

**City of Perry  
Urban Revitalization Plan  
Handbook  
&  
Green Building Program**



Version 1.0

## Overview

The City of Perry has implemented an urban revitalization plan, otherwise known as a residential tax abatement program. The full plan and details may be found on the City's website at [www.perryia.org](http://www.perryia.org) ; but some of the key details are outlined here.

### PLAN OBJECTIVES

The primary objectives of this Plan are as follows:

- To encourage new construction of residential properties through abatement of taxes on the value of the improvements.
- To encourage the remodeling, renovation, rehabilitation or addition to residential properties through abatement of taxes on the value of improvements.
- To improve economic conditions and housing opportunities in the area and take steps to enhance the general attractiveness and marketability of the Urban Revitalization Area.

### ELIGIBILITY REQUIREMENTS

In order for a property owner to qualify for the abatement program there are several thresholds that must be met including; *(note, please see the Plan document for detailed information on qualification limits.)*

1. The improvements must have been added during the time the area has been designated a revitalization area.
2. Improvements consisting of rehabilitation or additions to existing improvements must have increased the actual value of the qualified real estate by at least \$20,000 for property assessed as residential and 15% for property assessed as multi-family residential.
3. The improvements must be completed in accordance with all applicable zoning, building and other regulations of the City of Perry and all necessary permits have been obtained.
4. If the improvements are occupied, the occupancy must be in conformance with the applicable provisions of the Building Codes in Chapter 155 of the Code of Ordinances.

5. Green Building Standards shall be incorporated into all new construction and existing residential improvement projects in order to be eligible Improvements. The City of Perry is working to make our community a sustainable city. In doing so, Perry seeks to provide affordable housing that reduces the costs to home buyers and renters for heating & cooling, reduces the environmental impact of our community and provides universal access to the elderly and disabled. The City of Perry will continue to develop green building policies that help create houses that are affordable to operate and maintain, are energy efficient, healthy, and reduce the impact on the environment by managing storm water run-off and provide green space for healthy neighborhoods.
6. 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 owners.
7. To qualify for abatement under this plan, new construction improvements must achieve minimum green building certification under the “City of Perry Green Building Program”.

Green Criteria Point Range*	Certification Category
10 points	Green
11-25 points	Bronze
26-31 points	Silver
32-37 points	Gold
38-50 points	Platinum

\*All new construction projects must include the five mandatory criteria plus at least five additional points, not including Criteria 4.10 (Renewable Energy).

Rehabilitation projects are encouraged to strive to obtain and incorporate as many of the items as possible, although it is acknowledged that most of these items may not apply to some forms of rehabilitation.

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, community facilities, and businesses while enhancing quality of life for residents, visitors and employees.

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

- Result in a high-quality, healthy living and working environment
- Lower utility costs
- Enhance connections to nature
- Protect the environment by conserving energy, water, materials and other resources Advance the health of local and regional ecosystems

## **How to Use This Document**

The Perry Criteria is based on The Iowa Green Streets Criteria and the national Green Communities Criteria; both of which are available online at:

<http://www.icgov.org/site/CMSv2/file/planning/commDev/sfNew/greenCriteria.pdf>

or

[www.greencommunitiesonline.org/tools/criteria/index.asp](http://www.greencommunitiesonline.org/tools/criteria/index.asp)

This document is based off of the City of Adel's Urban Revitalization Handbook which was developed in partnership with the Greater Dallas County Development Alliance and the Iowa Department of Economic Development who developed the Criteria allowed adaptations in the use of those criteria in development of these criteria.

The version criteria, either locally, at the state level, or nationally is purposefully aligned with the United States Green Building Council's Leadership in Energy and Environmental Design (LEED™) Rating System for Homes to assist criteria users that are considering achievement of a LEED rating for their project. Achievement of a LEED rating is not a requirement of the Perry Green Building Program. Cross references to LEED for Homes measures are provided to assist housing project developers interested in seeking a LEED rating.

Please be aware that this criteria document is subject to periodic revision and update. Refer to the City of Perry's website, [www.perryia.org](http://www.perryia.org) for the most current version.

## **Activities and Projects Covered by the Perry Green Building Program**

The Perry Green Building Program include mandatory and optional components in the criteria for the following types of activities or projects.

Single-family new construction  
Multi-family new construction

Single-family rehabilitation  
Multi-family rehabilitation

**Rehabilitation Improvements** – Rehabilitation Improvements are defined as: Improvements consisting of rehabilitation or additions to existing improvements must have increased the actual value of the qualified real estate by at least \$20,000 for property assessed as residential and 15% for property assessed as multi-family residential.

## Additional Requirements

In addition to the Perry Green Building Program, the following requirements, as applicable, apply to all activities and projects covered by this program.

All new construction including single-family and multi-family housing activities and projects are subject to the requirements of the International Energy Conservation Code (the most current version as adopted by the State Building Code).

All new construction and rehabilitation activities or projects must meet the requirements of any and all locally adopted and enforced building codes, standards and ordinances. In the absence of locally adopted and enforced building codes, the building code requirements of the State Building Code shall apply.

## Other Resources

Here are some additional resources to assist you with your green project:

AARP – [www.aarp.org](http://www.aarp.org)  
American Institute of Architects, Iowa Chapter – [www.aiaiowa.org](http://www.aiaiowa.org)  
Building Green, LLC/Environmental Building News – [www.buildinggreen.com/](http://www.buildinggreen.com/)  
Center on Sustainable Communities – [www.icosc.com/](http://www.icosc.com/)  
Certified 3rd-Party Energy Raters – [www.natresnet.org/directory/raters.aspx](http://www.natresnet.org/directory/raters.aspx)  
Energy Star - [www.energystar.gov](http://www.energystar.gov)  
Green Communities – [www.greencommunitiesonline.org/resources.asp](http://www.greencommunitiesonline.org/resources.asp)  
Green Home Guide – [www.greenhomeguide.org/](http://www.greenhomeguide.org/)  
Green Home New Construction Specifications – [www.gmhf.com/homeplans/green.htm](http://www.gmhf.com/homeplans/green.htm)  
Iowa Department of Cultural Affairs – [www.culturalaffairs.org](http://www.culturalaffairs.org)  
Iowa Department of Public Health – [www.idph.state.ia.us](http://www.idph.state.ia.us)  
Iowa Energy Center – [www.energy.iastate.edu/](http://www.energy.iastate.edu/)  
Iowa Go Green – [www.iowagogreen.com](http://www.iowagogreen.com)  
Iowa State University Extension – [www.extension.iastate.edu/](http://www.extension.iastate.edu/)  
National Association of Homebuilders Model Green Home Building Guidelines – [www.nahb.org/fileUpload\\_details.aspx?contentTypeID=7&contentID=1994](http://www.nahb.org/fileUpload_details.aspx?contentTypeID=7&contentID=1994)  
Partnership for Advanced Technologies in Housing – [www.pathnet.org/](http://www.pathnet.org/)  
U.S. Green Building Council – [www.usgbc.org/](http://www.usgbc.org/)  
University of Minnesota Center for Sustainable Building Research – [www.csbr.umn.edu/index.html](http://www.csbr.umn.edu/index.html)

**For additional information about the Perry Green Building Program, please call:  
515-465-2481**

**Or e-mail:**

**Sven Peterson: [sven.peterson@perryia.org](mailto:sven.peterson@perryia.org)**

**Visit the Web site:**

**[www.perryia.org](http://www.perryia.org)**

## Section 1: Integrated Design

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 occupant representatives. The team must be committed to environmentally responsive, resource conserving and healthy building principles and practices.

Integrated Design	
1.1	Universal Design and Visitability Create spaces that meet the needs of all people, young, old, abled, and disabled.

### How

Create spaces that meet the needs of all people: young, old, abled, and disabled. Adhere to the requirements below for minimum accessibility. Use of and adherence to the University of Iowa Clinical Law Programs' Universal Design Survey Checklist is encouraged.

See: <http://www.uiowa.edu/~clinic/housingUnivDesign.shtml> for more information.

### Wall Reinforcement

At least one bathroom within the same level where occupants enter their place of residence shall be provided with wood blocking installed within wall framing, to support grab bars as needed. The wood blocking, when measured to the center, shall be located between thirty-three inches (33") and thirty-six inches (36") above the finish floor. The wood blocking shall be located in all walls adjacent to a toilet, shower stall or bathtub.

### Interior Doors

All doorways within the same level where occupants enter their place of residence shall provide a minimum clear opening of thirty-two inches (32") when the door is open ninety degrees (90°), measured between the face of the door and the opposite stop.

### Switch and Outlet Requirements

All wall switches controlling light fixtures and fans, shall be located at a height not to exceed forty-eight inches (48") above the finished floor. Height shall be determined by measuring from the finished floor to the center of the switch. All receptacles shall be located at a height not less than fifteen inches (15") above the finished floor. Height shall be determined by measuring from the finished floor to the center of the receptacle. When the receptacle placement is prohibited by

the height of a window or design feature, an alternate location can be selected that meets the accessibility intent of these requirements.

### **No-Step Entrance**

Must provide at least one building entrance that is an accessible entrance served by a ramp or a no-step entrance. A building entrance door must have a minimum net clear opening of thirty-two inches (32”).

### **Intent**

Universal design improves the ability of Perry’s aging population to age in place and improves overall building accessibility for all populations.

### **Things to Consider**

Design and construct kitchen spaces, sinks, cabinets, and appliances so they support or can be easily adapted to support universal design concepts.

Universal Design Checklist and Survey by University of Iowa Clinical Law Programs includes a very useful project checklist and links to many additional resources on universal design and green construction. See <http://www.uiowa.edu/~clinic/washingtonCourt.shtml>. On this site you may also conduct your own universal design and green home survey by using materials from the University of Iowa Clinical Law Programs

“Aging-In Place Checklist,” [www.toolbase.org/Home-Building-Topics/Universal-Design/aging-in-place-checklists](http://www.toolbase.org/Home-Building-Topics/Universal-Design/aging-in-place-checklists)

Principles of Universal Design, [www.toolbase.org/Home-Building-Topics/Universal-Design/principals-universal-design](http://www.toolbase.org/Home-Building-Topics/Universal-Design/principals-universal-design)

## **Section 2: Site, 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 can reduce 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. Safer streets and streetscapes also promote physical activity and public health, while creating opportunities for social interaction and increased safety by bringing more eyes on public spaces.



Site, Location, and Neighborhood Fabric		
2.1	Smart Site Location: Passive Solar Heating / Cooling Orient building to make greatest use of passive solar heating and cooling.	

## How

Orient building to make the greatest use of passive or active 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 home. Passive solar energy means that mechanical means are not employed to utilize solar energy.

## Things to Consider

Projects that achieve this measure meet the requirements for LEED for Homes credit ID 1.5, “Building Orientation for Solar Design,” worth 1 point toward LEED certification.

Consider placing different window films on north, east, south and west facades. The south windows should have a high solar heat gain coefficient (SHGC) with a low U-value. The west windows should have the lowest SHGC and a Low U-value and the north and east windows should have the lowest U-value. See

[www.eere.energy.gov/consumer/your\\_home/windows\\_doors\\_skylights/index.cfm/mytopic=13370](http://www.eere.energy.gov/consumer/your_home/windows_doors_skylights/index.cfm/mytopic=13370).

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), properly designed single-loaded corridors, and an open floor plan optimize daylight penetration and passive ventilation. Shading through overhangs and canopies on the south and deciduous trees on the south and west prevent the summer sun from entering the interior.

U.S. Department of Energy, Building Technologies Program,  
[www.eere.energy.gov/buildings/publications/pdfs/building\\_america/29236.pdf](http://www.eere.energy.gov/buildings/publications/pdfs/building_america/29236.pdf).

Site, Location, and Neighborhood Fabric		
2.2	Erosion and Sediment Control Implement SUDAS and City standards for best practices for erosion and sedimentation control during construction.	Mandatory

## How

All construction that disturbs one acre or more requires a stormwater general permit #2 from the Iowa Department of Natural Resources. Obtain authorization and follow the requirements of the permit including the development and implementation of a Stormwater Pollution Prevention Plan. Submit a copy of the stormwater general permit #2 and the Stormwater Pollution Prevention Plan before site disturbance begins.

For projects disturbing less than one acre, implement EPA's Best Management Practices for erosion and sedimentation control during construction, referring to the EPA document, Stormwater Management for Construction Activities (EPA 832-R-92-005). Erosion control measures must include all of the following: Stockpile and protect disturbed topsoil from erosion (for reuse); Control the path and velocity of runoff with silt fencing or comparable measures; Protect on-site storm sewer inlets, streams, and lakes with straw bales, silt fencing, silt sacks, rock filters, or comparable measures; Provide swales to divert surface water from hillsides; If soils in a sloped area (i.e., 25%, or 4:1 slope) are disturbed during construction, use tiers, erosion blankets, compost blankets, filter socks and berms, or some comparable approach to keep soil stabilized; and no compaction inside the drip ring of existing trees and shrubs.

## Intent

Erosion and sediment control during site development keeps soils on site, reduces stormwater runoff and prevents sediment from entering local waterways. Erosion and sediment control helps to avoid stormwater related problems that can delay construction, cause environmental degradation to creeks, streams and lakes and damage public and private properties downstream.

## Things to Consider

Specific design and specifications of best management practices to minimize soil erosion and sediment movement from the construction site and satisfy the requirements of General Permit #2 can be found in both the Iowa Construction Site Erosion Control Manual and the Iowa Statewide Urban Design and Specifications Manual (SUDAS). The City of Perry has adopted SUDAS and the site requirements listed therein are required in the community.

Iowa Construction Site Erosion Control Manual, [www.ctre.iastate.edu/erosion](http://www.ctre.iastate.edu/erosion)

Iowa Department of Natural Resources General Permit #2 information can be found at [www.iowadnr.com/water/stormwater/index.html](http://www.iowadnr.com/water/stormwater/index.html)

Iowa Statewide Urban Design and Specifications (SUDAS), <http://www.iowasudas.org/design.cfm>

Iowa Stormwater Education Program, [www.iowastormwater.org](http://www.iowastormwater.org)

Urban Resources and Borderland Alliance Network (URBAN), <http://www.rainscapingiowa.org/> Projects that achieve this measure also meet the requirement for LEED for Homes prerequisite SS 1.1, “Erosion Controls During Construction,” which is a mandatory requirement for LEED certification. Consider opting for one of the following methods – phasing, seeding, grading, protecting onsite vegetation, directing runoff to on-site depressions or swales – instead of using silt fencing. Additionally, the measures that are employed should result in no visible off-site discharge.

The EPA’s document, Stormwater Management for Construction Activities, may be purchased as item PB 922 359 51 from the National Technical Information Service at <http://yosemite.epa.gov/water/owrcatalog.nsf>

Site, Location, and Neighborhood Fabric	
2.3	<b>Landscaping</b> Plant a minimum of two trees, one of which is placed in the front yard. Trees must be at least 1” caliper trees and be on the City’s approved Tree List found in City Code Section 151. Provide a plan for additional landscaping that mitigates the effects of storm water and / or solar impact on the structure. Plan shall be provided at time of Certificate of Occupancy inspection. Locate plants to provide shading in the summer and allow for heat gain in the winter.

### How

Commit to providing a tree or plant list, to be certified by the Architect or Landscape Architect at Construction Documents stage, so that the selection of new trees and plants are at least 50% native species, 100% appropriate to the site’s soils and microclimate, and do not include invasive species (see definition below). Limit application of non-native turf species.

### 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.

### Definition

Invasive species are plants that are introduced to an area outside their original range, threaten Iowa’s biodiversity and cause harm in their new home.”

### Things to Consider

The requirement of this measure that projects “...not include invasive species” also meets the requirement of LEED for Homes prerequisite, “No Invasive Plants,” which is a mandatory requirement for LEED certification.

See the City of Perry’s Tree Ordinance for additional information on Approved trees lists and information from the City Tree Board.

See Iowa Stormwater Management Manual Native Landscaping section, [www.ctre.iastate.edu/PUBS/stormwater/documents/2E-6NativeLandscaping.pdf](http://www.ctre.iastate.edu/PUBS/stormwater/documents/2E-6NativeLandscaping.pdf)

Iowa Native Lands recommended native plant list, [www.prrcd.org/inl/recommended\\_plants.htm](http://www.prrcd.org/inl/recommended_plants.htm)

See the Iowa Native Plant Society to exchange ideas and for information on native plantings, [www.public.iastate.edu/~herbarium/inps/index.php](http://www.public.iastate.edu/~herbarium/inps/index.php)

Iowa Prairie Network, [www.iowaprairienetwork.org](http://www.iowaprairienetwork.org)

Iowa Living Roadway Trust Fund, [www.iowalivingroadway.com](http://www.iowalivingroadway.com)

Combine landscape plan with stormwater management to provide surface water filtration and aesthetic benefits.

Non-native turf needs significant amounts of water every year to thrive, whereas native turf needs much less water every year.

While turf is appropriate for some landscaping, such as for play areas, it should be minimized wherever possible, except in climates where it needs 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 employed.

Site, Location, and Neighborhood Fabric		
2.4	Surface Water Management Capture, retain, infiltrate and / or harvest the first ½ inch of rainfall that falls in a 24 hour period.	

### How

Capture, retain, infiltrate and/or harvest rainfall equivalent to up to 1.25” per rainfall event.

### Intent

Stormwater quality can be improved with better site planning and development to reduce post-construction runoff volume. This can be accomplished by decreasing impervious area and increasing emphasis on infiltration practices as described by the guidelines found in the Iowa Stormwater Management Manual.

Reducing stormwater 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

Iowa Stormwater Management Manual, [www.ctre.iastate.edu/PUBS/stormwater](http://www.ctre.iastate.edu/PUBS/stormwater)

Incorporate the use of water-permeable walkways and parking areas into your project to infiltrate stormwater. Projects achieving this measure also may satisfy the requirements of LEED for Homes SS 4.3, “Management of Runoff from Roof” and/or WE 1.1, “Rainwater Harvesting System.” See the LEED for Homes Rating System for the specific requirements.

Projects that achieve this measure through installation of a green roof may be eligible for up to 1 point toward LEED certification under LEED for Homes credit SS 4.3, “Management of Runoff from Roof.” To achieve this point, LEED for Homes requires that the green roof covers at least 50% of the roof area for 0.5 point, or 100% of the roof area for 1 point.

Projects that achieve this measure may be eligible for points under LEED for Homes SS 4.1, “Permeable Lot,” worth up to 4 points toward LEED certification. To achieve points under this credit, at least 70% of the built environment, not including area under roof, must be permeable or designed to capture water runoff for infiltration on-site. See SS 4.1 in the LEED for Homes Rating System for more information.

U.S. Environmental Protection Agency, Heat Island Effect, [www.epa.gov/heatisland](http://www.epa.gov/heatisland)

This Web site contains basic information about heat island effect, its social and environmental costs, and strategies to minimize its prevalence, including shading and coloration of hardscapes.

Use water-permeable materials such as pervious interlocking concrete paving blocks, concrete grid pavers and perforated brick pavers.

NAHB Research Center ToolBase Services: Permeable Pavement

<http://toolbase.org/Technology-Inventory/Sitework/permeable-pavement>

This is 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.

Make use of innovative, low-impact techniques such as rain gardens, green roofs, rain barrels and cisterns to capture and reuse stormwater.

Minimize impervious areas (surfaces that do not allow stormwater infiltration), including roofs, driveways, sidewalks and streets, or use porous materials for such areas.

## Section 3: 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 graywater sources.

Water Conservation	
3.1	<p><b>Water – Conserving Appliances and Fixtures: New Construction</b>            Install water-conserving fixtures with the following minimum specifications:            toilets – 1.3 GPF; showerheads – 2.0 GPM; kitchen faucets – 2.0 GPM; bathroom faucets – 2.0 GPM.</p>

### How

For **residential** projects, install water-conserving fixtures with the following specifications:

- ✓ Toilets – 1.3 GPF (gallons per flush) or better, dual-flush toilets meeting the 1.3 GPF or better are encouraged
- ✓ 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.

### Things to consider

EPA’s WaterSense® Web site, [www.epa.gov/owm](http://www.epa.gov/owm), maintains a list of toilets meeting the 1.28 GPF requirements. An economic alternative to high efficiency toilets may be to purchase a 1.6 GPF toilet and retrofit with a dual flush retrofit kit.

Projects achieving the requirements of this measure may be eligible for points toward LEED certification under LEED for Homes credit WE 3.2 “Very High Efficiency Fixtures and Fittings.” 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 available at [www.epa.gov/owm/water-efficiency](http://www.epa.gov/owm/water-efficiency). Maximum Performance (MaP™) Testing California Urban Water Conservation Council, [www.cuwcc.org/maptesting.lasso](http://www.cuwcc.org/maptesting.lasso). 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.

Composting Toilet Reviews, [www.buildinggreen.com/features/mr/waste.html](http://www.buildinggreen.com/features/mr/waste.html)

Water Use It Wisely, [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.

Water Conservation	
3.2	<p><b>Water – Conserving Appliances and Fixtures: Rehabilitation</b>            Install water-conserving fixtures with the following minimum specifications <i>for toilets and shower heads</i> and following requirements for other fixtures wherever and whenever they are replaced: toilets – 1.3 GPF; showerheads – 2.0 GPM; kitchen faucets – 2.0 GPM; bathroom faucets – 2.0 GPM.</p>

This measure is in effect when rehabilitating an existing residential structure. The same recommendations and suggests as for new construction above should be considered.

### How

For **residential** projects, install water-conserving fixtures with the following specifications:

- ✓ Toilets – 1.3 GPF (gallons per flush) or better, dual-flush toilets meeting the 1.3 GPF or better are encouraged
- ✓ 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.

Water Conservation	
3.3	<p><b>Water – Conserving Appliances and Fixtures</b>            Install water-conserving fixtures with the following minimum specifications: toilets – 1.1 GPF; showerheads – 1.75 GPM; kitchen faucets – 2.0 GPM; bathroom faucets – 1.5 GPM. Implementation of this task also qualifies homeowner with meeting 3.1 or 3.2 above.</p>

This measure takes the water conservation initiative one step further and provides for more active conservation measures. It also provides the homeowner with extra points towards criteria eligible for certification under Perry Green Building Program. Implementation of this task also qualifies a homeowner with meeting 3.1 or 3.2 above in addition to 3.3.



## How

For **residential** projects, install water-conserving fixtures with the following specifications:

- ✓ Toilets – 1.1 GPF (gallons per flush) or better, dual-flush toilets meeting the 1.1 GPF or better are encouraged
- ✓ Showerheads – 1.75 GPM (gallons per minute) or better
- ✓ Kitchen faucets – 2.0 GPM or better
- ✓ Bathroom faucets – 1.5 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.

Water Conservation	
3.4	<b>Efficient Irrigation</b> If irrigation is necessary, use recycled gray water, roof water, collected site runoff, water from municipal storm system. Use of a highly efficient irrigation system including all of the following: system designed by EPA Water Sense professional, plant beds with a drip irrigation system, separately zoned turf and bedding types, a watering zone timer / controller, and moisture sensor control.

## How

If irrigation is necessary, use recycled gray water, roof water, collected site runoff, water from a municipal recycled water system or a highly efficient irrigation system including at least the following requirements:

- ✓ Install irrigation system designed by an EPA Water Sense certified professional or qualified landscape professional.
- ✓ At least 50 percent of landscape planting beds have a drip irrigation system to minimize evaporation.
- ✓ Turf and each type of bedding area (based on watering needs) should be separately zoned.
- ✓ A timer/controller that activates the valves for each watering zone at the best time of day to minimize evaporative losses while maintaining healthy plants and obeying local regulations and water-use guidance.
- ✓ Install a moisture sensor controller or rain delay controller.
- ✓ Watering tubes for trees are allowed for a grace period of two years.



## 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

Projects achieving the requirements of this measure for a high efficiency irrigation system may be eligible for up to 3 points toward LEED certification under LEED for Homes credit WE 2.1 “High Efficiency Irrigation System.”

Design and install irrigation system with head-to-head coverage.

- ✓ Install a central shut-off meter.
- ✓ Install a sub-meter for the irrigation system.
- ✓ Pressure regulating devices to maintain optimal pressure.
- ✓ Utilize high-efficiency nozzles with an average
- ✓ Distribution Uniformity (DU) of at least 0.70. This may include conventional rotors, multi-stream rotors, or high efficiency spray heads, but the DU must be verified by manufacturer documentation or third-party tests.
- ✓ Check valves in heads.

American Society of Landscape Architects: [www.asla.org](http://www.asla.org)

International Center for Water Technology: [www.icwt.net](http://www.icwt.net)

The International Center for Water Technology is a consortium of public and private entities, led by the efforts of California State University – Fresno. This website includes research papers and educational materials about cutting-edge progress in water- saving technologies.

U.S. EPA WaterSense<sup>SM</sup>: Efficiency Made Easy: [www.epa.gov/owm/water-efficiency](http://www.epa.gov/owm/water-efficiency)

This site provides information on the Environmental Protection Agency’s WaterSense labeling program for water-efficient landscape irrigation products plus tips and recommendations for water-efficient irrigation. Follow the link to “Weather- or Sensor-Based Irrigation Control Technologies” for related information on high- efficiency irrigation controllers.

Water-Efficient Landscaping: Preventing Pollution and Using Resources Wisely:  
[www.epa.gov/owm/water-efficiency/docs/water-efficient\\_landscaping\\_508.pdf](http://www.epa.gov/owm/water-efficiency/docs/water-efficient_landscaping_508.pdf)

This manual from the Environmental Protection Agency provides information about reducing water consumption through creative landscaping techniques.

Water Wiser: The Water Efficiency Clearinghouse: [www.awwa.org/waterwiser](http://www.awwa.org/waterwiser)

This clearinghouse provides articles, reference materials and papers on all forms of water efficiency.

Water Conservation		
3.5	No Irrigation Do not install irrigation	

### How

Do not install irrigation. Watering tubes for trees are allowed for a grace period of two years. Irrigation systems already in existence onsite are grandfathered in. The use of captured rainwater for grandfathered in irrigation systems is encouraged.

### 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 established, even in dry periods.

### Things to Consider

Projects achieving the requirements of this measure for no irrigation system may be eligible for up to 10 points toward LEED certification under LEED for Homes credits SS 2.5 “Reduce Overall irrigation Demand by at Least 20%” and WE 2.3 “Reduce Overall irrigation Demand by at Least 45%.”

American Society of Landscape Architects, [www.asla.org](http://www.asla.org)

ASLA is the national professional association representing landscape architects. The Web site provides information about members, products, services, publications, and events.

International Center for Water Technology, [www.icwt.net](http://www.icwt.net)

The International Center for Water Technology is a consortium of public and private entities, led by the efforts of California State University–Fresno. This website includes research papers and educational materials about cutting-edge progress in watersaving technologies.

Water-Efficient Landscaping: Preventing Pollution and Using Resources Wisely, [www.epa.gov/owm/water-efficiency/docs/water-efficient\\_landscaping\\_508.pdf](http://www.epa.gov/owm/water-efficiency/docs/water-efficient_landscaping_508.pdf)

This manual from EPA provides information about landscaping techniques to reduce water use.

Water Wiser: The Water Efficiency Clearinghouse, [www.awwa.org/waterwiser](http://www.awwa.org/waterwiser)

This clearinghouse provides articles and reference materials on all forms of water efficiency. Watering tubes for trees are allowed for a grace period of two years.

## Section 4: Energy Efficiency

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

Energy Efficiency		
4.1	Efficient Energy Use: New Construction Meet IECC 2009 and Energy Star standards and achieve a HERS Index of 70 using a third-party HERS Rater.	Mandatory

## How

For **residential** projects:

Use a professionally certified, third-party Home Energy Rating System (HERS) rater and Mortgage Industry National Home Energy Rating Standards (HERS) to verify energy efficiency achievement by meeting the following performance levels identified below.

- ✓ Follow Energy Star standards, to achieve a HERS Index of 70 or better for all structures under four stories above grade regardless of climate zone, [http://www.energystar.gov/index.cfm?c=bldrs\\_lenders\\_raters.homes\\_guidelns](http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.homes_guidelns)
- ✓ Use a certified, third-party HERS Rater independent of the project team and developer to verify that all items of the Energy Star Thermal Bypass Inspection Checklist have met the requirements of the checklist. The builder cannot self-verify achievement of any of the checklist requirements. See checklist at [http://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/Thermal\\_Bypass\\_Inspection\\_Checklist.pdf](http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Thermal_Bypass_Inspection_Checklist.pdf)
- ✓ Meet or exceed the requirements of the 2009 International Energy Conservation Code.
- ✓ For buildings of four stories or more above grade, exceed the performance of ASHRAE 90.1-2007 Appendix G by 10 percent.
- ✓ Pass a pre-drywall inspection by the energy rater verifying proper sealing and insulation practices.
- ✓ An energy rating performed by a certified HERS rater is required on each unit after it is completed to verify that actual construction meets the above listed requirements. In the event that the proposed construction does not meet the overall U-Value standards with a HERS Index of 70 or better, the rater will provide suggestions for corrections to plans and specifications that will ensure that IECC standards, overall U-Value standards and HERS Index of 70 or better will be met. The certified HERS Rater must verify upon completion of actual construction that the home met or exceeded the required HERS Index.
- ✓ Use a professionally certified third-party energy rater to document that the HVAC system was installed correctly for each unit by measuring and documenting that actual BTU delivery is 90% or greater of the system's rated output capacity.
- ✓ Use of the installed efficiency testing standard (System Efficiency Ratio (SER) of the National Comfort Institute (NCI) is recommended.

- ✓ Where used, it is recommended that air conditioning equipment should be at least 14 SEER and use R-410a refrigerant that is charged according to manufacturer specifications. Heating equipment is recommended to be at least 92 AFUE for furnaces where used and 85 AFUE for boilers where used. Project developers are advised to contact their local utility provider, as some providers require higher levels of efficiency for equipment to meet the minimum requirements for rebate and other incentive programs.

## 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, hot water, normalized lights and appliance 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, appliances and lighting. 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 90.1-2007 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 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 Web site, [www.energycodes.gov](http://www.energycodes.gov).

The Energy Star pilot program for mid and high-rise buildings requires 20 percent better than ASHRAE 90.1-2004. 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 100. From this point, each 1 percent reduction in energy usage (compared to the reference unit) results in a one point decrease in the HERS score.

Energy Star requires a unit to be significantly more energy efficient than the reference unit. HERS ratings are conducted by third-party HERS raters, [www.natresnet.org/directory/raters.aspx](http://www.natresnet.org/directory/raters.aspx)

## Things to Consider

For a list of certified HERS raters, visit <http://www.natresnet.org/directory/raters.aspx>

An additional list of raters is also available on EPA's Energy Star Web site at [www.energystar.gov/index.cfm?fuseaction=new\\_homes\\_partners.showHomesSearch](http://www.energystar.gov/index.cfm?fuseaction=new_homes_partners.showHomesSearch)

The ASHRAE Advanced Energy Design guides and the Advanced Building Core Performance Guide provide a simplified step-by-step approach to achieving predictable energy performance that exceeds state and national standards.

ASHRAE Advanced Energy Design Guide applicable to the project,  
[www.ashrae.org/publications/page/1604](http://www.ashrae.org/publications/page/1604)

Advanced Building Core Performance Guide, [www.advancedbuildings.net](http://www.advancedbuildings.net)

Projects that are three stories or less and meet this measure also fulfill the requirement of LEED for Homes prerequisite EA 1.1 “Energy Performance,” a mandatory requirement for LEED certification.

Contact your local utility provider to determine project design assistance and incentives that may be available.

For more information regarding Energy Star standards go to the new homes section of the Energy Star homepage, [www.energystar.gov](http://www.energystar.gov)

Guidelines for Energy Star qualified new homes are online at  
[www.energystar.gov/index.cfm?c=bldrs\\_lenders\\_raters.homes\\_guidelns](http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.homes_guidelns)

See PATH write-up “Advanced Framing Techniques: Optimum Value Engineering (OVE),  
[www.toolbase.org/TechInventory/TechDetails.aspx?ContentDetailID=625&BucketID=6&CategoryID=13](http://www.toolbase.org/TechInventory/TechDetails.aspx?ContentDetailID=625&BucketID=6&CategoryID=13)

See PATH case study “Save Thousands with Advanced Framing for Walls,”  
<http://www.pathnet.org/si.asp?id=2443>

See examples of model wall assemblies online at the Energy and Environmental Building Alliance, [www.eeba.org](http://www.eeba.org), and Building Science Corporation, [www.buildingscience.com](http://www.buildingscience.com)

Use 1” x 4” let-in bracing and 1” expanded polystyrene sheathing sealed at all edges and penetrations for exterior wall construction instead of oriented-strand board.

Use products such as insulated concrete forms, structural insulated panels, and spray foams to achieve a better thermal envelope and better energy performance.

Any wet blown insulation product installed in wall cavities must be tested and verified to have a moisture content level of less than 15 percent prior to enclosure.

Use products such as energy recovery and heat recovery ventilators to save energy and improve ventilation.

To find a Home Energy Rater in your area, call the Energy Star toll-free hotline: 888-STAR-YES or visit [www.natresnet.org/directory/raters.aspx](http://www.natresnet.org/directory/raters.aspx)

For more information on ASHRAE, go to [www.ashrae.org](http://www.ashrae.org) or call 888-527-4723. Iowa law considers geothermal heat pump applications as an energy efficiency technology.

Energy Efficiency	
4.2	Efficient Energy Use: New Construction Meet Energy Star standards (single family and low rise residential); exceed ASHRAE 90.1 – 2007 by 10 percent.

## How

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

- ✓ Energy Star standards (HERS Index of 85 in climate zones 1–5)
- ✓ HERS Index of 80 in climate zones 6–8, as established by the Residential Energy Services Network (RESNET) policy effective July 1, 2006) for all residential structures under four stories.

U.S. climate zones are identified in the 2007 International Energy Conservation Code (IECC 2007).

See the Energy Star for Homes website to identify the climate zone in which the project is located: [http://www.energystar.gov/index.cfm?fuseaction=windows\\_doors.search\\_climate](http://www.energystar.gov/index.cfm?fuseaction=windows_doors.search_climate)

## 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, hot water, normalized lights and appliance 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, appliances and lighting. 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 90.1-2004 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 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](http://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 100. From this point, each 1 percent reduction in energy usage (compared to the reference unit) results in a one-point decrease 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 85 in climate zones 1-5, or 80 in climate zones 6-8. 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.

### Things to Consider

Projects that are three stories or less and meet this measure also fulfill the requirement of LEED for Homes prerequisite EA 1.1 “Energy Performance,” a mandatory requirement for LEED certification.

For more information regarding Energy Star standards, go to the new homes section of the Energy Star homepage, [www.energystar.gov](http://www.energystar.gov)

For information on Builder Option Packages, go to [www.energystar.gov/index.cfm?c=bop.pt\\_bop\\_index](http://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.

Energy Efficiency	
4.3	<b>Efficient Energy Use: Rehabilitation</b> Perform an energy audit / analysis of existing building condition, estimate costs of improvements, and implement measures that will improve building energy performance by 15% from pre-renovation figures.

### 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 must use software recognized by the energy modeling industry to model the current and projected energy performance of the building. Implement energy improvements adequate to improve the building’s energy performance by 15 percent from pre-renovation figures.

The 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 substantial and 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. Building upgrades should represent a significant improvement in energy performance from pre-renovation performance; 15 percent has been selected for this criterion as a minimum level of improvement in energy performance, based on data from and alignment with other national and regional green building programs.

### Things to Consider

As an alternative way of achieving energy performance requirements, moderate and substantial rehab projects may opt to fulfill the requirements of 4.2.

Energy Efficiency		
4.4	<b>Energy Star Appliances</b> If providing appliances, install Energy Star clothes washers, dishwashers, and refrigerators, and dryers with built-in moisture sensors. Energy Star rating is the current rating system in effect at the time of the effective date of this ordinance.	Mandatory

### How

If providing appliances, install Energy Star refrigerators, Energy Star labeled washers and dryers with built in moisture sensors.

When the energy performance of the home is modeled to produce a HERS Index for 4.1, the model should include the appliances and the HERS Index should reflect this.

If not providing appliances, provide information on purchasing Energy Star appliances in the occupant manual required in section 7.2

### 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

Projects that achieve this measure may be eligible for points toward LEED certification under LEED for Homes credit EA 9.1 “High Efficiency Appliances,” for up to 2 points. Note that this credit is part of the prescriptive pathway in the energy category in LEED for Homes; thus, projects receiving points in the performance pathway (for energy performance under credit EA 1) are not eligible for this credit, and vice versa.

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 ENERGY STAR 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.

Energy Efficiency		
4.5	<b>Efficient Lighting: Interior</b> Install 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 out doors.	IECC 404.1 Mandatory

## How

For **residential** projects:

Integrate proper use of day-lighting into building designs. Install 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. Use compact fluorescent lamps (CFL) or light-emitting diodes (LED).

If reusing existing fixtures in a rehab, installing compact fluorescent light bulbs (CFLs) or other products that achieve equal to or better energy performance is permitted. If installing new fixture, these must be ENERGY STAR labeled.

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

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

Projects that achieve this measure should meet the requirements of LEED for Homes prerequisite EA 8.1 “ENERGY STAR Lights,” a mandatory requirement for LEED certification.

Additionally, projects that achieve this measure also may be eligible for points toward LEED certification under LEED for Homes credit EA 8 for installing the ENERGY STAR Advanced Lighting Package.

Note that this credit is part of the prescriptive pathway in the energy category in LEED for Homes; thus, projects receiving points in the performance pathway (for energy performance under credit EA 1) are not eligible for this credit, and vice versa.

The ENERGY STAR Advanced Lighting Package (ALP) designation identifies homes equipped with a comprehensive set of ENERGY STAR qualified light fixtures. The ALP designation applies to lighting packages for new home construction that consist of a minimum of 60% ENERGY STAR qualified hard-wired fixtures and 100% ENERGY STAR qualified ceiling fans where installed.

Information on the ALP can be found at:

[www.energystar.gov/index.cfm?c=bldrs\\_lenders\\_raters.ALP\\_Builder](http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.ALP_Builder)

This site includes complete information on EPA’s Advanced Lighting Program specifications and requirements, along with extensive technical resources, qualified product and manufacturer lists and locators, case studies, and marketing support resources.

For information on lighting, see the Energy Star Products section at [www.energystar.gov](http://www.energystar.gov)

Also see the Energy Star Program Requirements for Solid State Lighting Luminaries, [www.netl.doe.gov/ssl/PDFs/ENERGY%20STAR%20SSL%20Final%209.12.07.pdf](http://www.netl.doe.gov/ssl/PDFs/ENERGY%20STAR%20SSL%20Final%209.12.07.pdf)

Incorporate the use of motion sensors into lighting applications to turn off lights when rooms are not being used.

For information on proper disposal of mercury containing compact fluorescent lamps, visit the Iowa DNR Web site, [www.iowadnr.com/waste/cfl.html](http://www.iowadnr.com/waste/cfl.html)

Energy Efficiency		
4.6	Efficient Lighting: Exterior Install daylight sensors or timers on all outdoor lighting, including front and rear porch lights in single family homes.	IECC 404.1

## How

Install daylight sensors or timers on all outdoor lighting, including front and rear porch lights. Design and install outdoor lighting to eliminate light trespass from the building and site and to minimize impact on nocturnal environments. Only light areas needing to be lit.

The following lighting types are exempt from this requirement: emergency lighting; lighting required by code for health and safety purposes; lighting used for eye adaptation near covered vehicle entrances and exits; and historic 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

Projects that achieve this measure are eligible for points toward LEED certification under LEED for Homes credit EA 8.2 for improved lighting. Note that this credit is part of the prescriptive pathway in the energy category in LEED for Homes; thus, projects receiving points in the performance pathway (for energy performance under credit EA 1) are not eligible for this credit, and vice versa.

Design outdoor lighting to eliminate light trespass from the building and site, and to minimize impact on nocturnal environments.

Use down-lighting instead of up-lighting.

Consult the Illuminating Engineering Society of North America's Recommended Practice Manual: Lighting for Exterior Environments.

Energy Efficiency		
4.7	HVAC Sizing, Installation and Duct Systems Size heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manual, part J or other approved heating and cooling methods.	IECC 403.06

### How

Size heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manual, Parts D, J and S, ASHRAE handbooks, or equivalent software, to prevent short-cycling of heating or air conditioning and ensure adequate dehumidification. Seal all ductwork with mastic or an appropriate seam sealer. Insulating all supply ducts is recommended.

### Intent

Appropriately sized equipment can improve efficiency and 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

Projects that achieve this measure also meet the requirements under LEED for Homes prerequisite EA 6.1 “Good HVAC Design and Installation,” which is a mandatory requirement for LEED certification.

The HVAC system contractor or designer 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](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 Checklist, [www.acca.org/Files/?id=66](http://www.acca.org/Files/?id=66)

Air Conditioning Contractors of America, information on Manuals D, J and S, [www.acca.org/store/category.php?cid=1](http://www.acca.org/store/category.php?cid=1)

Air Conditioning Contractors of America, HVAC Quality Installation Specification, [www.acca.org/quality](http://www.acca.org/quality)

This site provides a 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 [www.energy.ca.gov/efficiency/qualityhomes/procedures.html](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.

Energy Efficiency	
4.8	Ventilation: New Construction Install a ventilation system for the dwelling unit, providing adequate fresh air per ASHRAE 62.2 – 2007 for single family and low-rise multifamily dwellings.

## How

Install a ventilation system for the dwelling unit providing adequate fresh air per ASHRAE 62.2 for single family and low-rise multifamily dwellings.

## Intent

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

## Things to Consider

Projects that achieve this measure also meet the requirements of LEED for Homes prerequisite EQ 4.1 “Basic Outdoor Air Ventilation,” which is a mandatory requirement for LEED certification.

Projects that meet this measure may also be eligible for 1 point toward LEED certification under EQ 4.2 “Enhanced Outdoor Air Ventilation.”

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:

[www.ashrae.org/technology/page/548](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:

[www.extension.umn.edu/distribution/housingandclothing/DK7284.html](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:

[www.buildingscience.com/documents/reports](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.

Energy Efficiency	
4.9	Additional Reductions in Energy Use Exceed the relevant Energy Star HERS score for residential buildings or exceed other standards by increased percentages.

## How

Exceed the relevant Energy Star HERS Index of 70 for low-rise residential buildings. Receive one additional credit for each point of improvement in the HERS Index or for each percent better than the ASHRAE 90.1-2007 beyond 10 percent.

Provide calculations for the following:

Forecast the annual energy efficiency of the entire project to exceed ASHRAE 90.1-2007 by 16 percent.

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.

For rehabilitation projects, perform energy modeling as required in 4.3 and determine percentage that exceeds the required 15% reduction in energy usage from pre-renovation figures.

### **Intent**

The relative energy efficiency of a given dwelling unit is established by comparing it to the HERS Reference Home, an accepted national standard based on the 2006 International Energy Conservation Code that uses a scale of 0-100. The lower the score is, the more efficient the home. The HERS Reference Home scores a HERS Index of 100 points. Essentially, one point is awarded or deducted for each 1 percent change in energy efficiency for the home's thermal envelope, heating, cooling and domestic hot water systems relative to the 2006 IECC. A home that uses approximately 20 percent less energy than the HERS Reference Home scores 20 points and is equivalent to an Energy Star-qualified home in climate zones 6-8. A home with zero purchased energy scores 0.

For new construction, adding incremental improvements will advance 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.

### **Things to Consider**

Projects that achieve this measure may be eligible for points toward LEED certification under LEED for Homes credit EA 1.2, "Exceptional Energy Performance," for up to 34 points. See EA 1 in the LEED for Homes Rating System for the logarithmic equations that relate the HERS Index to the appropriate number of LEED points.

For more information regarding Energy Star standards go to the new homes section of the Energy Star homepage, [www.energystar.gov](http://www.energystar.gov)

For information on Builder Option Packages, go to [www.energystar.gov/index.cfm?c=bop.pt\\_bop\\_index](http://www.energystar.gov/index.cfm?c=bop.pt_bop_index)

To find a Home Energy Rater in your area, call the Energy Star toll-free hotline: 888-STAR-YES.

For a list of certified HERS raters, visit <http://www.natresnet.org/directory/raters.aspx>

An additional list of raters is also available on EPA's Energy Star Web site at [www.energystar.gov/index.cfm?fuseaction=new\\_homes\\_partners.showHomesSearch](http://www.energystar.gov/index.cfm?fuseaction=new_homes_partners.showHomesSearch)

For more information on ASHRAE, go to [www.ashrae.org](http://www.ashrae.org) or call 888-527-4723.

Energy Efficiency		
4.10	<b>Renewable Energy</b> Install PV panels, wind turbines or other renewable energy source to provide at least 50% of the project’s estimated electricity demand. (All such applications must meet current zoning and building code regulations.)	8 points

### How

Install photovoltaic (PV) panels, wind turbines, solar assisted hot water heating or domestic hot water or other renewable source to provide at least 50 percent of the project’s estimated energy demand. Describe whether the installed renewable energy system will benefit common space, occupant space, or both and how the renewable energy system will benefit the owner and occupants.

### 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

Projects that achieve this measure may be eligible for up to 10 points toward LEED for Homes certification under credit EA 10 “Renewable Energy System.” Projects can receive 1 point for every 3% of the annual reference electrical load met by the renewable energy system. *Note that the annual reference electric load is defined as the amount of electricity that a typical home (e.g., the HERS Reference Home) would consume in a typical year.*

American Solar Energy Society, [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.

American Wind Energy Association, [www.awea.org](http://www.awea.org)

AWEA is a national association representing wind power plant developers, wind turbine manufacturers, utilities, consultants, insurers, financiers, researchers, and others involved in the wind industry.

Database of State Incentives for Renewable Energy, [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, [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.

National Center for Photovoltaics, [www.nrel.gov/ncpv](http://www.nrel.gov/ncpv)

NCPV provides a clearinghouse on all aspects of photovoltaic (PV) solar cell systems.

National Renewable Energy Laboratory, [www.nrel.gov](http://www.nrel.gov)

The National Renewable Energy Laboratory is a very useful resource.

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy,

[www.eere.energy.gov](http://www.eere.energy.gov)

The EERE Web site contains many renewable energy technology and energy efficiency resources.

Energy Efficiency		
4.11	Photovoltaic (PV) Ready Site, design, engineer and wire the project to accommodate installation of PV in the future.	Mandatory

## How

Site, design, engineer and wire the development to accommodate installation of PV in the future.

General contractor (GC) and PV contractor must document the following:

- ✓ Install and label a 4' x 4' plywood panel area for mounting an inverter and balance of system components.
- ✓ Install a 1" metal conduit for the DC wire run from the designated array location to the designated inverter location (cap and label both ends).
- ✓ Install a 1" metal conduit from designated inverter location to electrical service panel (cap and label both ends).
- ✓ Install and label a 70-amp dual pole circuit breaker in the electrical service panel for use by the PV system (label the service panel).

GC and PV contractor must provide documentation to building owner and / or manager.

Submit documentation and 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

## 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 are available.

Database of State Incentives for Renewable Energy, [www.dsireusa.org](http://www.dsireusa.org)

This North Carolina Solar Center database collects 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 provides incentive details on a state-by-state basis.

*Building New Homes that are Renewable Ready*, [www.focusonenergy.com/Information-Center/Renewables/Fact-Sheets-Case-Studies/Solar.aspx](http://www.focusonenergy.com/Information-Center/Renewables/Fact-Sheets-Case-Studies/Solar.aspx)

*Constructing Commercial Buildings to be Solar-Energy Ready*, [www.focusonenergy.com/Information-Center/Renewables/Fact-Sheets-Case-Studies/Solar.aspx](http://www.focusonenergy.com/Information-Center/Renewables/Fact-Sheets-Case-Studies/Solar.aspx)

## Section 5: Materials Beneficial to the Environment

Reducing, reusing and recycling building materials conserves natural resources and reduces 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.

Materials Beneficial to the Environment	
5.1	Construction Waste Management Develop and implement a construction waste management plan to reduce the amount of material sent to the landfill by at least 25 percent.

### How

Reduce the amount of construction waste sent to the landfill.

Investigate and document local options for diversion (recycling, reuse, etc.) of all anticipated major constituents of the project waste stream, including cardboard packaging and “household” recyclables (e.g., beverage containers).

Commit to following a waste management plan that is appropriate for the site and local conditions, and that prevents, recycles or salvages at least 25 percent of non-hazardous construction and demolition debris. Residential and mixed used projects may base their

prevention and recycling amounts on the National Association of Home Builders' Research Center's industry average of 4.2 pounds of waste per conditioned square foot. See table below to calculate debris prevention and recycling for home projects.

<b>Amount to Landfills and Incinerators</b>			
<b>Reduced construction waste</b>		<b>Increased waste diversion</b>	
<i>Pounds/ft<sup>2</sup></i>	<i>Cubic Yards/1,000 ft<sup>2</sup></i>	<i>Percentage waste</i>	<i>Percentage diverted</i>
4.0	25.5	100	0
3.5	22.3	88	12
3.0	19.1	75	25
2.5	15.9	63	37
2.0	12.8	50	50
1.5	9.6	38	62
1.0	6.4	25	75
.5	3.2	13	87

(Source: "Table 27: Waste Diversion," LEED for Homes Rating System, pg. 84)

### 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.com](http://www.nahbrc.com))

Approximately 20 percent of all waste landfilled in Iowa is construction and demolition debris. An estimated 520,000 tons of construction and demolition debris are landfilled in Iowa annually.

### Things to Consider

See the National Association of Home Builders' Green Building Guidelines, section 2.1 "Reduce Quantity of Materials and Waste,"

[www.nahb.org/fileUpload\\_details.aspx?contentTypeID=7&contentID=1994](http://www.nahb.org/fileUpload_details.aspx?contentTypeID=7&contentID=1994)

The Iowa Department of Natural Resources Web site, [www.iowadnr.gov/waste/](http://www.iowadnr.gov/waste/) and the department's Iowa Waste Exchange program, [www.iowadnr.com/waste/iwe/index.html](http://www.iowadnr.com/waste/iwe/index.html) may be a resource to assist with construction and demolition debris recycling efforts.

See [www.iowadnr.com/waste/recycling/files/examplebid.pdf](http://www.iowadnr.com/waste/recycling/files/examplebid.pdf) for an example of sample bid language for construction and demolition debris management services.

See [www2.ci.seattle.wa.us/Implement/pdfs/SampleCWMP.pdf](http://www2.ci.seattle.wa.us/Implement/pdfs/SampleCWMP.pdf) for an example of a construction debris management plan.

Best Management Practices Waste Reduction Construction and Demolition Debris: A Guide for Building, Construction, and Environmental Professionals,  
[www.iowalifechanging.com/business/downloads/bestmgmtpractices.pdf](http://www.iowalifechanging.com/business/downloads/bestmgmtpractices.pdf)

Contact your local integrated solid waste management agency for assistance.

This measure helps a project meet LEED for Homes prerequisite MR 3.1 “Construction Waste Management Planning,” a mandatory requirement for LEED certification. The other mandatory requirement that is part of this LEED prerequisite is to document the diversion rate for construction waste. Projects may also be eligible for additional points toward LEED certification for construction waste reduction under MR 3.2.

Create detailed framing plans or scopes of work and accompanying architectural details for use on the job site. Refer to LEED for Homes MR 1.2: Detailed Framing Documents for additional information.

Create a detailed cut list and lumber order prior to construction. Refer to LEED for Homes MR 1.3: Detailed Cut List and Lumber Order for additional information.

NAHB Research Center, Toolbase.org, “Best Practices for Construction Waste Management,”  
[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.

U.S. EPA WasteWise Program, [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.

EPA Construction & Demolition Debris, [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.

Construction Materials Recycling Association, [www.cdrecycling.org](http://www.cdrecycling.org)

This site includes links to Web sites on recycling concrete, asphalt roof shingles, and drywall and a state-by-state listing of construction waste reusers and recyclers.

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 [www.nrdc.org/cities/building/rwoodus.asp](http://www.nrdc.org/cities/building/rwoodus.asp)

Materials Beneficial to the Environment	
5.2	Recycled Content Material Use materials with recycled content, provide calculation for recycled content

	percentage based on cost or value or recycled content in relation to total materials for project. Minimum recycled material must be 5 percent.	
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## How

The percentage of recycled-content building material is based on cost or value (if using salvaged/reused materials) and does not include mechanical and electrical equipment. Provide calculations for recycled content percentage as follows:

Use at least five percent recycled content for the project's total material costs or value. 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

Projects that achieve this measure may be eligible for points under LEED for Homes credit MR 2.2 "Environmentally Preferable Products," worth .5 point per component toward LEED certification. *Note that a particular material must make up 90% of the component, by weight or volume. See MR 2.2 in the LEED for Homes Rating System for more information.*

Consider incorporating recycled-content materials from the early stages of project design. EPA's Comprehensive Procurement Guidelines provide specifications for recycled-content materials, [www.epa.gov/cpg](http://www.epa.gov/cpg)

Oikos Green Building Source, [www.oikos.com/green\\_products/index.php](http://www.oikos.com/green_products/index.php)

A Web site dedicated to sustainable and energy-efficient construction: Green Building News, Products Database, Product Gallery, Energy Source Builder Newsletter, and more.

Green Building Supply, [www.greenbuildingsupply.com](http://www.greenbuildingsupply.com)

An Iowa company dedicated to supplying green building materials and cleaning products.

Materials Beneficial to the Environment	
5.3	<p><b>Certified, Salvaged and Engineered Wood</b></p> <p>Commit to using at least 25% (by cost) wood products and materials that are salvaged wood, engineered framing materials or certified in accordance with the Forest Stewardship Council.</p>

### How

Commit to using at least 25 percent (by cost) wood products and materials that are certified in accordance with the Forest Stewardship Council (<http://www.fscus.org/>), salvaged wood, or engineered framing materials. The percentage of certified, salvaged and engineered wood products is based on cost or value. The project architect or designer 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

Projects that achieve this measure through FSC-certified or salvaged wood may be eligible for points under LEED for Homes credit MR 2.2 “Environmentally Preferable Products,” worth .5 point per component toward LEED certification for environmental preferability (FSC-certification) or local production.

To achieve points for local production, products must be extracted, processed, and manufactured within 500 miles of the project. See MR 2.2 in the LEED for Homes Rating System for more information. For help in locating FSC-certified products, visit <http://www.fscus.org/>

Rainforest Alliance, “SmartGuide to Green Building Wood Sources,” [www.rainforestalliance.org/smartguides](http://www.rainforestalliance.org/smartguides)

This site lists U.S. suppliers, manufacturers, and distributors of FSC-certified building products.

Materials Beneficial to the Environment	
5.4	<p><b>Water-Permeable Walkways / Parking areas</b></p> <p>Use water-permeable materials in 50 percent or more of all walkways and parking areas.</p>

### 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

Projects that achieve this measure may be eligible for points under LEED for Homes SS 4.1 “Permeable Lot,” worth up to 4 points toward LEED certification. To achieve points under this credit, at least 70 percent of the built environment, not including area under roof, must be permeable or designed to capture water runoff for infiltration on-site. See SS 4.1 in the LEED for Homes Rating System for more information.

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:

[www.toolbase.org/Technology-Inventory/Sitework/permeable-pavement](http://www.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.

Materials Beneficial to the Environment		
5.5	Reduce Heat – Island Effect: Roofing Use Energy Star-compliant and high-emissive roofing.	

## How

Use Energy Star-compliant (reflectivity of greater than .65) 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](http://www.earthpledge.org/GreenRoof.html)

## Things to Consider

Lawrence Berkeley National Laboratory, Heat Island Group, <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.

Materials Beneficial to the Environment	
5.6	<b>Reduce Heat – Island Effect: Paving</b> Use light-colored, high albedo materials and/or open grid pavement with a minimum Solar Reflective Index of 6.0 over at least 30 percent of the site’s hardscape area.

### 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.

### Things to Consider

Projects achieving this measure may be eligible for 1 point toward LEED certification under LEED for Homes credit SS 3.1, “Reduce Local Heat Island Effects.” To achieve this point, LEED for Homes requires that light-colored, high-albedo materials or vegetation are installed for **at least 50% of sidewalks, patios, and driveways within 50 feet of the home.**

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.

Trees Forever is an Iowa-based organization providing a variety of resources related to the planting and care of trees, [www.treesforever.org](http://www.treesforever.org)

U.S. Environmental Protection Agency, Heat Island Effect, [www.epa.gov/heatisland](http://www.epa.gov/heatisland)

This Web site contains basic information about heat island effect, its social and environmental costs, and strategies to minimize its prevalence, including shading and coloration of hardscapes..

5.7	<b>Reduce Heat – Island Effect: Plantings</b> Locate trees or other plantings to provide shading for at least 50 percent of sidewalks, patios and driveways within 50 feet of buildings.	
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### How

Locate trees or other plantings to provide shading for at least 50% of sidewalks, patios, and driveways within 50 feet of the building. Shading should be calculated for noon on June 21, when the sun is directly overhead, based on five years' growth.

### 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.

### Things to Consider

Projects that achieve this measure also meet a requirement of LEED for Homes credit SS 3.1 "Reduce Local Heat Island Effects," worth 1 point toward LEED certification.

Trees Forever is an Iowa-based organization providing a variety of resources related to the planting and care of trees, [www.treesforever.org](http://www.treesforever.org)

Check with local utility providers and the Iowa Department of Natural Resources Bureau of Forestry, [www.iowadnr.gov/forestry/index.html](http://www.iowadnr.gov/forestry/index.html) for tree planting information and incentives.

Use natural mulches instead of rock.

The Home Depot Foundation encourages programs that create or expand partnerships between community tree organizations and those focused on other areas of community development. See [www.homedepotfoundation.org/support\\_trees.html](http://www.homedepotfoundation.org/support_trees.html)

## Section 6: Healthy Living Environment

The importance of a healthy living environment is a significant green building issue directly affecting occupants. 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.



Healthy Living Environment		
6.1	Low / No Volatile Organic Compounds (VOC) Paints and Primers Specify that all interior paints and primers must comply with current Green Seal standards for low VOC	

**How**

Specify that all interior paints and primers must comply with current Green Seal standards for low VOC limits. Specify pre-finished products or low VOC stains, varnishes, and lacquers.

**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**

This measure helps a project meet the requirement of LEED for Homes credit MR 2.2, “Environmentally Preferable Products,” worth .5 point per component toward LEED certification for products that meet low emissions specifications. See MR 2.2 in the LEED for Homes Rating System for more information.

The Web site [www.greenseal.org/resources/reports/CGR\\_wood\\_finish.pdf](http://www.greenseal.org/resources/reports/CGR_wood_finish.pdf) contains information on recommended VOC levels and products for wood finishes and stains.

The Web site [www.greenseal.org/findaproduct/index.cfm#paints](http://www.greenseal.org/findaproduct/index.cfm#paints) lists paints that are Green Seal certified. Also, the Green Seal Standard GS-11 (available for download at [www.greenseal.org/certification/environmental.cfm](http://www.greenseal.org/certification/environmental.cfm)) shows the below VOC limits for paints:

<b>Architectural paints, coatings and primers applied to interior walls and ceilings</b>	<b>Flats: 50 g/L Nonflats: 150 g/L</b>	<b>Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993</b>
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The Web site [www.toolbase.org](http://www.toolbase.org) has information on low- and no-VOC paints, including a list of paint manufacturers that carry these products.

The resource [www.greenguide.com](http://www.greenguide.com) provides information on low/no VOC paints and primers.

6.2	<b>Exhaust Fans: Bathroom</b> Install Energy Star-labeled bathroom fans that exhaust to the outdoors and are connected to a light switch and are equipped with a humidistat sensor or timer or operate continuously.	IRC M1506.2
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## How

### For residential projects:

Install low-sone Energy Star-labeled bathroom fans that exhaust to the outdoors and are connected to a light switch and are equipped with a humidistat sensor or timer, or operate continuously. If using a heat recovery ventilator or energy recovery ventilator, connect the exhaust fan to the heat recovery or energy recovery ventilator system.

## 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

This criterion helps a project meet one of two requirements under LEED for Homes prerequisite EQ 5.1 “Basic Local Exhaust,” which is a mandatory requirement for LEED certification. The other requirement is that of designing and installing a local exhaust system in the kitchen(s). Projects achieving this criterion also may be eligible for 1 point toward LEED certification under LEED for Homes credit EQ 5.2 “Enhanced Local Exhaust.” See EQ 5 in the LEED for Homes Rating System for more information.

For more information on bathroom fans, go to the products section of the Energy Star homepage: [www.energystar.gov/index.cfm?c=vent\\_fans.pr\\_vent\\_fans](http://www.energystar.gov/index.cfm?c=vent_fans.pr_vent_fans)

This Web site 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 50CFM or 20CFM if operating continuously, per ASHRAE Standard 62.2-2007 section 5.

Home Ventilating Institute, Ventilation Systems and Controls [www.hvi.org](http://www.hvi.org) 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, [www.buildingscience.com/documents/reports](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.

### Additional Things to Consider

(source: ASHRAE Advanced Energy Design Guide for K-12 School Buildings)

Zone exhaust airflows (for restrooms, janitorial closets, science laboratories, kitchens, art and vocational classrooms, locker rooms, etc.) should be determined based on the current version of ASHRAE Standard 62.1, but should not be less than the values required by local code unless approved by the authority having jurisdiction.

Central exhaust systems for restrooms, janitorial closets, and locker rooms should be interlocked to operate with the air-conditioning system, except during unoccupied periods. Such a system should have a motorized damper that opens and closes with the operation of the fan. The damper should be located as close as possible to the duct penetration of the building envelope to minimize conductive heat transfer through the duct wall and avoid having to insulate the entire duct. During unoccupied periods, it should remain closed and the exhaust fan turned off, even if the air-conditioning system is operating to maintain setback or setup temperatures. Consider designing exhaust ductwork to facilitate recovery of energy from Class 1 and Class 2 (e.g., restrooms) exhaust air, per the requirements of ASHRAE Standard 62.1.

Kitchens will generally have separate exhaust and make-up air systems according to the use of the kitchen and to the equipment manufacturers’ suggestions. If showers are provided in locker rooms, exhaust must be increased during use and will generally require separate air intake (intake hood or make-up air unit).

ASHRAE Advanced Energy Design Guides, [www.ashrae.org/publications/page/1604](http://www.ashrae.org/publications/page/1604)  
ASHRAE Standard 62.1-2007, [www.ashrae.org/technology/page/548](http://www.ashrae.org/technology/page/548)

This site provides a viewable version of ASHRAE Standard 62.1-2007.

Healthy Living Environment		
6.3	Exhaust Fans: Kitchen – New Construction or Rehabilitation Install power vented fans or range hoods that exhaust to the exterior.	IRC M1502.1

### How

#### For residential projects:

Install 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**

This measure helps a project meet one of two requirements under LEED for Homes prerequisite EQ 5, “Basic Local Exhaust,” which is a mandatory requirement for LEED certification. The other requirement is that of designing and installing a local exhaust system in the bathroom(s). See EQ 5 in the LEED for Homes Rating System for more information on how to meet this prerequisite.

There is currently no ENERGY STAR labeling program for kitchen range fans. Avoid oversized range fans, which can depressurize homes and cause back-drafting of combustion appliances. For most kitchen applications, a range hood fan with a capacity of ~200 cubic feet per minute (CFM) is more than adequate.

For more information on kitchen fans or range hoods, go to the Products section of the Energy Star homepage, [www.energystar.gov](http://www.energystar.gov)

If continuous, the CFM for intermittent kitchen fans should be at least 100 CFM or five air changes per hour (ach), based on kitchen volume, per ASHRAE Standard 62.2-2007 section 5.

### **Additional Things to Consider**

(source: ASHRAE Advanced Energy Design Guide for K-12 School Buildings) Zone exhaust airflows (for restrooms, janitorial closets, science laboratories, kitchens, art and vocational classrooms, locker rooms, etc.) should be determined based on the current version of ASHRAE Standard 62.1, but should not be less than the values required by local code unless approved by the authority having jurisdiction.

Central exhaust systems for restrooms, janitorial closets, and locker rooms should be interlocked to operate with the air-conditioning system, except during unoccupied periods. Such a system should have a motorized damper that opens and closes with the operation of the fan. The damper should be located as close as possible to the duct penetration of the building envelope to minimize conductive heat transfer through the duct wall and avoid having to insulate the entire duct.

During unoccupied periods, it should remain closed and the exhaust fan turned off, even if the air-conditioning system is operating to maintain setback or setup temperatures. Consider designing exhaust ductwork to facilitate recovery of energy from Class 1 and Class 2 (e.g., restrooms) exhaust air, per the requirements of ASHRAE Standard 62.1.

Kitchens will generally have separate exhaust and make-up air systems according to the use of the kitchen and to the equipment manufacturers’ suggestions. If showers are provided in locker rooms, exhaust must be increased during use and will generally require separate air intake (intake hood or make-up air unit).

ASHRAE Advanced Energy Design Guides, [www.ashrae.org/publications/page/1604](http://www.ashrae.org/publications/page/1604)  
ASHRAE Standard 62.1-2007, [www.ashrae.org/technology/page/548](http://www.ashrae.org/technology/page/548)

This site provides a viewable version of ASHRAE Standard 62.1-2007.

Healthy Living Environment	
6.4	<b>Water Heaters: Mold Prevention</b> Use tankless hot water heaters or install conventional hot water heaters in rooms with drains or catch pans with drains piped to the exterior of the dwelling and with non-water sensitive floor coverings.

### How

Install conventional hot water heaters in rooms with drains or catch pans with drains piped to the exterior of the dwelling and with nonwater sensitive floor coverings or use tankless hot water heaters. Drain pans shall be sloped and corrosion resistant (e.g., stainless or plastic) with drains at the low point. Condensate lines shall be drained to drainage system; not just deposited under slab.

### 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)

Healthy Living Environment	
6.5	<b>Material in Wet Areas: Surfaces</b> In wet area, use materials that have smooth, durable, cleanable surfaces. Do not use mold-propagating materials such as vinyl wallpaper and unsealed grout.

### 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.

## Things to Consider

This measure will help a project to meet part of a prerequisite in LEED for Homes. Prerequisite ID 2.1, part c) requires, among other things, that kitchens, bathrooms, laundry rooms, spa areas, and entryways within 3 feet of the exterior door make use of water-resistant flooring. Carpet is not allowed.

Healthy Living Environment		
6.6	<b>Basements and Concrete Slabs: Vapor Barrier</b> Provide vapor barrier under all slabs. For concrete floors either in basements or on-grade slab install a capillary break of 4 inches of gravel over soil. Cover all gravel with 6 millimeter polyethylene sheeting moisture barrier with joints overlapped one foot or more. On interior below grade walls, avoid using separate vapor barrier or below grade vertical insulation.	

## 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 diameter 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.

Install at least 1” extruded polystyrene below the slab in addition to the vapor barrier to control mold growth.

Place a capillary break on top of footing between footing and foundation wall to stop capillary action.

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. Semi-vapor permeable rigid insulation is not considered a vapor barrier.

## 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.

Healthy Living Environment		
6.7	<b>Water Drainage</b> Provide drainage of water to the lowest level of concrete away from windows, walls, and foundations.	IRC 405.1

## How

Provide drainage of water to the lowest level of concrete away from windows, walls and foundations by implementing the following techniques:

- ✓ **Water management – Walls**
  - Provides a house-wrap/weather resistive barrier with sheets lapped, shingle style, especially over windows, doors and other penetrations to prevent rain water that penetrates the finished exterior cladding system, from entering the wall assembly or being introduced into window or door openings
  - Provides a pathway for liquid water that has penetrated the cladding system or accumulates due to daily or seasonal changes in thermal and humidity levels behind the cladding system to safely exit the exterior wall assembly
  - Flashing and/or weather-resistive barriers installed in rough window and door openings must integrate with window and door unit flashings, particularly at the sill and head OR
  - Install pan flashing, side flashing that extends over pan flashing, and Head Flashing (top flashing) that extends over side flashing on windows and exterior door openings. Apply window pan flashing over building paper at sill and corner patches.
  - Flashings at roofs wall intersections and at penetrations through the wall (i.e. plumbing, electrical, vents, HVAC refrigerant lines, etc.) that are provided by other trades must be integrated with the drainage plane to keep water from entering the wall assembly.
  
- ✓ **Water Management - Roof Systems**
  - Installation of drip edge at entire perimeter of roof
  - Flashing where sloped roofs meet gable wall end/all vertical wall integrated into building drainage plane
  - Use of kick-out flashings at all wall eave intersections integrated into drainage plane
  - At wall/roof intersections maintain  $\geq 2''$  clearance between wall cladding and roofing materials

- Integrity and Continuity of the Thermal Barrier
- The drainage plane, when properly sealed, can also reduce airflow through the wall assembly, which improves the thermal performance of the cavity insulation

### 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 ensures proper water drainage.

### Things to Consider

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

See Building America Best Practice Guides- free downloads at:

[www.eere.energy.gov/buildings/building\\_america](http://www.eere.energy.gov/buildings/building_america)

See EEBA Water Management Guide (for purchase only) at: [www.eeba.org/bookstore](http://www.eeba.org/bookstore)

Search examples of model wall assemblies online at the Energy and Environmental Building Alliance, [www.eeba.org](http://www.eeba.org), and Building Science Corporation, [www.buildingscience.com](http://www.buildingscience.com)

Any wet blown insulation product installed in wall cavities must be tested and verified to have a moisture content level of less than 15 percent prior to enclosure.

Healthy Living Environment		
6.8	<p><b>Garage Isolation</b> Provide a continuous air barrier between the conditioned (living) space and any unconditioned garage space. In single-family houses with attached garages, install a CO alarm inside the house on the wall that is attached to the garage and outside the sleeping area, and do not install air handling equipment in the garage.</p>	

### How

#### For residential projects:

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.

Do not install HVAC equipment in a garage unless required by code.

All connecting doors between living space and garage shall include an automatic closer, and shall be fixed with gaskets or otherwise made substantially air-tight with weather stripping.



In single-family houses install a CO alarm inside the house on the wall that is attached to the garage and 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

Projects that achieve this measure also meet some of the requirements of LEED for Homes prerequisite EQ 10.1 “No HVAC in Garage,” which is a mandatory requirement for LEED certification.

Projects that meet this measure also may be eligible for points toward LEED certification under credits EQ 10.2 and 10.3 for minimizing pollutants from the garage and/or installing an exhaust fan in the garage.

Refer to ASHRAE 62.2 to specify garage contaminant isolation measures for residential projects. National Institute of Standards and Technology, “Air and Pollutant Transport from Attached Garages to Residential Living Spaces”

See [www.fire.nist.gov/bfrlpubs/build03/art068.html](http://www.fire.nist.gov/bfrlpubs/build03/art068.html)

Install a fan in the garage for ventilating exhaust and high moisture.

This report provides an overview of the major issues, as well as a review of relevant scientific studies and a series of field studies.

*Builder’s Guide* series for specific North American climate zones: Cold Climates, Mixed Humid Climates, Hot-Humid Climates, and Hot-Dry & Mixed Dry Climates, by Joseph Lstiburek, Ph.D., P.Eng. Building Science Press. Refer to the discussion and construction details regarding air sealing and connected garages.

See ASHRAE 62.1-2007 for contaminant isolation measures for non-residential projects, [www.ashrae.org/technology/page/548](http://www.ashrae.org/technology/page/548)

Healthy Living Environment		
6.9	Clothes Dryer Exhaust Clothes dryers must be exhausted directly to the outdoors.	IRC M1501.1

### How

Clothes dryers must be exhausted directly to the outdoors with a rigid type vent or via a heat or energy recovery ventilation system if applicable and appropriate.

### Intent

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

### Things to Consider

This measure will help a project meet part of a prerequisite in LEED for Homes. Prerequisite ID 2.1, part c) requires, among other things, that clothes dryers must be exhausted directly to the outdoors.

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.

Healthy Living Environment		
6.10	Cold and Hot Water Pipe Insulation Insulate exposed cold and hot water pipes in climates and building conditions susceptible to moisture condensation.	

### How

Insulate exposed cold and hot 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.

### Things to Consider

Any wet blown insulation product installed in wall cavities must be tested and verified to have a moisture content level of less than 15 percent prior to enclosure.

Healthy Living Environment		
6.11	Combustion Equipment: Includes Space and Water-Heating Equipment Specify power vented or combustion sealed equipment. Install one hard-wired CO detector for each sleeping area, minimum of one per floor.	

### How

Specify power vented or combustion sealed equipment. One hard-wired carbon monoxide (CO) detector shall be installed for each sleeping area, minimum one per floor.

## 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

This measure will help a project meet two of the four requirements of LEED for Homes prerequisite EQ 2.1 “Basic Combustion Venting Measures,” a mandatory requirement for LEED certification. Projects must also fulfill the following two requirements to meet this prerequisite:

- No unvented combustion appliances (e.g., decorative logs) are allowed.
- All fireplaces and woodstoves must have doors.

U.S. Environmental Protection Agency, Combustion Gases and Carbon Monoxide

See [www.epa.gov/iaq/combust.html](http://www.epa.gov/iaq/combust.html) and [www.epa.gov/iaq/co.html](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 [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.

Underwriters Laboratories, Product Safety Tips: CO Alarms

See [www.ul.com/consumers/co.html](http://www.ul.com/consumers/co.html)

This site provides a basic overview of the problems associated with carbon monoxide, as well as tips about purchasing and installing carbon monoxide alarms.

## Section 7: Operations and Maintenance

Operations and maintenance (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.

Operations and Maintenance	
7.1	<b>Building Maintenance Manual</b> Provide a manual that includes the following: a routine maintenance plan; instructions for all appliance, HVAC operation, water-systems turnoffs, lighting equipment, paving materials and landscaping, pest control and other systems that are part of each occupancy unit.

## How

Provide a manual that includes the following: a routine maintenance plan, operations and maintenance guidance for all appliances, HVAC operation, water-system turnoffs, lighting equipment, paving materials and landscaping, pest control, and other systems that are part of each occupancy unit. Also include an occupancy turnover plan that describes in detail the process of educating the tenant about proper use and maintenance of all building systems.

**Intent**

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

**Things to Consider**

Refer to Building Maintenance Manual Template under Information Resources at [www.greencommunitiesonline.org](http://www.greencommunitiesonline.org)

Projects that achieve this measure also meet one of the two requirements for LEED for Homes credit AE 2 “Education of Building Manager,” worth one point toward LEED certification. Note that the required LEED documentation must be included in the manual. The other requirement for this LEED credit is a one-hour walkthrough of the building before occupancy to identify installed equipment, provide instructions for operation and describe necessary maintenance protocol.

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.

“Healthy Homes Maintenance Checklist,” [www.centerforhealthyhousing.org](http://www.centerforhealthyhousing.org)

Operations and Maintenance	
7.2	<p><b>Occupant’s Manual</b></p> <p>Provide a guide for homeowners / building owners and renters that explains the intent, benefits, use and maintenance of green building features, along with the location of transit stops, transit opportunities in the community and other neighborhood conveniences, and encourages additional green activities such as recycling, gardening and use of healthy cleaning materials, alternate measures for pest control and purchase of green power. Promotion of additional recycling programs within the City or with the South Dallas County Landfill should also be distributed.</p>

**How**

Provide a guide for homeowners, building owners and renters that explains the intent, benefits, use and maintenance of green building features and native landscaping 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 (renewable) power from their local energy provider. For homeowners, include appropriate instructions from the Owner’s Manual in 7-1 above.

### Intent

Building owners and occupants may be unfamiliar with green systems or features installed in their homes or buildings, or with nearby amenities that can provide transportation choices and conveniences within walking distance. Assistance with understanding, operating and maintaining them will allow owners and occupants to fully realize the environmental, health and economic benefits that a sustainable home has to offer.

### Things to Consider

See Occupant Manual Template under Information Resources, [www.greencommunitiesonline.org](http://www.greencommunitiesonline.org)

Projects that achieve this measure also meet one requirement for LEED for Homes prerequisite AE 1.1 “Basic Operations Training,” a mandatory requirement for LEED certification. Note that the required LEED documentation must be included in the manual. The other mandatory requirement of this LEED prerequisite is a one-hour walkthrough of the home. Projects may also be eligible for additional points toward LEED certification for enhanced training or public awareness under AE 1.2 and 1.3.

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.

Minnesota Building Industry Foundation, Home-Smart, [www.home-smart.org](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 the first year.

Operations and Maintenance		
7.3	Homeowner / Building Owner Orientation Provide a walk-through and orientation to the homeowner / building owner or new occupant using the Occupant Manual from 7.1 above that reviews the building/s green features, operations and maintenance along with neighborhood conveniences.	

### How

Provide a comprehensive walk-through and orientation to the homeowner/building owner or new occupant using the Occupant Manual from 7-2 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 Perry Green Building Program achieves its intended environmental and economic benefits.

### **Things to Consider**

Projects that achieve this measure also meet one requirement for LEED for Homes prerequisite AE 1.1 “Basic Operations Training,” a mandatory requirement for LEED certification. The other mandatory requirement of this LEED prerequisite is provision of an operations and maintenance manual. Projects may also be eligible for additional LEED certification points for enhanced training or public awareness under AE 1.2 & 1.3.

Special Thanks to:

City of Adel  
Greater Dallas County Development Alliance  
Iowa Economic Development Authority

# Perry Green Building Program Development Worksheet

Developer Name: \_\_\_\_\_

Project Name: \_\_\_\_\_

Address (Street/City/State): \_\_\_\_\_

This worksheet provides a quick overview of the criteria and is a convenient resource for the project development team to track progress towards meeting the criteria during the planning stage. Please refer to the individual criterion for detailed information on how to comply with that particular criterion.

## Distinguishing Between Types of Rehab

For the purposes of this criterion with the City of Perry, gut rehabilitation is defined as an activity or project that involves extensive (substantial) rehabilitation. Refer to the full definition of gut rehabilitation on page 2 of the criteria. Rehabilitation is defined as projects with activities that are less extensive than gut rehabilitation.

Y N ?

Integrated Design		
1.1	<b>Universal Design and Visitability</b> Create spaces that meet the needs of all people, young, old, abled, and disabled.	

Y N ?

Site, Location, and Neighborhood Fabric		
2.1	<b>Smart Site Location: Passive Solar Heating / Cooling</b> Orient building to make greatest use of passive solar heating and cooling.	
2.2	<b>Erosion and Sediment Control</b> Implement SUDAS and City standards for best practices for erosion and sedimentation control during construction.	Mandatory
2.3	<b>Landscaping</b> Plant a minimum of two trees, one of which is placed in the front yard. Trees must be at least 1" caliper trees and be on the City's approved Tree List found in City Code Section 151. Provide a plan for additional landscaping that mitigates the effects of storm water and / or solar impact on the structure. Plan shall be provided at time of Certificate of Occupancy inspection. Locate plants to provide shading in the summer and allow for heat gain in the winter.	
2.4	<b>Surface Water Management</b> Capture, retain, infiltrate and / or harvest the first ½ inch of rainfall that falls in a 24 hour period.	

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Water Conservation		
3.1	<b>Water – Conserving Appliances and Fixtures: New Construction</b> Install water-conserving fixtures with the following minimum specifications: toilets – 1.3 GPF; showerheads – 2.0 GPM; kitchen faucets – 2.0 GPM; bathroom faucets – 2.0 GPM.	
3.2	<b>Water – Conserving Appliances and Fixtures: Rehabilitation</b> Install water-conserving fixtures with the following minimum specifications <i>for toilets and shower heads</i> and following requirements for other fixtures wherever and whenever they are replaced: toilets – 1.3 GPF; showerheads – 2.0 GPM; kitchen faucets – 2.0 GPM; bathroom faucets – 2.0 GPM.	
3.3	<b>Water – Conserving Appliances and Fixtures</b> Install water-conserving fixtures with the following minimum specifications: toilets – 1.1 GPF; showerheads – 1.75 GPM; kitchen faucets – 2.0 GPM; bathroom faucets – 1.5 GPM. Implementation of this task also qualifies homeowner with meeting 3.1 or 3.2 above.	
3.4	<b>Efficient Irrigation</b> If irrigation is necessary, use recycled gray water, roof water, collected site run-off, water from municipal storm system. Use of a highly efficient irrigation system including all of the following: system designed by EPA Water Sense professional, plant beds with a drip irrigation system, separately zoned turf and bedding types, a watering zone timer / controller, and moisture sensor control.	
3.5	<b>No Irrigation</b> Do not install irrigation	

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Energy Efficiency		
4.1	<b>Efficient Energy Use: New Construction</b> Meet IECC 2009 and Energy Star standards and achieve a HERS Index of 70 using a third-party HERS Rater.	Mandatory
4.2	<b>Efficient Energy Use: New Construction</b> Meet Energy Star standards (single family and low rise residential); exceed ASHRAE 90.1 – 2007 by 10 percent.	
4.3	<b>Efficient Energy Use: Rehabilitation</b> Perform an energy audit / analysis of existing building condition, estimate costs of improvements, and implement measures that will improve building energy performance by 15% from pre-renovation figures.	
4.4	<b>Energy Star Appliances</b> If providing appliances, install Energy Star clothes washers, dishwashers, and refrigerators, and dryers with built-in moisture sensors. Energy Star rating is the current rating system in effect at the time of the effective date of this ordinance.	Mandatory
4.5	<b>Efficient Lighting: Interior</b> Install 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 out doors.	Mandatory IECC 404.1



Y N ?

Energy Efficiency continued		
4.6	<b>Efficient Lighting: Exterior</b> Install daylight sensors or timers on all outdoor lighting, including front and rear porch lights in single family homes.	IECC 404.1
4.7	<b>HVAC Sizing, Installation and Duct Systems</b> Size heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manual, part J or other approved heating and cooling methods.	IECC 403.6
4.8	<b>Ventilation: New Construction</b> Install a ventilation system for the dwelling unit, providing adequate fresh air per ASHRAE 62.2 – 2007 for single family and low-rise multifamily dwellings.	
4.9	<b>Additional Reductions in Energy Use</b> Exceed the relevant Energy Star HERS score for residential buildings or exceed other standards by increased percentages.	
4.10	<b>Renewable Energy</b> Install PV panels, wind turbines or other renewable energy source to provide at least 10% of the project’s estimated electricity demand. (All such applications must meet current zoning and building code regulations.)	8 Points
4.11	<b>Photovoltaic (PV) Ready</b> Site, design, engineer and wire the project to accommodate installation of PV in the future.	Mandatory

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Materials Beneficial to the Environment		
5.1	<b>Construction Waste Management</b> Develop and implement a construction waste management plan to reduce the amount of material sent to the landfill by at least 25 percent.	
5.2	<b>Recycled Content Material</b> Use materials with recycled content, provide calculation for recycled content percentage based on cost or value or recycled content in relation to total materials for project. Minimum recycled material must be 5 percent.	
5.3	<b>Certified, Salvaged and Engineered Wood</b> Commit to using at least 25% (by cost) wood products and materials that are salvaged wood, engineered framing materials or certified in accordance with the Forest Stewardship Council.	
5.4	<b>Water-Permeable Walkways / Parking areas</b> Use water-permeable materials in 50 percent or more of all walkways and parking areas.	

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Materials Beneficial to the Environment continued		
5.5	<b>Reduce Heat – Island Effect: Roofing</b> Use Energy Star-compliant and high-emissive roofing.	
5.6	<b>Reduce Heat – Island Effect: Paving</b> Use light-colored, high albedo materials and/or open grid pavement with a minimum Solar Reflective Index of 6.0 over at least 30 percent of the site's hardscape area.	
5.7	<b>Reduce Heat – Island Effect: Plantings</b> Locate trees or other plantings to provide shading for at least 50 percent of sidewalks, patios and driveways within 50 feet of buildings.	

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Y N ?

Healthy Living Environment		
6.1	<b>Low / No Volatile Organic Compounds (VOC) Paints and Primers</b> Specify that all interior paints and primers must comply with current Green Seal standards for low VOC	
6.2	<b>Exhaust Fans: Bathroom</b> Install Energy Star-labeled bathroom fans that exhaust to the outdoors and are connected to a light switch and are equipped with a humidistat sensor or timer or operate continuously.	IRC M1506.2
6.3	<b>Exhaust Fans: Kitchen – New Construction or Rehabilitation</b> Install power vented fans or range hoods that exhaust to the exterior.	IRC M1502.1
6.4	<b>Water Heaters: Mold Prevention</b> Use tankless hot water heaters or install conventional hot water heaters in rooms with drains or catch pans with drains piped to the exterior of the dwelling and with non-water sensitive floor coverings.	
6.5	<b>Material in Wet Areas: Surfaces</b> In wet area, use materials that have smooth, durable, cleanable surfaces. Do not use mold-propagating materials such as vinyl wallpaper and unsealed grout.	
6.6	<b>Basements and Concrete Slabs: Vapor Barrier</b> Provide vapor barrier under all slabs. For concrete floors either in basements or on-grade slab install a capillary break of 4 inches of gravel over soil. Cover all gravel with 6 millimeter polyethylene sheeting moisture barrier with joints overlapped one foot or more. On interior below grade walls, avoid using separate vapor barrier or below grade vertical insulation.	

**Healthy Living Environment continued**

Y N ?

6.7	<b>Water Drainage</b> Provide drainage of water to the lowest level of concrete away from windows, walls, and foundations.	IRC 405.1
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Y N ?

6.8	<b>Garage Isolation</b> Provide a continuous air barrier between the conditioned (living) space and any unconditioned garage space. In single-family houses with attached garages, install a CO alarm inside the house on the wall that is attached to the garage and outside the sleeping area, and do not install air handling equipment in the garage.	
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Y N ?

6.9	<b>Clothes Dryer Exhaust</b> Clothes dryers must be exhausted directly to the outdoors.	IRC M1501.1
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Y N ?

6.10	<b>Cold and Hot Water Pipe Insulation</b> Insulate exposed cold and hot water pipes in climates and building conditions susceptible to moisture condensation.	
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Y N ?

6.11	<b>Combustion Equipment: Includes Space and Water-Heating Equipment</b> Specify power vented or combustion sealed equipment. Install one hard-wired CO detector for each sleeping area, minimum of one per floor.	
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**Operations and Maintenance**

Y N ?

7.1	<b>Building Maintenance Manual</b> Provide a manual that includes the following: a routine maintenance plan; instructions for all appliance, HVAC operation, water-systems turnoffs, lighting equipment, paving materials and landscaping, pest control and other systems that are part of each occupancy unit.	
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Y N ?

7.2	<b>Occupant's Manual</b> Provide a guide for homeowners / building owners and renters that explains the intent, benefits, use and maintenance of green building features, along with the location of transit stops, transit opportunities in the community and other neighborhood conveniences, and encourages additional green activities such as recycling, gardening and use of healthy cleaning materials, alternate measures for pest control and purchase of green power. Promotion of additional recycling programs within the City or with the South Dallas County Landfill should also be distributed.	
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Y N ?

7.3	<b>Homeowner / Building Owner Orientation</b> Provide a walk-through and orientation to the homeowner / building owner or new occupant using the Occupant Manual from 7.1 above that reviews the building/s green features, operations and maintenance along with neighborhood conveniences.	
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- IECC = International Energy Code Council, IRC = International Residential Code