

**NEW YORK STATE**  
DIVISION OF HOUSING  
AND  
COMMUNITY RENEWAL

**NEW YORK STATE**  
HOUSING TRUST FUND  
CORPORATION



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**December 2008**

**Green Building Criteria Reference Manual**

## **DEDICATION**

This *Green Building Criteria Reference Manual* is dedicated in memory of Leslie Adler, Director of the Design Services Unit at DHCR, who passed away in July 2008. Leslie was a dedicated architect and valued member of the DHCR team who truly cared about providing safe, decent affordable housing for low-income residents of New York State. Leslie was instrumental in the development of DHCR's Green Building Initiative and leaves behind a memory that will never fade.

**DHCR/HTFC**  
**Green Building Criteria**  
**Reference Manual**

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## **Introduction**

The Division of Housing and Community Renewal (DHCR) and the Housing Trust Fund Corporation (HTFC) have developed this Green Building Criteria Reference Manual to educate and inform affordable housing developers in developing sustainable and healthier housing developments. The Manual is intended to provide details on the various measures that developers must undertake in order to satisfy DHCR/HTFC requirements.

Green building design integrates materials and methods that promote environmental sustainability, economic vitality and social benefits through design, construction and operation of the built environment. DHCR/HTFC encourages green sustainable development that aligns affordable housing investment strategies with environmentally- responsible building practices.

The Green Building Initiative elements that are proposed to be incorporated in a project must be identified in the application attachments: Green Building Criteria Checklist, preliminary plans, and the outline specifications.

The New York State Division of Housing and Community Renewal (DHCR) and the Housing Trust Fund Corporation (HTFC) extend a special thank you to the Enterprise Foundation for their support and guidance provided in developing the DHCR/HTFC Green Building Initiative.

## **Green Building Criteria Overview**

The green building criteria and sustainable development criteria promote public health, energy conservation, operational savings and sustainable building practices in all housing design. As a result, the strategies in the following pages enhance affordable housing and communities as a whole.

In addition to increasing resource efficiency and reducing environmental impacts, green building strategies can yield cost savings through long-term reduction in operating expenses. The benefits include improved energy performance and comfort, a healthier indoor environment, increased durability of building components, and simplified maintenance requirements that can lead to financial efficiencies for property managers and owners. Green building practices improve the economics of managing affordable housing while enhancing quality of life for residents. When green building practices are incorporated into the location of affordable housing, placing homes near community amenities such as public transportation to create walkable, livable neighborhoods, the benefits for residents and communities include fewer sprawl-related transportation impacts.

## **Green Building Criteria Categories**

### **Integrated Design Process**

An integrated design process incorporates sustainability up-front, uses a holistic and total-systems approach to the development process, and promotes good health and livability through the building's life cycle. The goal is to establish a written commitment by the development team that articulates the project's green building and sustainability criteria and objectives through the building's life cycle.

Sustainable building strategies should be considered from the moment the developer initiates the project. The professional development team includes the developer, architect, engineer, landscape architect, LEED™ Accredited Professional or experienced green building design specialist, contractor, and asset and property management staff. Whenever possible, the team also should include maintenance staff and resident representatives. The team must be committed to environmentally responsive and healthy building principles and practices.

### **Location and Neighborhood Fabric**

Location within existing communities, or contiguous to existing development, helps conserve land and the spread of storm-water runoff to new watersheds. It also reduces travel distances. Proper site selection avoids development of inappropriate sites and damage to or loss of fragile, scarce environmental resources. The greatest savings come from developing in areas that already have infrastructure and civic amenities. Site selection is also an opportunity to clean up and redevelop brownfields, and restore the land and infill segmented communities.

Compact development encourages more resource-efficient development of land, reduces development costs and conserves energy. It can also contribute to more walkable, livable communities, while helping restore, invigorate, and sustain livable development patterns. Making the streetscape safer and more inviting for walkers and bicyclists encourages alternative transportation choices to the automobile. It also promotes physical activity and public health, while creating opportunities for social interaction and increased safety by bringing more eyes on public spaces.

### **Site Planning/Environmental Impacts**

Sustainable design and site planning integrate design and construction strategies to minimize environmental site impacts; enhance human health; reduce construction costs; maximize energy, water, and natural resource conservation; improve operational efficiencies, and promote alternative transportation.

### Water Conservation

Water efficiency conserves finite fresh water resources and reduces utility bills. Significant water savings can be realized by specifying and installing water-efficient appliances and plumbing fixtures, implementing low-water landscape and irrigation strategies, and taking advantage of rainwater catchment and gray water sources.

### Energy Efficiency

Energy efficiency helps to maximize resident comfort and health, and reduces utility bills. Conservation measures mitigate the accumulative burdens of energy production and delivery, extraction of non-renewable natural resources, degradation of air quality, global warming and the increasing concentration of pollutants.

### Materials Beneficial to the Environment

Reducing, reusing and recycling building materials conserve natural resources and reduce emissions associated with manufacturing and transporting raw materials. Many techniques and building products on the market contribute to more durable, healthy and resource-efficient buildings.

### Healthy Living Environment

The importance of a healthy living environment is a significant green building issue directly affecting residents. Creating a healthy living environment involves the use of materials that do not cause negative health impacts for residents or workers, especially for more sensitive groups such as children, seniors and individuals with existing respiratory problems and compromised immune systems.

### Operations and Management

Operations and management (O&M) practices can positively impact the building owner's costs and residents' health, comfort and safety. Sustainable building O&M practices enhance resident health and operational savings. The key to successful building performance is the integration of O&M plans, education and cost-effective, low-maintenance design.

## Green Building Criteria Checklist

<b>Applicant:</b>				
<b>Project Name:</b>				
<p><b>Instructions:</b> In order to qualify and receive points for the Green Building Initiative, applicants must complete the applicable sections of this checklist. The items listed in Section A are mandatory. Section B contains both mandatory and optional standard criteria. Section C must be completed if applicant is including green measures in the project beyond the standard criteria. All non-applicable items must be explained in the “Comments” section at the end of this attachment. More specific criteria information is included in DHCR’s Green Building Criteria Reference Manual.</p>				
<p><b><u>SECTION A – Threshold Criteria - MANDATORY</u></b></p> <p>All of the criteria in this section must be included in all projects. Possible exceptions include items A-2, A-5 and A-6 where the criteria may not be applicable to your project.</p> <p><b>Note:</b> These criteria have been included in the DHCR/HTFC Design Handbook.</p>				
Y	N	N/A	Item	Criteria
			A-1	Use Energy Star appliances, light fixtures and heating systems or the equivalent which will produce the same or comparable energy efficiency or savings.
			A-2	Landscaping: Select native or non-invasive new trees and plants that are appropriate to the site’s soil and microclimate.
			A-3	Install water conserving fixtures.
			A-4	Use daylight sensors or timers on outdoor lighting to maximize energy efficiency.
			A-5	Install a passive radon-reduction system (new construction) or an active radon-reduction system and measures (rehabilitation projects) to be activated should tests confirm the presence of radon gas in the building.
			A-6	Use lead-safe work practices during renovation, remodeling, painting and demolition (for properties built before 1978).
<p><b><u>SECTION B – Standard Criteria (Required to qualify for the Green Building Initiative)</u></b></p> <p>Use this section to identify the criteria included in your project.</p>				
<b>Integrated Design Process</b>				
Y	N	N/A	Item	Criteria
			B-1	<b>Green Development Plan (MANDATORY):</b> Submit a plan outlining the integrated approach used for this development that demonstrates involvement of the entire development team.
<b>Location and Neighborhood Fabric (Applicants must include a minimum of 4 criteria)</b>				
Y	N	N/A	Item	Criteria
			B-2a	<b>Smart Site Location: Proximity to Existing Development:</b> Locate on a site with access to existing roads, water, sewers and other infrastructure within or contiguous to existing development.
			B-2b	<b>Smart Site Location: Protecting Environmental Resources:</b> Do not locate new development in close proximity to wetlands, critical slope areas, prime farmland, public parkland, critical habitat or 100-year floodplain.

			B-2c	<b>Smart Site Location: Proximity to Services:</b> Locate projects in close proximity to community and retail facilities.
			B-2d	<b>Compact Development:</b> Achieve densities for new construction of at least six units per acre for detached/semi-detached houses; 10 for town homes; 15 for apartments.
			B-2e	<b>Walkable Neighborhoods: Sidewalks and Pathways:</b> Connect project to the pedestrian grid.
			B-2f	<b>Smart Site Location: Passive Solar Heating/Cooling:</b> Orient building to make the greatest use of passive solar heating and cooling.
			B-2g	<b>Transportation Choices:</b> Locate project in close proximity to public transit services.
<b>Site Planning/Environmental Impacts</b>				
Y	N	N/A	Item	Criteria
			B-3a	<b>Surface Water Management Plan (MANDATORY):</b> Provide SWMP identifying how storm water will be captured and address on the project site.
			B-3b	<b>Phase I Environmental Site Assessment:</b> Submit a Phase I ESA in accordance with ASTM Standard Practice for ESAs.
<b>Healthy Living Environment (Applicants must include a minimum of 7 criteria)</b>				
Y	N	N/A	Item	Criteria
			B-4a	<b>Low/No VOC Paints, Primers, Adhesives and Sealants:</b> All interior paints, primers, adhesives and sealants must contain low or no VOCs.
			B-4b	<b>Formaldehyde-free Composite Wood:</b> Use particleboard and medium density fiberboard (MDF) that is certified compliant with the ANSI A208.1 and A208.2.
			B-4c	<b>Green Label Certified Floor Covering:</b> Do not install carpets in below grade living spaces, entryways, laundry rooms, bathrooms, kitchens or utility rooms. If using carpet, use products that meet the Carpet and Rug Institute's Green Label certified carpet, pad and carpet adhesives.
			B-4d	<b>Exhaust Fans - Bathroom (New Construction):</b> Install Energy Star-labeled bathroom fans that exhaust to the outdoors and are equipped with a humidistat sensor or timer, or operate continuously.
			B-4e	<b>Ventilation (New Construction):</b> Install a ventilation system for the dwelling unit that provides 15 cubic feet per minute of fresh air, per occupant.
			B-4f	<b>Cooling Equipment:</b> Size heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manual, Parts J and S, ASHRAE handbooks, or equivalent software, to prevent short-cycling of heating or air conditioning and ensure adequate dehumidification.
			B-4g	<b>Water Heaters: Mold Prevention:</b> Use tankless hot water heaters or install conventional hot water heaters in rooms with drains or catch pans piped to the exterior of the dwelling and with non-water sensitive floor coverings.
			B-4h	<b>Water Heaters: Minimizing CO:</b> Specify direct vented or combustion sealed water heaters if the heater is located in a conditioned space.
			B-4i	<b>Cold Water Pipe Insulation:</b> Insulate exposed cold water pipes in climates and building conditions susceptible to moisture condensation.
			B-4j	<b>Materials in Wet Areas:</b> Use materials with smooth, durable, cleanable surfaces. Do not use mold-propagating materials such as vinyl wallpaper and unsealed grout.

			B-4k	<b>Clothes-Dryer Exhaust:</b> Clothes dryers must be exhausted directly to the outdoors.
			B-4l	<b>Integrated Pest Management:</b> Seal all wall, floor and joint penetrations to prevent pest entry. Provide rodent and corrosion proof screens (e.g., copper or stainless steel mesh) for large openings.
<b>Operations and Maintenance</b>				
Y	N	N/A	Item	Criteria
			B-5a	<b>Provide a Building Maintenance Manual (MANDATORY)</b>
			B-5b	<b>Provide an Occupant's Green Building Guide (MANDATORY)</b>
			B-5c	<b>Provide New Resident Orientation (MANDATORY)</b>
<b>SECTION C (Applicants must include a minimum of one criteria if including green building measures beyond the standard criteria.)</b>				
<b>Location and Neighborhood Fabric</b>				
Y	N	N/A	Item	Criteria
			C-1	<b>Smart Site Location: Brownfield, Grayfield or Adaptive Reuse Site:</b> Locate the project on a brownfield, grayfield or adaptive reuse site.
<b>Energy Efficiency</b>				
Y	N	N/A	Item	Criteria
			C-2	<b>Renewable Energy:</b> Install photovoltaic (PV) panels, wind turbines or other acceptable renewable source, to provide at least 10 percent of the project's estimated electricity demand.
<b>Materials Beneficial to the Environment</b>				
Y	N	N/A	Item	Criteria
			C-3a	<b>Construction Waste Management:</b> Develop and implement a construction waste management plan to reduce the amount of material sent to the landfill by 25%.
			C-3b	<b>Recycled Content Material:</b> Use 25% materials with recycled content; provide calculation for recycled content percentage based on cost or value of recycled content in relation to total materials for project.
			C-3c	<b>Certified, Salvaged and Engineered Wood:</b> Use at least 50 % (by cost or value) wood products and materials that are certified in accordance with the Forest Stewardship Council, salvaged wood, or engineered framing materials.
			C-3d	<b>Water-permeable walkways and parking areas:</b> Use water-permeable materials in 40% or more of walkways and 40% or more of paved parking areas.
			C-3e	<b>Reduce Heat-Island Effect: Roofing and Paving:</b> 1) Use Energy Star-compliant and high-emissive roofing for the entire roof or, install a "green" (vegetated) roof covering at least 50% of the roof; <u>and</u> 2) Use light-colored/high-albedo materials and/or an open-grid pavement over at least 30% of the site's hardscaped area.
Signed (Applicant): _____ Date: _____				
Signed (Green Design Professional): _____ Date: _____				

**Comments:**

## **SECTION A – Threshold Criteria (Mandatory)**

These criteria have been added to the DHCR/HTFC Design Handbook and are now mandatory for all projects, as applicable.

<b>A-1</b>	<b>Energy Star Appliances, Light Fixtures and Heating Systems</b>	<b>MANDATORY</b>
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Use Energy Star appliances, light fixtures, and heating systems or the equivalent which will produce the same or comparable energy efficiency or savings.

### **How**

Install refrigerators and any other provided appliances. Install Energy Star labeled, or equivalent heating systems (Energy Star qualified furnaces have an annual fuel utilization efficiency (AFUE) of 90% or greater; Energy Star qualified boilers have an annual fuel utilization efficiency (AFUE) rating of 85% or greater). Install Energy Star-labeled lighting fixtures or the Energy Star Advanced Lighting Package in all interior units, and use Energy Star or high-efficiency commercial grade fixtures in all common areas and outdoors.

### **Intent**

In 1992, EPA introduced Energy Star, a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Energy Star products must meet strict energy efficiency criteria set by EPA. These products reduce utility costs and greenhouse gas emissions.

### **Things to Consider**

For more information on Energy Star labeled appliances go to the appliances section of the Energy Star homepage, [www.energystar.gov/index.cfm?c=appliances.pr\\_appliances](http://www.energystar.gov/index.cfm?c=appliances.pr_appliances). This site includes links to lists of qualified dishwashers, clothes washers, refrigerators, and freezers, along with product and store locators, purchasing guides, and information about rebates and other incentive programs.

<b>A-2</b>	<b>Landscaping</b>	<b>MANDATORY</b>
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Select native or non-invasive new trees and plants that are appropriate to the site's soil and microclimate.

### **How**

Commit to providing a landscape plan, tree or plant list, to be certified by the Architect or Landscape Architect at construction document stage. Notations on specifications or site plans at time of application are acceptable. The plan must show that the selection of new trees and plants are native or non-invasive species appropriate to the site's location soils and microclimate, and that any newly planted trees are located to provide shading in the summer and allow for heat gain in the winter.

### **Intent**

Native vegetation is well adapted to the climate and provides excellent erosion, sediment, dust and pollution control. Native plants are also more resistant to naturally occurring disease, insects and low levels of nutrients, thereby reducing the need for fertilizers, pesticides or herbicides.

### **Things to Consider**

- Consult a local arborist and involve a landscape architect in the architectural design process to identify appropriate areas for landscaping and energy savings.
- Combine landscape plan with storm-water management to provide surface water filtration and aesthetic benefits.
- Non-native turf needs about 35 inches of water per year to thrive, whereas native turf needs much less water per year.
- While turf is appropriate for some landscaping, such as for play areas, it should be minimized wherever possible, except in climates where they need no irrigation.
- Lady Bird Johnson Wildlife Center  
See [www.wildflower.org](http://www.wildflower.org)  
The center, located in Austin, Texas, has the mission of educating people about the environmental necessity, economic value, and natural beauty of native plants. The website offers a number of resources, including a nationwide native plant information network and a national supplier's directory.
- National Invasive Species Information Center  
See [www.invasivespeciesinfo.gov/plants/main.shtml](http://www.invasivespeciesinfo.gov/plants/main.shtml)  
As part of the USDA's National Agricultural Library, NISIC serves as a reference gateway to information, organizations, and services about invasive species.
- U.S. Forest Service "Celebrating Wildflowers"  
See [www.fs.fed.us/wildflowers/nativegardening/instructions.shtml](http://www.fs.fed.us/wildflowers/nativegardening/instructions.shtml)
- A site hosted by the U.S. Forest Service has extensive information on native gardening, selecting appropriate native plants, invasive plant species, and basic instructions for restoration and native landscaping projects.

<b>A-3</b>	<b>Water-Conserving Fixtures</b>	<b>MANDATORY</b>
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### **How**

Install water-conserving fixtures with the following specifications:

- Toilets – 1.6 GPF (gallons per flush) or better
- Showerheads – 2.2 GPM (gallons per minute) or better
- Kitchen faucets – 2.2 GPM or better
- Bathroom faucets – 2.0 GPM or better

### **Intent**

Showers and faucets account for approximately 25 percent of indoor water use. Toilets account for approximately 20 percent of indoor water use. Saving water translates into utility savings, both by conserving water and reducing the energy required for water heating.

Compared with pre-1992 fixtures, water-conserving fixtures can reduce the amount of water used in showers and sinks by 75 percent and 50 percent, respectively.

### Things to Consider

- Not all high-efficiency toilets operate equally well, and poor design can lead to ineffective flushing and the need for multiple flushes. The U.S. Environmental Protection Agency's WaterSense program certifies toilets that achieve both water efficiency and operational effectiveness. The WaterSense label identifies high-efficiency products that have been verified for performance. WaterSense currently has a specification for high-efficiency toilets and bathroom faucets and specification for showerheads is under development. Information is available at [www.epa.gov/owm/water-efficiency](http://www.epa.gov/owm/water-efficiency).
- Maximum Performance (MaP™) TESTING California Urban Water Conservation Council. See [www.cuwcc.org/products/toilet-fixtures-main.aspx](http://www.cuwcc.org/products/toilet-fixtures-main.aspx). The Maximum Performance (MaP™) testing project was initiated in 2003 to test toilet models' performance. This testing protocol simulates real-world use to help consumers identify high-efficiency toilets that not only save water but also work well. The current MaP testing report provides performance information on 470 toilet models. This site provides access to the complete listings of the tested toilets.
- Composting Toilet Reviews  
See [www.buildinggreen.com/features/mr/waste.html](http://www.buildinggreen.com/features/mr/waste.html).  
An Environmental Building News article discusses commercial composting toilets.
- Water Use It Wisely  
See [www.wateruseitwisely.com/toolsLinks/index.shtml](http://www.wateruseitwisely.com/toolsLinks/index.shtml).  
This site provides extensive lists of links and related resources concerning water conservation in addition to a series of links to plumbing fixture and faucet resources and sites. Scroll down to the "Fixtures and Appliances" section of links and resources.

<b>A-4</b>	<b>Efficient Lighting: Exterior</b>	<b>MANDATORY</b>
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Use daylight sensors and timers on outdoor lighting to maximize energy efficiency.

### How

Install daylight sensors or timers on all outdoor lighting, including front and rear entryway lights in single family homes. The following lighting types are exempt from this requirement: emergency lighting; lighting required by code for health and safety purposes; and lighting used for eye adaptation near covered vehicle entrances and exits.

### Intent

Daylight sensors automatically turn off the exterior lighting when sufficient day lighting is available or lighting is otherwise not required. Proper aiming of exterior fixtures and the use of shade trees and plants help prevent unwanted glare (light trespass) into neighboring buildings and natural areas, and limit disturbance of the night sky (light pollution).

### Things to Consider

- Design outdoor lighting to eliminate light trespass from the building and site, and to minimize impact on nocturnal environments.
- Use downlighting instead of uplighting.
- Consult the Illuminating Engineering Society of North America's Recommended Practice Manual: Lighting for Exterior Environments.

<b>A-5</b>	<b>Radon-Reduction Systems</b>	<b>MANDATORY</b>
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Install and activate a radon-reduction system should tests confirm the presence of radon gas in the building.

### How

In EPA Zone 1 and 2 areas, for new construction, install passive radon-resistant features below the slab along with a vertical vent pipe with junction box available, if an active system should prove necessary. For rehabilitation projects, install an active radon-reduction system and measures, should test confirm the presence of radon gas in the building.

### Intent

Installation of radon-resistant features will reduce concentrations of radon, a cancer-causing soil gas that can leak into homes through cracks in the slab and foundation. Also, water can migrate through concrete and most other masonry materials. Proper foundation drainage prevents water from saturated soils from being pushed by hydrostatic pressure through small cracks. Vapor barriers and waterproofing materials can greatly reduce the migration of moisture that can occur even in non-saturated soils.

### Things to Consider

- Consult [www.epa.gov/radon/zonemap](http://www.epa.gov/radon/zonemap), or contact your state radon coordinator through the state health office, to determine if your development is located in a Zone 1 or 2 radon area.
- Consult "Building Radon Out." U.S. Environmental Protection Agency, 2006. (#EPA/402-K01-002, available at [www.epa.gov/iaq/radon/pubs](http://www.epa.gov/iaq/radon/pubs))
- Consult "Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings." U.S. Environmental Protection Agency. Available at [www.epa.gov/radon/pubs/mitstds.html](http://www.epa.gov/radon/pubs/mitstds.html).
- American Lung Association, "Radon Fact Sheet"  
See [www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=35420](http://www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=35420)  
This is a general overview of the health risks associated with radon exposure.
- Washington State Ventilation and Indoor Air Quality Code, "Builder's Field Guide"  
See [www.energy.wsu.edu/pubs](http://www.energy.wsu.edu/pubs)  
Chapter 2 of this field guide provides tips, procedures, and schematics for understanding how to mitigate radon risks during new construction.

<b>A-6</b>	<b>Lead-Safe Work Practices</b>	<b>MANDATORY</b>
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Use lead-safe work practices during renovation, remodeling, painting and demolition (for properties built before 1978).

**How**

For properties built before 1978, use lead-safe work practices during renovation, remodeling, painting and demolition. There can be no exemptions from all requirements of 24 CFR Part 35, HUD Guidelines for the Evaluation and Control of Lead-Based Hazards in Housing.

**Intent**

Any activity that disturbs painted surfaces or building components in pre-1978 dwellings that contain lead-based paint may generate and spread lead dust and debris, increasing the risk of lead poisoning for exposed children and families. Controlling lead dust and debris helps minimize lead in the environment.

**Things to Consider**

- Get a lead-based paint inspection or risk assessment if it is likely that the surfaces to be disturbed contain lead-based paint.
- Information about lead-safe work practices can be found at [www.epa.gov/lead/pubs/traincert.htm](http://www.epa.gov/lead/pubs/traincert.htm) and [www.hud.gov/offices/lead/training/index.cfm](http://www.hud.gov/offices/lead/training/index.cfm).

**SECTION B – Standard Criteria**

Required to qualify for the Green Building Initiative

**Integrated Design Process**

<b>B-1</b>	<b>Green Development Plan</b>	<b>MANDATORY</b>
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**How**

Submit a written development plan outlining the integrated design approach used for this development that demonstrates involvement of the entire development team.

The professional development team includes the developer, architect, engineer, landscape architect, experienced green building design professional, contractor, and asset and property management staff. A green building design professional is someone who has successfully completed green building projects. Submission of experience is required with the application.

The plan must provide the following:

- The name and role of each member of the professional design and development team.
- A statement of the overall green development goals of the project and the expected intended outcomes from addressing those goals.

- A description of the process that was used to select the green building strategies, systems and materials that will be incorporated into the project.
- A description of how each of the mandatory and selected items will be included in the project.
- Identification of which members of the design and development team are responsible for implementing the green features.  
A description of follow-up measures to be taken through the completion of design, permitting, construction and operation to ensure that the green features are included and correctly installed, and that the owners or tenants receive information about the function and operation of the features.

The plan must include meeting minutes or another type of documentation that captures and summarizes components of the integrated design process that have been completed at the time of application.

Indicate whether this is the first time the developer has completed a project with green features. If so, explain why the developer wants to incorporate them in this project. If this is not the first green project, the plan must include a written statement on how the integrated design approach taken for this project compares to approaches taken for previous affordable housing designed and developed by members of the project team.

### **Intent**

An integrated design process incorporates sustainability from the outset and connects the design to the regional climatic conditions. It takes into consideration the existing community context, and uses a holistic and total-systems approach to the development process, promoting good health and livability through the building's (or development's) life cycle. The benefits of an integrated design process can include substantially lower development costs and greater health, economic and environmental benefits for residents, property owners and communities. It is important that the development and property management teams are committed to a written plan that they can refer to throughout the development process. This plan will continue to inform the project's green objectives for the project throughout its life cycle.

### **Things to Consider**

- Conduct a green design charrette with the full development team, including professionals with expertise in the following:
  - architecture or residential building design;
  - mechanical or energy engineering;
  - building science or performance testing;
  - green building or sustainable design;
  - and civil engineering, landscape architecture, habitat restoration, or land-use planning.
- Whole Building Design Guide  
See [http://www.wbdg.org/wbdg\\_approach.php](http://www.wbdg.org/wbdg_approach.php)  
This website describes the core elements of “whole building design,” which includes the combination of an integrated design approach and an integrated team process.

This site helps users identify design objectives and organize their processes to meet those objectives.

## **Location and Neighborhood Fabric**

Applicants must include a minimum of **four (4)** criteria in this category to qualify for Green Building Initiative.

<b>B-2a</b>	<b>Smart Site Location</b>	Proximity to Existing Development
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### **How**

Provide site map demonstrating that the proposed development is to be located on a site with access to existing roads, water, sewers and other infrastructure required for the project within or contiguous to the proposed site. The proposed site must not require a sanitary sewer line extension of 1,000 feet or greater to service the property, installation of a septic system or be located within critical potable watershed area. The proposed development is to be located on a site in proximity to an existing improvement of similar use and density.

### **Intent**

Location within existing communities, within or contiguous to existing development, helps conserve land and the spread of storm-water runoff to new watersheds. It also reduces travel distances. Proper site selection avoids development of inappropriate sites and damage to or loss of fragile, scarce environmental resources. The greatest savings come from developing in areas that already have infrastructure and civic amenities. Site selection is also an opportunity to clean up and redevelop brownfields and to fill in gaps within the built environment.

<b>B-2b</b>	<b>Smart Site Location</b>	Protecting Environmental Resources
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### **How**

Do not locate new development, including buildings, built structures, roads or other parking areas, on portions of sites that meet any of the following:

- Land within 100 feet of wetlands
- Land within 100 feet of critical slope area
- Prime farmland
- Public parkland
- Land that is specifically identified as critical habitat for any species on federal or state threatened or endangered lists
- Land with elevation at or below the 100-year floodplain

### **Intent**

Proper site selection avoids development of inappropriate sites and damage to or loss of fragile and scarce environmental resources.

## Definitions

“Wetlands” is defined by the U.S. Code of Federal Regulations, 40 CFR, Parts 230-233 and Part 22, subject to Article 24 of the Environmental Conservation Law or a New York State Department of Environmental Conservation (DEC) mapped wetland. Maps of federal and state-protected wetlands are available at DEC regional offices, as well as municipal and county offices. For state wetlands, a project can only build within the 100' adjacent area if granted a Freshwater Wetland permit by DEC, which would likely entail mitigation measures and monitoring of the viability of the wetland after the development is completed. For federal wetlands, the project can be built near a wetland as long as the developer shows on a site plan that the "limits of site disturbance" is less than 1/10th of an acre and will not be in or close to the delineated wetland area.

“Critical slope area” is an area within a tract of land that has a greater than 15 percent change in elevation or an erodability factor of greater than 0.4 as determined by the Natural Resources Conservation Service of the USDA.

“Prime farmland” is defined by the U.S. Department of Agriculture (USDA) in the U.S. Code of Federal Regulations, Title 7, Volume 6, Parts 400-699, Section 657.5 and NYS Agriculture and Markets Law, Part 371. Prime farmland is land that contains “prime soils”, “unique soils”, or “soils of state significance” as identified in state Natural Resources Conservation Service soil surveys. Sites that are previously developed are exempt from this requirement.

“Critical habitat” is an area that the U.S. Fish and Wildlife Service or a state or tribal authority designates as occupied by a threatened or endangered species, or essential to the conservation of a threatened or endangered species. See, for example, Endangered Species Act, 16 U.S.C. 1532(5).

The “100-year floodplain” is defined by FEMA in the Agency’s national flood information map.

## Things to Consider

- Protect existing trees.
- Protect habitat of potential endangered species. Use state and local lists to identify these habitats.
- U.S. Department of Energy, Building Technologies Program  
<http://www.eere.energy.gov/buildings/>  
This website addresses the following siting topics: rehabilitation or infill versus undeveloped site, site planning, design to minimize impacts to site, parking and pavement, exterior water management, and water efficiency.
- U.S. Department of Agriculture, Natural Resources Conservation Service  
Web Soil Survey available at <http://websoilsurvey.nrcs.usda.gov/app/>
- Digital Q3 Flood Data Availability, States Map  
Federal Emergency Management Agency (FEMA), FEMA’s national flood information maps. <http://msc.fema.gov>

**B-2c Smart Site Location****Proximity to Services****How**

The proposed project must be located within walking distance (1/4 mile for elderly and 1/2 mile for family projects) to at least four essential services. Provide a location map with exact distances to the following facilities: Supermarket, public school, library, licensed child care center, usable park space, bank, medical or dental office, post office, convenience store, laundry/dry cleaner, pharmacy, place of worship, community or civic center that is accessible to residents.

**Intent**

Locating projects in communities with services strengthens those communities and residents' ties to society. It also prevents leapfrog development, which carries numerous negative consequences, including fragmented ecosystems, the spread of polluted runoff to new watersheds, strain on municipal budgets that must stretch to accommodate longer service routes and infrastructure lines, and damage to landscapes that nourish the connection between humans and the natural world.

Pedestrian- and transit-oriented neighborhoods inspire smaller streets and less land relegated to the automobile, and create a more livable, efficient community. These neighborhoods offer residents a range of services, parks and employment opportunities within walking and biking distance. They also offer opportunities for a healthier quality of life while lowering residents' dependence on cars, thereby reducing the costs of owning a car and the need for garages and other parking areas.

**B-2d Compact Development****New Construction****How**

The project architect must complete the density calculation as defined below and certify its correctness. The minimum density for new construction must be:

- Six (6) units per acre for detached or semi-detached houses
- Ten (10) for townhomes
- Fifteen (15) for apartments

Net density is measured by taking the total dwelling units after construction, divided by the acreage of the entire tract down to one decimal point, minus dedicated acreage of public street rights of way, riparian and wetland buffers, and open space that has been dedicated through a conservation program.

**Intent**

Compact development encourages more resource-efficient development of land, reduces development costs and conserves energy. It also can contribute to creating more walkable communities, while helping restore, invigorate and sustain livable development patterns.

### Things to Consider

- Congress for New Urbanism  
See [www.cnu.org](http://www.cnu.org)  
This non-profit organization provides tools and resources for promoting walkable, neighborhood-based development as an alternative to sprawl.
- Smart Growth Network  
See [www.smartgrowth.org](http://www.smartgrowth.org)  
This website outlines smart growth principles, provides a guide through smart growth terms and technical concepts, and hosts a searchable catalogue of reports, websites, tools, and case studies dating from 1997 to today.
- Urban Land Institute  
See [www.washington.uli.org](http://www.washington.uli.org)  
The Urban Land Institute is a non-profit organization based in Washington, D.C., that promotes the responsible use of land to enhance the total environment. ULI's online bookstore includes numerous publications regarding compact and higher-density development.

<b>B-2e</b>	<b>Walkable Neighborhoods</b>	Sidewalks and Pathways
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### How

Connect the project to the pedestrian grid. Provide a site map indicating that sidewalks or other all-weather pathways exist or were created within a multi-family property or single-family subdivision to link the residential development to pedestrian pathways, public spaces, open spaces and adjacent development. Projects whose building entrances open directly on to a public sidewalk meet this requirement.

### Intent

Making the streetscape safer and more inviting for walkers and bicyclists encourages alternative transportation choices to the automobile. It also promotes physical activity and public health, while creating opportunities for social interaction and increased safety by bringing more eyes on public spaces.

### Things to Consider

- Use porous pavement for sidewalks and other paved surfaces to reduce storm-water runoff and the distribution of pollutants to streams, rivers and water bodies. Design sidewalks to distribute storm water to open space for recharge and to prevent flooding.
- Unimproved dirt pathways do not qualify as “all-weather” walking facilities.

<b>B-2f</b>	<b>Smart Site Location</b>	Passive Solar Heating/Cooling
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### How

Orient all buildings to make the greatest use of passive solar heating and cooling.

- Elongate building on an east-west axis. The east-west axis of the building should be within 15 degrees of due east-west.
- The glazing area on the north- and south-facing walls of the building should be at least 50% greater than the sum of the glazing area on the east- and west- facing walls.
- The roof should have a minimum of 450 square feet of south-facing area that is oriented appropriately for solar applications.
- At least 90% of the glazing on the south-facing wall should be completely shaded (using shading, overhangs, etc.) at noon on June 21 and unshaded at noon on December 21.

### **Intent**

Solar energy is a radiant heat source that yields natural processes on which all life depends. Some of the natural processes can be managed through building design to help heat and cool the building. The basic natural processes used in passive solar energy are the thermal energy flows associated with radiation, conduction and natural convection. When sunlight strikes a building, the building materials can reflect, transmit or absorb the solar radiation. Additionally, the heat produced by the sun causes air movement that can be predictable in designed spaces. These basic responses to solar heat lead to design elements, material choices and placements that can provide heating and cooling effects in a building. Passive solar energy means that mechanical means are not employed to utilize solar energy.

### **Things to Consider**

- Interior spaces requiring the most light, heating and cooling should be along the south face of the building.
- A narrow floor plate (less than 40 feet), single-loaded corridors, and an open floor plan optimize daylight penetration and passive ventilation.
- Shading through overhangs and canopies on the south and trees on the west prevent the summer sun from entering the interior.
- U.S. Department of Energy, Building Technologies Program  
[www.eere.energy.gov/buildings/](http://www.eere.energy.gov/buildings/)  
A part of the department's "Building Toolbox," this site includes tips and techniques for passive solar heating, passive solar cooling, thermal storage, and daylighting.
- Passive Solar Design for the Home, U.S. Department of Energy Office of Energy Efficiency and Renewable Energy. Report # DOE/GO-102001-1105. February, 2001. Available from the U.S. Office of Scientific and Technical Information (www.osti.gov) or on-line at <http://www.nrel.gov/docs/fy01osti/27954.pdf>

<b>B-2g</b>	<b>Transportation Choices</b>	Proximity to Public Transit
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### **How**

Provide a context map demonstrating that the site is within walking distance (1/4 mile for elderly and 1/2 mile for family projects) of publicly-subsidized, regularly scheduled transportation services with adequate frequency to serve the needs of the residents.

**Intent**

Encouraging the use of public transportation minimizes dependence on car ownership. Transit-oriented neighborhoods reduce residents' needs to own a car, eliminating or lowering the costs of auto ownership, and controlling the area needed for car use and storage. Transit use reduces related emissions of air pollutants and climate-change gasses.

**Things to Consider**

- Reconnecting America  
See [www.reconnectingamerica.org](http://www.reconnectingamerica.org)  
Reconnecting America provides both the public and private sectors with an impartial, fact-based perspective on development-oriented transit and transit-oriented development, and seeks to reinvent the planning and delivery system for building regions and communities around transit and walking rather than solely around the automobile.
- Victoria Transportation Policy Institute  
See [www.vtppi.org](http://www.vtppi.org)  
This independent research organization provides consulting and publicly available research about solutions to emerging transportation issues, such as transportation demand management.

**Site Planning/Environmental Impacts**

<b>B-3a</b>	<b>Surface Water Management Plan</b>	<b>MANDATORY</b>
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**How**

Provide a surface water management plan that identifies how storm water runoff will be captured and addressed on the project site.

**Intent**

Reducing storm-water runoff through design and management techniques increases on-site filtration, prevents pollutants from entering waterways and reduces soil erosion. Water storage and nutrient collection processes reduce the need for irrigation and contribute to forming a healthier ecological community within the landscape.

**Things to Consider**

- Minimize impervious areas (surfaces that do not allow storm-water infiltration), including roofs, driveways, sidewalks and streets, or use porous materials for such areas.
- Make use of innovative, low-impact techniques such as rain gardens, green roofs, rain barrels and cisterns to capture and re-use storm water.

<b>B-3b</b>	<b>Environmental Remediation</b>	Conduct a Phase I Environmental Site Assessment
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**How**

Conduct a Phase I Environmental Site Assessment in accordance with the American Society for Testing and Materials (ASTM) Standard Practice for ESAs: Phase I ESA Process (ASTM Designation E 1527 and E 1528) to identify the presence or likely presence of any hazardous substances or petroleum products on the property; and any additional assessments required to determine whether any hazardous materials are present on site. Provide an executive summary of the Phase I Environmental Site Assessment, and a Phase II abatement plan, if available.

**Intent**

A Phase I Site Assessment is an investigation of the site's conditions, often performed before purchase of the property to satisfy the due-diligence requirements of a property transaction. The site assessment helps to assess potential environmental liabilities associated with real property acquisition and ownership.

**Healthy Living Environment**

Applicants must include a minimum of **seven (7)** criteria to qualify for Green Building Initiative.

<b>B-4a</b>	<b>Low/No VOC Paints, Primers, Adhesives and Sealants</b>	Indoor Air Quality
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**How**

All paints, primers, adhesives and sealants must contain low or no VOCs. Specify that all interior paints and primers will comply with current Green Seal standards for low VOC limits.

**Intent**

VOCs (volatile organic compounds) are chemicals containing carbon molecules that are volatile enough to evaporate from material surfaces into indoor air at normal temperatures. Interior paints and primers that release VOCs may pose health hazards to residents and workers. Outdoors, VOCs react with sunlight and nitrogen in the atmosphere to form ground level ozone, a chemical that has a detrimental effect on human health and ecosystems. Ozone damages lung tissue, reduces lung function and sensitizes the lungs to other irritants. Use of low-VOC paints and primers will reduce the concentration of such airborne chemicals. Interior caulks, sealants and adhesives that release VOCs may pose health hazards to residents and workers. Use of low-VOC adhesives and sealants will reduce the concentration of such airborne chemicals.

**Things to Consider**

- The website <http://www.green seal.org/findaproduct/index.cfm#paints> lists paints that are Green Seal certified. Also, the Green Seal Standard GS-11 (available for

download at <http://www.greenseal.org/certification/environmental.cfm>) shows VOC limits for paints.

- The website [www.toolbase.org/secondaryT.asp?TrackID=&CategoryID=1312](http://www.toolbase.org/secondaryT.asp?TrackID=&CategoryID=1312) has information on low- and no-VOC paints, including a list of paint manufacturers that carry these products.
- See *Weatherize Your Home – Caulk and Weatherstrip*, U.S. Department of Energy, National Renewable Energy Laboratory, p. 4.
- See [www.eere.energy.gov/buildings/building\\_america/](http://www.eere.energy.gov/buildings/building_america/)

## **B-4b** Formaldehyde-free Composite Wood

Indoor Air Quality

### **How**

Use particleboard and medium density fiberboard (MDF) that is certified compliant with the ANSI A208.1 and A208.2 - see Things to Consider below. If using composite wood that does not comply with ANSI, all exposed edges and sides must be sealed with low-VOC sealants.

### **Intent**

Particleboard and MDF may emit urea formaldehyde. Formaldehyde is a volatile organic compound. Symptoms of exposure vary widely and can include watery eyes, nausea, coughing, chest tightness, wheezing, skin rashes, allergic reactions and burning sensations in the eyes, nose and throat. In a new report, the World Health Organization (WHO) International Agency for Research on Cancer upgraded its evaluation of formaldehyde from a probable carcinogen to a known human carcinogen based on new evidence that formaldehyde causes nasopharyngeal cancer in humans. Avoiding products with added urea formaldehyde will reduce the quantity of harmful indoor air contaminants.

### **Things to Consider**

- Make this requirement part of the specifications for sub-contractor submittals. Obtain the manufacturer's specifications to determine whether materials meet this requirement. See third party testing labels documenting compliance with the relevant ANSI standards. Materials certified as compliant with ANSI A208.1 and A208.2 must meet formaldehyde emission limits. The American National Standard for Particleboard, ANSI A208.1, classifies particleboard by density and class, and is the voluntary particleboard standard for the North American industry. This standard covers physical, mechanical and dimensional characteristics as well as formaldehyde levels. ANSI A208.1 for particleboard limits formaldehyde in industrial particleboard to 0.30 parts per million (ppm), and 0.20 ppm in particleboard flooring.
- ANSI Standard A208.2, Medium Density Fiberboard, is the North American industry standard for MDF. This standard classifies MDF by density and use (interior or exterior) and identifies product grades. Specifications identified in the standard include physical and mechanical properties, dimensional tolerances and formaldehyde emission limits. ANSI A208.2 sets the formaldehyde emission limit for MDF at 0.30 parts per million (ppm) at a loading of 0.26m/m (0.08 ft<sup>2</sup>/ft<sup>3</sup>). The addition of finishes or overlays may significantly alter product emissions.

- If feasible, specify urea-formaldehyde-free plywood or medium-density fiberboard.

<b>B-4c</b>	<b>Green Label Certified Floor Covering</b>	Indoor Air Quality
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**How**

Do not install carpets in below grade living spaces, entryways, laundry rooms, bathrooms, kitchens or utility rooms. If using carpet, use products that meet the Carpet and Rug Institute’s Green Label certified carpet, pad and carpet adhesives.

**Intent**

New carpets, padding and adhesives release VOCs that may pose health hazards to residents and workers. Carpets also attract allergens such as dirt, pollen, mold spores, dust mites and other microbes that may pose health hazards to individuals allergic to these substances. The Carpet and Rug Institute’s program certifies that labeled carpets are low VOC.

**Things to Consider**

- More information on the Carpet and Rug Institute can be found on their website at [www.carpet-rug.org](http://www.carpet-rug.org). Details are provided under “Commercial Customers,” and within “Green Building and the Environment.”
- The EPA Energy Star with Indoor Air Package Specifications requires Green Label Plus carpet. The “Plus” label is more stringent. The California Rug Institute maintains a list of manufacturers and products meeting the Green Label Plus standard. To view the list, go to [www.carpet-rug.org/drill\\_down\\_2.cfm?page=8&sub=17&requesttimeout=350](http://www.carpet-rug.org/drill_down_2.cfm?page=8&sub=17&requesttimeout=350).
- Make this requirement part of the specifications for sub-contractor submittals. Do not specify the use of wall-to-wall carpets in bathrooms, kitchens, entryways, utility rooms and other wet areas. Instead, use smooth and resilient flooring that can tolerate moisture (e.g., ceramic tile or linoleum).

<b>B-4d</b>	<b>Exhaust fans – Bathrooms</b>	New Construction
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**How**

Install Energy Star-labeled bathroom fans that exhaust to the outdoors and are equipped with a humidistat sensor or timer, or operate continuously.

**Intent**

Properly sized and controlled exhaust fans in bathrooms reduce moisture condensation, lowering the potential for indoor mold growth that may yield odors and pose health hazards to residents. Energy Star-qualified fans use 65 percent less energy on average than standard models and move more air per unit energy used with less noise. Timers and humidistat sensors help ensure that fans regularly remove moisture and provide increased ventilation.

**Things to Consider**

- For more information on bathroom fans, go to the products section of the Energy Star

home page: [http://www.energystar.gov/index.cfm?c=vent\\_fans.pr\\_vent\\_fans](http://www.energystar.gov/index.cfm?c=vent_fans.pr_vent_fans). This website describes the advantages of ENERGY STAR–labeled bathroom, utility room, and kitchen exhaust fans and provides product and manufacturer lists.

- The cfm for intermittent bath fans should be at least 50 cfm or 20 cfm if operating continuously, per ASHRAE Standard 62.2-2007 section 5.
- Home Ventilating Institute, Ventilation Systems and Controls  
See <http://www.hvi.org/>; <http://www.hvi.org/assets/pdfs/HVIGuide2006Low.pdf> and [http://www.hvi.org/assets/pdfs/Ventilation\\_Controls\\_for\\_Life-Styles.pdf](http://www.hvi.org/assets/pdfs/Ventilation_Controls_for_Life-Styles.pdf)  
HVI provides consumers an assurance of product performance. It also works to increase public awareness of the need for good ventilation and provides resources for selecting the proper ventilation products.
- Review of Residential Ventilation Technologies  
See <http://www.buildingscience.com/documents/reports>  
This page provides a link to “Review of Residential Ventilation Technologies,” a report that reviews current and potential ventilation technologies for residential buildings with particular emphasis on North American climates and construction.

<b>B-4e</b>	<b>Ventilation</b>	New Construction
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### How

Install a ventilation system for the dwelling unit that provides 15 cubic feet per minute of fresh air, per occupant.

### Intent

Optimal ventilation improves indoor air quality by providing fresh air to the living space on a regular basis.

### Things to Consider

- Specify a mechanical whole-house ventilation system per ASHRAE 62.2 2007 and the EPA Energy Star with Indoor Air Package Specifications.
- ASHRAE Standard 62.2-2007 and ASHRAE Standard 62.1-2007  
See <http://www.ashrae.org/technology/page/548>  
This site provides a viewable version of ASHRAE Standard 62.2-2007. The online version cannot be printed or saved but can be previewed.
- University of Minnesota, Common Questions about Heat and Energy Recovery Ventilators  
See <http://www.extension.umn.edu/distribution/housingandclothing/DK7284.html>  
This site provides a brief, easy-to-understand overview of heat- and energy-recovery ventilators.
- Building Science.com, Review of Residential Ventilation Technologies  
See <http://www.buildingscience.com/documents/reports>  
This page provides a link to “Review of Residential Ventilation Technologies,” a report that reviews current and potential ventilation technologies for residential buildings with particular emphasis on North American climates and construction.

**How**

Size heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manual, Parts J and S, ASHRAE handbooks, or equivalent software, to prevent short-cycling of heating or air conditioning and ensure adequate dehumidification.

**Intent**

Appropriately sized equipment can ensure adequate dehumidification, preventing short-cycling that can lead to excess moisture in the air, which can cause mold growth and resident discomfort.

**Things to Consider**

- The HVAC designer generates a Manual J load calculation to ensure proper sizing of the cooling system. This calculation accounts for factors such as the building's orientation with respect to the sun, window design and insulation rating. The designer can utilize one of the HVAC-industry adopted software programs, based upon Manual J, which assists with these designs. Consult [www.acca.org](http://www.acca.org) for a list of software programs to perform Manual J calculations.
- Air Conditioning Contractors of America, Manual D: Residential Duct Design  
See [http://www.acca.org/tech/codes/Manual\\_D\\_verification.pdf](http://www.acca.org/tech/codes/Manual_D_verification.pdf)
- Air Conditioning Contractors of America, Manual J: Residential Load Calculation  
See <http://www.acca.org/tech/manualj/>
- Air Conditioning Contractors of America, HVAC Quality Installation Specification  
See <http://acca.org/>  
This website provides a free link to the ACCA Standard: "HVAC Quality Installation Specification: Residential and Commercial Heating, Ventilating, and Air Conditioning Applications." The site also includes a link to various articles and other ANSI and ACCA standards.
- California Energy Commission, Procedures for HVAC System Design and Installation  
See <http://www.energy.ca.gov/efficiency/qualityhomes/procedures.html>  
This site provides an overview of good practices for designing and installing the HVAC system, as well as detailed strategies and measures for the "house as a system" approach to construction.

**How**

Use tankless hot water heaters or install conventional hot water heaters in rooms with drains or catch pans piped to the exterior of the dwelling and with non-water sensitive floor coverings.

### Intent

The use of heaters or heaters with drains and catch pans prevents moisture problems caused by leakage or overflow. Capturing water overflow from hot water heaters or allowing for proper drainage will prevent water from sitting idle, creating excess moisture and allowing mold to germinate. Cooling coils, as part of the HVAC equipment for air conditioning, can generate significant amounts of water through condensation on the surface of the coils. If this water is not constantly drained from the “drip pan” under the coil, mold and other organisms can grow in the standing water. HVAC-system air blowing across this area can distribute this mold and other material throughout the home.

### Things to Consider

- ASHRAE, *User's Manual of Standard 62.1-2004*. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 2004. (Fig 4.9a and 4.9b). See [www.ashrae.org](http://www.ashrae.org)
- International Residential Code; see [www.iccsafe.org](http://www.iccsafe.org)

<b>B-4h</b>	<b>Water Heaters</b>	Minimizing CO
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### How

Specify direct vented or combustion sealed water heaters.

### Intent

Direct vent systems draw all the air needed directly from the outside so there is no risk of spilling combustion contaminants into the residence. Power vented equipment uses a fan or blower to create the pressure difference that causes air to flow from inside the house, through the combustion device out an approved chimney or vent system to the outdoors.

### Things to Consider

- U.S. Environmental Protection Agency, Combustion Gases and Carbon Monoxide  
See <http://www.epa.gov/iaq/combust.html> and <http://www.epa.gov/iaq/co.html>  
These two extensive EPA sites describe the sources of carbon monoxide and other combustion gases, their health effects, steps to reduce exposure, related standards and guidelines, and additional resources and links.
- Canada Mortgage and Housing Corporation  
See [http://www.cmhc-schl.gc.ca/en/co/maho/yohoyohe/inaiqu/inaiqu\\_004.cfm](http://www.cmhc-schl.gc.ca/en/co/maho/yohoyohe/inaiqu/inaiqu_004.cfm)  
This site is part of CMHC’s “About Your House” series of educational articles. It includes information about combustion gases, the effects of exposure, and strategies for limiting exposure.

<b>B-4i</b>	<b>Cold Water Pipe Insulation</b>	Mold Prevention
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### How

Insulate exposed cold water pipes in climates and building conditions susceptible to moisture condensation.

**Intent**

Insulation of cold water pipes prevents condensation that can lead to mold growth. Wherever there is a high differential between indoor air temperatures and the temperature of water supplies, i.e., in locations with moderate-to-high humidity, condensation on cold water pipes is likely to occur. Plumbing on exterior walls may be exposed to substantial variations in temperature making it more vulnerable to leakage or damage.

<b>B-4j</b>	<b>Materials in Wet Areas</b>	Surfaces, Tub and Shower Enclosures
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**How**

In wet areas, use materials that have smooth, durable, cleanable surfaces. Do not use mold-propagating materials such as vinyl wallpaper and unsealed grout. Use fiberglass or similar enclosure or, if using any form of grouted material, use backing materials such as cement board, fiber cement board or equivalent (i.e., not paper-faced).

**Intent**

The use of moisture-resistant materials in wet areas such as bathrooms reduces moisture buildup, diminishing the potential for indoor mold growth that may yield odors and pose health hazards to residents.

<b>B-4k</b>	<b>Clothes-Dryer Exhaust</b>	Mold Prevention
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**How**

Clothes dryers must be exhausted directly to the outdoors.

**Intent**

Outdoor venting of clothes dryers substantially reduces air moisture that can lead to mold growth.

**Things to Consider**

- It is important to minimize the duct run to avoid build up of moisture and particles that can inhibit the flow of air through the duct. Rigid duct materials are preferred to help ensure clean ducts and reduce build up on particles and moisture.

<b>B-4l</b>	<b>Integrated Pest Management</b>	Healthy Environment
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**How**

Seal all wall, floor and joint penetrations to prevent pest entry. Provide rodent and corrosion proof screens (e.g., copper or stainless steel mesh) for large openings.

**Intent**

Sealing of cracks and penetrations will minimize entry points for pests such as rodents and cockroaches.

## **Operations and Maintenance – Mandatory**

Applicants must include these **three (3)** criteria to qualify for Green Building Initiative

<b>B-5a</b>	<b>Building Maintenance Manual</b>	<b>MANDATORY</b>
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### **How**

Provide, prior to occupancy, a manual that includes the following: a routine maintenance plan; operations and maintenance guidance for all appliances, HVAC systems, water-system turnoffs, lighting equipment, paving materials and landscaping, pest control, and other systems that are part of each occupancy unit; and an occupancy turnover plan that describes in detail the process of educating the tenant about proper use and maintenance of all building systems. Reference the Building Maintenance Manual in your Green Development Plan.

### **Intent**

A regularly maintained building and site will provide optimum health benefits and ensure environmental and economic performance.

### **Things to Consider**

- NCHH. “Healthy Homes Maintenance Checklist.” National Center for Healthy Housing, 2005.  
See [http://www.centerforhealthyhousing.org/Healthy\\_Housing\\_CheckList.pdf](http://www.centerforhealthyhousing.org/Healthy_Housing_CheckList.pdf)
- For an example of a Green operations and Maintenance Manual template, see: [www.practitionerresources.org/showdoc.html?id=63995](http://www.practitionerresources.org/showdoc.html?id=63995)
- Incorporate a “no-spray” policy in the ongoing maintenance of a green property, as sprays are ineffective at managing pests and very harmful for residents.

<b>B-5b</b>	<b>Occupant’s Guide</b>	<b>MANDATORY</b>
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### **How**

Provide a guide for homeowners and renters that explains the intent, benefits, use and maintenance of green building features, along with the location of transit stops and other neighborhood conveniences and features, and encourages additional green activities such as recycling, gardening, use of healthy cleaning materials, alternative measures to pest control, and purchase of green power. For homeowners, include appropriate instructions from B-5a above.

### **Intent**

Renters and homeowners may be unfamiliar with green systems or features installed in their buildings or homes, or with nearby amenities that can provide transportation choices and conveniences within walking distance. Assistance with understanding, operating and maintaining them will allow both homeowners and renters to fully realize the environmental, health and economic benefits of green development.

## Things to Consider

- For an example of an Occupant’s manual template, see [www.practitionerresources.org/showdoc.html?id=63997](http://www.practitionerresources.org/showdoc.html?id=63997)
- Provide homeowners/tenants with two radon test kits designed for 48-hour exposure with instructions for use and follow up action, per EPA’s Indoor Air Package.
- Connecticut Department of Environmental Protection, “Health Home Brochure”  
See <http://www.ct.gov/dep/lib/dep/p2/individual/healthyhome.pdf>  
This site links to the “A Green Home Is a Healthy Home” brochure; a good example of a simple brochure with a readable layout and presentation.
- Minnesota Building Industry Foundation, Home-Smart  
See <http://www.home-smart.org>  
This site provides information for homeowners on maintaining their home. It includes seasonal checklists and step-by-step instructions for general maintenance, as well as special instructions for new-home buyers on maintaining their home during its first year.

<b>B-5c</b>	<b>New Resident Orientation</b>	<b>MANDATORY</b>
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### How

Provide a walk-through and orientation to the new resident or homeowner using the Occupant Manual from B-5b above that reviews the building’s green features, operations and maintenance, along with neighborhood conveniences that may facilitate a healthy lifestyle.

### Intent

A walk-through and orientation will help ensure that the Green Development Plan achieves its intended environmental and economic benefits.

## **SECTION C – Required only if the applicant is including green building measures beyond the standard criteria.**

### **Location and Neighborhood Fabric**

<b>C-1</b>	<b>Smart Site Location</b>	Brownfield, Grayfield or Adaptive Reuse Site
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### How

Locate the project on a brownfield, grayfield or adaptive reuse site.

### Intent

Use of previously developed sites, including those where development is complicated by real or perceived environmental contamination or physical constraints, reduces pressure on undeveloped land and the spread of pavement to new watersheds. Many such sites are

otherwise prime locations for redevelopment and provide potential economic and location benefits to citizens, neighborhoods and regions. Reuse of existing structures reduces the need for new materials and utilizes embodied energy.

### **Definitions**

- Brownfields are abandoned, idled or under-used properties where expansion or redevelopment is complicated by real or perceived environmental contamination. They typically are former industrial or commercial properties where operations may have resulted in environmental contamination. Brownfields often pose not only environmental, but legal and financial burdens on communities. Brownfields require a Phase II Environmental Site Assessment and remediation plan.
- Grayfields are previously developed abandoned sites, such as parking lots, obsolete shopping centers, and dilapidated residential structures scheduled to be deconstructed or demolished.
- An adaptive reuse site is one that was previously developed for non-residential purposes, in which at least 25 percent of the proposed development will reuse existing non-residential structures.

### **Things to Consider**

- U.S. Environmental Protection Agency, Brownfields Cleanup and Redevelopment  
See <http://www.epa.gov/brownfields/index.html>  
On this site, you can find information about EPA's Brownfields Program, including the brownfields law, EPA Brownfields Grants, technical tools and resources, and information on brownfield projects across the county.
- New York State Department of Environmental Conservation, Environmental Cleanup and Brownfields  
See <http://www.dec.ny.gov/chemical/brownfields.html>  
This site provides information on New York State's brownfields cleanup programs.
- Municipal Research and Services Center of Washington, Infill Development Strategies for Shaping Livable Neighborhoods  
See <http://www.mrsc.org/Publications/textfill.aspx>  
This site, sponsored by the State of Washington, contains an overview of strategies for encouraging and implementing infill development patterns. The principal audience is policymakers and developers in Washington, but the insights are broadly applicable.
- Congress of New Urbanism, "Greyfields into Goldfields: Dead Malls Become Living Neighborhoods"  
See <http://www.cnu.org/malls>  
This website contains a 2002 study on the opportunity for converting dead shopping malls into new neighborhoods.
- National Vacant Properties Campaign  
See [www.vacantproperties.org/](http://www.vacantproperties.org/)  
This website provides information, resources, tools, and assistance to support vacant property revitalization efforts.

## **Energy Efficiency**

<b>C-2</b>	<b>Renewable Energy</b>	PV Panels, Wind Turbines and Other Sources
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### **How**

Install PV panels, wind turbines or other acceptable renewable source, to provide at least 10 percent of the project's estimated electricity demand.

### **Intent**

Use of renewable energy reduces environmental impacts associated with utility energy production and use. These impacts include natural resource destruction, air pollution, greenhouse gas emissions and water pollution. Use of onsite renewable energy technologies, such as PV panels and wind turbines, can also result in energy cost savings.

### **Things to Consider**

- U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy  
See [www.eere.energy.gov](http://www.eere.energy.gov)  
The EERE website includes information on all types of renewable energy technologies and energy efficiency.
- National Renewable Energy Laboratory  
See [www.nrel.gov](http://www.nrel.gov)  
The National Renewable Energy Laboratory is a leader in the U.S. Department of Energy's effort to secure an energy future for the nation that is environmentally and economically sustainable.
- American Solar Energy Society  
See [www.ases.org](http://www.ases.org)  
ASES is a nonprofit organization committed to a sustainable energy economy. ASES accelerates the development and use of solar and other renewable energy resources through advocacy, education, research, and collaboration among professionals, policymakers, and the public.
- National Center for Photovoltaics  
See [www.nrel.gov/ncpv](http://www.nrel.gov/ncpv)  
NCPV provides a clearinghouse on all aspects of photovoltaic (PV) solar cell systems.
- Database of State Incentives for Renewable Energy  
See [www.dsireusa.org](http://www.dsireusa.org)  
The North Carolina Solar Center developed this database to collect information on state financial and regulatory incentives (e.g., tax credits, grants, and special utility rates) designed to promote the application of renewable energy technologies. DSIRE also offers additional features such as preparing and printing reports that detail the incentives on a state-by-state basis.
- Florida Solar Energy Center  
See [www.fsec.ucf.edu/en/consumer/solar\\_electricity/index.htm](http://www.fsec.ucf.edu/en/consumer/solar_electricity/index.htm)  
A resource for basic information on types of photovoltaic solar electric systems, sizing, installation, and system ratings. FSEC also has an industry resources page that

includes its Photovoltaic System Design Course Manual, available at [www.fsec.ucf.edu/en/industry/resources/pv/index.htm](http://www.fsec.ucf.edu/en/industry/resources/pv/index.htm).

- American Wind Energy Association  
See [www.awea.org](http://www.awea.org)  
AWEA is a national trade association representing wind power plant developers, wind turbine manufacturers, utilities, consultants, insurers, financiers, researchers, and others involved in the wind industry.

## **Materials Beneficial to the Environment**

<b>C-3a</b>	<b>Construction Waste Management</b>	Environmental Protection
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### **How**

Reduce the amount of construction waste sent to the landfill by 25%. Submit calculations that estimate the entire amount of construction waste, and then describe how the reduction of 25% will be obtained.

### **Intent**

The amount of job-site waste resulting from construction of the average (2000 sq. ft.) U.S. home is 4 pounds per square foot of conditioned space, totaling about 8,000 pounds and taking up 50 cubic yards of landfill space. To the extent possible, waste should be avoided because 1) landfill space is rapidly diminishing, 2) incineration produces pollutants, 3) waste of materials is in itself a negative environmental impact. (Source: National Association of Home Builders Research Center, 2001, [www.nahbrc.org](http://www.nahbrc.org))

### **Things to Consider**

- Consider creating detailed framing plans or scopes of work and accompanying architectural details for use on the job site.
- Consider creating a detailed cut list and lumber order prior to construction.
- U.S. Environmental Protection Agency, Construction and Demolition Debris  
See [www.epa.gov/epaoswer/non-hw/debris-new/index.htm](http://www.epa.gov/epaoswer/non-hw/debris-new/index.htm)  
This site includes basic information on construction and demolition debris disposal practices, regional and state programs, publications, and links.
- U.S. EPA WasteWise Program  
See [www.epa.gov/wastewise/targeted/challenge/cbres.htm](http://www.epa.gov/wastewise/targeted/challenge/cbres.htm)  
This site has information about the WasteWise Building Challenge program, including articles, publications, and various links and resources for more information.
- Construction Materials Recycling Association  
See [www.cdrecycling.org](http://www.cdrecycling.org)  
Includes links to websites on recycling concrete, asphalt roof shingles, and drywall, as well as a state-by-state listing of construction waste re-users and recyclers.
- NAHB Research Center, Toolbase.org, “Best Practices for Construction Waste Management”  
See [www.toolbase.org/Best-Practices/Construction-Waste/waste-mgmt-field-guide](http://www.toolbase.org/Best-Practices/Construction-Waste/waste-mgmt-field-guide)

This page includes frequently asked questions, case studies, reports, and various links. It also includes “A Builder’s Field Guide,” which includes guidance for creating a step-by-step construction waste management and recovery plan.

- Residential Construction Waste Management: A Builder's Field Guide. NAHB Research Center, 1997. This guide may be used to create a step-by-step construction waste management and recovery plan.  
See <http://www.nahbrc.org/bookstore/cw0503w.aspx>
- Efficient Wood Use in Residential Construction. Natural Resources Defense Council, 1998. This NRDC handbook describes the advantages of several wood-efficient approaches to design, material selection, and construction for residential applications and includes extensive practical and resource information for builders, architects, engineers, and developers. It may be purchased online, at <http://www.nrdc.org/cities/building/rwoodus.asp>

<b>C-3b</b>	<b>Recycled Content Material</b>	Environmental Protection
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### How

Use 25% materials with recycled content. The percentage of recycled content material is based on cost or value and does not include mechanical and electrical equipment. Provide calculations for recycled content percentage as follows:

- For a given material or furnishing, multiply the recycled content percentage by weight (post-consumer or post-industrial) by the value of the product to find the value of the recycled content for that item.
- Add up the values of the recycled content of all the materials and furnishings.
- Divide this sum by the total value of the materials for the project.

### Intent

Recycled materials have been recovered or otherwise diverted from the solid waste stream either during the manufacturing process or after consumer use. Use of recycled content materials reduces the negative impact resulting from extraction and processing of virgin materials. Many recycled content materials have additional benefits, which yield better results and a stronger final product.

### Things to Consider

- Consider the incorporation of recycled content building materials from the early stages of project design.
- Many commonly used products, such as metals, concrete, masonry, acoustic tile, drywall, carpet, ceramic tile and insulation, are now available with recycled content. For guidance, see the Federal Trade Commission document, *Guides for the Use of Environmental Marketing Claims*, 16 CFR 260.7(e).
- Oikos Green Building Source  
See [www.oikos.com/green\\_products/index.php](http://www.oikos.com/green_products/index.php)

This is a website dedicated to sustainable and energy-efficient construction: Green Building News, Products Database, Product Gallery, Energy Source Builder Newsletter, and more.

<b>C-3c</b>	<b>Certified, Salvaged and Engineered Wood</b>	Environmental Protection
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### **How**

Use at least 50 percent (by cost) wood products and materials that are certified in accordance with the Forest Stewardship Council Sustainable Forestry Initiative, salvaged wood, or engineered framing materials. The percentage of certified, salvaged and engineered wood products is based on cost or value. The project architect must complete and submit the following calculation: Divide the sum of the value of all certified, salvaged or engineered wood products by the value of all wood products.

### **Intent**

Less than 10 percent of the old growth forest remains in the United States. The use of Forest Stewardship Council-certified wood encourages forestry practices that are environmentally responsible, socially beneficial and economically viable. The use of salvaged wood and engineered wood products precludes the need to use old-growth lumber.

### **Things to Consider**

- For help in locating FSC-certified products, fill out the form on the website below and submit it to FSC-US; FSC will circulate it to certified companies, who then will contact you if they have your desired product(s) available. The form is located at: [http://www.fscus.org/faqs/fsc\\_products.php](http://www.fscus.org/faqs/fsc_products.php) and <http://www.findfsc.org>
- Rainforest Alliance, “SmartGuide to Green Building Wood Sources”  
See [www.rainforestalliance.org/smartguides](http://www.rainforestalliance.org/smartguides)  
This site lists U.S. suppliers, manufacturers, and distributors of FSC-certified building products.

<b>C-3d</b>	<b>Water-Permeable Walkways and Parking Area</b>	Environmental Protection
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### **How**

Use water-permeable materials in 40 percent or more of walkways. Use water-permeable materials in 40 percent or more of paved parking areas.

### **Intent**

Water-permeable materials reduce storm-water runoff by allowing water to soak into the ground. Storm-water runoff pollutes receiving waterways by carrying sediment and other pollutants and by raising water temperature. Storm-water runoff also causes downstream flooding and erosion, and hampers aquifer recharge and transmission of moisture for vegetation. Water-permeable materials reduce storm-water runoff by allowing water to soak into the ground.

### Things to Consider

- Use water-permeable materials such as pervious interlocking concrete paving blocks, concrete grid pavers, perforated brick pavers and compacted gravel.
- NAHB Research Center ToolBase Services: Permeable Pavement  
<http://toolbase.org/Technology-Inventory/Sitework/permeable-pavement>  
In a resource provided through a partnership with the Department of Housing and Urban Development, the Partnership for Advancing Technology in Housing (PATH), and the National Association of Home Builders Research Center, this site provides details, lists of manufacturers, and related information on permeable paving options.

<b>C-3e</b>	<b>Reducing Heat-Island Effect: Roofing and Paving</b>	Environmental Protection
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### How

- 1) Use Energy Star-compliant (reflectivity of greater than 6.5) and high-emissive roofing (with an emissivity of at least 0.8 when tested in accordance with ASTM 408) or, install a “green” (vegetated) roof for at least 50 percent of the roof area; and
- 2) Use light colored/high-albedo materials and/or an open grid pavement, with a minimum Solar Reflective Index of 0.6, over at least 30% of the site’s hardscaped area.

### Intent

Urban heat islands disturb the atmosphere and cause energy waste by increasing loads on cooling systems. Heat islands create thermal gradient differences between developed and undeveloped areas. Using roof and paving surfaces that do not retain heat reduces the heat island effect. Resources and information on green roofs can be found at [www.earthpledge.org/GreenRoof.html](http://www.earthpledge.org/GreenRoof.html)

### Things to Consider

- The Solar Reflectance Index (SRI) is a measure of the constructed surface’s ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980-01.
- U.S. Environmental Protection Agency, Heat Island Effect  
See [www.epa.gov/heatisland](http://www.epa.gov/heatisland)  
Basic information about heat island effect, its social and environmental costs, and strategies to minimize its prevalence, including shading and coloration of hardscapes.
- Lawrence Berkeley National Laboratory, Heat Island Group  
See <http://eetd.lbl.gov/HeatIsland>  
The Lawrence Berkeley National Laboratory conducts research to find, analyze, and implement solutions to minimizing heat island effects; its current efforts focus on the study and development of more reflective surfaces for roadways and buildings.