wood/agrifiber panel products must either contain no added urea-formaldehyde resins or must be third-party certified for low formaldehyde emissions.	**6**	Manufacturer's spec sheet Third-party listing
5.1.6	Install carpet, carpet pad, and floor covering adhesives that hold "Green Label" from Carpet and Rug Institute's indoor air quality testing program or meet equivalent thresholds verified by a third party.	**6**	Manufacturer's spec sheet Third-party listing
5.1.7	Mask HVAC outlets during construction and vacuum ducts, boots, and grilles before turning on central heating/cooling system.	**5**	
5.1.8	Use low-VOC-emitting wallpaper.	**3**	Builder's spec sheet
5.2 MANAGE POTENTIAL POLLUTANTS GENERATED IN THE HOME			
5.2.1	Vent kitchen range exhaust to the outside.	**7**	Builder spec sheet Use guidance in homeowner's manual

		PTS	HOW TO VERIFY
5.2.2	Provide mechanical ventilation at a rate of 7.5 cfm per bedroom + 7.5 cfm and controlled automatically or continuous with manual override. The ventilation equipment may be:		Builder spec sheet Use guidance in homeowner's manual
	A. Exhaust or supply fan(s), or	7	
	B. Balanced exhaust and supply fans, or	9	
	C. Heat-recovery ventilator, or	10	
	D. Energy-recovery ventilator.	10	
5.2.3	Install MERV 9 filters on central air or ventilation systems.	3	Use guidance in homeowner's manual
5.2.4	Install humidistat to control whole-house humidification system.	4	Use guidance in homeowner's manual
5.2.5	Install sub-slab de-pressurization system or infrastructure to facilitate future installation of radon mitigation system. *The more stringent requirement between a local building code and this provision shall apply.	6	Builder spec sheet
5.2.6	Verify all exhaust flows meet design specifications.	9	
5.3 MOISTURE MANAGEMENT (VAPOR, RAINWATER, PLUMBING, HVAC)			
5.3.1	Control bathroom exhaust fan with a timer or humidistat.	6	Builder spec sheet
5.3.2	Install moisture-resistant backerboard—not paper-faced sheathing—under tiled surfaces in wet areas.	6	Builder spec sheet
5.3.3	Install vapor retarder directly under slab (6-mil) or on crawl space floor (8-mil). In crawl spaces, extend poly up wall and affix with glue and furring strips, or damp-proof wall below grade. Joints lapped 12 inches.	9	Builder spec sheet
5.3.4	Protect unused moisture-sensitive materials from water damage through just-in-time delivery, storing unused materials in a dry area, or tenting materials and storing on a raised platform.	6	Builder's moisture management practice or plan
5.3.5	Keep plumbing supply lines out of exterior walls.	5	
5.3.6	Insulate cold water pipes in unconditioned spaces with one-half-inch insulation or other coating that comparably prevents condensation.	4	Builder spec sheet
5.3.7	Insulate HVAC ducts, plenums, and trunks in unconditioned basements and crawl spaces to avoid condensation.	4	Builder spec sheet
5.3.8	Check moisture content of wood before it is enclosed on both sides. Ensure moisture content of subfloor/substrate meets the appropriate industry standard for the finish flooring material to be installed.	4	Builder's moisture management practice or plan
5.4 INNOVATIVE OPTIONS			

OPERATION, MAINTENANCE, AND HOMEOWNER EDUCATION

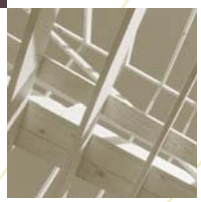
	PTS	HOW TO VERIFY
6.1 PROVIDE MANUAL TO OWNERS/OCCUPANTS ON THE USE AND CARE OF THE HOME. MANUAL MUST INCLUDE ALL ITEMS BELOW:		
A. Narrative detailing the importance of maintenance and operation to keep a green-built home green	9	Copy of the home manual
B. Local green building program certificate		
C. Warranty, operation, and maintenance instructions for equipment and appliances		
D. Household recycling opportunities		
E. Information on how to enroll in a program so that the home receives energy from a renewable energy provider		
F. Explanation of the benefits of using compact fluorescent light bulbs in high-usage areas		
G. A list of habits or actions to optimize water and energy use		
H. Local public transportation options (if applicable)		
I. Clearly labeled diagram showing safety valves and controls for major house systems.		
6.2 OPTIONAL INFORMATION TO INCLUDE IN THE HOME MANUAL		
(Choose at least five.)		
A. A list of local service providers that focus on regularly scheduled maintenance and proper operation of equipment and the structure (sealants, caulks, gutter and downspout system; shower/tub surrounds, irrigation systems, etc.)	2	
B. A photo record of framing with utilities installed. Photos should be taken prior to installing insulation, clearly marked, and provided in homeowner's manual.		
C. List of Green Home Building Guidelines items included in the home		
D. User-friendly maintenance checklist		
E. Instructions for proper handling and disposal of hazardous materials		
F. Information on organic pest control, fertilizers, de-icers, and cleaning products		
G. Information about native or low-water landscape		

	PTS	HOW TO VERIFY
H. Information on how to keep a home's relative humidity in the range of 30%-60%		
I. Instructions for checking crawl space for termite tubes periodically		
J. Instructions for keeping gutters clean. Instructions should note that downspouts should divert water at least five feet away from foundation		
6.3 PROVIDE EDUCATION TO OWNERS/OCCUPANTS IN THE USE AND CARE OF THEIR DWELLINGS.		
A. Instruct homeowners/occupants about the building's goals and strategies and occupant's impacts on costs of operating the building. Provide training to owners/occupants for all control systems in the house.	7	
6.4 SOLID WASTE		
A. Encourage homeowners/occupants to recycle by providing built-in space in the home's design (e.g., kitchen, garage, covered outdoor space) for recycling containers.	1	
6.5 INNOVATIVE OPTIONS		

SECTION 7 GLOBAL IMPACT

		PTS	HOW TO VERIFY
7.1 PRODUCTS			
7.1.1	Product manufacturer's operations and business practices include environmental management system concepts (the product line, plant, or company must be ISO 14001 certified).	**3**	ISO 14001 certification
7.1.2	Choose low- or no-VOC indoor paints. VOC concentrations (grams/liter) of interior paints should be equal to or less than those specified by the EPA's Environmentally Preferable Purchasing Program: • Interior latex coatings: Flat: 100 grams/liter; Non-flat: 150 grams/liter • Interior oil-based paints: 380 grams/liter	**6**	Builder spec sheet Manufacturer's spec or third-party listing
7.1.3	Use low-VOC sealants. VOC concentrations for construction adhesives and sealants should meet the limits specified in the California Air Resources Board Regulation for Reducing Volatile Organic Compound Emissions from Consumer Products: • Construction adhesives: the greater of 15% by weight or 200 grams/liter • Sealants and caulks: the greater of 4% by weight or 60 grams/liter • Contact adhesives: the greater of 80% by weight or 650 grams/liter	**5**	Manufacturer's spec or third-party listing
7.2 INNOVATIVE OPTIONS			
7.2.1	Builder's operations and business practices include environmental management system concepts (the builder must be ISO 14001 certified).	**4**	ISO 14001 certification

APPENDIX A—SITE PLANNING AND LAND DEVELOPMENT



	PTS	HOW TO VERIFY
1.0 IDENTIFY GOALS WITH YOUR TEAM		
• Establish a knowledgeable team and communicate in writing.		Written list of team members
• Establish a "green development" mission statement.		Written project mission statement
• Identify goals and objectives.		Written project goals
• Identify team member roles and how they relate to various phases of development.		Written project team member roles
• Provide training to onsite supervisors and team members on the green development practices that will be instituted onsite.		Training materials information
• Create a checklist to be filled out onsite that contains only those targeted green development practices that will be implemented in this project *(see Guideline 4a for execution of this checklist).*		Checklist of green development practices that will be implemented
2.0 SELECT THE SITE		
Select the site to minimize environmental impact.		
• Avoid environmentally "sensitive areas" as identified through site footprinting process or third party.		Any one of the following: • Comprehensive plan • Wetland Institute • Local jurisdiction's guidelines • Site footprinting process results • Set of site plans
• Choose an EPA-recognized brownfield *(see User Guide for definition).*		Confirmation from a federal, state, or local brownfield site inventory list or representative that the site is a brownfield
• Choose a greyfield site *(see User Guide for definition).*		
• Choose an infill site *(see User Guide for definition).*		

	PTS	HOW TO VERIFY
3.0 DESIGN THE SITE		
Minimize environmental impact; protect, enhance, and restore the natural features and environmental quality of the site (points for each guideline are only rewarded upon execution of these plans).		
• Conserve natural resources.		
• Complete a natural resources inventory that is used to drive and create the site plan.		Pre- and post-development natural resources inventory
• Create a protection and maintenance plan for priority natural resources/areas during construction. *(See Section 4 for guidance in forming the plan.)*		Protection and maintenance plan
• Locate roads, buildings, and other built features to conserve high-priority vegetation.		Certificate or letter indicating participation in a natural resources conservation program
• Participate in a natural resource conservation program.		
• Orient streets and configure lots to allow for the majority of homes to optimize solar potential *(see the Energy Efficiency module for guidance on solar resource optimization)*		House plans
• Minimize slope disturbance.		
• Limit development footprint on steep slopes (slopes greater than or equal to 25%).		Hydrological/soil stability study results
• Complete a hydrological/soil stability study for steep slopes, and use this study to guide the design of all structures onsite.		Topographical map with contour lines
• Align roads with natural topography to minimize grade to reduce cut and fill.		
• Reduce long-term erosion effects through the design and implementation of terracing, retaining walls, landscaping, and restabilization techniques.		
• Minimize soil disturbance and erosion.		
• Phase development to minimize exposed soils.		Sediment and erosion control plans
• Use alternative means to install utilities, such as tunneling instead of trenching, use of smaller equipment, shared trenches or easements, and placement of utilities under streets instead of yards.		
• Manage storm water properly.		Storm water management plan
• Direct storm water to a locally approved regional storm water management and treatment facility that has been designed to address water quality.		
• Preserve and utilize natural water and drainage features.		
• Develop and implement storm water management plans that minimize concentrated flows and seek to mimic natural hydrology.		

	PTS	HOW TO VERIFY

• Minimize impervious surfaces, and utilize permeable materials for
  • Parking areas
  • Walkways
  • Streets—minimize street widths and rights-of-way as per recommendations in either local code or in *Residential Streets, 3rd Edition:*
  a. No on-street parking: 18 feet
  b. Parking on one side: 22–24 feet
  c. Parking on both sides: 24–26 feet		

• Use an advanced wastewater system as an alternative to the conventional septic system and drain field, where municipal sewage is not available. Examples include sand/media filters, aerobic treatment units, and community package plants.		System specifications
• Devise landscape plans to limit water demand while preserving or enhancing the natural environment.		Landscape plan
• Formulate a plan to restore or enhance natural vegetation that is cleared during construction or development. Within this plan, phase landscaping to ensure denuded areas are quickly vegetated.		
• Select turf grass and other vegetation that are native or regionally appropriate species.		
• Limit turf areas of landscaped area, selecting native and regionally appropriate trees and vegetation in a way that complements the natural setting.		
• Group plants with similar watering needs (hydrozoning).		
• Specify planting of trees to increase site shading and moderate temperatures *(see also Energy Efficiency Guideline 3.3.5.1 specifying siting of trees to reduce the energy consumption of the home).*		
• Require onsite tree trimmings of regionally appropriate species to be used as protective mulch during construction or as a base for walking trails.		
• Establish an integrated pest management plan to minimize chemical use in pesticides and fertilizers.		
• Maintain wildlife habitat.		Certificate or letter indicating participation in a wildlife conservation plan
• Preserve open space as wildlife corridors where possible.		
• Institute wildlife habitat measures		
• Participate in a wildlife conservation program.		
• Prepare operation and maintenance plan (manual) for transfer of common open spaces, utilities (storm water, wastewater), and environmental management.		Copy of the manual
• Disassemble existing buildings, and reuse or recycle the building materials (deconstruction) instead of demolishing.		Catalogue reused or recycled building materials

	PTS	HOW TO VERIFY
4.0 DEVELOP THE SITE		
Minimize environmental intrusion during onsite construction.		
• Provide onsite supervision and coordination during clearing, grading, trenching, paving, and installation of utilities to ensure that targeted green development practices are implemented.		Protection and maintenance plan
• Conserve existing onsite vegetation.		
• Provide basic training in tree and other natural resource protection to onsite supervisor.		Protection and maintenance plan and/or set of site plans
• Minimize disturbance of and damage to trees and other vegetation designated for protection through installation of fencing and avoidance of trenching, significant changes in grade, and compaction of soil and critical root zones.		
• Prepare designated existing trees and vegetation for the impacts of construction through pruning, root pruning, fertilizing, and watering.		
• Improve the soil with organic amendments and mulch.		
• Minimize onsite soil disturbance and erosion.		Sediment and erosion control plans
• Demarcate limits of clearing and grading.		
• Create construction "no disturbance" zones using fencing or flagging to protect vegetation and sensitive areas from construction vehicles, material storage, and washout.		
• Install and maintain sediment and erosion controls.		
• Stockpile and cover good soil for later use.		
• Reduce soil compaction from construction equipment through laying mulch, chipped wood, or plywood sheets.		
• Stabilize disturbed areas within the EPA-recommended 14-day period.		
5.0 INNOVATIVE OPTIONS		
Seek to obtain waivers or variances from local development regulations to enhance green building.		
• Cluster development to preserve meaningful open space.		Set of site plans
• Reduce street widths.		Set of site plans
• Share driveways or parking.		Set of site plans
• Other (specify).