LEED® for Homes Rating System

Multifamily Mid-Rise | October 2010

California Version, 2011 Update

U.S. Green Building Council

This document includes credits from the LEED for Homes Rating System: 2008 and LEED for Homes Multfamily Mid-Rise: 2010 but does not include the LEED for Homes addenda please refer to the addenda document for a comprehensive list of changes made to the LEED for Homes 2008 Rating System.

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Disclaimer and Notices

Trademark

This document describes the LEED for Homes program as it applies to multi-family mid-rise buildings. Any and all multi-family mid-rise projects are welcome to participate as long as the eligibility requirements below are met. Project managers should be aware that this pilot is part of an evaluation effort for mid-rise buildings, and they are asked to

be flexible, maintain regular communication with their Provider, and document any and all challenges, complications, etc. associated with the LEED for Homes program requirements.

Changes from the LEED for Homes Rating System

This document builds upon the LEED for Homes 2008 Rating System, available on the USGBC website. In the schematics that precede each section below, the dark green shaded boxes (e.g. ID 2) refer to credits that are already described in the national LEED for Homes Rating System and are not changed for mid-rise buildings. The light green shaded boxes (e.g. EA credit 1) refer to credits that have been customized for mid-rise projects. These credits are presented in more detail in the following pages.

Eligibility and applicability

Any projects interested pursuing LEED for Homes multifamily mid-rise must contract with a LEED for Homes Provider and submit an informal request for participation to the LEED for Homes Program Director prior to construction.

Buildings in the LEED for Homes mid-rise multi-family pilot must meet the following criteria:

- Each project must register through a designated LEED for Homes Provider.
- At least 50% of the occupied space must be residential. If more than 50% of the occupied spaces is non-residential, the building must pursue LEED for New Construction (LEED-NC) certification. Mixed-use buildings are subject to the LEED for Homes policy on mixed-used spaces.
- The building must include 4-6 above-grade occupiable stories. A building with fewer than 4 above-grade stories must pursue certification using the standard LEED for Homes Rating System. Any occupiable space, including commercial space, should be counted toward the number of stories except garages, basements, or cellars.[1] A story should be counted if 20% or more of the space is occupiable.[2]
- The building must include at least 2 living units. A building that contains only one living unit is considered a single-family home and must use the standard LEED for Homes Rating System.
- The prerequisites and credits and applicable for the entire building, not just the residential spaces. For any section of the building not completed at the time of certification (e.g., commercial space up for lease), tenant fit-out guidelines must be part of any contract and a copy must be submitted with

[1] Even conditioned basements or cellars should not be counted as “stories”.
[2] If a project has more than 20% occupied space on a garage level, the project may appeal to USGBC for inclusion in the mid-rise pilot. However, these projects are encouraged instead to pursue LEED-NC.

the certification documents to ensure that all prerequisites and credits are met by the entire building, as appropriate.

Additional Documentation Required

In addition to the regular documentation required for certification within the LEED for Homes program, mid-rise projects must also submit an energy modeling information form. This should be submitted as early as possible, and no later than when the project applies for certification. This form is available on the LEED for Homes Provider Resources website.

Sampling

Mid-rise buildings may use the LEED for Homes Multi-family Sampling Protocol. Note that the scope of this sampling protocol is for one multi-family building. If a project team wishes to sample across multiple multi-family buildings, the LEED for Homes Provider must contact the USGBC with a proposed sampling protocol for the project, which must be approved by the USGBC.

Overview of LEED for Homes

LEED for Homes is an initiative designed to promote the transformation of the mainstream homebuilding industry toward more sustainable practices. LEED for Homes is targeting the top 25% of new homes with best practice environmental features. LEED for Homes is a collaborative initiative that actively works with all sectors of the homebuilding industry.

By recognizing sustainable design and construction in homes nationwide, LEED for Homes helps home builders differentiate their homes as some of the best homes in their markets, using a recognized national brand. Furthermore, homebuyers can more readily identify third-party verified green homes.

While there are already a number of local or regional green homebuilding programs, LEED for Homes is attempting to provide national consistency in defining the features of a green home and to enable builders anywhere in the country to obtain a green rating on their homes. LEED for Homes represents a consensus standard for green homebuilding developed and refined by a diverse cadre of national experts and experienced green builders. The LEED for Homes Rating System is part of the comprehensive suite of LEED assessment tools offered by USGBC to promote sustainable design, construction, and operations practices in buildings nationwide.

The LEED for Homes Rating System measures the overall performance of a home in eight categories:

1. **Innovation & Design Process (ID).** Special design methods, unique regional credits, measures not currently addressed in the Rating System, and exemplary performance levels.
2. **Location & Linkages (LL).** The placement of homes in socially and environmentally responsible ways in relation to the larger community.
3. **Sustainable Sites (SS).** The use of the entire property so as to minimize the project's impact on the site.
4. **Water Efficiency (WE).** Water-efficient practices, both indoor and outdoor.
5. **Energy & Atmosphere (EA).** Energy efficiency, particularly in the building envelope and heating and cooling design.
6. **Materials & Resources (MR).** Efficient utilization of materials, selection of environmentally preferable materials, and minimization of waste during construction.
7. **Indoor Environmental Quality (EQ).** Improvement of indoor air quality by reducing the creation of and exposure to pollutants.
8. **Awareness & Education (AE).** The education of homeowner, tenant, and/or building manager about the operation and maintenance of the green features of a LEED home.

The LEED for Homes Rating System works by requiring a minimum level of performance through prerequisites, and rewarding improved performance in each of the above categories. The level of performance is indicated by four

performance tiers – Certified, Silver, Gold and Platinum – according to the number of points earned (Exhibit 1).

Exhibit 1
LEED for Homes Certification Levels

LEED for Homes Certification Levels	*Number of LEED for Homes points Required*
Certified	45-59
Silver	60-74
Gold	75-89
Platinum	90-136
Total available points	136

The number of points for each certification level is adjusted for smaller-than-average and larger-than-average homes using a mechanism called the Home Size Adjustment.

The Rating System guarantees minimum levels of sustainable practice through 18 prerequisites in the eight credit categories. At the same time, projects enjoy flexibility with the wide variety of credits available to achieve certification. Credit Interpretation Requests (CIRs) are also available to projects that seek clarification or special consideration on specific credits.

Credit Interpretations and Innovative Design Requests

The measures in the LEED for Homes Rating System are worth a total of 136 possible points. Aside from the requirements stated for each credit, there are two alternative methods of acquiring points:

Credit Interpretation Requests (CIRs). If a project team identifies an alternative way of achieving the intent of an existing LEED credit, the team can request permission to meet the intent of the credit using an approach that is different from the stated requirements.

Innovative Design Requests (IDRs). An innovative design credit is a way of earning extra LEED points outside the established credit categories. These credits are counted in ID 3.1-3.4. There are three ways to earn ID points:

- Implement technologies or strategies that are not included in the Rating System but offer substantial environmental benefits.
- Implement a regionally appropriate green technology or strategy that is not already addressed in the Rating System, for use within a defined region.
- Demonstrate "exemplary performance" by substantially exceeding the requirements in a LEED for Homes credit. Exemplary performance guidelines for various credits are included in the LEED for Homes Reference Guide.

For both kinds of requests (CIRs and IDRs), the project team must submit a formal request to USGBC through the Provider. No points are awarded until USGBC has reviewed and approved the request. Both requests are handled according to the following process:

1. Formal request. The Provider submits a project team's request to USGBC. The request or proposal should be structed like a LEED credit; that is, it should include a title, intent, rationale, requirements, and documentation or verification requirements.
2. Preliminary response. After reviewing the Credit Interpretation or Innovative Design Request, USGBC responds to the Provider by indicating that the proposed approach is (a) appropriate and eligible to earn points, (b) ineligible to earn points, or (c) appropriate and likely to earn the desired points with some indicated modifications, such as additional documentation or a higher performance threshold. In case (c), the USGBC ruling is preliminary, subject to the receipt of the indicated modifications from the Provider.
3. Final rating. At the time of the final rating, the Provider can include the credit interpretation or innovative design credit in the final scoring for that LEED home.

Both CIRs and IDRs should be submitted during the preliminary rating, and may be submitted only by the Provider on behalf of the project team.

Accountability Forms

Many of the measures in the LEED for Homes Rating System have a substantial design component. These measures are very difficult for the Green Rater to visually verify in the field. If the Green Rater is to fully understand how these measures were installed, it would require a great deal of the Rater's time to retrace the design steps.

An Accountability Form is intended to shift the responsibility for the verification from the Green Rater to the design professional responsible for a specific LEED for Homes measure. The form is to be signed by the responsible party (e.g., the builder, engineer, architect, landscape professional) who actually completed the design. With this form, he or she formally attests to the completion of the measure and compliance with the requirements.

Credits that require an Accountability Form signature are noted on the LEED for Homes checklist by the "  " symbol.

Home Size Adjustment

The Home Size Adjustment compensates for the overarching effect of home size on resource consumption by adjusting the award level point thresholds (for certified, silver, gold, and platinum) based on home size. The adjustments are based on material and energy impacts as described below under *Rationale*. The LEED for Homes Checklist automatically makes this adjustment when the home size and number of bedrooms are entered.

The effect of the adjustment on award thresholds can also be determined by consulting Exhibits 4-6, as described below under “Instructions” below. For multifamily buildings, see “Home Size Adjustment for Multifamily Buildings” that follows.

Instructions

1. Calculate the area of the home in square feet. Follow the calculation method laid out in ANSI Standard Z765, but include all directly conditioned square footage, whether finished or not, that meets building code requirements for living space (e.g., head room, egress, etc.).
2. Determine the number of bedrooms in the home. A “bedroom”, for purposes of this adjustment, is any room or space that could be used or is intended to be used for sleeping purposes and meets local fire and building code requirements. It is advantageous to count as bedrooms all rooms that meet this definition. When in doubt, consider whether the room in question might be used as a bedroom if another member were added to the household (e.g. new baby, nanny, grandparent, exchange student); if the answer is yes, count the room as a bedroom.
3. If there are 5 or fewer bedrooms, find the size of the home in the appropriate column in Exhibit 4. Read across the row to find the number of points to add or subtract. If the home is larger than the size shown in the bottom row of the applicable column, refer to Exhibit 5 to estimate the threshold adjustment, or to Exhibit 6 to calculate the adjustment.
4. If there are 6 or more bedrooms, use Exhibit 5 and/or Exhibit 6 to calculate the adjustment.
5. Add the adjustment to the number of points needed to earn the desired award level (Certified, Silver, Gold, or Platinum). A negative adjustment (for homes that are smaller than average) will lower the threshold for each award level (making it easier to reach); positive adjustments will raise the thresholds.

Definition: A *bedroom*, for purposes of this adjuster, is any room or space that could be used or is intended to be used for sleeping purposes and meets local fire and building code requirements.

Exhibit 4
Threshold Adjustment
(point range: -10 to +10)

Maximum home size (ft^2) by number of bedrooms					*Adjustment to award thresholds**
≤ 1 Bedroom	*2 Bedrooms*	*3 Bedrooms*	*4 Bedrooms*	*5 Bedrooms*	
610	950	1290	1770	1940	-10
640	990	1340	1840	2010	-9
660	1030	1400	1910	2090	-8
680	1070	1450	1990	2180	-7
710	1110	1500	2060	2260	-6
740	1160	1570	2140	2350	-5
770	1200	1630	2230	2440	-4
800	1250	1690	2320	2540	-3
830	1300	1760	2400	2640	-2
860	1350	1830	2500	2740	-1
900	**1400**	**1900**	**2600**	**2850**	**0 (“neutral”)**
940	1450	1970	2700	2960	+1
970	1510	2050	2810	3080	+2
1010	1570	2130	2920	3200	+3
1050	1630	2220	3030	3320	+4
1090	1700	2300	3150	3460	+5
1130	1760	2390	3280	3590	+6
1180	1830	2490	3400	3730	+7
1220	1910	2590	3540	3880	+8
1270	1980	2690	3680	4030	+-9
1320	2060	2790	3820	4190	+10
For larger homes, or homes with more bedrooms, see below.					

Note: As an example, an Adjustment of -5 means that the threshold for a “Certified” LEED home is 40 points (rather than the 45 points for an averaged sized home). Similarly, Silver would require a minimum of 55 points rather than 60 points; Gold would require a minimum of 70; and Platinum would require a minimum of 85 points.

Exhibit 5
Threshold Adjustment Equation

Threshold adjustment = 18 * *log* (actual home size / neutral home size) / *log* (2)

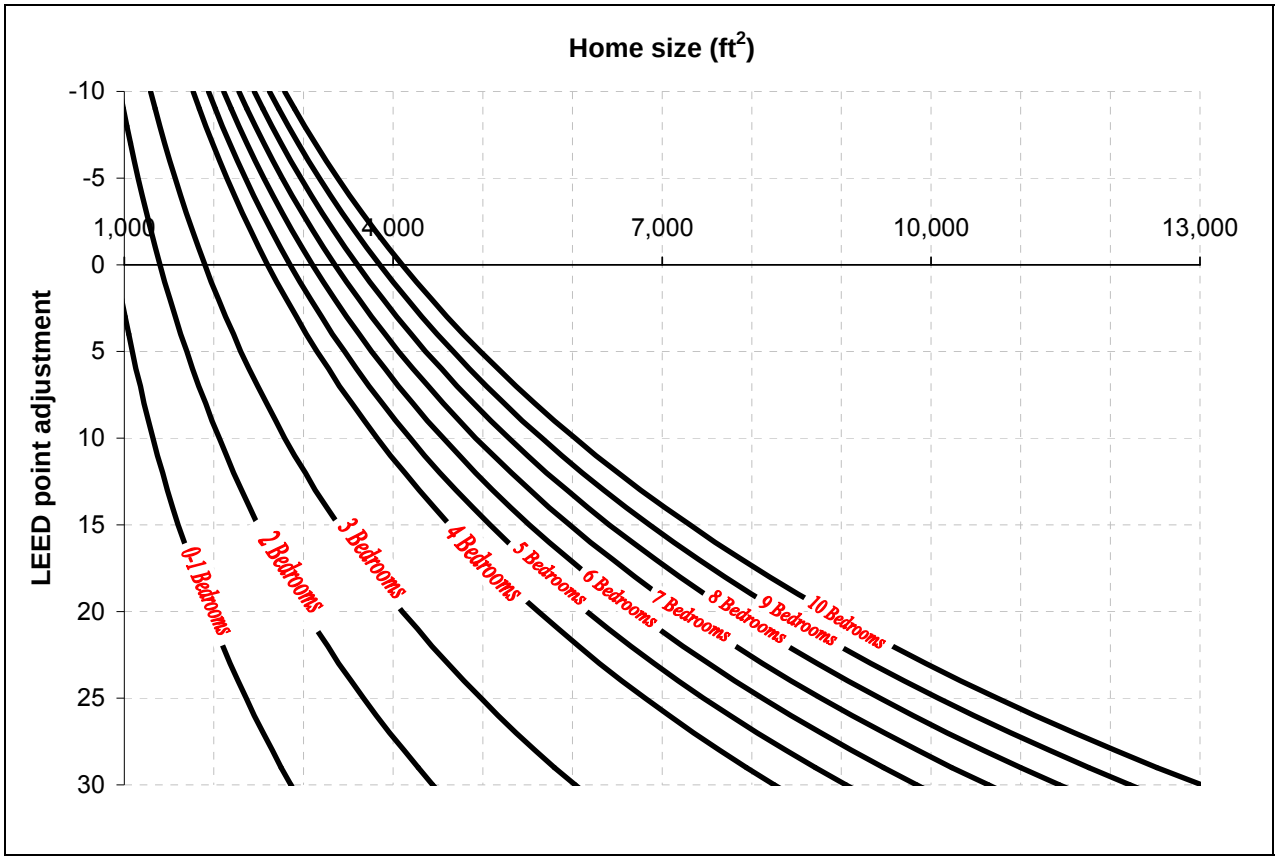
Neutral home size, as used in Exhibit 6, is determined according to the following table:

Bedrooms	***≤1***	***2***	***3***	***4***	***5***	***6 or more***
Neutral home size (ft^2)	900	1,400	1,900	2,600	2,850	250 ft^2 more for each additional bedroom

Note: For homes with more than 5 bedrooms, “neutral home size” is defined as follows:

*2600 + [250 * (number of bedrooms – 5)]*

Exhibit 6
Threshold Adjustment Curves
(point range: -10 and above)



Rationale

All things being otherwise equal, a large home consumes more materials and energy than a small home over its lifecycle (including pre-construction, construction, use, and demolition or deconstruction). The adjustment compensates for these impacts by making it easier or harder to reach each LEED for Homes certification. There is no impact on award thresholds for average-sized homes, whereas thresholds for smaller-than-average homes are lowered and thresholds for larger-than-average homes are raised.

Data published by the U.S. Census Bureau in the *American Housing Survey for 2005* shows a strong correlation between number of bedrooms and number of occupants. Although a home may serve many different households over its lifespan, in general, a home with more bedrooms will serve more people. The adjustment therefore categorizes homes by the number of bedrooms.

The relationship between home size and LEED points is based on estimated

energy and materials impacts within the context of the LEED for Homes Rating System. Available published data and informal studies of energy and materials usage in homes reveal two key relationships:

- A 100% increase in home size yields an increase in annual energy usage of 15% to 50%, depending on the design, location, and occupants of the home.
- A 100% increase in home size yields an increase in materials usage of 40% to 90%, depending on the design and location of the home.

These data were simplified and generalized to the assumption that as home size doubles, energy consumption increases by roughly one-quarter and material consumption increases by roughly one-half; combined, these amount to an increase in impact of roughly one-third with each doubling in home size. Thus the point adjustment equates to one-third of the points available in the Materials & Resources and Energy & Atmosphere categories combined for each doubling in home size.

Home Size Adjustment for Multifamily Buildings

For each unit type (0, 1, 2, 3 bedroom, etc.), respectively:

Weighted Average Home Size Adjustment for Building

= [$\sum_{\text{by unit type}}$ (adjustment for unit * number of units of that type in project)] ÷ total number of units in project

where *home size adjustment for unit* is equal to the point adjustment from Exhibit 4 or Exhibit 6 above, based on the average floor area for all units of that type.

Example

1-Bedroom Units

Number of Units:	10
Total Floor Area for 1BR Units:	8,300 SF
Average Area / Unit:	830 SF
Home Size Adjustment (1 bedroom):	-2 points

2-Bedroom Units

Number of Units:	5
Total Floor Area for 2BR Units:	7,250 SF
Average Area / Unit:	1,450 SF
Home Size Adjustment (2 bedrooms):	+1 points

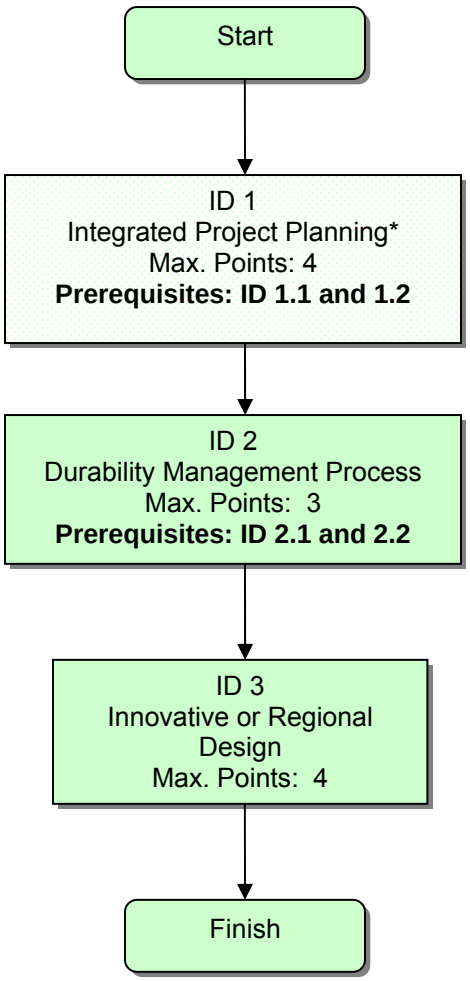
Overall Home Size Adjustment

Weighted Average Home Size Adjustment
= [(1-BR score * 1-BR units) + (2-BR score * 2-BR units)] ÷ total units
= [(-2 * 10) + (+1 * 5)] / 15
= -1

Thus, the LEED for Homes award thresholds for this multifamily building are Certified, 44 points; Silver, 59 points; Gold, 74 points; and Platinum, 89 points.

Innovation & Design Process (ID)

Pathway through the ID Category



ID 1. Integrated Project Planning *in Mid-rise Buildings*

Maximum points: 4

Intent

Maximize opportunities for integrated, cost-effective adoption of green design and construction strategies.

Requirements

Prerequisite

1.1 **Preliminary Rating.** As early as practical, conduct a preliminary LEED for Homes meeting, with the participation of the Provider and key members of the project team. As part of the meeting, create an action plan that identifies the following:

- The targeted LEED award level (Certified, Silver, Gold, or Platinum).
- The LEED for Homes credits that have been selected to meet the targeted award level.
- The party accountable for meeting the LEED for Homes requirements for each selected credit.

1.2 **Energy Expertise in MID-RISE.** Each project team must include at least the following set of expertise:

- An individual familiar with mid-rise energy systems and components, including mechanical equipment, envelope upgrades, etc. Experience with green mid-rise or high-rise residential buildings is preferred, but not required
- An individual with experience performing energy modeling per ASHRAE Standard. 90.1, Appendix G. Experience with LEED-NC energy modeling is preferred, but not required.

Credits

1.3 **Professional Credentialed with Respect to LEED for Homes** (1 point). At least one principal member of the project team shall be a professional who is credentialed with respect to LEED for Homes as determined by the U.S. Green Building Council.

1.4 **Design Charrette** (1 point). No later than the design development phase and preferably during schematic design, conduct at least one full-day integrated design workshop with the project team, which must include at least three of the following skill sets:

- Architecture or residential building design;
- Mechanical or energy engineering, or someone that meets the qualifications defined in ID 1.2;
- Building science or performance testing;
- Green building or sustainable design;
- Civil engineering, landscape architecture, habitat restoration, or land-use planning

Use the workshop to integrate green strategies across all aspects of the building design, drawing on the expertise of all participants.

1.5 **Building Orientation for Solar Design** (1 point). Design the building such that all of the following requirements are met:

a) The glazing area on the north- and south-facing walls of the building is at least 50% greater than the sum of the glazing area on the east- and west- facing walls.

b) The east-west axis of the building is within 15 degrees of due east-west.

c) The roof has a minimum of 450 square feet of south-facing area that is oriented appropriately for solar applications.

d) At least 90% of the glazing on the south-facing wall is completely shaded (using shading, overhangs, etc.) at noon on June 21 and unshaded at noon on December 21.

1.6 **Trades Training for MID-RISE** (1 point). Beginning prior to construction but after trades have been hired for the project, hold a total of 8 hours of training focusing on the green or otherwise unusual aspects of the project, including each LEED for Homes relevant prerequisite, and the expectations for ensuring certification. Include at least the following trades:

- Plumbing
- Mechanical systems
- Insulation

Synergies and Trade-Offs

This credit is intended to promote an integrated, system-oriented approach to green project design and development. The selected green homebuilding strategies and technologies in the Rating System should each be fully integrated into a home's design.

ID 2. Durability Management Process

Maximum points: 3

Intent

Promote durability and high performance of the building enclosure and its components and systems through appropriate design, materials selection, and construction practices.

Requirements

Note: USGBC and its representatives are responsible only for verifying the completion of LEED for Homes requirements; such verification in no way constitutes a warranty as to the appropriateness of the selected durability measures or the quality of implementation (see Disclaimer, page 2).

Prerequisites

2.1 **Durability Planning**. Prior to construction, the project team shall do the following:

a) Complete the Durability Risk Evaluation Form to identify all moderate- and high-risk durability issues for the building enclosure.

b) Develop specific measures to respond to those issues.

c) Identify and incorporate all the applicable indoor moisture control measures listed in Table 1.

d) Incorporate the measures from 2.1(b) and (c), above, into project documents (drawings, specifications, and/or scopes of work, as appropriate).

e) List all the durability measures and indicate their locations in the project documents in a durability inspection checklist. Include the checklist in project documents for use in verification.

2.2 **Durability Management.** During construction, the builder shall have a quality management process in place to ensure installation of the durability measures. This prerequisite can be satisfied by having the builder inspect and check off each measure in the durability inspection checklist created for 2.1(e), above.

Credits

2.3 **Third-Party Durability Management Verification** (3 points). Have the Green Rater inspect and verify each measure listed in the durability inspection checklist created for 2.1(e), above.

Table 1. Indoor Moisture Control Measures

Location or equipment	*Required moisture control measure*
Tub, showers, and spa areas	Use nonpaper-faced backer board on walls.
Kitchen, bathroom, laundry rooms, and spa areas	Use water-resistant flooring; do not install carpet.
Entryway (within 3 feet of exterior door)	Use water-resistant flooring; do not install carpet.
Tank water heater in or over living space	Install drain and drain pan.
Clothes washer in or over living space	Install drain and drain pan, or install accessible single-throw supply valve.
Conventional clothes dryer	Exhaust directly to outdoors.
Condensing clothes dryer	Install drain and drain pan.

Synergies and Trade-Offs

Many of the credits in the LEED for Homes Rating System can serve as durability strategies and may be used in the creation of a durability inspection checklist. If this is done, the home can still receive LEED points for those credits.

ID 3. Innovative or Regional Design **Maximum points: 4**

Intent

Minimize the environmental impact of the home by incorporating additional green design and construction measures that have tangible and demonstrable benefits beyond those in the LEED for Homes Rating System.

Requirement

Prerequisites

None.

Credits

3.1 **Innovation 1** (1 point). Prepare a written Innovative Design Request, to be submitted by the LEED for Homes Provider to USGBC, explaining the merits of the proposed measure. This point cannot be counted until LEED for Homes has ruled on the request. All written submittals must contain the following:

- the intent of the proposed measure;
- the proposed requirement for compliance;
- the proposed documentation to demonstrate compliance; and
- a description and an estimate of the benefit or impact provided by the proposed measure.

3.2 **Innovation 2** (1 point).

3.3 **Innovation 3** (1 point).

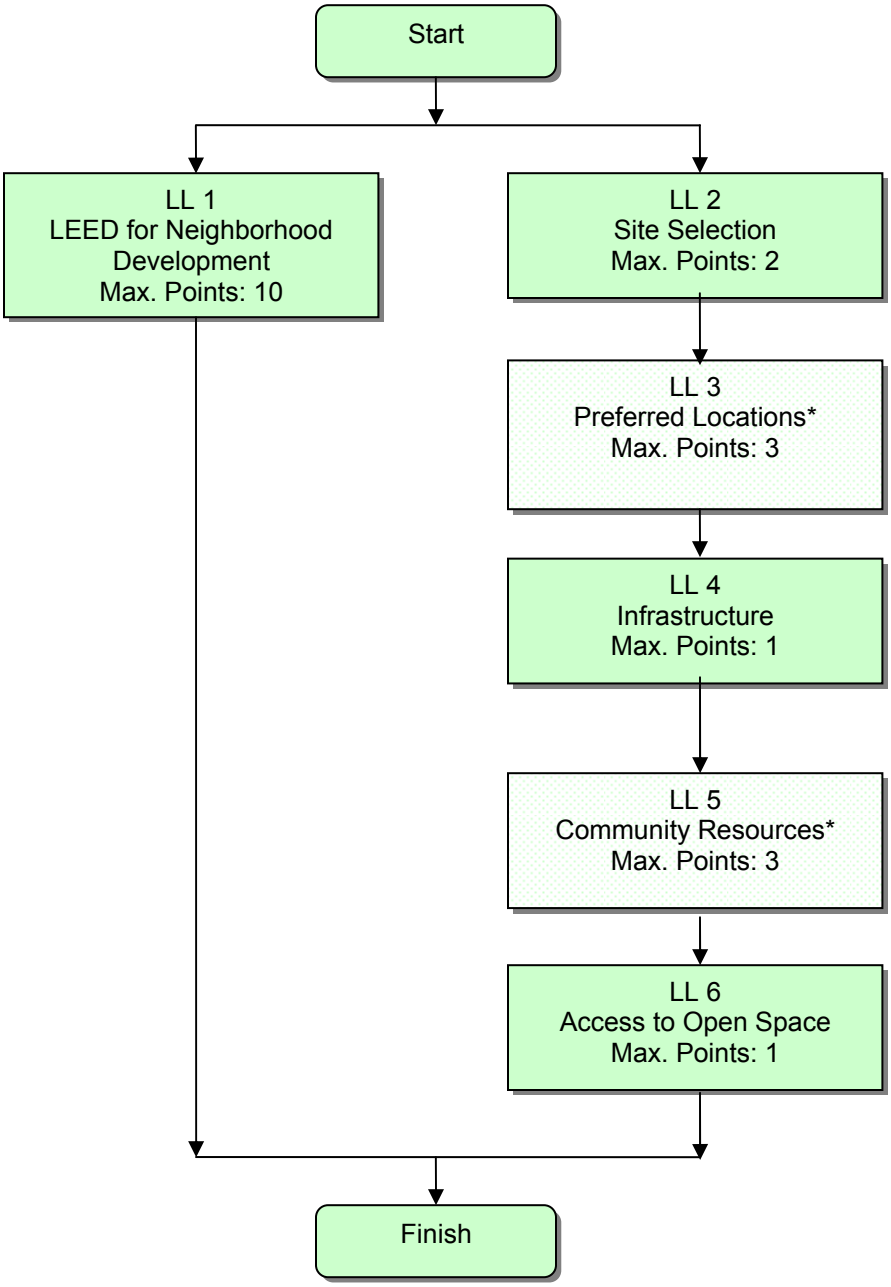
3.4 **Innovation 4** (1 point).

Synergies and Trade-Offs

This credit rewards innovative or regional measures that are not addressed elsewhere in the Rating System. A project can also receive 1 LEED point for exceeding the performance requirements of existing credits.

Location & Linkages (LL)

Optional Pathways through the LL Category



LL 1. LEED for Neighborhood Development **Maximum points: 10**

Intent

Minimize the environmental impact of land development practices by building homes in LEED for Neighborhood Development certified developments.

Requirements

Prerequisites

None.

Credits

1 **LEED for Neighborhood Development** (10 points). Complete the requirements of the LEED for Neighborhood Development (LEED-ND) certification program.

Synergies and Trade-Offs

A project receiving points for LL 1 is not eligible for points under LL 2-6, and vice versa.

LL 2. Site Selection

Maximum points: 2

Intent

Avoid development on environmentally sensitive sites.

Requirements

Prerequisites

None.

Credits

2 **Site Selection** (2 points). Do not develop buildings, built structures, roads or parking areas on portions of sites that meet any of the following criteria:

a) Land whose elevation is at or below the 100-year floodplain as defined by FEMA.

b) Land that is specifically identified as habitat for any species on federal or state threatened or endangered lists.

c) Land within 100 feet of any water, including wetlands as defined by U.S. Code of Federal Regulations 40 CFR, Parts 230–233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, *or* land within distances given in applicable state or local regulations, whichever is more stringent. New wetlands constructed as part of stormwater mitigation or other site restoration efforts are exempt from this part of the requirement.

d) Land that prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (park authority projects are exempt).

e) Land that contains “prime soils”, “unique soils”, or “soils of state significance”, as identified in state Natural Resources Conservation Service soil surveys. Verification of soil types should be conducted by the project civil engineer, wetlands engineer, or biologist. If no project team member is qualified to verify this requirement, follow the steps laid out in the LEED for Homes Reference Guide. Sites that are previously developed are exempt from this requirement.

Synergies and Trade-Offs

A project receiving points for LL 1 is not eligible for points under LL 2-6, and vice versa.

LL 3. Preferred Locations *in Mid-rise Buildings*

Maximum points: 3

Intent

Encourage the building of LEED mid-rise buildings near or within existing communities, and to rehabilitate damaged sites where development is complicated by environmental contamination.

Requirements

Prerequisites

None.

Credits

3.1 **Edge Development** (1 point). Select a lot such that at least 25% of the perimeter immediately borders previously developed land. In the case of a multi-building new development, each mid-rise building in the development is awarded this point if at least 25% of the development site immediately borders previously developed land.

OR

3.2 **Infill** (2 points). Select a lot such that at least 75% of the perimeter immediately borders previously developed land. In the case of a multi-building new development, each mid-rise building in the development is awarded these points if at least 75% of the development site immediately borders previously developed land.

Note: in order to be counted toward the above calculations, adjacent land must have been developed at least 5 years prior to project certification.

AND/OR

3.3 **Brownfield Redevelopment for MID-RISE** (1 point). Do one of the following:

a) Develop on a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local voluntary cleanup program).

b) Develop on a site defined as a brownfield by a local, state, or federal government agency.

Synergies and Trade-Offs

A project receiving points for LL 1 is not eligible for points under LL 2-6, and vice versa.

LL 4. Infrastructure

Maximum points: 1

Intent

Encourage the building of LEED homes in developments that are served by or are near existing infrastructure (i.e., sewers and water supply).

Requirements

Prerequisites

None.

Credits

4 **Existing Infrastructure** (1 point). Select a lot that is within ½ mile of existing water service lines and sewer service lines. In the case of a multihome new development, each home in the development is awarded this point if the center of the development site is within ½ mile of existing water service lines and sewer service lines.

Synergies and Trade-Offs

A project receiving points for LL 1 is not eligible for points under LL 2-6, and vice versa.

LL 5. Community Resources *in Mid-rise Buildings*

Maximum points: 3

Intent

Encourage the building of LEED mid-rise buildings in development patterns that allow for walking or biking (thereby minimizing dependency on personal automobiles and their associated environmental impacts).

Requirements

Prerequisites

None.

Credits

5.1 **Basic Community Resources for MID-RISE** (1 point). Select a site that meets one of the following criteria:

a) Located within ¼ mile of four basic community resources (Table 1).

b) Located within ½ mile of seven basic community resources (Table 1).

OR

5.2 **Extensive Community Resources for MID-RISE** (2 points). Select a site that meets one of the following criteria:

a) Located within ¼ mile of seven basic community resources (Table 1).

b) Located within ½ mile of 11 basic community resources (Table 1).

OR

5.3 **Outstanding Community Resources for MID-RISE** (3 points). Select a site that meets one of the following criteria:

a) Located within ¼ mile of 11 basic community resources (Table 1).

b) Located within ½ mile of 14 basic community resources (Table 1).

Table 1.
Types of Basic Community Resources

- ☐ Arts and entertainment center
- ☐ Bank
- ☐ Community or civic center
- ☐ Convenience store
- ☐ Daycare center
- ☐ Fire station
- ☐ Fitness center or gym
- ☐ Laundry or dry cleaner
- ☐ Library
- ☐ Medical or dental office
- ☐ Museum
- ☐ Pharmacy
- ☐ Police station
- ☐ Post office
- ☐ Place of worship

- ☐ Restaurant
- ☐ School
- ☐ Supermarket
- ☐ Other neighborhood-serving retail
- ☐ Other office building or major employment center

Note: Up to two of each type of community resource may be counted. For example, two restaurants within ¼ mile may be counted as two community resources; four restaurants also count as two.

Synergies and Trade-Offs

A project receiving points for LL 1 is not eligible for points under LL 2-6, and vice versa.

LL 6. Access to Open Space

Maximum points: 1

Intent

Provide open spaces to encourage walking, physical activity, and time spent outdoors**.**

Requirements

Prerequisites

None.

Credits

6 **Access to Open Space** (1 point). Select a location within ½ mile of a publicly accessible or community-based open space that is at least ¾ acre in size. The open space requirement can be met by either one large open space or two smaller spaces totaling ¾ acre.

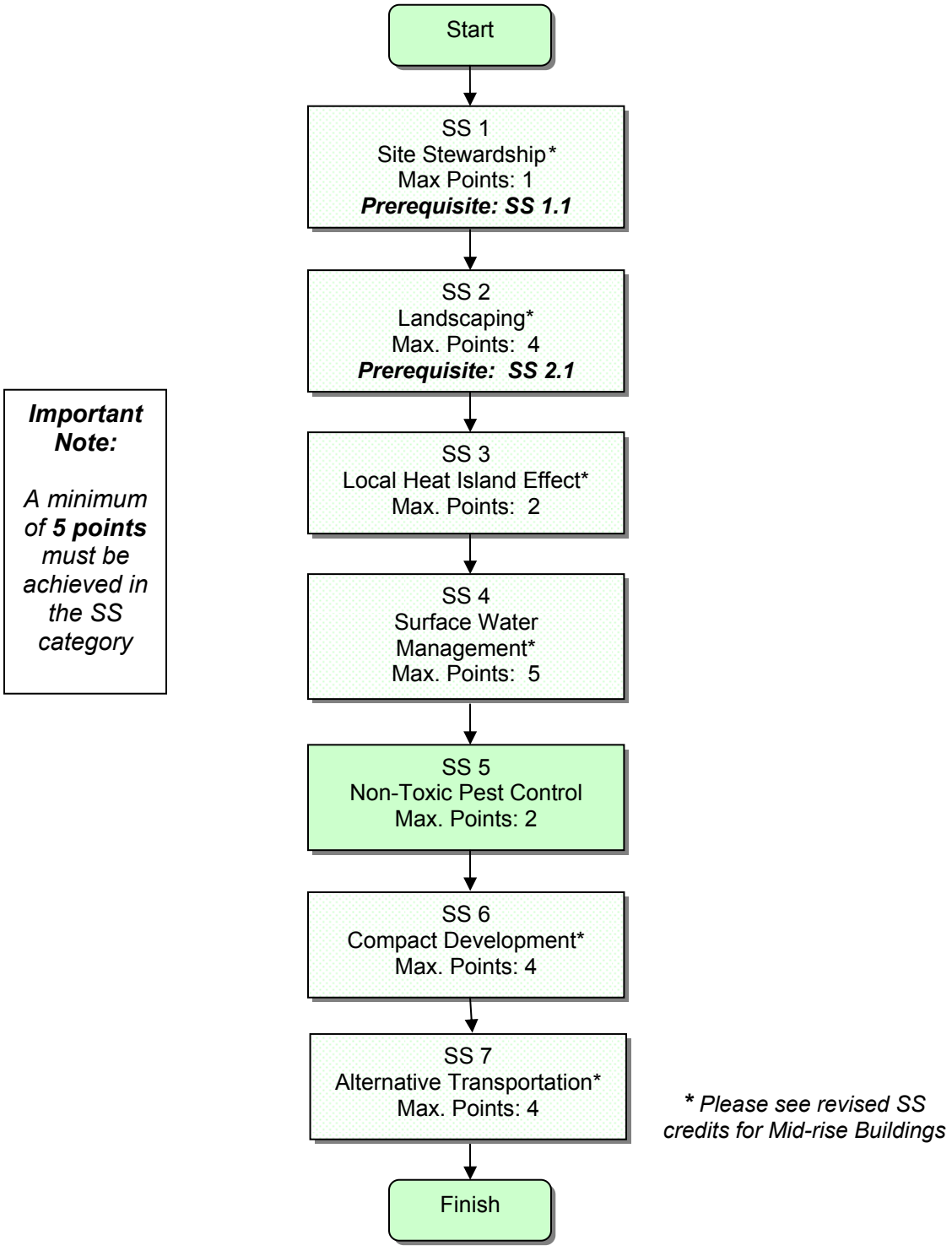
Note: *Open spaces* must consist predominantly of softscapes such as soil, grass, shrubs, and trees. These include natural open spaces; city, county, and state parks; play areas; and other community open spaces specifically intended for recreational use. Ponds can be counted as open space if they border a walking or bicycle path. Private lands open to the public for passive recreation are also acceptable provided there is deeded public access or a history of allowable public use and anticipated continued future public use for at least 10 years.

Synergies and Trade-Offs

A project receiving points for LL 1 is not eligible for points under LL 2-6, and vice versa.

Sustainable Sites (SS)

Pathway through the SS Category



Important Note:

*A minimum of **5 points** must be achieved in the SS category*

** Please see revised SS credits for Mid-rise Buildings*

SS 1. Site Stewardship *in Mid-rise Buildings*

Maximum points: 1

Intent

Minimize long-term environmental damage to the building lot during the construction process.

Requirements

Prerequisites

1.1 **Erosion Controls During Construction.** Prior to construction, design and plan appropriate erosion control measures. During construction, implement these measures. Erosion control measures must include all of the following:

a) Stockpile and protect disturbed topsoil from erosion (for reuse).

b) Control the path and velocity of runoff with silt fencing or comparable measures.

c) Protect on-site storm sewer inlets, streams, and lakes with straw bales, silt fencing, silt sacks, rock filters, or comparable measures.

d) Provide swales to divert surface water from hillsides.

e) 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.

Credits

1.2 **Minimize Disturbed Area of Site for MID-RISE** (1 point). Minimize disturbance to the site by meeting the following:

Where the site is not previously developed:

a) Develop a tree or plant preservation plan with “no-disturbance” zones clearly delineated on drawings and on the lot (see Note 1 below).

b) Leave at least 40% of the buildable lot area undisturbed, not including area under roof. Only softscapes can be counted toward this credit; projects cannot receive credit for preserving preexisting hardscapes, such as driveways.

OR

Where the site is previously developed:

c) Develop a tree or plant preservation plan with “no-disturbance” zones clearly delineated on drawings and on the lot (see Note 1 below), and rehabilitate the lot by undoing any previous soil compaction, removing existing invasive plants, and meeting the requirements of SS 2.2 (see Note 2, below).

OR

d) Build with housing density for the project that is equal to or greater than 40 units per acre. The average lot size shall be calculated as the total lot size divided by the number of units.

Notes: 1. *Any "no-disturbance" zones must also be protected from parked construction vehicles and building material storage. Soils compacted by vehicles or stored materials can cause major difficulties in establishing any new landscaping.*

2. *Mid-rise buildings on previously developed lots that disturb the entire lot during construction can earn this credit by meeting the requirements in part (c) above.*

Synergies and Trade-Offs

SS 4.2 rewards projects for the installation of permanent erosion controls.

If the project does not include full landscaping, then homeowner association, condo/coop association, or other rules or covenants must require homeowners to have the site fully landscaped within one year; see SS 2. Erosion controls and soil stabilization measures must be robust enough to function until landscaping is in place (i.e., up to one year).

SS 2. Landscaping *in Mid-rise Buildings*

Maximum points: 4

Intent

Design landscape features to avoid invasive species and minimize demand for water and synthetic chemicals.

Requirements

Prerequisites

2.1 **No Invasive Plants.** Introduce no invasive plant species into the landscape.

Note: Invasive plant species vary by region. Consult the local Cooperative Extension Service or state agencies. A list of regional resources is available from the U.S. Department of Agriculture, at www.invasivespeciesinfo.gov/unitedstates/state.shtml. Not all nonnative species are considered invasive.

Credits

Note: Points shown below are for buildings that are fully landscaped. A project that has not completed the designed landscaping may earn up to 50% of the points for each credit as long as 50% or more of the designed landscaping is completed upon certification. In this case, 100% completion of the landscaping must be required by homeowner association or other rules within a specific time period not to exceed one year after occupancy. Erosion controls and soil stabilization measures must be robust enough to be effective for one year. The builder or project team must also develop a landscaping plan that meets the requirements in SS 2 and provide it to the homeowner.

2.2 **Basic Landscape Design** (1 point). Meet the following requirements for all designed landscape softscapes:

a) Any turf must be drought-tolerant.
b) Do not use turf in densely shaded areas.
c) Do not use turf in areas with a slope of 25% (i.e., 4:1 slope).
d) Add mulch or soil amendments as appropriate.

Mulch is defined as a covering placed around plants to reduce erosion and water loss and to help regulate soil temperature. In addition, upon decomposition, organic mulches serve as soil amendments. The type of mulch selected can affect soil pH.

e) All compacted soil (e.g., from construction vehicles) must be tilled to at least 6 inches."

2.3 **Limit Conventional Turf for MID-RISE** (maximum 2 points, as specified in Table 2). Limit the use of conventional turf in the designed landscape softscapes.

AND/OR

2.4 **Drought-Tolerant Plants for MID-RISE** (1 point). Install drought-tolerant plants. Both points must be earned under SS 2.3 in order to earn this credit. Install

drought-tolerant plants such that at least 90% of the installed plants are drought-tolerant.

OR

2.5 **Reduce Overall Irrigation Demand by at Least 20% for MID-RISE** (maximum 3 points, as specified in Table 3). Design the landscape and irrigation system to reduce overall irrigation water usage. The estimates must be calculated and prepared by a landscape professional, biologist, or other qualified professional using the method outlined below.

Table 2. Limited Conventional Turf

Percentage of designed landscape softscape area that is conventional turf	*Points*
21–40%	1
20% or less	2

Table 3. Reduction in Water Demand

Reduction in estimated irrigation water usage	*SS 2.5 points*	*WE 2.2 points*	*Total points*
20–24%	1	0	1
25–29%	1.5	0	1.5
30–34%	2	0	2
35–39%	2.5	0	2.5
40–44%	3	0	3
45–49%	3	0.5	3.5
50–54%	3	1	4
55–59%	3	1.5	4.5
60% or more	3	2	5

Synergies and Trade-Offs

A project receiving points in SS 2.5 should also refer to WE 2.2.

Any measures chosen in SS 2 should be integrated with irrigation system design, which is addressed in WE 2. Rainwater and graywater reuse systems (WE 1) should also be included in landscaping design.

Method for Calculating Reduction in Irrigation Demand

Step 1. Calculate the baseline irrigation water usage:

Baseline Usage = Landscaped Area * ET_0 * 0.62

where ET_o = Baseline Evapotranspiration Rate (available from local and state Departments of Agriculture)

Step 2. Calculate the design case irrigation water usage:

Design Case Usage = (Landscaped Area * ET_L ÷ IE) * CF * 0.62

where $ET_L = ET_0 * K_L$ and $K_L = K_S * K_{MC}$. Refer to Tables 4 and 5 for values for K_S and K_{MC}, and to Table 6 for values for IE. For CF, use estimated value based on manufacturer's specifications for percentage water savings.

Step 3. Calculate the percentage reduction in irrigation water usage:

Percentage Reduction = (1 – Design Case Usage ÷ Baseline Usage) * 100

Step 4. Refer to Table 3, above, to determine points earned.

Table 4. Species Factor

Vegetation type	*Species factor (K_S)*		
	Low	*Average*	*High*
Trees	0.2	0.5	0.9
Shrubs	0.2	0.5	0.7
Groundcover	0.2	0.5	0.7
Turf	0.6	0.7	0.8

Table 5. Microclimate Factor

Example microclimate impacts	*Microclimate factor (K_{MC})*		
	Low	*Average*	*High*
Shading	0.5	0.8	1.0
High sun exposure	1.0	1.2	1.5
Protection from wind	0.8	0.9	1.0
Windy area	1.0	1.2	1.5

Table 6. Irrigation Efficiency

Irrigation type	*Irrigation efficiency (IE)*	
	Low	*High*
Fixed spray	0.4	0.6
Impact and microspray	0.5	0.7
Rotors	0.6	0.8
Multistream rotators	0.6	0.8
Low volume and point source (e.g., drip)	0.7	0.9

SS 3. Local Heat Island Effects *in Mid-rise Buildings*

Maximum points: 2

Intent

Design landscape features and choose roofing materials to reduce local heat island effects.

Requirements

Prerequisites

None.

Credits

3.1 **Reduce Site Heat Island Effects for MID-RISE** (1 point). Do one of the following:

a) Locate trees or other plantings to provide shading for at least 50% of the site hardscapes (including sidewalks, patios, courtyards, driveways, or parking decks). Shading should be calculated for noon on June 21, when the sun is directly overhead, based on five years' growth.

b) Install light-colored, high-albedo materials or vegetation for at least 50% of the site hardscapes (including sidewalks, patios, courtyards, driveways, or parking decks). Acceptable strategies include the following:

i. White concrete;
ii. Open pavers (counting only the vegetation, not the pavers); and
iii. Any material with a solar reflectance index (SRI) of at least 29.

3.2 **Reduce Roof Heat Island Effects for MID-RISE** (1 point). Do one of the following:

a. Use roofing materials with a solar reflectance index (SRI) equal to or greater than the values in the table below for a minimum of 75% of the roof surface.

Roofing materials having a lower SRI value than those listed below may be used if the weighted rooftop SRI average meets the following criteria:

$$\frac{\text{Area Roof Meeting Minimum SRI}}{\text{Total Roof Area}} \times \frac{\text{SRI of Installed Roof}}{\text{Required SRI}} \geq 75\%$$

Roof Type	Slope	SRI
Low-sloped roof	≤ 2:12	78
Steep-sloped roof	> 2:12	29

b. Install a vegetated roof that covers at least 50% of the roof area.

c. Install high-albedo and vegetated roof surfaces that, in combination, meet the following criteria:

$$\frac{\text{Area Roof Meeting Minimum SRI}}{0.75} + \frac{\text{Area of Vegetated Roof}}{0.5} \geq \text{Total Roof Area}$$

Synergies and Trade-Offs

Shading hardscapes can reduce irrigation needs. Shading and reducing heat absorption by the building can temper the building's outdoor environment and reduce cooling loads.

Providing shade is addressed in EA 1.3 (Optimize Energy Performance). A vegetated roof can also be used as a strategy for achieving SS 4.3 (Stormwater Quality Control). Locating fences, trees, shrubs or other plantings appropriately can capture or deflect seasonal breezes.

SS 4. Surface Water Management *in Mid-rise Buildings*

Maximum points: 5

Intent

Design site features to minimize erosion and runoff from the building site.

Requirements

Prerequisites

None.

Credits

Note: Certain surface water management strategies may be regulated, restricted, or even prohibited by local water authorities or code requirements.

4.1 **Permeable Lot for MID-RISE** (maximum 2 points, as specified in Table 8). Design the lot such that at least 70% of the buildable land, not including area under roof, is permeable or designed to capture water runoff for infiltration on-site. Area that can be counted toward the minimum includes the following:

a) Vegetative landscape (e.g., grass, trees, shrubs).

b) Permeable paving, installed by an experienced professional. Permeable paving must include porous above-ground materials (e.g., open pavers, engineered products) and a 6-inch porous subbase, and the base layer must be designed to ensure proper drainage away from the home.

c) Impermeable surfaces that are designed to direct all runoff toward an appropriate permanent infiltration feature (e.g., vegetated swale, on-site rain garden, or rainwater cistern).

4.2 **Permanent Erosion Controls** (1 point). Design and install one of the following permanent erosion control measures:

a) If portions of the lot are located on a steep slope, reduce long-term runoff effects through use of terracing and retaining walls.

OR

b) Plant one tree, four 5-gallon shrubs, or 50 square feet of native groundcover per 500 square feet of disturbed lot area (including area under roof).

4.3 **Stormwater Quality Control for MID-RISE** (2 points).
Implement a stormwater management plan that reduces impervious cover, promotes infiltration and captures and treats the stormwater runoff from 90% of the average annual rainfall[3] using acceptable best management practices (BMPs).

BMPs used to treat runoff must be capable of removing 80% of the average annual post development total suspended solids (TSS) load based on existing monitoring reports. BMPs are considered to meet these criteria if:

---

[3] There are 3 distinct climates in the United States that influence the nature and amount of annual rainfall. Humid watersheds are defined as those that receive at least 40 inches of rainfall each year. Semiarid watersheds receive between 20 and 40 inches of rainfall per year, and arid watersheds receive less than 20 inches of rainfall per year. For this credit, 90% of the average annual rainfall is equivalent to treating the runoff from the following (based on climate):
• Humid Watersheds — 1 inch of rainfall
• Semiarid Watersheds — 0.75 inches of rainfall
• Arid Watersheds — 0.5 inches of rainfall

a) They are designed in accordance with standards and specifications from a state or local program that has adopted these performance standards,

OR

b) There exists infield performance monitoring data demonstrating compliance with the criteria. Data must conform to accepted protocol (e.g., Technology Acceptance Reciprocity Partnership [TARP], Washington State Department of Ecology) for BMP monitoring.

Table 8. Permeable Area

Percentage of buildable lot (excluding area under roof) that is permeable	*Points*
70–79%	0.5
80–89%	1
90–99%	1.5
100%	2

Synergies and Trade-Offs

SS 1.1 addresses erosion control during construction. Materials used to reduce imperviousness and promote infiltration can also reduce heat island effects in SS 3 (e.g., vegetated roof and lot).

Trees, shrubs or groundcover installed for erosion control can be designed as drought-tolerant or otherwise preferable; see SS 2 for more information on landscaping. Conventional turf is less permeable than other plantings and consequently less effective at managing runoff.

Use alternative surfaces (e.g., vegetated roofs, pervious pavement, grid pavers) and nonstructural techniques (e.g., rain gardens, vegetated swales, disconnection of imperviousness, rainwater recycling) to reduce imperviousness and promote infiltration and thereby reduce pollutant loadings.

Use sustainable design strategies (e.g., low-impact development, environmentally sensitive design) to create integrated natural and mechanical treatment systems such as constructed wetlands, vegetated filters and open channels to treat stormwater runoff.

SS 5. Nontoxic Pest Control

Maximum points: 2

Intent

Design home features to minimize the need for poisons for control of insects, rodents, and other pests.

Requirements

Prerequisites

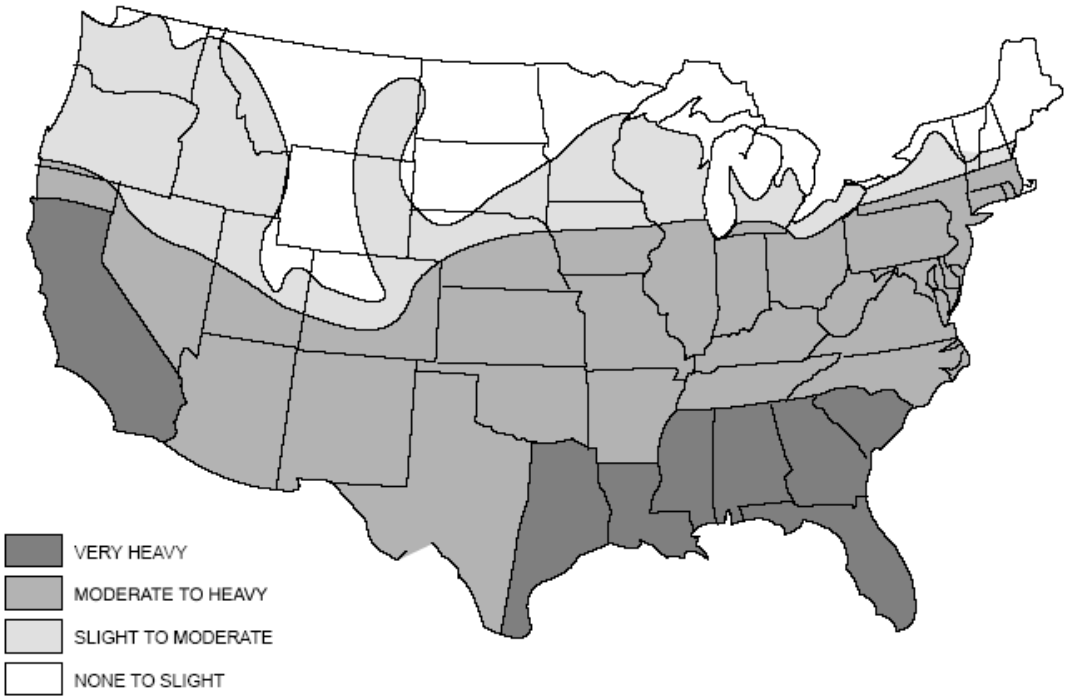
None.

Credits

5. **Pest Control Alternatives** (½ point each, maximum 2 points). Implement one or more of the measures below. All physical actions (for pest management practices) must be noted on construction plans.
   a) Keep all wood (i.e., siding, trim, structure) at least 12 inches above soil (code typically requires 8 inches).
   b) Seal all external cracks, joints, penetrations, edges, and entry points with caulking. Where openings cannot be caulked or sealed, install rodent- and corrosion-proof screens (e.g., copper or stainless steel mesh). Protect exposed foundation insulation with moisture-resistant, pest-proof cover (e.g., fiber cement board, galvanized insect screen).
   c) Include no wood-to-concrete connections *or* separate any exterior wood-to-concrete connections (e.g., at posts, deck supports, stair stringers) with metal or plastic fasteners or dividers.
   d) Install landscaping such that all parts of mature plants will be at least 24 inches from the home.
   e) In areas marked “moderate to heavy” through “very heavy” on the termite infestation probability map (Figure 1), implement one or more of the following measures (½ point each):
      i) Treat all cellulosic material (e.g., wood framing) with a borate product to a minimum of 3 feet above the foundation.
      ii) Install a sand or diatomaceous earth barrier.
      iii) Install a steel mesh barrier termite control system.
      iv) Install non-toxic termite bait system.
      v) Use noncellulosic (i.e., not wood or straw) wall structure.
      vi) Use solid concrete foundation walls or masonry wall with top course of solid block bond beam or concrete-filled block.

Figure 1. Termite Infestation Probability Map

Source: Excerpted from the 2000 International Residential Building Code™.



Note: Lines defining areas are approximate only. Local conditions may be more or less severe than indicated by the region classification.

FIGURE R301.2(6)
TERMITE INFESTATION PROBABILITY MAP

Synergies and Trade-Offs

Limiting conventional turf and installing native plants (SS 2) can help reduce the need for fertilizers and pesticides that contain toxic chemicals.

Keeping plants away from the home makes it unnecessary to irrigate close to the home and risk leaking moisture into the home's foundation.

The thermal bypass inspection, required in the EA credit category, addresses cracks, joints and penetrations in the building envelope.

SS 6. Compact Development *in Mid-rise Buildings*

Maximum points: 4

Intent

Make use of compact development patterns to conserve land and promote community livability, transportation efficiency, and walkability.

Requirements

Prerequisites

None.

Credits

6.1 **Moderate Density for MID-RISE** (2 points). Build homes with an average housing density of 40 or more dwelling units per acre of buildable land.

OR

6.2 **High Density for MID-RISE** (3 points). Build homes with an average housing density of 60 or more dwelling units per acre of buildable land.

OR

6.3 **Very High Density for MID-RISE** (4 points). Build homes with an average housing density of 80 or more dwelling units per acre of buildable land.

Note: Buildable land area is calculated as follows:

- *Exclude public streets or public rights of way, land occupied by nonresidential structures, public parks, and land excluded from residential development by law.*
- *For multiple-lot developments, include only the sum of the lot areas for mid-rise buildings being built for LEED for Homes.*
- *The numerator is the number of housing units in the project and the denominator is the buildable land area included in the project (subject to the above exclusions). Both relate to the project only, not the surrounding area.*

SS 7. Alternative Transportation *in Mid-rise Buildings*

Maximum points: 4

Intent

To reduce pollution and land development impacts from automobile use.

Requirements

Prerequisites

None.

Credits

7.1 **Public Transit** (maximum 2 points). Select a site that meets one of the following criteria:

a) Locate project within ½ mile of transit services that offer 30 or more transit rides per weekday (combined bus, rail, and ferry). (1 point)

b) Locate project within ½ mile of transit services that offer 60 or more transit rides per weekday (combined bus, rail, and ferry). (2 points)

Transit rides per weekday are calculated as follows: (1) within a ½ mile radius, count all the transit stops; (2) multiply each transit stop by the number of buses, trains, and ferries that pass through that stop per day; (3) add the total number of rides available at each stop within ½ mile together. Example: if there are 4 bus stops, and at each bus stop the service frequency is half-hourly (48 times per day), the total transit rides per day is 192.

7.2 **Bicycle Storage** (1 point). Provide covered storage facilities for securing bicycles for 15% or more of building occupants. Expect 2 persons for a studio or 1-bedroom apartment, with one additional person per additional bedroom.

7.3 **Parking Capacity / Low Emitting and Fuel-Efficient Vehicles** (1 point). Provide one of the following:

a) Low-emitting and fuel-efficient vehicles for 3% of the total vehicle parking capacity and provide preferred parking for these vehicles.

b) Preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site.

c) Install alternative-fuel refueling stations for 3% of the total vehicle parking capacity of the site (liquid or gaseous fueling facilities must be separately ventilated or located outdoors).

d) Size parking capacity to not exceed minimum local zoning requirements, AND, provide infrastructure to facilitate shared vehicle usage such as carpool drop-off areas, designated parking for vanpools, or car-share services, ride boards, and shuttle services to mass transit.

e) Provide no new parking.

For the purposes of this credit, low-emitting and fuel-efficient vehicles are defined as vehicles that are either classified as Zero Emission Vehicles (ZEV) by the California Air Resources Board or have achieved a minimum green score of 40 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide.

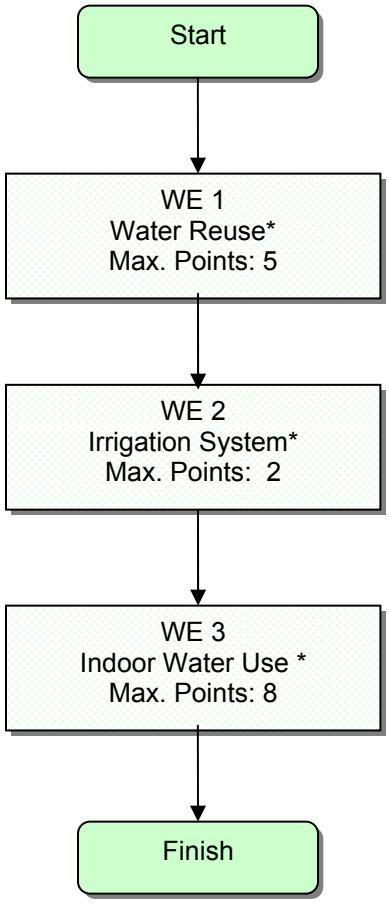
“Preferred parking” refers to the parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped) or parking passes provided at a discounted price.

Water Efficiency (WE)

Pathway through the WE Category

Important Note:

*A minimum of **3 points** must be achieved in the WE category*



** Please see revised WE credits for Mid-rise Buildings*

WE 1. Water Reuse *in Mid-rise Buildings*

Maximum points: 5

Intent

Use municipal recycled water, or offset central water supply through the capture and controlled reuse of rainwater and/or graywater.

Requirements

Prerequisites

None.

Credits

Note: Rainwater and graywater capture systems are subject to local codes and may require special permits. Note that the water quality should meet local standards and consult manufacturers' recommendations to determine the compatibility of plumbing fixtures with graywater. Many states and regulatory agencies require that water going into a toilet or sink meet potable water standards; builders should comply with local codes.

1. **Water Reuse for MID-RISE** (maximum of 5 points, as specified in Table 9). Design and install systems so that ≥10% of total water demand (landscape irrigation and indoor water use combined) is offset by water reuse strategies, including any combination of the strategies listed below. Estimates must be calculated and prepared by a qualified professional using the method outlined below.

   a) Rainwater Harvesting System. Design and install a rainwater harvesting and storage system (including surface runoff and/or roof runoff) for landscape irrigation use or indoor water use.

   b) Graywater Reuse System. Design and install a graywater reuse system for landscape irrigation use or indoor water use. Graywater may be collected from any of the following:

      - clothes washers;
      - showers;
      - faucets and other sources.

   c) Municipal Recycled Water System. Design the plumbing such that the irrigation system water demand is supplied by municipal recycled water. This is applicable only in communities with a municipal recycled water program.

Table 9. Water Reuse

Percentage of total water demand supplied by water reuse strategies	*Points*
≥ 10%	1
≥ 20%	2
≥ 30%	3
≥ 40%	4
≥ 50%	5

Method for Calculating the Percent of Water Reuse

Step 1. Calculate Total Indoor Water Use for one month for the entire building for the following sources: toilets, bathroom sinks, kitchen sinks, showers, clothes washing, and dish washing. Assumptions for the calculation are given in Tables 10-1 and 10-2 below.

For fixture flow rates and appliance water consumption, use information provided by the manufacturer. If units have different fixtures and appliances, calculate water usage for *each* unit and sum the water use over *all* units. If the water usage for fixtures, fittings, and appliances are unknown, use default values in Table 11 below.

Step 2. Calculate Outdoor Water Use. Use either of the following approaches:

a) Design Case Usage, calculated using project information for the landscape and irrigation system. Use the methodology in this guidance for WE Credit 2.2, Step 2.

OR

b) Default Usage, calculated according to the following equation:

Default Usage = Landscaped Area * ET_0 * 0.62,

Where: Landscaped Area is the square footage of landscape softscapes and ET_0 is the average evapotranspiration rate in inches for the month of July.

Step 3. Calculate Total Water Demand:

Total Water Demand = Total Indoor Water Use + Outdoor Water Use

Step 4. Estimate the total monthly reused water for each of the following water reuse methods, as applicable to the project. Sum the volumes of water provided by graywater collection, rainwater collection, and municipal recycled water for the Total Water Reuse.

a) For graywater collection, predict the volume using the values calculated in Step 1 for each fixture or appliance providing graywater.

b) For rainwater collection, *EITHER*

a)Use historical average precipitation for the month of July

OR

b)Estimate the volume of water expected to be in the storage cistern at the beginning of July, based on precipitation and usage estimates for each month prior to July, AND add this to the volume of precipitation collected during July.

c) For municipal recycled water, predict the volume using the agreement with the recycled water provider.

Note: The amount of water reused cannot exceed the water usage being offset. For example, if a graywater system is designed to collect 5,000 gallons of water from showerheads, but the water will only be reused in toilets with a monthly demand of 2,000 gallons, the Total Water Reuse should be 2,000 gallons per month, not 5,000 gallons.

Step 5. Calculate the Percent of Water Reuse:

Percent Water Reuse = Total Reused Water ÷ Total Water Demand * 100%

Table 10-1. Indoor Water Usage Assumptions & Sample Calculator for Fixtures & Fittings

Flush Fixture	*Monthly uses per resident*	*Building residents*[4]	*Flowrate (GPM or GPF)*	*Duration*	*Monthly water use (gal)*
Toilet	150			1 flush	
Bathroom Sink	150			0.25 min.	
Kitchen Sink	120			1 min.	
Shower	30			5 min.	
*Where monthly water use = monthly uses per resident * residents * flowrate * duration*					

Table 10-2. Indoor Water Usage Assumptions & Sample Calculator for Appliances

Appliance	*Monthly uses per unit*	*Number of units in the building*	*Water consumption per use (gal)*	*Monthly water use (gal)*
Dishwasher*	16			
Clothes washer**	30			
*Where monthly water use = monthly uses per unit * units * consumption per unit*				

* For each unit without a dishwasher, add 96 gal per month to account for washing by hand.
** If there are clothes washers in the building, this calculation should still be completed, even if the clothes washers are not in each unit.

Table 11. Default Water Usage Values

Fixture or Appliance	*Default Flowrate or Water Consumption*
Toilet	1.6 gal/flush
Bathroom Sink	2.5 gal/minute
Kitchen Sink	2.5 gal/minute
Shower	2.5 gal/minute
Dishwasher	6 gal/cycle
Clothes washer	40 gal/load

Synergies and Trade-Offs

Reused water used for irrigation systems should be integrated with resource-efficient landscape (SS 2) and irrigation system design (WE 2). Rainwater harvesting can be used for stormwater quality control (SS 4.3).

[4] For the number of residents in each unit, expect 2 persons for a studio or 1-bedroom apartment, with one additional person per additional bedroom. Multiply total number of residents by 0.93 - the standard occupancy rate for multi-family buildings.

WE 2. Irrigation System *in Mid-rise Buildings*

Maximum points: 2

Intent

Minimize outdoor demand for water through water-efficient irrigation.

Requirements

Prerequisites

None.

Credits

Note: Points shown below are for irrigation systems installed throughout the designed landscape. If only 50% of the designed landscape includes these measures, then only 50% of the points are available. Even if part of the yard is not landscaped, the irrigation system must be stubbed to that part of the yard, as appropriate.

2.1 **High-Efficiency Irrigation System for MID-RISE** (0.5 point each, maximum 2 points). Design and install a high-efficiency irrigation system (based on overall landscaping plans, including measures adopted in SS 2) such that any of the following are met:

a) Install an irrigation system designed by an EPA Water Sense certified professional.

b) Design and install an irrigation system with head-to-head coverage.

c) Install a central shut-off valve.

d) Install a submeter for the irrigation system.

e) Use drip irrigation for at least 50% of landscape planting beds to minimize evaporation.

f) Create separate zones for each type of bedding area based on watering needs.

g) Install a timer or 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.

h) Install pressure-regulating devices to maintain optimal pressure and prevent misting.

i) Utilize high-efficiency nozzles with an average distribution uniformity (DU) of at least 0.70. This may include conventional rotors, multistream rotors, or high-efficiency spray heads, but the DU must be verified by manufacturer documentation or third-party tests. A point source (drip) irrigation system should be counted as having a DU of 0.80.

j) Install check valves in heads.

k) Install a moisture sensor controller or rain delay controller. For example, “smart" evapotranspiration controllers receive radio, pager, or Internet signals to direct the irrigation system to replace only the moisture that the landscape has lost because of heat, wind, etc.

l) Perform a third-party inspection of the irrigation system in operation, including observation of all of the following:

i. All spray heads are operating and delivering water only to intended zones.

ii. Any switches or shut-off valves are working properly.

iii. Any timers or controllers are set properly.

iv. Any irrigation systems are located at least 2 feet from the building

v. Irrigation spray does not hit the building.

OR

2.2 **Reduce Overall Irrigation Demand by at Least 45% for MID-RISE** (maximum 2 points, as specified in Table 12). Design the landscape and irrigation system to reduce the overall irrigation water demand water budget. The estimates must be calculated and prepared by a landscape professional, biologist, or other qualified professional using the method outlined below.

Note: A project must earn full points in SS 2.5 before receiving points for this credit.

Table 12. Reduction in Water Demand

Reduction in estimated irrigation water usage	*WE 2.2 points*	*SS 2.5 points*	*Total points*
45–49%	0.5	3	3.5
50–54%	1	3	4
55–59%	1.5	3	4.5
60% or more	2	3	5

Synergies and Trade-Offs

A project earning points for WE 2.2 must skip WE 2.1.

A project receiving points for WE 2.2 must achieve full points in SS 2.5.

The irrigation system design must take into consideration all aspects of the landscape design, including any features from SS 2, as well as any rainwater harvesting or graywater reuse system (WE 1).

Method for Calculating Reduction in Irrigation Demand

Step 1. Calculate the baseline irrigation water usage:

Baseline Usage = Landscaped Area * ET_0 * 0.62

where ET_o = Baseline Evapotranspiration Rate (available from local and state Departments of Agriculture)

Step 2. Calculate the design case irrigation water usage:

Design Case Usage = (Landscaped Area * ET_L ÷ IE) * CF * 0.62

where $ET_L = ET_0 * K_L$ and $K_L = K_S * K_{MC}$. Refer to Tables 13 and 14 for values for K_S and K_{MC}, and to Table 15 for values for IE. For CF, use estimated value based on manufacturer's specifications for percentage water savings.

Step 3. Calculate the percentage reduction in irrigation water usage:

Percentage Reduction = (1 – Design Case Usage ÷ Baseline Usage) * 100

Step 4. Refer to Table 11, above, to determine points earned.

Table 13. Species Factor

Vegetation type	*Species factor (K_S)*		
	Low	*Average*	*High*
Trees	0.2	0.5	0.9
Shrubs	0.2	0.5	0.7
Groundcover	0.2	0.5	0.7
Turf	0.6	0.7	0.8

Table 14. Microclimate Factor

Example microclimate impacts	*Microclimate factor (K_{MC})*		
	Low	*Average*	*High*
Shading	0.5	0.8	1.0
High sun exposure	1.0	1.2	1.5
Protection from wind	0.8	0.9	1.0
Windy area	1.0	1.2	1.5

Table 15. Irrigation Efficiency

Irrigation type	*Irrigation efficiency (IE)*	
	Low	*High*
Fixed spray	0.4	0.6
Impact and microspray	0.5	0.7
Rotors	0.6	0.8
Multistream rotators	0.6	0.8
Low volume and point source (e.g., drip)	0.7	0.9

WE 3. Indoor Water Use *in Mid-rise Buildings*

Maximum points: 8

Intent

Minimize indoor demand for water through water-efficient fixtures and fittings.

Requirements

Prerequisites

None.

Credits

Note: Compensating shower valves and conventional, non-compensating shower valves may not work properly when low -flow showerheads (restricting water flow below 2.5 gpm) are installed. Installing low-flow showerheads where compensating valves or conventional, non-compensating valves are installed can increase the risk of scalding (or other types of injuries, such as slips and falls due to thermal shock) when the plumbing system experiences pressure changes. Make sure any low-flow showerhead is installed with a valve that has been designed, tested and verified to function safely at the reduced flow rate. If in doubt, consult the manufacturer of the valve before installing a low-flow showerhead.

3.1 **High-Efficiency Fixtures and Fittings** (1 point each, maximum 3 points). Meet one or more of the following requirements by installing high-efficiency (low-flow) fixtures or fittings. A project cannot earn points in both WE 3.1 and WE 3.2 for the same fixture type (e.g., faucet, shower, or toilet).

a) The average flow rate for all lavatory faucets must be ≤ 2.00 gpm.

b) The average flow rate for all showers must be ≤ 2.00 gpm per stall.

c) The average flow rate for all toilets must be ≤ 1.30 gpf ***OR***

toilets must be dual-flush and meet the requirements of ASME A112.19.14 ***OR***

toilets must meet the U.S. EPA WaterSense specification and be certified and labeled accordingly.

3.2 **Very High Efficiency Fixtures and Fittings** (2 points each, maximum 6 points). Meet one or more of the following requirements by installing very high efficiency fixtures or fittings. A project cannot earn points in both WE 3.1 and WE 3.2 for the same fixture type (e.g., faucet, shower, or toilet).

a) The average flow rate for all lavatory faucets must be ≤ 1.50 gpm ***OR***

lavatory faucets must meet the U.S. EPA WaterSense specification and be certified and labeled accordingly.

b) The average flow rate for all showers must be ≤ 1.75 gpm per stall.

c) The average flow rate for all toilets must be ≤ 1.10 gpf.

3.3 **Water-Efficient Appliances for MID-RISE** (1 point each, maximum 2 points). Install one or both of the following:

a) Water-Efficient Clothes Washer. Install clothes washers with modified energy factor (MEF) ≥ 2.0 and water factor (WF) < 5.5. Clothes washers must be installed in each unit, or provided in a shared facility to adequately meet the demand of the entire building.

b) ENERGY STAR labeled dishwasher(s) that use 6.0 gallons or less per cycle.

Synergies and Trade-Offs

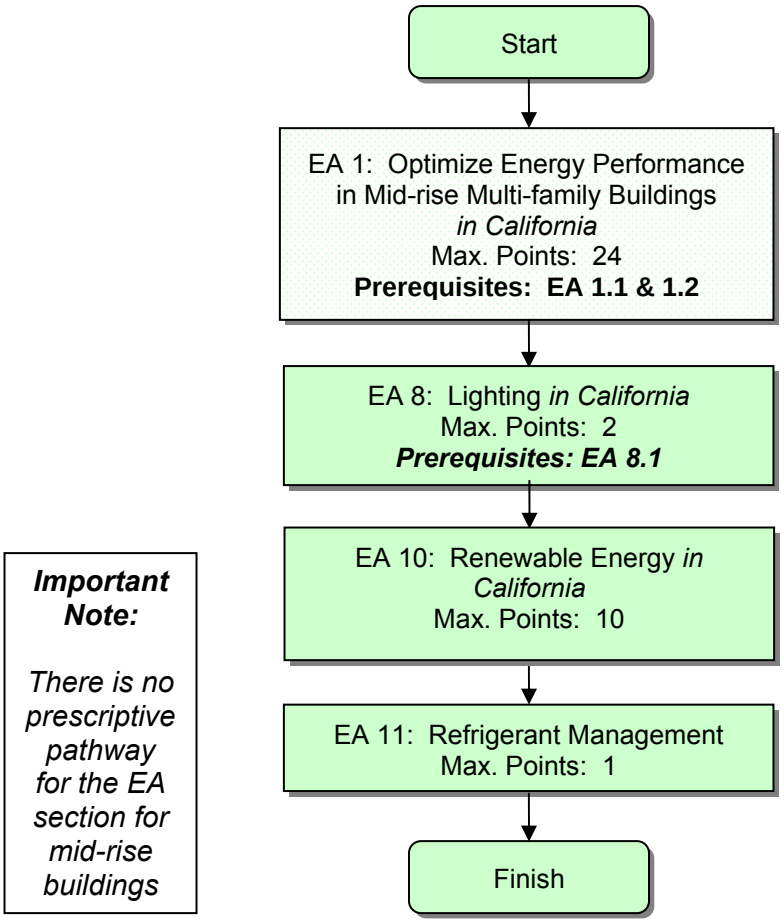
Indoor water savings also can be achieved with more efficient water distribution systems and appliances. Points for indoor water distribution-related savings are available under EA 7.1.

Low-flow showerheads and faucets will reduce demand for hot water and resulting energy use for water heating. Energy modeling in the EA category addresses water heating efficiency.

Energy & Atmosphere (EA)

Pathway through the EA Credits

In Mid-rise Multi-family Buildings in California



Important Note:

There is no prescriptive pathway for the EA section for mid-rise buildings

EA 1. Optimize Energy Performance *in Mid-rise Buildings in California*

Maximum Points: 24

Intent

To establish the minimum level of energy efficiency for the proposed building and systems to reduce environmental and economic impacts associated with excessive energy use.

Requirements

Prerequisites

1.1 **Minimum Energy Performance for MID-RISE.** Meet the following performance requirements:

a) Using the output of a whole building simulation model and the load modifications outlined in Appendix A, demonstrate at least a 15% reduction in energy use in the proposed building when compared to a baseline building meeting the requirements of Title-24 2008 (using TDV kbtu/ft2-yr). The whole building simulation model must be developed by a current Certified Energy Plans Examiner (CEPE) or Certified Energy Analyst (CEA). All elements within the energy model must be verified by a certified third-party HERS Rater. All projects, including gut-rehab projects, must be modeled modeled as "new construction".

Note: For buildings modeled in parts for the purposes of code compliance (e.g. in mixed-use buildings), combine the results of the various energy models.

b) Have the EPA ENERGY STAR Thermal Bypass Checklist or CEC Quality Insulation Installation merged protocols verified by a certified, third-party HERS Rater.

Note: This requirement applies to all projects, even those that may not be able to take credit for the QII under CEC modeling rules (e.g. homes with ICF or SIP construction, or spray foam insulation). Projects with SIPs or ICFs must also complete the Energy Star Structural Insulated Panel Visual Inspection Form, available from EPA.

1.2 **Testing and Verification for MID-RISE**. Meet all of the EPA Multifamily High-rise Program Testing and Verification Protocols requirements.

Credits

1.3 **Optimize Energy Performance** (maximum 24 points). Using the output of the whole building simulation model and the load modifications outlined in Appendix A, demonstrate more than a 15% reduction in energy use in the proposed building when compared to a baseline building meeting the requirements of Title-24 2008 (using TDV kbtu/ft2-yr). Figure 2 below describes the relationship between energy performance and LEED for Homes points.

Complete and submit the following forms to USGBC (both are available in the California Mid-rise Multi-family project checklist file provided by USGBC):

- Mid-rise Energy Model Information Form
- EA 1 Adjusted Savings Form

Figure 2
LEED for Homes Points for Mid-rise Buildings
Based on Energy Reductions Compared to Title-24 2008

Energy Reduction Compared to Title-24 2008	LEED for Homes Mid-Rise Points
15%	4.0
16%	5.0
17%	6.0
18%	7.0
19%	8.0
20%	9.0
21%	10.0
22%	10.5
23%	11.5
24%	12.0
25%	13.0
26%	13.5
27%	14.5
28%	15.0
29%	15.5
30%	16.0
31%	16.5
32%	17.0
33%	17.5
34%	18.5
35%	19.0
36%	19.5
37%	19.5
38%	20.0
39%	20.5
40%	21.0
41%	21.5
42%	22.0
43%	22.5
44%	22.5
45%	23.0
46%	23.5
47%	Maximum 24 Points Available
48%	
50%	

EA 8. Lighting
in Mid-rise Buildings in California

Maximum Points: 3

Intent

Reduce energy consumption associated with interior and exterior lighting.

Requirements

Prerequisites

8.1 **Basic Lighting.** Meet the lighting requirements of Title-24 in California.

Credits

8.2 **Advanced In-Unit Lighting** (3 Points). In-unit apartment lighting must meet one of the following requirements:[5]

a) Installing high-efficacy lighting throughout the units, as described in Chapter 6 of the CEC 2005 Building Energy Efficiency Standards Compliance Manual);

b) Where controls (e.g. occupant sensors, dimmers) are used to comply with Title-24 requirements, at least 60% of all fixtures must be ENERGY STAR labeled.

c) Where controls (e.g. occupant sensors, dimmers) are used to comply with Title-24 requirements, at least 90% of all lamps must be ENERGY STAR labeled.[6]

Note: In multi-family buildings, these requirements only apply to in-unit lighting, not corridor or exterior lighting.

Synergies and Trade-Offs

The lighting loads produced by the energy simulation model should not be included when calculating overall energy performance for EA prerequisite 1.1 and EA credit 1.3.

[5] California code (see 2005 Building Energy Efficiency Standards) requires that all in-unit lighting either be provided by high-efficacy light fixtures or controls (e.g. dimmers, sensors).
[6] A home may meet the requirements of part c) with ENERGY STAR labeled compact fluorescent lamps.

EA 10. Renewable Energy *in Mid-rise Buildings in California*

Maximum Points: 10

Intent

Reduce consumption of non-renewable energy sources by encouraging the installation and operation of renewable electric generation systems.

Requirements

Prerequisites

None

Credits

10 **Renewable Energy System. (Max 10 Points.)** Design and install a renewable electricity generation system. Use energy modeling to estimate both the electricity supplied by the renewable energy system and the annual reference energy demand. Receive 1 Point for every 3% of the total annual reference energy demand met by the system.

Complete and submit the EA 10 form included in the California project checklist file provided by USGBC.

Synergies and Trade-Offs

Passive solar designs and solar water heating systems are not eligible for credit in EA 10, but may be reflected in the energy model for credit in EA 1.

EA 11. Residential Refrigerant Management **Maximum points: 1**

Intent

Select and test air-conditioning refrigerant to ensure performance and minimize contributions to ozone depletion and global warming.

Requirements

Prerequisites

11.1 **Refrigerant Charge Test.** Provide proof of proper refrigerant charge of the air-conditioning system (unless home has no mechanical cooling system).

Credits

11.2 **Appropriate HVAC Refrigerants** (1 point). Do one of the following:

a) Do not use refrigerants.

b) Install an HVAC system with non-HCFC refrigerant (e.g., R-410a).

c) Install an HVAC system with a refrigerant that complies with the following equation. (See Table 21 for examples of the equation applied to R410a used in different system sizes).

$$LCGWP + LCODP \times 10^{5} \leq 160$$

where

LCODP = [ODPr x (Lr x Life + Mr) x Rc]/Life

LCGWP = [GWPr x (Lr x Life + Mr) x Rc]/Life

LCODP = Lifecycle Ozone Depletion Potential (lb CFC11/ton-year)

LCGWP = Lifecycle Direct Global Warming Potential (lb CO_2/ton-year)

GWPr = Global Warming Potential of Refrigerant (0–12,000 lb CO_2/lbr)

ODPr = Ozone Depletion Potential of Refrigerant (0–0.2 lb CFC11/lbr)

Lr = Refrigerant Leakage Rate (0.5–2.0%; default of 2% unless otherwise demonstrated)

Mr = End-of-life Refrigerant Loss (2.0–10%; default of 10% unless otherwise demonstrated)

Rc = Refrigerant Charge (0.50–5.0 lbs of refrigerant per ton of cooling capacity)

Life = Equipment Life (10–35 years; default based on equipment type, unless otherwise demonstrated)

Table 21. Examples of Residential Refrigerants Eligible for EA 11.2

Refrigerant	*Combined LCGWP+ LCODP score*	*System size*	*Refrigerant charge*	*Leakage rate*	*Equipment life*
R410a	152	2 tons	3.7 lb/ton	1.5%	15 years
R410a	151	3 tons	3.0 lb/ton	2.0%	15 years
R410a	151	4 tons	3.0 lb/ton	2.0%	15 years
R410a	121	5 tons	3.0 lb/ton	2.0%	15 years

Synergies and Trade-Offs

Efficient air-conditioning systems are covered under EA 6.

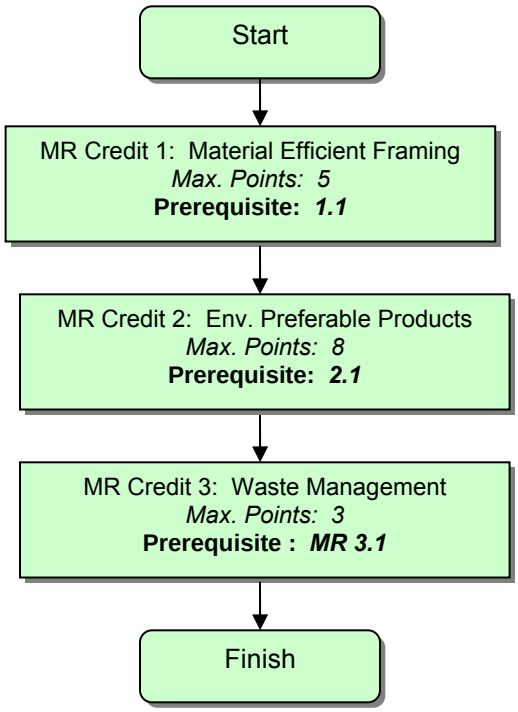
This credit is available to every project, whether the performance approach (EA 1) or the prescriptive approach (EA 2–10) is used.

Materials and Resources (MR)

Pathway through the MR Category

Important Note:

*A minimum of **2 points** must be achieved in the MR category*



MR 1. Material-Efficient Framing

Maximum points: 5

Intent

Optimize the use of framing materials.

Requirements

Prerequisites

1.1 **Framing Order Waste Factor Limit.** Limit the overall estimated waste factor to 10% or less. If the waste factor on any portion of the framing order exceeds 10%, calculate the overall waste factor as shown in Table 22.

Waste factor is defined as the percentage of framing material ordered in excess of the estimated material needed for construction.

Table 22. Sample Framing Order Waste Factor Calculation

Framing component	*Total cost*	*Waste factor*	*Waste cost*
Random lengths	$1,000	15%	$150
Studs	$2,000	5%	$100
Beams and headers	$500	20%	$100
Roof deck	$2,000	0%	$0
Wall sheathing	$0	0%	$0
Rafters	$2,000	0%	$0
Ceiling joists	$1,500	10%	$150
Cornice work	$3,000	10%	$300
TOTAL	$12,000		$1,000
Overall waste factor (waste $ / cost $)			8.3%

Credits

1.2 **Detailed Framing Documents** (1 point). Prior to construction, create detailed framing plans or scopes of work and accompanying architectural details for use on the job site. Indicate the specific locations, spacing, and sizes of all framing members in the floors, walls, roof, and ceiling (if different from the roof).

1.3 **Detailed Cut List and Lumber Order** (1 point). The requirements in MR 1.2 must be met to earn this credit. Prior to construction, create a detailed cut list and lumber order that corresponds directly to the framing plans and/or scopes of work.

AND/OR

1.4 **Framing Efficiencies** (maximum 3 points). Implement measures from Table 23.

OR

1.5 **Off-Site Fabrication** (4 points). Use either of the following alternatives to on-site framing:

a) Panelized construction. Wall, roof, and floor components are delivered to the job site preframed.

b) Modular, prefabricated construction. All principal building sections are delivered to the job site as prefabricated modules.

Table 23. Efficient Framing Measures

Measure	*Points*
Precut framing packages	1.0
Open-web floor trusses	1.0
Structural insulated panel (SIP) walls	1.0
SIP roof	1.0
SIP floors	1.0
Stud spacing greater than 16” o.c	1.0
Ceiling joist spacing greater than 16” o.c.	0.5
Floor joist spacing greater than 16” o.c.	0.5
Roof rafter spacing greater than 16” o.c.	0.5
Implement any 2 of the following: • Size headers for actual loads • Use ladder blocking or drywall clips • Use 2-stud corners	0.5

Note: Alternative measures not listed in Table 23 may be eligible to earn points if they save comparable amounts of framing material. A formal credit interpretation request with full justification of any alternative measure’s potential savings must be submitted by the Provider to USGBC.

Synergies and Trade-Offs

Reduced framing can reduce the number and size of thermal breaks and increase the amount of insulation installed, leading to better energy performance (EA 1 and 2).

Credit MR 1.2 is a prerequisite for MR 1.3. A home that earns points for MR 1.2, 1.3 and 1.4 cannot earn points for MR 1.5, and vice versa.

Optimizing the use of framing will reduce the amount of construction waste (MR 3.2).

MR 2. Environmentally Preferable Products

Maximum points: 8

Intent

Increase demand for environmentally preferable products and products or building components that are extracted, processed, and manufactured within the region.

Requirements

Prerequisites

2.1 **FSC Certified Tropical Wood.** Meet the following two requirements, as applicable:

a) Provide all wood product suppliers with a notice (see Figure 4, below) containing all the following elements:
   i. a statement that the builder's preference is to purchase products containing tropical wood only if it is FSC-certified;
   ii. a request for the country of manufacture of each product supplied; *and*
   iii. a request for a list of FSC-certified tropical wood products the vendor can supply.

b) If tropical wood is intentionally used (i.e., specified in purchasing documents), use only FSC-certified tropical wood products. Reused or reclaimed materials are exempt.

Note: A species of wood is considered *tropical* for the purposes of this prerequisite if it is grown in a country that lies between the Tropics of Cancer and Capricorn.

Credits

2.2 **Environmentally Preferable Products** (0.5 point each, maximum 8 points). Use building component materials that meet one or more of the criteria below. Except as noted in Table 24, a material must make up 90% of the component, by weight or volume. A single component that meets each criterion (i.e., environmentally preferable, low emissions, and local sourcing) can earn points for each.

a) Environmentally preferable products (0.5 point per component). Use products that meet the specifications in Table 24.

   Note: Recycled content products must contain a minimum of 25% postconsumer recycled content, except as noted in Table 24. Postindustrial (preconsumer) recycled content must be counted at half the rate of postconsumer content.

AND/OR

b) Low emissions (0.5 point per component). Use products that meet the emissions specifications in Table 24.

AND/OR

c) Local production (0.5 point per component). Use products that were extracted, processed, *and* manufactured within 500 miles of the home.

Table 24. Environmentally Preferable Products

Assembly	Component	EPP specifications (0.5 point per component)	Emission specifications (0.5 point per component)	Local production (0.5 point per component)
Exterior wall	Framing / wall structure	Concrete wall structure: Use 30% fly ash or slag wood frame: FSC-certified or reclaimed or finger joint studs	*N/A*	Eligible
Exterior wall	Siding or masonry	Recycled content, reclaimed, or FSC-certified	*N/A*	Eligible
Floor	Flooring (45% of total floor area)	Linoleum, cork, bamboo, FSC-certified or reclaimed wood, sealed concrete, recycled-content flooring, *or combination*	Carpet & pad: all carpet & pad complies with Carpet & Rug Institute Green Label Plus program Hard flooring: automatic 1/2 point for 100% hard surface flooring Hard flooring: additional 1/2 point for using a product that is SCS FloorScore certified	Eligible
Floor	Flooring (90% of total floor area)	Meet specifications above to receive *additional* 0.5 point.		Eligible (*additional* 0.5 point)
Floor	Framing	FSC-certified or reclaimed	*N/A*	Eligible
Foundation	Aggregate	*N/A*	*N/A*	Eligible
Foundation	Cement	Use 30% fly ash or slag	*N/A*	Eligible
Interior wall	Framing	FSC-certified or reclaimed	*N/A*	Eligible
Interior walls AND ceilings	Gypsum board	*N/A*	*N/A*	Eligible
Interior walls AND ceilings AND millwork	Paints and coatings	Recycled paint that meets Green Seal standard GS-43	Use products that comply with all applicable standards in Table 25.	Not eligible
Landscape	Decking or patio material	Recycled content, FSC-certified, or reclaimed	*N/A*	Eligible
Other	Cabinets	Recycled content, FSC-certified, or reclaimed AND composite materials must contain no added urea-formaldehyde resins	*N/A*	Eligible
Other	Counters (kitchens and bathrooms)	Recycled content, FSC-certified, or reclaimed AND composite materials must contain no added urea-formaldehyde resins	*N/A*	Eligible
Other	Doors (not including garage or insulated doors)	Recycled content, FSC-certified, or reclaimed	*N/A*	Eligible
Other	Trim	Recycled content, FSC-certified, or reclaimed AND composite materials must contain no added urea-formaldehyde resins	*N/A*	Eligible
Other	Adhesives and sealants	*N/A*	Use products that comply with all applicable standards in Table 26.	Not eligible
Other	Window framing	Recycled content, FSC-certified, or reclaimed	*N/A*	Eligible
Roof	Framing	FSC-certified	*N/A*	Eligible
Roof	Roofing	Recycled content	*N/A*	Eligible
Roof AND floor AND wall	Insulation	Recycled content of 20% or more	Comply with California "Practice for Testing of VOCs from Building Materials Using Small Chambers": www.dhs.ca.gov/ehlb/IAQ/VOCS/Practice.htm	Eligible
Roof, floor, wall (2 of 3)	Sheathing	Recycled content, FSC-certified, or reclaimed	N/A	Eligible

Figure 4. Example Notice to Wood Products Suppliers

Notice to Vendors: [The company] prefers to purchase products that contain tropical wood only if they are certified according to the guidelines of the Forest Stewardship Council (FSC). Please provide the country of manufacture of each product you expect to supply to us. Also please provide a list of FSC-certified products you can supply.

Table 25. Standards for Environmentally Preferable Paints and Coatings

Component	*Applicable standard (VOC content)*	*Reference*
Architectural paints, coatings and primers applied to interior walls and ceilings	Flats: 50 g/L Nonflats: 150 g/L	Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993
Anticorrosive and antirust paints applied to interior ferrous metal substrates	250 g/L	Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997
Clear wood finishes	Varnish: 350 g/L Lacquer: 550 g/L	South Coast Air Quality Management District Rule 1113, Architectural Coatings
Floor coatings	100 g/L	
Sealers	Waterproofing: 250 g/L Sanding: 275 g/L All others: 200 g/L	
Shellacs	Clear: 730 g/L Pigmented: 550 g/L	
Stains	250 g/L	

Table 26. Standards for Low-Emissions Adhesives and Sealants

(meet South Coast Air Quality Management District Rule #1168)

	Applicable standard (VOC content, g/L less water)
Architectural applications	
Indoor carpet adhesives	50
Carpet pad adhesives	50
Wood flooring adhesives	100
Rubber floor adhesives	60
Subfloor adhesives	50
VCT and asphalt adhesives	50
Drywall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Specialty applications	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Contact adhesive	80
Special-purpose contact adhesive	250
Structural wood member adhesive	140
Sheet-applied rubber lining operations	850
Top and trim adhesive	250
Substrate-specific applications	
Metal to metal	30
Plastic foams	50
Porous materials (except wood)	50
Wood	30
Fiberglass	80
Sealants	
Architectural	250
Nonmembrane roof	300
Roadway	250
Single-ply roof membrane	450
Other	420
Sealant primers	
Architectural nonporous	250
Architectural porous	775
Other	750

Synergies and Trade-Offs

Products with low emissions of volatile organic compounds (VOCs) may improve indoor air quality. Such products are included in this credit rather than in the EQ section in order to consolidate information pertaining to materials selection, specification, and purchase.

A substantial amount of energy is used to transport materials from product manufacturing plants to home construction sites. Choosing local products will reduce the embedded transportation energy usage associated with construction.

MR 3. Waste Management

Maximum points: 3

Intent

Reduce waste generation to a level below the industry norm.

Requirements

Prerequisites

3.1 **Construction Waste Management Planning.** Complete the following tasks related to management of construction waste:

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

b) Document the diversion rate for construction waste. Record the diversion rate for land clearing and/or demolition, if applicable (e.g., on gut rehab project), separately from the rate for the new construction phase of the project.

Credits

3.2 **Construction Waste Reduction** (maximum 3 points). Reduce or divert waste generated from new construction activities from landfills and incinerators to a level below the industry norm. Use either of two options:

a) Reduced construction waste. Generate 2.5 pounds (or 0.016 cubic yards) or less of net waste (not including waste diverted for reclamation or recycling) per square foot of conditioned floor area. Use column 1 or 2 and column 5 of Table 27 to determine the score.[7]

b) Increased waste diversion. Divert 25% of more of the total materials taken off the construction site from landfills and incinerators. Use column 3 or 4 and column 5 of Table 27 to determine the score; calculate the percentage using either weight or volume.

Note*:* Land clearing and demolition waste (e.g., from removal of preexisting structures on the site) should not be counted in this calculation**.**

[7] The industry average is 4.2 pounds (0.0265 cubic yards) of waste per square foot of conditioned floor area, based on data provided by the National Association of Home Builders' Research Center.

Table 27. Waste Diversion

Amount to landfills and incinerators				
Reduced construction waste		*Increased waste diversion*		
Pounds / ft²	*Cubic yards / 1,000 ft²*	*Percentage waste*	*Percentage diverted*	*Points*
4.0	25.5	100%	0%	0.0
3.5	22.3	88%	13%	0.0
3.0	19.1	75%	25%	0.5
2.5	15.9	63%	38%	1.0
2.0	12.8	50%	50%	1.5
1.5	9.6	38%	63%	2.0
1.0	6.4	25%	75%	2.5
0.5	3.2	13%	88%	3.0

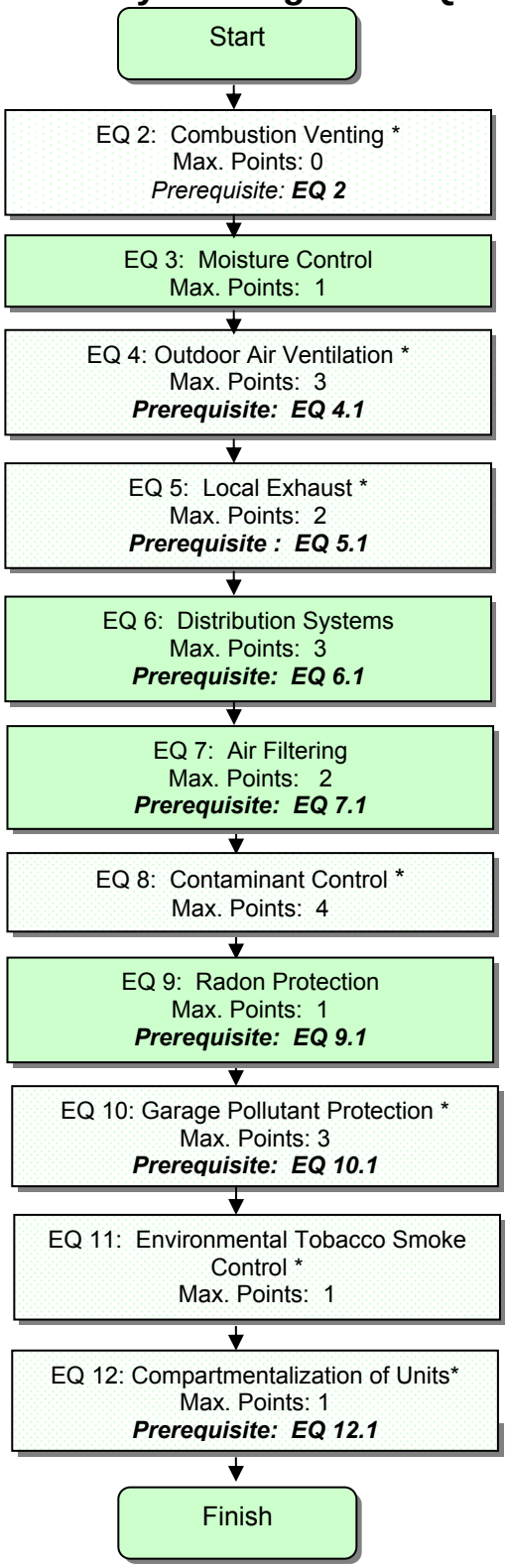
Synergies and Trade-Offs

Waste can be minimized by creating a detailed framing plan and using advanced framing techniques or off-site fabrication (MR 1).

The use of products with reclaimed or recycled content (MR 2.2) reduces both the production of new materials and the burden on landfills.

Indoor Environmental Quality (EQ)

Optional Pathways through the EQ Category



Important Note:

*A minimum of **3 points** must be achieved in the IEQ category*

** Please see revised EQ credits for Mid-rise Buildings*

EQ 2. Combustion Venting *in Mid-rise Buildings*

Maximum Points: 0

Intent

Minimize the leakage of combustion gases into the occupied space of the building.

Requirements

Prerequisites

2. **Basic Combustion Venting Measures.** Meet all of the following requirements:
   a) No unvented combustion appliances (e.g. decorative logs) are allowed.
   b) A carbon monoxide (CO) monitor must be installed on each floor of each unit.
   c) All fireplaces and woodstoves must have doors.
   d) Space and water heating equipment that involves combustion must meet one of the following. Space heating systems in buildings located in IECC-2006 climate zone 1 or 2 are exempt.
      i. It must be designed and installed with closed combustion (i.e. sealed supply air and exhaust ducting);
      ii. it must be designed and installed with power-vented exhaust; or
      iii. it must be located in a detached utility building or open-air facility.

Credits

None.

Table 29. Fireplace and Stove Combustion-Venting Requirements

Fireplace or stove	*Enhanced combustion-venting measures*	
	Better practice (1 point)	*Best practice (2 points)*
None	See 'best practice'.	Granted automatically.
Masonry wood-burning fireplace	Install masonry heater as defined by American Society for Testing and Materials Standard E-1602 and International Building Code 2112.1.	Meet requirement for 'better practice', *and* conduct back-draft potential test to ensure ∆ P ≤ 5 Pascals (see "conducting a back-draft potential test" below).
Factory-built wood-burning fireplace	Install equipment listed by approved safety testing facility (e.g., UL, CSA, ETL) that either is EPA certified or meets the following: equipment with catalytic combustor must emit less than 4.1 g/hr of particulate matter, and equipment without catalytic combustor must emit less than 7.5 g/hr of particulate matter.	Meet requirement for better practice, *and* conduct back-draft potential test to ensure ∆ P ≤ 5 Pascals (see "Conducting a Back-Draft Potential Test," below).
Woodstove and fireplace insert	Install equipment listed by approved safety testing facility that either is EPA certified or meets following requirement: equipment with catalytic combustor must emit less than 4.1 g/hr of particulate matter, and equipment without catalytic combustor must emit less than 7.5 g/hr of particulate matter.	Meet requirement for better practice, *and* conduct back-draft potential test to ensure ∆ P ≤ 5 Pascals (see "conducting a back-draft potential test" below).
Natural gas, propane, or alcohol stove	Install equipment listed by approved safety testing facility that is power-vented or direct-vented and has permanently fixed glass front or gasketed door.	Meet requirement for better practice, *and* include electronic (not standing) pilot.
Pellet stove	Install equipment that is either EPA certified or listed by approved safety testing facility to have met requirements of ASTM E 1509-04, "Standard Specification for Room Heaters, Pellet Fuel-Burning Type."	Meet requirement for better practice, *and* include power venting or direct venting.

Conducting a Back-Draft Potential Test

Using the results from a blower-door test, measure the pressure difference created by the presence of a chimney-vented appliance. To ensure a limited risk of back-drafting, the pressure difference (∆ P) must be less than or equal to 5 Pascals, where

$$\Delta P = (Q/C)^{1/n} \quad \text{(must be} \leq 5 \text{ Pascals)}$$

and Q is equal to the sum of the rated exhaust provided by the two biggest exhaust appliances in the home, and C and n are both constants produced by the blower-door test results.

Synergies and Trade-Offs

A project receiving points for EQ 1 is not eligible to earn points in EQ 2.2. A project pursuing EQ 2.2 must meet all the prerequisites in EQ 2–10.

EQ 3. Moisture Control

Maximum points: 1

Intent

Control indoor moisture levels to provide comfort, reduce the risk of mold, and increase the durability of the home.

Requirements

Prerequisites

None.

Credits

3 **Moisture Load Control** (1 point). Install dehumidification equipment with sufficient latent capacity to maintain relative humidity at or below 60%. This must be achieved through one of the following:

a) Additional dehumidification system(s).

b) A central HVAC system equipped with additional controls to operate in dehumidification mode.

Note: LEED for Homes does not encourage active dehumidification for all projects. Work with the HVAC contractor to determine whether this credit is appropriate and/or necessary.

Synergies and Trade-Offs

A project receiving points for EQ 1 is not eligible to earn points in EQ 3. A project pursuing EQ 3 must meet all the prerequisites in EQ 2–10.

Water leakage through the building envelope can cause mold and other indoor environmental problems. Improved foundation, exterior walls, and roof water management should be addressed in the durability inspection checklist (ID 2).

In hot and humid climates, dehumidification can reduce the energy demands associated with air-conditioning (EA 1, 6).

EQ 4. Outdoor Air Ventilation *in Mid-rise Buildings*

Maximum Points: 3

Intent

Reduce occupant exposure to indoor pollutants by ventilating with outdoor air.

Requirements

Prerequisites

4.1 Basic Outdoor Air Ventilation for MID-RISE. Meet all of the following requirements:

a) Design and install a whole-unit ventilation system for each individual dwelling unit that complies with the requirements of ASHRAE Standard 62.2-2007 (with errata but without addenda). Major components of the standard are summarized below.

i. Outdoor air must be provided to each unit directly from the outdoors. Projects using exhaust ventilation systems must specify how outside air is delivered at the flow rate required by ASHRAE 62.2-2007. Systems that rely on transfer air from pressurized hallways or corridors, adjacent dwelling units, attics, etc. are prohibited.

ii. For continuous ventilation systems, meet the requirements of ASHRAE 62.2-2007, which is summarized in Table 16-1 or Equation 16-1 below. Continuous in unit ventilation fans must be rated for sound at a maximum of 1.0 sone per ASHRAE 62.2 Section 7.2.1.

iii. For intermittent ventilation systems, install fans to meet ASHRAE Standard 62.2. The requirement states that the fan flow rate is equal to the outdoor air flow requirements provided in Table 16-1 or Equation 16-1 below multiplied by the fan flow rate multiplier shown in Table 16-2. The system must be designed so that it can operate automatically based on a timer. Fans must be rated for sound at a maximum of 1.0 sone.

iv. As applicable, follow the restrictions on system types for Hot, Humid Climates and Very Cold Climates. In hot, humid climates, whole-house mechanical net exhaust flow shall not exceed 7.5 cfm per 100ft^2 of conditioned floor area. Mechanical supply-only systems exceeding 7.5 cfm per 100ft^2 shall not be used in very cold climates. See ASHRAE 62.2 Section 4.5 and Section 8 for more details and a list of applicable climates.

v. Air inlets that are part of the ventilation design shall be located a minimum of 10 feet from known sources of contamination such as a stack, vent, exhaust hood, or vehicle exhaust. The intake shall be placed so that entering air is not obstructed by snow, plantings, or other material. Forced air inlets shall be provided with rodent/insect screens (mesh not larger than ½ inch). See ASHRAE 62.2 Section 6.8 for more details and a list of exceptions.

b) Meet the minimum requirements of Sections 4 through 7 of ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality (with errata but without addenda) for all spaces outside the dwelling units, and:

i. **Mechanically Ventilated Spaces** must be designed using the ventilation rate procedure or the applicable local code, whichever is more stringent.

ii. **Naturally Ventilated Spaces** must comply with ASHRAE Standard 62.1-2007, Paragraph 5.1 (with errata but without addenda[1]).

Credits

4.2 **Enhanced Outdoor Air Ventilation for MID-RISE** (2 points). Install a system that provides heat transfer between the incoming outdoor air stream and the exhaust air stream, such as a heat-recovery ventilator (HRV) or energy-recovery ventilator (ERV). The heat recovery system must be listed by a certified testing lab (e.g., UL, ETL).

4.3 **Third-Party Performance Testing for MID-RISE** (1 point). Have a third-party test the flow rate of ventilation to each unit and verify that the ventilation requirements in EQ 4.1 are met.

Synergies and Trade-Offs

From a health perspective, it is important not to under-ventilate a home. From an energy perspective, it is important not to over-ventilate.

Exhaust fans, which also provide the local exhaust required by EQ 5.1, can simultaneously facilitate the outdoor air ventilation system for the home, with sufficient make-up air provided mechanically or by a dedicated make up outdoor air source (e.g., trickle ventilators, z-ducts, etc.).

Table 16-1. Minimum Air Flow Requirements for Continuous Ventilation Systems, in cfm.

The table below is used to estimate continuous outdoor air flow requirement, in cfm, for EQ 4.1a.

Conditioned Floor Area (ft^2)	Bedrooms				
	0, 1	2	3	4	5
≤ 500	20 cfm	27.5 cfm	35 cfm	42.5 cfm	50 cfm
501 – 1,000	25	32.5	40	47.5	55
1,001 – 1,500	30	37.5	45	52.5	60
1,501 – 2,000	35	42.5	50	57.5	65
2,001– 2,500	40	47.4	55	62.5	70
2,501 – 3,000	45	52.5	60	67.5	75

Credit : ASHRAE 62.2-2007. ©American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.

Equation 16-1

$$Q_{fan} = 0.01\ A_{floor} + 7.5\ (N_{br} + 1)$$

Where :

Q_{fan} = fan flow rate, cfm
A_{floor} = floor area, ft^2
N_{br} = number of bedrooms ; not to be less than one

Table 16-2. Fan Flow Rate Multiplier for Intermittent Ventilation Systems.

This multiplier is used to determine how to size the intermittent fan in order to meet the ventilation requirements for EQ 4.1a.

Fractional On-time	If the system operates at least once every 3 hours	If the system *does not* operate at least once every 3 hours
10%	10.0	30.3
20%	5.0	15.2
30%	3.3	10.1
40%	2.5	5.0
50%	2.0	4.0
60%	1.7	2.2
70%	1.4	1.9
80%	1.3	1.3
90%	1.1	1.1

EQ 5. Local Exhaust *in Mid-rise Buildings*

Maximum points: 2

Intent

Reduce moisture and exposure in indoor pollutants in kitchens and bathrooms.

Requirements

Prerequisites (Mandatory Measures)

5.1 **Basic Local Exhaust**. Meet all of the following requirements:

a) For each individual dwelling unit, design and install local exhaust systems in all bathrooms (including halfbaths) and the kitchen to meet the requirements of Section 5 of ASHRAE Standard 62.2-2007. Sample requirements that relate to minimum intermittent local exhaust flow rates are shown in Table 19, below.

b) For each individual dwelling unit, design and install the fans and ducts to meet the requirements of Section 7 of ASHRAE Standard 62.2-2007.

c) Exhaust air to the outdoors (i.e., exhaust to attics or interstitial spaces is not permitted).

d) Use ENERGY STAR labeled bathroom exhaust fans (except for exhaust fans serving multiple bathrooms).

e) For all spaces outside dwelling units, meet the requirements for local exhaust from ASHRAE Standard 62.1-2007.

Credits (Optional Measures)

5.2 **Enhanced Local Exhaust** (1 point). Use one of the following strategies in every bathroom to control the use of the local exhaust fan:

a) An occupancy sensor.

b) An automatic humidistat controller.

c) An automatic timer to operate the fan for 20 minutes or more after occupant leaves the room.

d) A continuously operating exhaust fan.

5.3 **Third-Party Performance Testing** (1 point). Perform a third-party test of each exhaust air flow rate for compliance with the relevant requirements: Section 5 of ASHRAE 62.2-2007 for in-unit exhaust; Table 6-4 in ASHRAE Standard 62.1-2007 for spaces outside the dwelling units.

Table 19: ASHRAE 62.2 Requirements: Minimum Air Flow Requirements for in-Unit Local Exhaust

Location	Minimum Air Flow: Intermittent	Minimum Air Flow: Continuous
Kitchen	100 cfm	5 ach
Bathroom	50 cfm	20 cfm

Synergies and Trade-Offs

If designed properly, exhaust fans can also provide sufficient outdoor air ventilation system for the entire home, as required by EQ 4.1.

EQ 6. Distribution of Space Heating and Cooling

Maximum points: 3

Intent

Provide appropriate distribution of space heating and cooling in the home to improve thermal comfort and energy performance.

Requirements

A. Forced-Air Systems:

Prerequisites

6.1 **Room-by-Room Load Calculations.** Perform design calculations (using ACCA Manuals J and D, the ASHRAE Handbook of Fundamentals, or an equivalent computation procedure) and install ducts accordingly.

Credits

6.2 **Return Air Flow** (1 point). Ensure that every room (except baths, kitchens, closets, pantries, and laundry rooms) has adequate return air flow through the use of multiple returns, transfer grilles, or jump ducts. Meet one of the following requirements:

a) Size the opening to 1 square inch per cfm of supply (this area may include free area undercut below door).

b) Demonstrate that the pressure differential between closed rooms and adjacent spaces with return is no greater than 2.5 Pa (0.01 inch w.c.).

6.3 **Third-Party Performance Test** (2 points). Have the total supply air flow rates in each room tested using a flow hood with doors closed, or one of the other acceptable methods cited by the ACCA Quality Installation Specifications. Supply air flow rates must be within +/- 15% (or +/- 10 cfm) of calculated values from ACCA Manual J (as required by EA 6.1).

B. Nonducted HVAC Systems (e.g., Hydronic Systems):

Prerequisites

6.1 **Room-by-Room Load Calculations.** Perform design calculations (using ACCA Manual J and D, the ASHRAE Handbook of Fundamentals, or an equivalent computation procedure) and install system accordingly.

Credits

6.2 **Room-by-Room Controls** (1 point). Design the HVAC system with flow control valves on every radiator.

6.3 **Multiple Zones** (2 points). Install nonducted HVAC system with at least two distinct zones with independent thermostat controls.

Synergies and Trade-Offs

A project receiving points for EQ 1 is not eligible to earn points for EQ 6.2 or EQ 6.3. A project pursuing EQ 6.2 or EQ 6.3 must meet all the prerequisites in EQ 2–10.

The choice of air filter (EQ 7) should be made prior to duct design, to ensure adequate air flow. Filters with a high MERV can create a large pressure drop that should be accommodated during system design.

Space heating and cooling loads and room air flow rates must be calculated using ACCA Manual J (EA 6.1). The design calculations conducted for this credit should be based on those Manual J calculations.

Duct installation should be visually inspected during the predrywall insulation inspection (EA 5).

EQ 7. Air Filtering

Maximum points: 2

Intent

Reduce particulate matter from the air supply system.

Requirements

A. Forced-Air Systems:

Prerequisites

7.1 **Good Filters.** Install air filters with a minimum efficiency reporting value (MERV) ≥ 8 and ensure that air handlers can maintain adequate pressure and air flow. Air filter housings must be airtight to prevent bypass or leakage.

Credits

7.2 **Better Filters** (1 point). Install air filters ≥ MERV 10 and ensure that air handlers can maintain adequate pressure and air flow. Air filter housings must be airtight to prevent bypass or leakage.

OR

7.3 **Best Filters** (2 points). Install air filters ≥ MERV 13 and ensure that air handlers can maintain adequate pressure and air flow. Air filter housings must be airtight to prevent bypass or leakage.

B. Nonducted HVAC Systems (e.g., Hydronic Systems):

Prerequisites

7.1 **Good Filters.** Install air filters ≥ MERV 8 and maintain adequate pressure and air flow in any mechanical ventilation systems. A home in a climate with fewer than 4,500 infiltration degree-days, or a home that uses only passive or exhaust-only ventilation, is exempt from this requirement.

Credits

7.2 **Better Filters** (1 point). Install air filters ≥ MERV 10 and maintain adequate pressure and air flow for any mechanical ventilation systems.

7.3 **Best Filters** (2 points). Install air filters ≥ MERV 13 and maintain adequate pressure and air flow for any mechanical ventilation systems.

Synergies and Trade-Offs

A project receiving points for EQ 1 is eligible to earn points for EQ 7.2 or EQ 7.3.

The choice of air filter should be made during or prior to duct design (EQ 6) to ensure adequate air flow. Filters with a high MERV can create a large pressure drop that should be accommodated during system design.

EQ 8. Contaminant Control *in Mid-rise Buildings*

Maximum *Points: 4*

Intent

Reduce occupant's and construction workers' exposure to indoor airborne contaminants through source control and removal.

Requirements

Prerequisites (Mandatory Measures)

None.

Credits (Optional Measures)

8.1 **Indoor Contaminant Control During Construction** (1 Point). Upon installation, seal all permanent ducts and vents to minimize contamination during construction. Remove any seals after all phases of construction are completed.

8.2 **Indoor Contaminant Control for MID-RISE** (1 Point each, Max. 2 Points). Select from the measures below:

a) For individual units with primary entrances that lead to the outdoors, design and install permanent walk-off mats at each entry that are at least 4 feet in length and allow accessibility for cleaning (e.g. grating with catch basin).

AND

For common entryways, employ permanent entryway systems at least 10 feet long in the primary direction of travel to capture dirt and particulates entering the building at regularly used exterior entrances. Acceptable entryway systems include permanently installed grates, grill s and slotted systems that allow for cleaning underneath. Roll-out mats are acceptable only when maintained on a weekly basis by a contracted service organization. Qualifying entryways are those that serve as regular entry points for building users, and that are directly connected to the outdoors.

b) In each unit, design a space near entryway for removing and storing shoes that is separated from living areas. This space may not have wall-to-wall carpeting and it must be large enough to accommodate a bench and at least 2 pairs of shoes per bedroom.

c) Install a central vacuum system in each unit with exhaust to the outdoors. Ensure exhaust is not near ventilation air intake.

8.3 **Preoccupancy Flush** (1 Point). Flush each unit with fresh air, according to the following guidelines:

a) Flush prior to occupancy but after all phases of construction are completed.

b) Flush the entire unit, keeping all interior doors open.

c) Flush for 48 total hours; the hours may be nonconsecutive, if necessary.

d) Keep all windows open and run a fan (e.g., HVAC system fan) continuously or flush the home with all HVAC fans and exhaust fans operating continuously at the highest flow rate.

e) Use additional fans to circulate air within the home.

f) Replace or clean HVAC air filter afterward, as necessary.

Synergies and Trade-Offs

Products with low VOC emissions greatly benefit indoor air quality. Source control of these kinds of emissions is addressed in MR 2.

EQ 9. Radon Protection

Maximum points: 1

Intent

Reduce occupant exposure to radon gas and other soil gas contaminants.

Requirements

Prerequisites

9.1 **Radon-Resistant Construction in High-Risk Areas.** If the home is in EPA Radon Zone 1, design and build the home with radon-resistant construction techniques as prescribed by EPA, the International Residential Code, Washington State Ventilation and Indoor Air Quality Code, or some equivalent code or standard.

Credits

9.2 **Radon-Resistant Construction in Moderate-Risk Areas** (1 point). If the home is outside EPA Radon Zone 1, design and build the home with radon-resistant construction techniques as prescribed by EPA, the International Residential Code, Washington State Ventilation and Indoor Air Quality Code, or some equivalent code or standard.

Note: Radon-resistant construction does not guarantee that occupants will not be exposed to radon. The Surgeon General and EPA recommend that every home in the country be tested for radon. Information about radon testing is available at the EPA Web site, at www.epa.gov/radon/radontest.html.

Synergies and Trade-Offs

A project receiving points for EQ 1 is not eligible to earn points for EQ 9.2.

EQ 10. Garage Pollutant Protection *in Mid-rise Buildings*

Maximum *Points: 3*

Intent

Reduce occupant exposure to indoor pollutants originating from an adjacent garage.

Requirements

Prerequisites (Mandatory Measures)

10.1 **No HVAC in Garage**. Place all air-handling equipment and ductwork outside the fire-rated envelope of the garage.

Credits (Optional Measures)

10.2 **Minimize Pollutants from Garage for MID-RISE** (2 Points). Tightly seal shared surfaces between garage and conditioned spaces, including all of the following:

a) In conditioned spaces above the garage:
   i) seal all penetrations;
   ii) seal all connecting floor and ceiling joist bays; and

b) In conditioned spaces next to the garage:
   i) weather strip all doors;
   ii) place carbon monoxide detectors in adjacent rooms that share a door with the garage;
   iii) seal all penetrations; and
   iv) seal all cracks at the base of walls.

c) Include a vestibule that provides an airlock between the garage and adjacent occupiable spaces OR provide self-closing doors and deck-to-deck partitions or a hard lid ceiling.

d) **Exhaust Fan in Garage**. Follow the requirements laid out in ASHRAE 62.1-2007. Exhaust the garage sufficiently to create negative pressure with respect to adjacent spaces with the doors to the room closed. The exhaust rate shall be at least 0.75 cfm/ ft^2, with no air recirculation, provided continuously.

OR

10.3 ***Detached Garage or No Garage*** (3 Points).

Synergies and Trade-Offs

A project receiving points EQ 10.3 is not eligible to earn points for EQ 10.2 and vice versa.

EQ 11: Environmental Tobacco Smoke (ETS) Control *in Mid-rise Buildings*

Maximum Points: 1

Intent

To prevent or minimize exposure of building occupants, indoor surfaces and ventilation air distribution systems to environmental tobacco smoke (ETS).

Requirements

Prerequisites

None.

Credits

11.1 **Environmental Tobacco Smoke Reduction for MID-RISE** (Maximum 1 Point). Meet one of the following.

a) Reduce smoke exposure and transfer (½ point). Implement rules and restrictions to achieve the following:

i. Prohibit smoking in all common areas of the building. The prohibition must be communicated in building rental/lease agreements or condo/coop association covenants and restrictions, and provisions for enforcement must be included.

ii. Locate any exterior designated smoking areas, including balconies where smoking is permitted, at least 25 feet from entries, outdoor air intakes and operable windows opening to common areas.

iii. Prohibit on-property smoking within 25 feet of entries, outdoor air intakes and operable windows. Provide signage to allow smoking in designated areas, prohibit smoking in designated areas or prohibit smoking on the entire property.

b) Prohibit smoking throughout the building (1 point). Implement rules and restrictions to achieve the following:

i. Prohibit smoking within living units. The prohibition must be communicated in building rental/lease agreements or condo/coop association covenants and restrictions, and provisions for enforcement must be included.

ii. Prohibit smoking in all common areas of the building. The prohibition must be communicated in building rental/lease agreements or condo/coop association covenants and restrictions, and provisions for enforcement must be included.

iii. Any exterior designated smoking areas must be located at least 25 feet away from all entries, outdoor air intakes, and operable windows.

Synergies and Trade-Offs

None.

EQ 12: Compartmentalization of Units *in Mid-rise Buildings*

Maximum Points: 1

Intent

To limit the exposure of building occupants to indoor air pollutants by minimizing the transfer of air between units.

Requirements

Prerequisites (Mandatory Measures)

12.1 Compartmentalization of Units. Each unit must be compartmentalized, to prevent excessive leakage between units. Meet both of the following:

a. Weather-strip all exterior doors and operable windows in the residential units to minimize leakage from outdoors. Minimize uncontrolled pathways for ETS and other indoor air pollutant transfer between individual residential units by sealing penetrations in walls, ceilings and floors in the residential units and by sealing vertical chases (including utility chases, garbage chutes, mail drops, and elevator shafts) adjacent to the units. Weather-strip all doors in the residential units leading to common hallways to minimize air leakage into the hallway. .

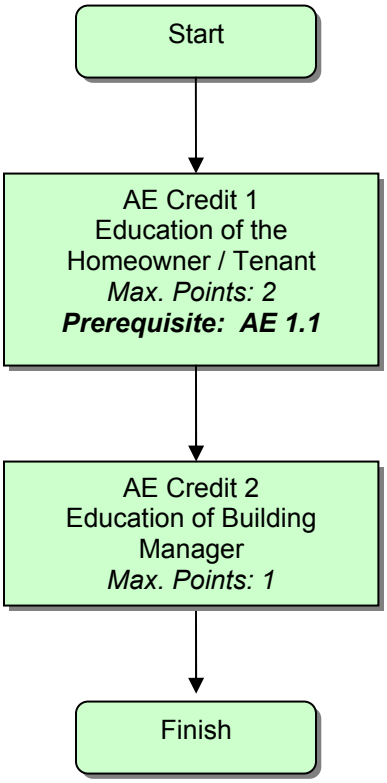
b. Demonstrate acceptable sealing of residential units by a blower door test. Follow the procedure described in the ENERGY STAR Testing and Verification Protocols for multifamily high-rise buildings, with an allowable maximum leakage of 0.30 cfm50 per square foot of enclosure (i.e. all surfaces enclosing the apartment, including exterior and party walls, floors, ceiling).

Credits

12.2 **Enhanced Compartmentalization of Units** (1 Point). Significantly reduce smoke and other indoor air pollutant exposure and transfer (1 point). Meet the requirements of part (a) above and perform a blower door test to ensure that smoke transfer is minimized. Follow the procedure described in the ENERGY STAR Testing and Verification Protocols for multifamily high-rise buildings, with an allowable maximum leakage of 0.225 cfm50 per square foot of enclosure (i.e. all surfaces enclosing the apartment, including exterior and party walls, floors, ceiling).

Awareness & Education (AE)

Pathway through the AE Category



AE 1. Education of the Homeowner or Tenant **Maximum points: 2**

Intent

Maintain the performance of the home by educating the occupants (i.e., the homeowner or tenant) about the operations and maintenance of the home's LEED features and equipment.

Requirements

Prerequisites

1.1 **Basic Operations Training.** Provide the home's occupant(s) with the following:

a) An operations and maintenance manual or binder that includes all the following items:

i. The completed checklist of LEED for Homes features.

ii. A copy of each signed Accountability Form.

iii. A copy of the durability inspection checklist.

iv. The product manufacturers' manuals for all installed equipment, fixtures, and appliances.

v. General information on efficient use of energy, water, and natural resources.

vi. Operations and maintenance guidance for any LEED for Homes–related equipment installed in the home, including

- space heating and cooling equipment;
- mechanical ventilation equipment;
- humidity control equipment;
- radon protection system;
- renewable energy system; and
- irrigation, rain water harvesting, and or graywater system.

vii. Guidance on occupant activities and choices, including the following:

- cleaning materials, methods, and supplies;
- water-efficient landscaping;
- impacts of chemical fertilizers and pesticides;
- irrigation;
- lighting selection; and
- appliance selection.

viii. Educational information on "green power".

b) A minimum one-hour walkthrough of the home with the occupant(s), featuring the following:

i. Identification of all installed equipment.

ii. Instruction in how to use the measures and operate the equipment.

iii. Information on how to maintain the measures and equipment.

Credits

1.2 **Enhanced Training** (1 point). Provide two hours of training for the occupant(s) in addition to the training provided for AE 1.1. Examples of eligible trainings include:

a) An additional walkthrough or training held in another home that has similar green measures and equipment.

b) A builder- or developer-sponsored meeting of potential homebuyers that informs participants of the unique features of a LEED home.

c) A group homebuyer training that includes discussion of the required items in the occupant's operations and maintenance manual, including information on efficient use of resources, appropriate use of measures and systems and proper maintenance of measures and systems.

d) A homebuyer DVD with operations and maintenance information on the home's LEED for Homes measures.

1.3 **Public Awareness** (1 point). Promote general public awareness about LEED for Homes by conducting at least three of the following activities:

a) Hold an advertised, attended public open house that lasts at least four hours per day on at least four weekends, or participate in a green building exhibition or tour. The home or building must display at least four informational stations about the LEED for Homes features (and/or offer a guided tour that highlights at least four LEED for Homes features).

b) Publish a website with at least two pages that provides detailed information about the features and benefits of LEED homes.

c) Generate a newspaper article on the LEED for Homes project.

d) Display LEED for Homes signage, measuring six square feet or more, on the exterior of the home or building.

Synergies and Trade-Offs

Many of the measures in the Rating System should be addressed in the operations manual and the on-site training, particularly any measures that require routine maintenance (e.g., air filters) or instruction for proper operation (e.g., heat-recovery systems).

AE 2. Education of Building Manager

Maximum points: 1

Intent

Maintain the performance of the home by educating the building manager about the operations and maintenance of the home's LEED features and equipment.

Requirements

Prerequisites

None.

Credits

2 **Education of Building Manager** (1 point). For multifamily buildings (more than five units), provide the building manager with the following:

a) A building owner's manual or binder that includes these items:
   i. The completed checklist of LEED for Homes features.
   ii. A copy of each signed Accountability Form.
   iii. A copy of the durability inspection checklist.
   iv. The product manufacturers' manuals for all installed equipment, fixtures, and appliances.
   v. General information on efficient use of energy, water, and natural resources.
   vi. Operations and maintenance guidance for any LEED for Homes related equipment installed in the home, including:
      - space heating and cooling equipment;
      - mechanical ventilation equipment;
      - humidity control equipment;
      - radon protection system;
      - renewable energy system; and
      - irrigation, rainwater harvesting, and/or graywater system.
   vii. Guidance on occupant activities and choices, including the following:
      - cleaning materials, methods, and supplies;
      - water-efficient landscaping;
      - impacts of chemical fertilizers and pesticides;
      - irrigation;
      - lighting selection; and
      - appliance selection.
   viii. Educational information on "green power".

b) A minimum one-hour walkthrough of the building before occupancy, featuring the following:
   i. Identification of all installed equipment.
   ii. Instruction in how to use the measures and operate the equipment in each unit.
   iii. Information on how to maintain the measures and equipment in each unit.

Synergies and Trade-Offs

Many of the measures in the Rating System should be addressed in the building manager's manual and on-site training, particularly any measures that require routine maintenance (e.g., air filters) or specific instruction for proper operation (e.g., heat-recovery systems).

Abbreviations and Acronyms

ACCA – Air Conditioning Contractors of America
AE – Awareness & Education section
AFUE – annual fuel utilization efficiency
ALP – ENERGY STAR Advanced Lighting Package
AP – LEED Accredited Professional
ASHRAE – American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME – American Society of Mechanical Engineers
ASTM – American Society for Testing and Materials
CAE – combined annual efficiency
CFA – conditioned floor area
CFC – chlorofluorocarbon
CFL – compact fluorescent light
CFM – cubic feet per minute
CFR – US Code of Federal Regulations
CIR – Credit Interpretation Request
CO – carbon monoxide
COC – chain of custody
COP – coefficient of performance
CRI – Carpet & Rug Institute
CZ – climate zone
DHW – domestic hot water
DOE – US Department of Energy
DU – distribution uniformity
EA – Energy & Atmosphere section
EER – energy efficiency rating
EERE – US Office of Energy Efficiency and Renewable Energy
EF – energy factor
EPA – US Environmental Protection Agency
ET – evapo-transpiration
EQ – Indoor Environmental Quality section
FEMA – US Federal Emergency Management Agency
FSC – Forest Stewardship Council
GPF – gallons per flush
GPM – gallons per minute
HCFC – hydrochlorofluorocarbon
HEPA – high-efficiency particle absorbing

GLOSSARY

HERS – Home Energy Rating Standards
HET – high-efficiency toilet
HOA – homeowner's association
HSPF – heating season performance factor
HVAC – heating, ventilation, and air conditioning
IAP – ENERGY STAR with Indoor Air Package
IAQ – indoor air quality
ICF – insulated concrete form
ID – Innovation & Design section
IDR – Innovative Design Request
IECC – International Energy Conservation Code
IRC – International Residential Code
KW – kilowatt
KWH – kilowatt-hour
LED – light-emitting diode
LEED – Leadership in Energy and Environmental Design
LL – Location & Linkages section
MEF – modified energy factor
MERV – minimum efficiency reporting value
MR – Materials & Resources section
NFRC – National Fenestration Rating Council
OSB – oriented strand board
RESNET – Residential Energy Services Network
SCS – Scientific Certification Systems
SEER – seasonal energy efficiency rating
SHGC – solar heat gain coefficient
SIP – structural insulated panels
SS – Sustainable Sites section
SRI – solar reflectance index
TASC – Technical Advisory Subcommittee
UL – Underwriter's Laboratory
USGBC – US Green Building Council
VOC – volatile organic compound
WE – Water Efficiency section
WF – water factor
WFA – window-to-floor ratio

Glossary

adhesive any substance used to bond one surface to another by attachment. Adhesives include adhesive bonding primers, adhesive primers, adhesive primers for plastics, and any other primer.

albedo a measure of the reflectivity of a surface. High-albedo materials are very reflective of solar radiation.

balancing damper an adjustable plate that regulates air flow within ducts.

bedroom in LEED for Homes, any room or space that could be used or is intended to be used for sleeping purposes and meets local fire and building code requirements.

borate a wood preservative that is nontoxic to humans but highly toxic to wood-boring insects, such as termites.

buildable land the portion of a site where construction can occur. Buildable land excludes public streets and other public rights-of-way, land occupied by nonresidential structures, public parks and land excluded from residential development by law.

built environment the manmade alterations to a specific area, including its natural resources. On a home site, this includes everything that has been disturbed during construction.

catchment the surface area of a roof that captures rainwater for a rainwater harvesting system.

central vacuum system a network of tubing with inlets throughout the house designed to remove dust and debris to a remote receptacle. A central vacuum system is more efficient than a traditional vacuum cleaner.

chain-of-custody in forest certification, the path taken by raw materials, processed materials, and products from the forest to the consumer, including all successive stages of processing, transformation, manufacturing and distribution. A chain-of-custody certificate number on invoices for nonlabeled products indicates that the certifier's guidelines for product accounting have been followed. A chain-of-custody certification is not required by distributors of a product that is individually labeled with the Forest Stewardship Council logo and manufacturer's chain-of-custody number.

charrette an intensive, collaborative session in which a project team discusses design and construction options related to all aspects of the home.

chlorofluorocarbon (CFC) a chemical compound, once commonly used in refrigeration, that depletes the stratospheric ozone layer.

circulation loop a system that returns cold water to the water heater (instead of down the drain) until hot water reaches the faucet. A circulation loop is one component of a structured plumbing system.

climate zone in the U.S., one of 8 regions as defined by the International Energy Conservation Code that characterize the temperature of an area of the country. Climate zone 1 is the hottest and climate zone 8 is the coldest.

closed combustion a design for furnaces and water heaters in which the supply air is ducted from the outside and exhaust gases are ducted to the outdoors. All elements of the system are sealed to prevent combustion exhaust from leaking into the home.

combustion exhaust gases the most common gases resulting from fossil fuel combustion, including carbon dioxide, carbon monoxide, sulfur dioxide and nitrogen oxides. These gases pose health hazards at high concentrations.

compensating shower valves: designed to keep bathing water temperatures in the shower fairly constant when other appliances, such as a washing machine or toilet, are in use and when the hot or cold water supply pressures change or the bathing water outlet temperature changes. Three types of valves are available: ***Thermostatic compensating valves*** are designed to keep bathing water temperatures in the shower fairly constant when other appliances, such as a washing machine or toilet, are in use and when the hot or cold water supply pressures change or the bathing water outlet temperature changes. The response of this type of mechanism is different to that of a pressure balance compensating valve. ***Pressure balance compensating valves*** are designed to keep bathing water temperature in the shower fairly constant when other appliances, such as a washing machine or toilet, are in use and when the hot or cold water supply pressures change. ***Conventional, non-compensating valves*** are completely dependent on the user to adjust the temperature at all times by changing the adjustment.

composite wood a product consisting of wood or plant particles or fibers bonded together by a synthetic resin or binder. Examples include plywood, particleboard, oriented-strand board (OSB), medium-density fiberboard (MDF) and composite door cores.

conditioned space interior area that utilizes any method of air-conditioning or heating to control temperature and/or humidity levels, usually measured in cubic feet.

conventional turf grass, typically a monoculture, that requires considerable watering, mowing, and/or fertilizers. What is considered conventional turf may vary by region.

demand-controlled circulation the automatic circulation of water, triggered by a switch or sensor, through a looped system to ensure that hot water is immediately available while keeping unused cold water in the system, saving both water and energy.

density the quantity of structures on a site, measured for residential buildings as dwelling units per acre of buildable land available for residential uses, and for nonresidential buildings as floor area ratio per net acre of buildable land available for nonresidential uses.

designed landscape the arrangement of features on a site, including softscapes (e.g., grass, shrubs) and hardscapes (e.g., patios, fountains) but not areas under roof. Preserved natural areas are not considered part of the designed landscape.

development the homes and building lots that surround the new LEED home project that is to be built. A development may be new or preexisting. Preexisting developments may be referred to as the community.

distribution uniformity A metric for estimating how uniformly water is applied to an area. Distribution Uniformity (DU) ranges between 0 and 1, where 1 indicates that the irrigation system is providing perfectly equal coverage. A higher DU means less likelihood of overwatering or underwatering.

disturbed lot area the part of a site that is directly affected by construction activity, including any activity that would compact the soil or damage vegetation.

diverted waste debris from construction or demolition that is not sent to a landfill or incinerator. Strategies for diverting waste include reclamation, recycling and, for certain materials, mulching.

drip irrigation system a network of pipes and valves that rest on the soil or underground and slowly deliver water to the root systems of plants. Drip irrigation saves water by minimizing evapotranspiration and topsoil runoff. Drip irrigation usually involves a network of pipes and valves that rest on the soil or underground at the root zone.

dry well an underground structure that collects runoff and distributes it over a large area, increasing absorption and minimizing erosion.

dual-flush toilet a toilet with two flush volumes, one for solid waste and a reduced volume for liquid waste.

durability The ability of a building or any of its components to perform its required function in its service environment over the period of time without unforeseen cost for maintenance or repair.

edge development generally, a group of homes that extend an existing community beyond its borders but remain connected to it. In LEED for Homes, at least 25% of an edge development's perimeter must border land that has been previously developed.

ENERGY STAR home a home built to a high standard of energy efficiency (at least 15% more efficient than the International Energy Conservation Code). For more information, visit www.energystar.gov/homes.

ENERGY STAR with Indoor Air Package (IAP) a certification program that recognizes homes with systems to ensure high standards of indoor air quality and rated as an ENERGY STAR home.

envelope see *thermal envelope.*

erosion a process in which materials of the earth's surface are loosened, dissolved or worn away and transported by natural agents, such as water, wind or gravity.

fly ash the fine ash residue from coal combustion. Fly ash can be substituted for Portland cement, a bonding material in concrete.

formaldehyde a naturally occurring volatile organic compound used as a preservative. When present in high concentrations, formaldehyde can cause headaches, dizziness, mental impairment, and other symptoms—and may be a carcinogen.

graywater wastewater that comes from household baths and clothes washers and is neither clean nor heavily soiled. More specifically, (1) "untreated house-hold wastewater which has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom wash basins, and water from clothes-washer and laundry tubs. It shall not include wastewater from kitchen sinks or dishwashers" (Uniform Plumbing Code, Appendix G, "Grey Water Systems for Single-Family Dwellings); (2) "wastewater discharged from lavatories, bathtubs, showers, clothes washers, and laundry sinks" (International Plumbing Code, Appendix C, "Grey water Recycling Systems"). Some states and local authorities allow kitchen sink wastewater to be included in graywater.

Green Rater an individual that performs field inspections and performance testing of LEED for Homes measures for the LEED for Homes Provider. A HERS rater with additional training can become a Green Rater.

hardscape "elements added to a natural landscape, such as paving stones, gravel, walkways, irrigation systems, roads, retaining walls, sculpture, street amenities, fountains, and other mechanical features" (American Society of Landscape Architects). Hardscapes are often impermeable, but they are not impermeable by definition.

high-efficiency toilet (HET) a toilet that uses no more than 1.3 gallons per flush.

Home Energy Rating System (HERS) index a system for evaluating the energy efficiency of a home using an energy simulation model. A HERS index of 100 represents the energy efficiency of a home that meets basic IECC code requirements; each additional index point represents a 1% increase in energy use, and lower index numbers indicate the percentage savings in energy use.

hydrochlorofluorocarbon (HCFC) a chemical compound used as a refrigerant. HCFCs deplete the stratospheric ozone layer but to a lesser extent than chlorofluorocarbons (CFCs).

hydronic system a heating or cooling system that uses circulating water as the heat-transfer medium, such as a boiler with hot water circulated through radiators.

infill site a lot in an existing community. In LEED for Homes, an infill site is defined as having at least 75% of its perimeter bordering land that has been previously developed.

infiltration degree-days the sum of the heating degree-days and the cooling degree-days.

invasive species "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health" (Executive Order 13112). Not all nonnative species are considered invasive, and invasive species differ by region. Regional agencies that list invasive species are available at www.invasivespeciesinfo.gov/unitedstates/state.shtml.

ladder blocking a method of framing in which interior partition walls meet and are reinforced by exterior walls, with minimal framing.

light fixture illumination that is permanently fixed to the home. A fluorescent light fixture has an integrated ballast. A compact fluorescent lamp (CFL) is not a light fixture.

local heat island effect the incidence of higher air and surface temperatures caused by the absorption of solar energy and its reemission from roads, buildings and other structures.

lot the individual parcel of land on which a home is to be built.

minimum efficiency reporting value (MERV) the effectiveness of a mechanical air filter based on the number and size of the particles that pass through it under normal conditions. The higher the rating, the more effective the filter.

native plant a plant that has evolved within the particular habitat that it is being used. Native plants provide food and shelter to indigenous wildlife and grow in balance with surrounding plant and animal species. The characterization of a plant as 'native' may vary regionally and even locally.

no-disturbance zone an area that is preserved during construction.

postconsumer recycled content material used and then recycled by consumers, as distinguished from the recycled by-products of manufacturing, called preconsumer (postindustrial) recycled content.

postconsumer waste material generated by households or by commercial, industrial and institutional facilities that can no longer be used for its intended purpose. This includes returns of materials from the distribution chain (Source: ISO 14021). Examples include construction and demolition debris, materials collected through recycling programs, broken pallets (from a pallet refurbishing company, not a pallet-making company), discarded cabinetry and decking, and home maintenance waste (leaves, grass clippings, tree trimmings).

potable suitable for drinking. Potable water is generally supplied by municipal water systems.

power-vented exhaust the use of an active fan system to pull combustion gases out of the home. Combustion equipment with power venting can use indoor air as the combustion supply air.

preconsumer content material diverted from the waste stream during the manufacturing process. Formerly known as postindustrial content. Examples include planer shavings, plytrim, sawdust, chips, bagasse, culls, trimmed materials and obsolete inventory.

Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it (Source ISO 14021).

previously developed land having pre-existing paving, construction, or significantly altered landscapes. This does not apply to altered landscapes resulting from current agricultural use, forestry use, or use as preserved natural area.

previously developed site in LEED for Homes, a lot consisting of at least 75% previously developed land**.**

prime farmland "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses" (U.S. CFR, Title 7, Part 657.5).

project the design and construction of a LEED home. A project may include multiple homes in a development.

Provider an organization that recruits, trains and coordinates LEED for Homes Green Raters to serve as third-party verifiers of LEED homes. Providers are the official certifiers of LEED for Homes on behalf of the U.S. Green Building Council.

radon a radioactive gas that naturally vents from the ground. Not all homes have problems with radon. High levels of radon are known to be carcinogenic.

rain garden a swale, or low tract of land into which water flows, planted with vegetation that requires or tolerates high moisture levels. A rain garden can be designed to reduce the volume of water entering storm drains and replenish groundwater.

reclaimed material building components that have been recovered from a demolition site and are reused in their original state (i.e., not recycled). Also known as salvaged or reused material.

recycled content the weight of recycled material, including both postconsumer and preconsumer (postindustrial) material, divided by the overall weight of the assembly.

recycling the collection, reprocessing, marketing and use of materials that were diverted or recovered from the solid waste stream.

refrigerant a fluid that absorbs heat from a reservoir at low temperatures and rejects heat at higher temperatures.

reuse the return of salvaged materials to use in the same or a related capacity.

R-value a measure of thermal resistance, defined as the number of watts lost per square meter at a given temperature difference. R-value is the inverse of U- value (i.e., R = 1/U).

salvaged material see 'reclaimed material'.

sedimentation the deposition of soil and other natural solids in waterbodies. Sedimentation decreases water quality and accelerates the aging process of lakes, rivers and streams.

siltation the deposition and accumulation of fine very particles in waterbodies. Siltation is often harmful to lake, river and stream ecosystems.

site the individual building lot where a home is to be built. A site may include all of the lots that a builder is responsible for.

softscape the natural elements of a landscape, such as plant materials and soil. Softscapes can include hard elements, such as rocks.

solar heat gain coefficient (SHGC) a measure of how well a window blocks heat from the sun, expressed as a fraction of the heat from the sun that enters the window. A lower SHGC is generally preferable, particularly in hot climates.

solar window screen mesh used to block light and heat from the sun, as well as insects.

subdivision the homes and building lots that immediately surround the new LEED home project that is to be built. A subdivision may be new or preexisting, and belongs to a larger development.

sustainable forestry the practice of managing forest resources to meet the long-term forest product needs of humans while maintaining the integrity of forested landscapes and sustaining a full range of forest values—economic, social and ecological.

Technical Advisory Sub- Committee in LEED for Homes, a group of specialists who rule on Credit Interpretation Requests and Innovative Design Requests.

termite a wood-eating social insect (order Isoptera) that can cause serious structural damage to buildings in many regions of the United States. Also known as white ant.

thermal bridge a part of a building envelope that has high heat conductance, lowering the average R-value.

thermal envelope the thermal enclosure created by the building exterior and insulation.

topsoil The uppermost layer of soil, containing high levels of nutrients and organic matter. Healthy topsoil is essential for the survival of trees and plants.

tree/plant preservation plan A formal assessment of the lot and a development of a landscaping plan that seeks to preserve the most trees and native plants. This is important to do as one of the first steps in the design process to ensure the developed area takes into account the preservation plan.

ureaformaldehyde a combination of urea and formaldehyde used in some glues and adhesives, particularly in composite wood products. At room temperature, ureaformaldehyde emits formaldehyde, a toxic and possibly carcinogenic gas.

U-value a measure of thermal conductivity (often used for windows) that is the inverse of R-value. A lower U-value means a more energy-efficient window. Also known as U-factor.

vegetated roof a roof partially or fully covered by vegetation, used to manage water runoff and provide additional insulation in winter and cooling in summer.

vegetated swale see *rain garden.*

volatile organic compound (VOC) a carbon compound that vaporizes (becomes a gas) at normal room temperatures. VOCs contribute to air pollution directly and through atmospheric photochemical reactions to produce secondary air pollutants, principally ozone and peroxyacetyl nitrate.

walk-off mat an exterior pad or grate designed to trap dust and debris.

wetland an area inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions (U.S. Code of Federal Regulations, Title 40, Part 232). Wetlands generally include swamps, marshes, bogs, and similar areas.

Appendix A. Adjustments to the Title-24 simulation model output for use with EA prerequisite 1.1 and EA credit 1.3 LEED for Homes Mid-rise Multi-family

Section A1. Introduction

Title-24 provides thorough guidance for how to conduct a whole-building energy simulation model. A code-compliant energy model can be constructed using various programs, but every program produces two sets of data: the annual energy loads ($kBtu/ft^2$) for the Standard Design and the annual energy loads for the Proposed Design. Each set of annual energy loads includes a breakdown for nine demand components, which include: space heating; space cooling; indoor fans; heat rejection; pumps & miscellaneous; domestic hot water; lighting; receptacle; and process.

In an effort to promote deeper energy reductions, LEED for Homes awards points in EA credit 1.3 for exceeding the performance requirements of Title-24. Since the Title-24 modeling regime was designed primarily to help builders demonstrate code compliance, not to create a benchmark for improved performance, LEED for Homes requires some adjustments to the model output.

This section explains how the Title-24 energy simulation model output should be adjusted for use in meeting EA prerequisite 1.1 and earning points in EA credit 1.3. The adjustments to the model output consist of 5 basic steps:

Step 1. Conduct a whole-building energy simulation using any Title-24 code-compliant software. This model will produce annual energy loads for the Standard Design and Proposed Design.

Step 2. In a separate calculation (outside the model), subtract the lighting loads from both the Standard Design and Proposed Design. Lighting is addressed in EA credit 8.

Step 3. In a separate calculation, replace the domestic hot water load estimate for the Proposed Design with a modified domestic hot water load estimate using the method laid out in Section A2 below. The Standard Design domestic hot water load should not be modified.

Step 4. In a separate calculation, replace the receptacle load estimate for both the Standard Design and Proposed Design with modified receptacle load estimates using the method laid out in Section A3 below.

Step 5. Add the modified receptacle load to the remaining energy loads for the Standard Design. Add the modified receptacle load and domestic hot water load to the remaining energy loads for the Proposed Design. Compare the modified totals for the Proposed Design to the modified totals for the Standard Design to calculate the overall energy reduction estimate needed for EA prerequisite 1.1 and EA credit 1.3.

Section A2. Modified Domestic Hot Water Loads

The modeling regime for Title-24 does not provide any incentive for reducing hot water loads. LEED for Homes wants to encourage reduced hot water demand, so this section outlines a method for modifying the domestic hot water loads. This method allows buildings to take credit for four strategies:

- Low-flow shower heads
- Low-flow fixtures
- Water-efficient dishwashers
- Water-efficient clothes washers

The method outlined in this section produces a modified DHW load for the Proposed Design, which impacts the energy performance as calculated for EA prerequisite 1.1 and EA credit 1.3. Buildings that install low-flow fixtures can also earn points in the Water Efficiency section of the LEED for Homes Rating System.

Use equations (1) through (3) to calculate the modified domestic hot water load for the Proposed Design.

(1) DHWp = DHWm*(0.4) + DHWm*Fix*(0.45) + DHWm*App*(0.15)

(2) Fix = 0.36 + 0.54*(LFS/2.5) + 0.1*(LFF/2.2)

(3) App = (CWp + DWp) / (CWb + DWb)

Where:

DHWm is the DHW load for the Proposed Design estimated by the Title-24 model
DHWp is the modified DHW load for the Proposed Design
Fix is a multiplier to the hot water loads associated with fixtures
App is a multiplier to the hot water loads associated with appliances
LFS is the average flow (Gallons per minute) of the showerheads in the Proposed Design
LFF is the average flow (Gallons per minute) of the bathroom faucets in the Proposed Design
CWp is the hot water usage (Gal/yr) for the clotheswasher in the Proposed Design (see below)
DWp is the hot water usage (Gal/yr) for the dishwasher in the Proposed Design (see below)
CWb is the hot water usage (Gal/yr) for the clotheswasher in the Standard Design (see below)
DWb is the hot water usage (Gal/yr) for the dishwasher in the Standard Design (see below)

Solving Clothes washer usage (CWp and CWb)

1) If the proposed design clotheswasher is ENERGY STAR labeled, then go to www.energystar.gov/index.cfm?fuseaction=clotheswash.display_products_html and identify the water consumption and size (cubic feet) of the proposed model. Set CWp equal to 20% of the water consumption in the table. Set CWb = 0.2 * Vcf * 11 * 392, where Vcf is equal to the proposed clotheswasher volume.
2) If the proposed design clotheswasher is not known, but it is ENERGY STAR labeled, assume CWp is equal to 1375 gallons, and CWb is equal to 1700 gallons.
3) If the proposed design clotheswasher is not ENERGY STAR labeled, set CWp and CWb to 1700 gallons.

Solving Dishwasher usage (DWp and DWb)

1) If the proposed design dishwasher is known, identify the proposed water consumption for the appliance (Gal/cycle). Set DWp equal to 215 times the water use (Gal/cycle) for the proposed dishwasher. Set DWb equal to 1,935 gallons.
2) If the proposed design dishwasher is not known, but it is ENERGY STAR labeled, assume DWp is equal to 1,100 gallons, and DWb is equal to 1,935 gallons.
3) If the proposed design dishwasher is not known, assume set DWp and DWb equal to 1,935 gallons per year.

Section A3. Modified Receptacle Loads

The modeling regime for Title-24 does not provide any incentive for reducing appliance loads. LEED for Homes wants to encourage the use of high-efficiency appliances, so this section outlines a method for modifying the receptacle loads. This method allows buildings to take credit for three strategies:

- Energy-efficient refrigerators
- Energy-efficient dishwashers
- Energy-efficient clothes washers

The method outlined in this section produces modified receptacle loads for both the Proposed Design and Standard Design. These modified loads will affect the energy performance as calculated for EA prerequisite 1.1 and EA credit 1.3.

Step 1. Calculate the annual consumption (kWh) for all receptacle loads (including refrigerator, dishwasher, clothes washer, clothes dryer, cooking, and plug loads) using the methods described below.

Step 2. Convert the annual consumption for the receptacle loads from kWh to kBTU. Assume 3.413 kBTU per kWh.

Step 3. Calculate the energy density (kBTU/sf) by dividing the results from Step 2 by the total conditioned floor area of the building. This energy density is the modified receptacle load.

Follow these steps for both the Proposed Design and the Standard Design. Assume one refrigerator, one dishwasher, one clothes washer, one clothes dryer, and one cooking range/stove per unit, ***even if the building is not planning to include these appliances***.

Appendix A. Model Adjustments for Energy Performance Calculations

Refrigerator loads

1) If the model of ENERGY STAR refrigerator is known, go to http://www.energystar.gov/index.cfm?fuseaction=refrig.display_products_html and find the refrigerator being used. Use "kwh/yr" for the Proposed Design, and "Federal standard kwh/year" for the Standard Design. Multiply each number by the total number of units to get totals for the whole building.
2) If the model of refrigerator is not known, but ENERGY STAR models are being used throughout the building, use the table below to estimate consumption in the Standard and Proposed Design. If the type is unknown, assume "side-by-side".
3) If ENERGY STAR models are not being used, assume 500 kWh/yr per unit for both the Standard and Proposed Design.

Type of Refrigerator	Standard Design (kWh/yr/unit)	Proposed Design (kWh/yr/unit)
Top freezer	500	425
Bottom freezer	575	500
Side-by-side	600	525

Dishwasher loads

1) Assume 400 kWh/year per unit for the Standard Design.
2) If ENERGY STAR models are being used, assume 300 kWh/year per unit for the Proposed Design.
3) If ENERGY STAR models *are not* being used, assume 400 kWh/year per unit for the Proposed Design.

Clothes washer loads

1) Assume 310 kWh/year per unit for the Standard Design.
2) If ENERGY STAR models are being used, assume 200 kWh/year per unit for the Proposed Design.
3) If ENERGY STAR models *are not* being used, assume 310 kWh/year per unit for the Proposed Design.

Clothes dryer loads

1) Assume the Proposed Design and Standard Design consumption (kWh/year) per unit is equal to 418 + 319*N, where N= average number of bedrooms in each unit.

Cooking loads

1) If electric stove/range is used, assume 600 kWh/year per unit for both the Proposed Design and Standard Design.

Plug loads

1) Assume 1.37 kWh per square foot of finished floor area per year for both the Proposed Design and Standard Design