Green Communities Criteria
2006 Edition

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green communities™

Introduction

Despite record new-home starts and homeownership rates, housing remains unattainable for many people in the United States, particularly for families with low incomes. In the first years of the new millennium, the nation faces a shortfall of 3.3 million units of public and assisted housing for the poorest Americans. But closing the affordability gap requires more than negotiating supply and demand.

Growing awareness about the links among buildings, health and evolving spatial needs calls for a commitment to green and adaptable affordable housing. Substandard housing poses numerous environmental health risks. Each year, for example, there are more than 5,300 asthma-related deaths. According to the U.S. Centers for Disease Control and Prevention, low-income people endure the highest rates of asthma, with many known and suspected triggers linked to conditions in the home.

Development has a tremendous impact on the environment. Buildings consume or are responsible for 40 percent of the world's total energy; 25 percent of the world's timber harvest; 16 percent of fresh water withdrawal; 35 percent of all carbon dioxide emissions; 60 percent of the electricity generated in the United States; and 30 percent of raw materials produced. In addition, more than 210 million tons of solid waste is generated and disposed of annually – a substantial portion of which is attributed to construction-site and building-use waste.

Green Communities will transform the way America thinks about, designs and builds affordable communities. Green building integrates materials and methods that promote environmental quality, economic vitality and social benefits through design, construction and operation of the built environment. Green Communities aligns affordable housing investment strategies with environmentally responsive building practices.

As a community of affordable housing providers, we have an opportunity to use green building strategies that significantly reduce the impact on water quality, air pollution, global warming and the depletion of natural resources – while simultaneously lowering operating costs and maintenance needs. More importantly, people, not buildings, are the real focus of our work. Adopting green building practices will redouble our contribution to the physical health and well-being of people.

We would like to extend a special thank you to Gail Vittori and the Center for Maximum Potential Building Systems who provided support at a very early stage to the development of Green Communities and the Green Criteria. We also thank Joanne Quinn and the Seattle Office of Housing who so generously allowed Enterprise to use the SeaGreen Affordable Housing Guide as a foundation for the Green Criteria. Enterprise would like to acknowledge our many other partners including NRDC, the AIA, APA, Global Green USA, the National Center for Healthy Housing, Southface, Greg Kats, Jonathan Rose, and Michael Gatto who contributed their technical support and experience to the establishment of these Green Criteria.

Green Communities Criteria: An Overview

The Green Communities criteria promote public health, energy conservation, operational savings and sustainable building practices in affordable 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 inform 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 expand to include fewer sprawl-related transportation impacts.

Guiding principles behind the Green Communities criteria ensure that homes must be cost effective to build, and durable and practical to maintain. In addition, the principles work together to help produce green affordable housing that:

- Results in a high-quality, healthy living environment
- Lowers residents' utility costs
- Enhances residents' connection to nature
- Protects the environment by conserving energy, water, materials and other resources
- Advances the health of local and regional ecosystems

To be eligible for grants, loans and tax credit equity, a project must comply with all of the mandatory provisions of the Green Communities criteria. In addition, new construction must earn 25 points from the Optional Criteria, while moderate rehab projects must earn 20 points from the Optional Criteria. The Green Communities Grants Committee may waive compliance with specific criteria if the grant applicant can demonstrate that the criterion creates a hardship or is inadvisable for a specific project, and that alternative means meet the intent of the criteria. Projects should include at least 15 single-family homes occupied by households with incomes at or below 80 percent of area median income or at least 25 rental apartments occupied by households at or below 60 percent of area median income.

Section 1: An 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 that informs the project's 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 should include a 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.

Section 2: 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 also can contribute to creating 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.

Section 3: Site Improvements

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.

Section 4: Water Conservation

Water efficiency conserves finite fresh water resources and reduces utility bills. Between 20 percent and 40 percent of the contiguous United States has experienced moderate to extreme drought in the late 20th and 21st centuries. 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 graywater sources.

Section 5: 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.

Section 6: 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.

Section 7: Healthy Living Environment

The importance of a healthy living environment is a significant green building issue directly affecting residents. The goal of affordable housing is to provide safe, affordable housing for low-income residents. Safety includes using materials that do not cause negative health impacts for residents, especially for more sensitive groups such as children, seniors and individuals with existing respiratory problems and compromised immune systems. Creating a healthy living environment requires minimizing residents' and workers' exposure to toxic materials, and using safe, biodegradable materials and alternatives to hazardous materials.

Section 8: Operations and Management

Operations and management (O&M) practices 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 Communities Criteria Checklist

Integrated Design Process

Y	N	?	Item #	Item Title	Possible Points
			1.1	Green Development Plan	Mandatory

Location and Neighborhood Fabric

Y	N	?	Item #	Item Title	Possible Points
			2.1a	Smart Site Location — Proximity to Existing Development	Mandatory
			2.1b	Smart Site Location — Protecting Environmental Resources	Mandatory
			2.1c	Smart Site Location — Proximity to Services	Mandatory
			2.2	Compact Development	Mandatory
			2.3	Walkable Neighborhoods	Mandatory
			2.4a	Smart Site Location — Make Use of Passive Solar Heating/Cooling	5
			2.4b	Smart Site Location — Grayfield, Brownfield or Adaptive Reuse Site	10
			2.5	Compact Development	5
			2.6	Walkable Neighborhoods	5
			2.7	Transportation Choices	12

Site Improvements

Y	N	?	Item #	Item Title	Possible Points
			3.1	Environmental Remediation	Mandatory
			3.2	Erosion and Sedimentation Control	Mandatory
			3.3	Landscaping	Mandatory
			3.4	Surface Water Management	5
			3.5	Storm Drain Labels	2

Water Conservation

Y	N	?	Item #	Item Title	Possible Points
			4.1a	Water-Conserving Appliances and Fixtures	Mandatory
			4.1b	Water-Conserving Appliances and Fixtures	Mandatory
			4.2	Efficient Irrigation	Mandatory

Energy Efficiency

Y	N	?	Item #	Item Title	Possible Points
			5.1a	Efficient Energy Use	Mandatory
			5.1b	Efficient Energy Use	Mandatory
			5.2	Energy Star Appliances	Mandatory
			5.3a	Efficient Lighting – Interior	Mandatory
			5.3b	Efficient Lighting – Exterior	Mandatory
			5.4	Electricity Meter	Mandatory
			5.5a	Additional Reductions in Energy Use for New Construction	10
			5.5b	Additional Reductions in Energy Use for Moderate Rehab	10
			5.6a	Photovoltaic (PV) Panels	10
			5.6b	Photovoltaic (PV) Ready	2

Materials Beneficial to the Environment

Y	N	?	Item #	Item Title	Possible Points
			6.1	Construction Waste Management	5
			6.2	Recycled Content Material	14
			6.3	Certified, Salvaged and Engineered Wood	10
			6.4a	Water-Permeable Walkways	5
			6.4b	Water-Permeable Parking Areas	5
			6.5a	Reduce Heat-Island Effect – Roofing	5
			6.5b	Reduce Heat-Island Effect – Paving	5

Healthy Living Environment

Y	N	?	Item #	Item Title	Possible Points
			7.1	Low / No VOC Paints and Primers	Mandatory
			7.2	Low / No VOC Adhesives and Sealants	Mandatory
			7.3	Formaldehyde-free Composite Wood	Mandatory
			7.4	Green Label Certified Floor Covering	Mandatory
			7.5a	Exhaust Fans – Bathroom	Mandatory
			7.5b	Exhaust Fans – Kitchen	Mandatory
			7.6	Ventilation	Mandatory
			7.7	HVAC Sizing	Mandatory
			7.8a	Water Heaters – Mold Prevention	Mandatory
			7.8b	Water Heaters – Minimizing CO	2
			7.9	Cold Water Pipe Insulation	Mandatory
			7.10a	Materials in Wet Areas – Surfaces	Mandatory
			7.10b	Materials in Wet Areas – Tub and Shower Enclosure	Mandatory
			7.11a	Basements and Concrete Slabs – Vapor Barrier	Mandatory
			7.11b	Basements and Concrete Slabs – Radon	Mandatory
			7.12	Water Drainage	Mandatory
			7.13	Garage Isolation	Mandatory
			7.14	Clothes-Dryer Exhaust	Mandatory
			7.15	Integrated Pest Management	Mandatory
			7.16	Lead-Safe Work Practices	Mandatory
			7.17a	Healthy Flooring Materials – Alternative Sources	5
			7.17b	Healthy Flooring Materials – Reducing Dust	2

Operations and Maintenance

Y	N	?	Item #	Item Title	Possible Points
			8.1	Building Maintenance Manual	Mandatory
			8.2	Occupant's Manual	Mandatory
			8.3	Homeowner and New Resident Orientation	Mandatory

Section 1: Integrated Design

1-1	**Green Development Plan**
	MANDATORY

How

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

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 the rationale for choosing each of the green features and a description of how each of the mandatory and optional 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 capture and summarize 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 throughout the project's life cycle.

Things to Consider

- Conduct a green design charrette with the full development team.
- Refer to "Credit #4: Durability Plan" under materials and resources in LEED-H to think through the development and implementation of a durability plan. This will promote the increased service life of the building envelope, and its components and systems through appropriate design, materials and installation.

Section 2: Site, Location and Neighborhood Fabric

2-1a	**Smart Site Location – Proximity to Existing Development: New Construction**
	MANDATORY Except for Infill or Rehabilitation Projects

How

Provide site map demonstrating that the development is located on a site with access to existing roads, water, sewers and other infrastructure within or contiguous (having at least 25 percent of the perimeter bordering) to existing development. Do not build on tracts of land that require installing a septic tank or a sanitary sewer line extension of 1,000 feet or greater from the property line of the tract being developed, or within critical potable watershed areas.

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.

2-1b	**Smart Site Location – Protecting Environmental Resources: New Construction**
	MANDATORY Except for Infill Sites or Rehabilitation Projects

How

Do not locate new development on:

- Land within 100 feet of wetlands or wetland protection buffer zones
- Land within 100 feet of steep slopes
- Prime farmland
- Park land
- Land within 1,000 feet of a critical habitat

Intent

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

Definitions

- "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. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops, and is available for these uses. This restriction covers cropland, pastureland, rangeland, forestland and other land, and excludes urban built-up land.
- "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. 1523(5).
- "Wetlands" is defined by the U.S. Code of Federal Regulations, 40 CFR, Parts 230-233 and Part 22.
- "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.

2-1c	**Smart Site Location – Proximity to Services: New Construction**
	MANDATORY Except for Infill or Rehabilitation Projects

How

Provide a location map with exact distances indicating that the project is located within a ¼ mile of at least two, or ½ mile of at least four, of the following facilities: Adequate (see definition below) public transportation, supermarket, public school, library, licensed child care center, usable park space, 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.

Definitions
Adequate transportation means at least half-hourly bus service or hourly rail, subway or ferry service during peak periods.

2-2	**Compact Development: New Construction**
	MANDATORY Except for Infill or Rehabilitation Projects

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 units per acre for detached or semi-detached houses
- Ten for townhomes
- Fifteen for apartments

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, buffered wetlands 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.

2-3	**Walkable Neighborhoods – Sidewalks and Pathways**
	MANDATORY

How
Provide a site map indicating that sidewalks or suitable pathways were created within a multifamily property or single-family subdivision to link the residential development to public spaces, open spaces and adjacent development.

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.

2-4a	Smart Site Location – Passive Solar Heating / Cooling
	OPTIONAL (5 Points)

How
Orient building to make the greatest use of passive solar heating and cooling.

Intent
Solar energy is a radiant heat source that causes 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 home. Passive solar energy means that mechanical means are not employed to utilize solar energy.

Things to Consider
- Elongate building on an east-west axis.
- 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.

2-4b	Smart Site Location – Grayfield, Brownfield or Adaptive Reuse Site
	OPTIONAL (10 Points)

How
Locate the project on a grayfield, brownfield 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
- Grayfields are previously developed abandoned sites, such as parking lots and shopping centers.
- Brownfields require a Phase II Environmental Site Assessment and remediation plan.
- 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.

2-5	**Compact Development**
	OPTIONAL (5 Points maximum for an increase of at least five units per acre for multifamily buildings, at least two per acre for town homes and at least one unit per acre for single-family houses)

How
Increase average minimum density for new construction to meet or exceed the following guidelines: seven units per acre for detached or semi-detached; 12 units per acre for town homes; and 20 units per acre for apartments.

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.

2-6	**Walkable Neighborhoods – Connections to Surrounding Neighborhood**
	OPTIONAL (5 Points)

How
Provide a site map demonstrating at least three separate connections to sidewalks or pathways in surrounding neighborhoods.

Intent
Providing easy access to sidewalks or pathways promotes walking, biking and other healthier lifestyles. Walkable neighborhoods reduce dependence on automobile travel and possibly automobile ownership, while reducing auto-related emissions.

Things to Consider
- Integrate pedestrian and bicycle connections from the new development to the surrounding neighborhood through sidewalks, bike lanes or paths.
- Consider using 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 eliminate flooding.
- Where possible, wait until development is occupied before laying out paved pathways/sidewalks from the development to the surrounding neighborhood. Build the pathways/sidewalks where there is visible evidence of pedestrian and bicycle use.

2-7	**Transportation Choices**
	OPTIONAL (12 Points)

How
Provide a context map demonstrating that the site is within ¼ quarter mile radius of public transit service, or ½ mile radius from a fixed rail or ferry station.

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.

Definitions
Adequate transportation means at least half-hourly bus service or hourly rail, subway or ferry service during peak periods.

Section 3: Site Improvements

3-1	**Environmental Remediation**
	MANDATORY

How
Conduct a Phase I Environmental Site Assessment and any additional assessments required to determine whether any hazardous materials are present on site. Provide one of the following: ASTM Transaction Screen, Phase I Environmental Site Assessment, or Phase II abatement plan, if required.

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.

3-2	**Erosion and Sedimentation Control**
	MANDATORY

How
Implement EPA's Best Management Practices for erosion and sedimentation control during construction, referring to the EPA document, Storm Water Management for Construction Activities (EPA 832-R-92-005). The method of satisfying this item (Exhibit B) must clearly state which BMP are/will be incorporated into construction and site development plans and contracts.

Intent
Erosion and sedimentation control during site development keeps valuable top soils on site and reduces pollution, storm-water runoff and sediment runoff associated with construction activities into local waterways. Compacted soils resulting from construction are less able to absorb water and resist plant root penetration, and lack the porosity needed for adequate aeration. Erosion and sedimentation control helps to avoid storm-water-related problems that can delay construction, cause environmental degradation (to creeks, streams and coastal waters) and damage public and private properties downstream.

Things to Consider
The EPA's document, Storm Water Management for Construction Activities, may be purchased as item PB 922 359 51 from the National Technical Information Service at www.ntis.gov.

3-3	Landscaping
	MANDATORY (If Providing Landscaping)

How

Provide a landscape plan showing that the selection of new trees and plants are native species appropriate to the site's 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. (In areas where water shortages are common, xeriscape (a landscaping method that uses drought-resistant plants to conserve resources, especially water) should be considered.

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 lawns are appropriate for some landscaping, such as for play areas, they should be minimized wherever possible, except in climates where they need no irrigation.
- In areas where water shortages are common, xeriscape (a landscaping method that uses drought-resistant plants to conserve resources, especially water) should be considered.

3-4	Surface Water Management
	OPTIONAL (5 Points)

How

Capture the first ½ inch of rainfall that falls in a 24-hour period.

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

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

3-5	**Storm Drain Labels**
	OPTIONAL (2 Points)

How

Assure that the project plans and specifications call for labeling of all storm drains or storm inlets to clearly indicate where the drain or inlet leads.

Intent

Provide a visual reminder that storm sewer inlets connect to area waterways and groundwater storages, and should not be used to dump garbage of any kind.

Things to Consider

Use a simple painted stencil that reads: “Caution – leads to [name of body of water]!”

Section 4: Water Conservation

4-1a	**Water-Conserving Appliances and Fixtures: New Construction**
	MANDATORY

How

Install water-conserving fixtures with the following specifications:

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

4-1b	**Water-Conserving Appliances and Fixtures: Moderate Rehab**
	MANDATORY For Moderate Rehab

How

Install water-conserving fixtures with the following specifications for toilets and shower heads and follow requirements for other fixtures wherever and whenever they are replaced:

Toilets – 1.3 GPF (gallons per flush) or better
Showerheads – 2.0 GPM (gallons per minute) or better
Kitchen faucets – 1.5 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.

4-2	**Efficient Irrigation**
	MANDATORY (If Irrigation is Necessary)

How
If irrigation is necessary, use recycled gray water, roof water, collected site run-off or an irrigation system that will deliver up to 95 percent of the water supplied.

Intent
On average, outdoor water use accounts for about 40 percent of residential water use. Native landscapes or carefully selected plantings can tolerate no irrigation once they have been established, even in dry periods. Accurate delivery of water reduces evaporation and eliminates overspray. Proper scheduling eliminates wet/dry fluctuations that stress plants.

Things to Consider
Watering tubes may be used to water trees for the first few years if necessary.

Section 5: Energy Efficiency

5-1a	**Efficient Energy Use: New Construction**
	MANDATORY New Construction

How

Provide verification demonstrating energy efficiency by meeting or exceeding one of the following:

- Energy Star standards (projects applying in 2007 will be required to meet the new Energy Star standards going into effect in 2006; see below, **Things To Consider**)
- Home Energy Rating System (HERS) design score of 86
- ASHRAE 90.1 by 30 percent (projects in California must exceed Title 24 2001 by 15 percent)

Intent

In 1992, the EPA introduced Energy Star as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Energy Star is an accepted standard for single-family residential new construction projects.

Energy Star-qualified homes are independently verified to be energy efficient. These savings are based on heating, cooling and hot water energy use and are typically achieved through a combination of building-envelope upgrades, high-performance windows, controlled air infiltration, upgraded heating and air conditioning systems, tight duct systems and upgraded water-heating equipment. These features contribute to improved home quality and homeowner comfort, and to lower energy demand and reduced air pollution.

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1-1999 establishes minimum requirements for the energy-efficient design of buildings, except low-rise residential buildings. The standard is also the basis of Chapter 7 of the International Code Council's 2001 International Energy Conservation Codes. State energy codes that may be more stringent than ASHRAE 90.1 are identified on the U.S. Department of Energy's Building Energy Codes website, www.energycodes.gov.

A Home Energy Rating System (HERS) evaluates the energy efficiency of a home or apartment, compared with a computer-simulated reference unit of identical size and shape. The HERS rating results in a score between 0 and 100, with the reference unit assigned a score of 80. From this point, each 5 percent reduction in energy usage (compared to the reference unit) results in a one-point increase in the HERS score. Energy Star requires a unit to be significantly more energy efficient than the reference unit by setting a standard of achieving a HERS score of at least 86. HERS ratings are conducted by third-party HERS raters.

The Builder Option Package (BOP) is used to determine components of an Energy Star-qualified

new home. BOP represents a set of construction specifications for a particular climate zone, measuring performance levels for the thermal envelope, insulation, windows, orientation, HVAC system and water-heating efficiency. BOPs are provided for each of the 19 U.S. climate zones.

Things to Consider

- ENERGY STAR has implemented new performance guidelines and a new national builder option package that utilize the 2004 International Energy Conservation Code (IECC) and the new HERS rating system. For more information go to the new homes section of the Energy Star homepage, www.energystar.gov. These new guidelines and new HERS rating system must be used to qualify homes for the ENERGY STAR label that are not enrolled in a utility or state-based efficiency program before December 31, 2005, or permitted before July 1, 2006.
- For information on Builder Option Packages, go to www.energystar.gov/index.cfm?c=bop.pt_bop_index.
- To identify a Home Energy Rater in your area, call the Energy Star toll-free hotline: 888-STAR-YES.
- For more information on ASHRAE, go to www.ashrae.org or call 888-527-4723.

5-1b	**Efficient Energy Use: Moderate Rehab**
	MANDATORY For Moderate Rehab

How

Identify an architect with green building experience, an engineer or energy auditor to conduct an energy analysis of the existing building condition and identify cost-effective energy improvements by preparing an energy improvement report. The report analyzes the current and projected energy performance of the building. Implement those improvements with a 10-year or earlier payback as identified by a qualified engineer or home energy rater. Include the energy improvement report and recommendations by the qualified profession, indicating which improvements were chosen. A report does not have to be generated for each single-family home because the analysis presumably will recommend standard measures that can be applied to all homes that are of a similar building type.

Intent

In moderate rehabs, the financial benefits of making specific building improvements (added insulation, replacement windows, etc.) vary tremendously from one building to the next, in relation to existing building conditions and the local climate. Because of that, the most effective practice is to conduct a building assessment, determine the unique conditions of the building (amount of existing insulation, R-value of windows, etc.), and use software or manual calculations to determine the cost and return on investment of various alternative improvements. A 10-year payback period represents a 10 percent per year simple payback. This 10-year

payback benchmark was chosen because today's cost of mortgage financing is significantly below a 10 percent per annum. Therefore, the improvements are expected to save more money than they cost over the long run.

5-2	**Energy Star Appliances**
	MANDATORY If Providing Appliances

How
If providing appliances, install Energy Star clothes washers, dishwashers and refrigerators.

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 products section of the Energy Star homepage, www.energystar.gov.

5-3a	**Efficient Lighting – Interior**
	MANDATORY

How
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
Energy Star-qualified lighting uses 2/3 less energy and lasts six to 10 times longer than traditional lighting. Reduced energy use lowers utility costs and greenhouse gas emissions.

Things to Consider
For more in formation on lighting, go to the Products section of the Energy Star homepage, www.energystar.gov.

5-3b	Efficient Lighting – Exterior
	MANDATORY

How
Install daylight sensors or timers on all outdoor lighting.

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*.

5-4	Electricity Meter
	Mandatory Except for Zero-bedroom Dwelling Units

How
Install individual or sub-metered electric meters.

Intent
To raise residents' awareness of the cost associated with electricity consumption, which may reduce energy use.

5-5a	**Additional Reductions in Energy Use: New Construction**
	OPTIONAL (5 Points for each additional point awarded by the Home Energy Rating System (HERS) or for each 5 percent change in energy efficiency)

How

Provide calculations for the following:

- Forecast the annual energy efficiency of the entire project to meet Energy Star standards or the ASHRAE 90.1.
- Analyze and adopt additional energy improvements.
- Reforecast annual energy costs with the additional improvements. Use that figure to determine the percentage of energy savings from the baseline established in the first bullet.

Intent

The relative energy efficiency of a given dwelling unit is established by comparing it to the HERS Energy-Efficient Reference Home (EERH), an accepted national standard based on the Council of American Building Officials Model Energy Code (CABO/MEC) that uses a scale of 0-100. The higher the score is, the more efficient the home. The HERS EERH scores 80 points. Essentially, one point is awarded or deducted for each 5 percent change in energy efficiency for the home's thermal envelope, heating, cooling and domestic hot water systems relative to CABO/MEC. A home that uses approximately 30 percent less energy than the EERH scores 86 points and is equivalent to an Energy Star-qualified home. A home with zero-purchased energy scores 100.

For new construction, adding incremental improvements will improve energy efficiency while reducing utility and operating costs for residents and building owners. Renewable energy use and energy conservation lessen smog, acid rain and greenhouse gas emissions.

5-5b	**Additional Reductions in Energy Use: Moderate Rehab**
	OPTIONAL (10 Points for each additional point awarded by HERS or for adopting additional improvements that extend the payback period to at least 14 years)

How

Produce and provide the same energy improvement report and recommendations required in Item 5-1, but extend the maximum payback period to 14 years.

Intent

The relative energy efficiency of a given dwelling unit is established by comparing it to the HERS Energy-Efficient Reference Home (EERH), an accepted national standard based on the

Council of American Building Officials Model Energy Code (CABO/MEC) that uses a scale of 0-100. The higher the score is, the more efficient the home. The HERS EERH scores 80 points. Essentially, one point is awarded or deducted for each 5 percent change in energy efficiency for the home's thermal envelope, heating, cooling and domestic hot water systems relative to CABO/MEC. A home that uses approximately 30 percent less energy than the EERH scores 86 points and is equivalent to an Energy Star-qualified home. A home with zero-purchased energy scores 100.

Intent
If new construction standards can be achieved, use the same verification methods applied for new construction.

5-6a	**Photovoltaic (PV) Panels**
	OPTIONAL (5 Points, plus 5 points for each additional 10 percent increment, up to a maximum of 15 points)

How
Install PV panels 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, can also result in energy cost savings. PVs are composite materials that convert sunlight directly into electrical power.

5-6b	**Photovoltaic (PV) Ready**
	OPTIONAL (2 Points)

How
Site, design, engineer and wire the development to accommodate installation of PV in the future. Submit photos that demonstrate the following:

- Orient buildings to permit access to sunlight
- Design and include south facing architectural elements on the roof for PV
- Reserve unobstructed roof areas where panels can be placed
- Run wiring from the prospective PV location to a central panel, as part of the general electrical work

Intent
Photovoltaics are composite materials that convert sunlight directly into electrical power and are the easiest renewable energy source to use in affordable housing.

Generating and using renewable energy in a development is a hedge against rising costs for purchased energy. Further, it avoids the environmental impacts associated with conventional power generation: natural resource destruction, air and water pollution, and greenhouse gas production.

Things to Consider
The first cost of PV can be high, but grants and subsidies are available in many states. Building "PV Readiness" into a project reserves the opportunity to install a system later when resources become available.

Section 6: Materials Beneficial to the Environment (all items are optional)

6-1	**Construction Waste Management**
	OPTIONAL (5 Points)

How
Reduce the amount of construction waste sent to the landfill.

Intent
The amount of job-site waste resulting from construction of the average 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.hahbrc.org)

6-2	**Recycled Content Material**
	OPTIONAL (2 Points, plus 2 points for each additional 5 percent increment, not to exceed 14 points)

How
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).

6-3	**Certified, Salvaged and Engineered Wood**
	OPTIONAL (10 Points)

How
Use at least 50 percent (by cost) wood products and materials that are certified in accordance with the Forest Stewardship Council, 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.

6-4a	**Water-Permeable Walkways**
	OPTIONAL (5 Points)

How
Use water-permeable materials in 50 percent or more of walkways.

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.

Things to Consider
Use water-permeable materials such as pervious interlocking concrete paving blocks, concrete grid pavers, perforated brick pavers and compacted gravel.

6-4b	Water-Permeable Parking Areas
	OPTIONAL (10 Points)

How
Use water-permeable materials in 50 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.

Things to Consider
Water-permeable materials include pervious interlocking concrete paving blocks, concrete grid pavers, perforated brick pavers and compacted gravel.

6-5a	Reducing Heat-Island Effect – Roofing
	OPTIONAL (5 Points)

How
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. Combinations of high-albedo and vegetated roof can be used, providing they collectively cover 75 percent of the roof 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 surfaces that do not retain heat reduces the heat island. Resources and information on green roofs can be found at www.earthpledge.org/GreenRoof.html.

6-5b	Reducing Heat-Island Effect – Paving
	OPTIONAL (5 Points)

How
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 percent of the site's hardscaped area.

Intent

Urban heat islands have increased local air temperatures due to the absorption of solar energy by the built environment. They increase energy consumption by increasing loads on cooling systems. Heat islands create thermal gradient differences between developed and undeveloped areas. Use paving surfaces that do not retain heat and reduce the heat island effect.

Section 7: Healthy Living Environment

7-1	**Low / No VOC Paints and Primers**
	MANDATORY

How
Specify that all interior paints and primers must comply with current Green Seal standards for low VOC limits.

Intent
VOCs 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.

Things to Consider
- The website www.greenseal.org/standards/paints.htm lists VOC limits for paints.
- The website 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.

7-2	**Low / No VOC Adhesives and Sealants**
	MANDATORY

How
Specify that all adhesives must comply with Rule 1168 of the South Coast Air Quality Management District. All caulks and sealants must comply with regulation 8, rule 51, of the Bay Area Air Quality Management District.

Intent
Interior caulks, sealants and adhesives that release VOCs may pose health hazards to residents and workers. (See 7-1.) Use of low-VOC adhesives and sealants will reduce the concentration of such airborne chemicals.

Things to Consider

- Pontolilo, Brian. "Making Sense of Caulks and Sealants." *Fine Homebuilding Magazine* 62 (April/May 2004): 97-101.
- www.taunton.com/fh/ (From spec 4.2)
- NREL. *Weatherize Your Home – Caulk and Weatherstrip*. U.S. Department of Energy, National Renewable Energy Laboratory, p. 4.
- www.eere.energy.gov/buildings/building_america/ (From spec 4.2)

7-3	**Formaldehyde-free Composite Wood**
	MANDATORY

How

Do not use any composite wood in any area that has exposed particleboard (which contains added urea-formaldehyde), unless the exposed area has been sealed.

Intent

Particleboard and MDF may emit 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 ft2/ft3). The addition of finishes or overlays may significantly alter product emissions.

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

7-4	**Green Label Certified Floor Coverings**
	MANDATORY If Providing Floor Coverings

How

Do not install carpets in basements, entryways, laundry rooms, bathrooms or kitchens. If using carpet, use the Carpet and Rug Institute's Green Label certified carpet and pad.

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.
- The EPA Energy Star with Indoor Air Package Specifications require 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.
- 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, linoleum).

7-5a	**Exhaust fans – Bathroom: New Construction**
	MANDATORY

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 and kitchens reduce moisture condensation, lowering the potential for indoor mold growth that may yield odors and pose health hazards to residents. Besides helping to reduce moisture, kitchen fans also help remove carbon dioxide and carbon monoxide over fuel-burning appliances and other air contaminants that may be byproducts of cooking. 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 homepage: www.energystar.gov.
- The cfm for intermittent bath fans should be at least 50cfm or 20 cfm if operating continuously, per ASHRAE 62.2

7-5b	**Exhaust Fans – Kitchen: New Construction**
	MANDATORY Except for Moderate Rehabilitation

How
Install Energy Star-labeled power vented fans or range hoods that exhaust to the exterior.

Intent
Properly sized and controlled exhaust fans in bathrooms and kitchens reduce moisture condensation, lowering the potential for indoor mold growth that may yield odors and pose health hazards to residents. Besides helping to reduce moisture, kitchen fans also help remove carbon dioxide and carbon monoxide over fuel-burning appliances and other air contaminants that may be byproducts of cooking. 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 humidistats help ensure that fans regularly remove moisture and provide increased ventilation.

Things to Consider
- For more in formation on kitchen fans or range hoods, go to the Products section of the Energy Star homepage, www.energystar.gov.
- If continuous, the cfm for intermittent kitchen fans should be at least 100cfm or five air changes per hour, based on kitchen volume, per ASHRAE 62.2

7-6	**Ventilation**
	MANDATORY Except for Moderate Rehab

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
- Design the ventilation system to take maximum advantage of regional climate characteristics in order to help cut down on energy costs.
- Natural ventilation is acceptable in "paradise" climates defined under ASHRAE 62.2 Exceptions to 4.1.
- Specify a mechanical whole-house ventilation system per ASHRAE 62.2 and the EPA Energy Star with Indoor Air Package Specifications.

7-7	**HVAC Sizing**
	MANDATORY

How
Size heating and cooling equipment in accordance with the Air Conditioning Contractors of America Manual, Parts J and S, 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 contractor generates a Manual J load calculation to ensure proper sizing of the cooling system. This calculation accounts for factors such as the home's orientation with respect to the sun, window design and insulation rating. The contractor can utilize one of the HVAC-industry adopted software programs, based upon Manual J, which assists with these

designs. Consult www.acca.org for a list of software programs to perform Manual J calculations.

7-8a	Water Heaters – Mold Prevention
	MANDATORY

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.
- International Residential Code; see www.iccsafe.org.

7-8b	Water Heaters – Minimizing CO
	OPTIONAL (2 Points)

How
Specify direct vented or combustion sealed water heaters if the heater is located in a conditioned space.

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.

7-9	**Cold Water Pipe Insulation**
	MANDATORY

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.

7-10a	**Materials in Wet Areas – Surfaces**
	MANDATORY

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.

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.

7-10b	Materials in Wet Areas – Tub and Shower Enclosures
	MANDATORY

How
Use one-piece fiberglass or similar enclosure or, if using any form of grouted material, use backing materials such as cement board, fiber cement board, fiberglass-reinforced board or cement plaster.

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.

7-11a	Basements and Concrete Slabs – Vapor Barrier
	MANDATORY

How
Provide vapor barriers under all slabs. For concrete floors either in basements or the on-grade slab, install a capillary break of 4 inches of clean or washed gravel (0.5 inch or greater) placed over soil. Cover all gravel with a 6 millimeter polyethylene sheeting moisture barrier, with joints lapped 1 foot or more to prevent moisture from migrating from the soil through the slab to a living or storage area. On interior below grade walls, avoid using separate vapor barrier or a below grade vertical insulation (such as polyethylene sheeting, vinyl wallpaper or foil faced), which can trap moisture inside wall systems.

Intent
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. 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.

Things to Consider
Ensure that other trades work does not puncture the vapor barrier.

7-11b	Basements and Concrete Slabs – Radon: New Construction
	MANDATORY For New Construction

How

In EPA Zone 1 areas, 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.

Intent

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. 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.

Things to Consider

- Consult www.epa.gov/iaq/radon/zonemap, or contact your state radon coordinator through the state health office, if your development is located in a Zone 1 radon area.
- For rehab, test the homes or building for presence of radon. If elevated levels of radon exist, introduce radon-reduction measurements. Check technical guidance at www.epa.gov/iaq/radon/pubs/index.html.
- EPA. "Building Radon Out." U.S. Environmental Protection Agency, 2006. (#EPA/402-K-01-002, available at www.epa.gov/iaq/radon/pubs)

7-12	Water Drainage
	MANDATORY

How

Provide drainage of water to the lowest level of concrete away from windows, walls and foundations. Foundation walls should be carefully waterproofed on the exterior to avoid moisture migration. Moisture retarders on the exterior of foundation should not leach chemicals into the soil. If poured concrete walls are used, release agents used to free forms from concrete walls should not be comprised of used motor oil or some other toxic material. Install a coating on footers to keep moisture from wicking up through them.

Divert water drainage away from the building by directing gutters and downspouts to flow onto splash blocks or a proper drainage system. If possible, water should infiltrate on site at least 12 feet from any building foundation. Slope new and rebuilt walkways, stairs, patios and thresholds

away from the buildings. Properly flash all roof penetrations. Where feasible, extend eaves 18 inches to 2 feet to keep water off windows. Install pan flashing on windows and exterior doors. Apply window pan flashing over building paper at sill and corner patches.

Intent
Diverting water from the building prevents bulk water entry into foundations and basements, which can contribute to moisture-related problems such as mold and the deterioration of wood and other building materials. Flashing helps direct water away from wall cavities to the drainage plane. Careful architectural detailing of the drainage system and construction supervision ensure proper water drainage.

Things to Consider
Best practices include a grade of 0.5 inch per foot, or approximately a 4 percent pitch. EPA recommends a 2 percent pitch (0.25 inch per foot) for hard surfaces such as patio slabs, walks and driveways.

7-13	**Garage Isolation**
	MANDATORY

How
Provide a continuous air barrier between the conditioned (living) space and any unconditioned garage space to prevent the migration of any contaminants into the living space. In single-family houses with attached garages, install a CO alarm inside the house on the wall that is attached to the garage or is outside the sleeping area.

Intent
The CO alarm will help ensure that residents are alerted in the case of accidental accumulation of CO. The air barrier will help prevent CO migration from the garage to the living space.

Things to Consider
Refer to ASHRAE 62.2 to specify garage contaminant isolation measures.

7-14	**Clothes-Dryer Exhaust**
	MANDATORY

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.

7-15	**Integrated Pest Management**
	MANDATROY

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.

7-16	**Lead-Safe Work Practices – Rehabilitation**
	MANDATORY

How
For properties built before 1978, use lead-safe work practices during renovation, remodeling, painting and demolition.

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 and www.hud.gov/offices/lead/training/index.cfm.

7-17a	Healthy Flooring Materials – Alternative Sources
	OPTIONAL (5 Points)

How
Use non-vinyl, non-carpet floor coverings in all rooms.

Intent
While certain health hazards are linked with the production of vinyl products, some alternative flooring materials that are natural and renewable have demonstrated low-VOC emissions and an environmentally friendly production. Avoid the use of carpet, which can serve as a sink for dust, allergens and other substances that may pose health hazards to susceptible residents.

Things to Consider
- Use alternative flooring materials such as linoleum, laminate, ceramic tile, bamboo, cork, wood (especially salvaged wood) or rubber.
- For basements, leave the slab exposed and stained with low-VOC material rather than providing any floor treatments.

7-17b	Healthy Flooring Materials – Reducing Dust
	OPTIONAL (2 Points)

How
Install a whole-house vacuum system with high-efficiency particulate air filtration.

Intent
Frequent vacuuming reduces the amount of dust burden in the home. HEPA (High-Efficiency Particulate Air Filter) filtration prevents the airborne distribution of irritating or allergenic particulate matter during vacuuming.

Section 8: Operations and Maintenance

8-1	**Owner's Manual**
	MANDATORY

How
Provide a manual that includes the following: a routine maintenance plan; instructions for all appliances, HVAC operation, water-system turnoffs, lighting equipment and other systems that are part of each occupancy unit; an occupancy turnover plan that describes in detail the process of educating the tenant about proper use and maintenance of all building systems; and information on how to maintain the green features of the site, including paving materials and landscaping.

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 www.centerforhealthyhousing.org.

8-2	**Occupant's Manual**
	MANDATORY

How
Provide a guide for homeowners and renters that explains the intent, benefits, use and maintenance of green building features, and encourages additional green activities such as recycling, gardening and use of healthy cleaning materials.

Intent
Homeowners and renters may be unfamiliar with green systems or features installed in their houses or buildings. Assistance with understanding, operating and maintaining them will allow both homeowners and renters to fully realize the environmental, health and economic benefits that Green Communities offer.

8-3	Homeowner and New Resident Orientation
	MANDATORY

How

Provide a walk-through and orientation to the homeowner or new resident that reviews the building's green features, operations and maintenance.

Intent

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