LEED v4
HOMES DESIGN AND CONSTRUCTION

Updated October 5, 2018

Includes
LEED BD+C: Homes and Multifamily Lowrise
LEED BD+C: Multifamily Midrise

CREDIT: INTEGRATIVE PROCESS

2 points
This credit applies to

- Homes (1-2 points)
- Midrise (1-2 points)

Intent

To maximize opportunities for cost-effective adoption of integrative green design and construction strategies.

Requirements

HOMES, MIDRISE

Option 1. Integrative Project Team (1 point)

Assemble and involve a project team to meet the three criteria below:

a) Include team members whose capabilities include at least three of the following skill sets:

- architecture or residential building design;
- mechanical or energy engineering;
- building science or performance testing;
- green building or sustainable design; and
- civil engineering, landscape architecture, habitat restoration, or land-use planning.

b) Involve all team members referenced above in at least three of the following phases of the home design and construction process:

- conceptual or schematic design;
- LEED planning;
- preliminary design;
- energy and envelope systems analysis or design;
- design development;
- final design, working drawings or specifications; and
- construction.

c) Conduct meetings with the project team at least monthly to review project status, introduce new team members to project goals, discuss problems, formulate solutions, review responsibilities, and identify next steps.

AND/OR

Option 2. Design Charrette (1 point)

No later than the design development phase and preferably during schematic design, conduct at least one full-day workshop (or two half-day workshops) with the project team, as defined in Option 1. Use the workshop to integrate green strategies across all aspects of the building design, drawing on the expertise of all participants.

AND/OR

Option 3. Trades Training (1 point)

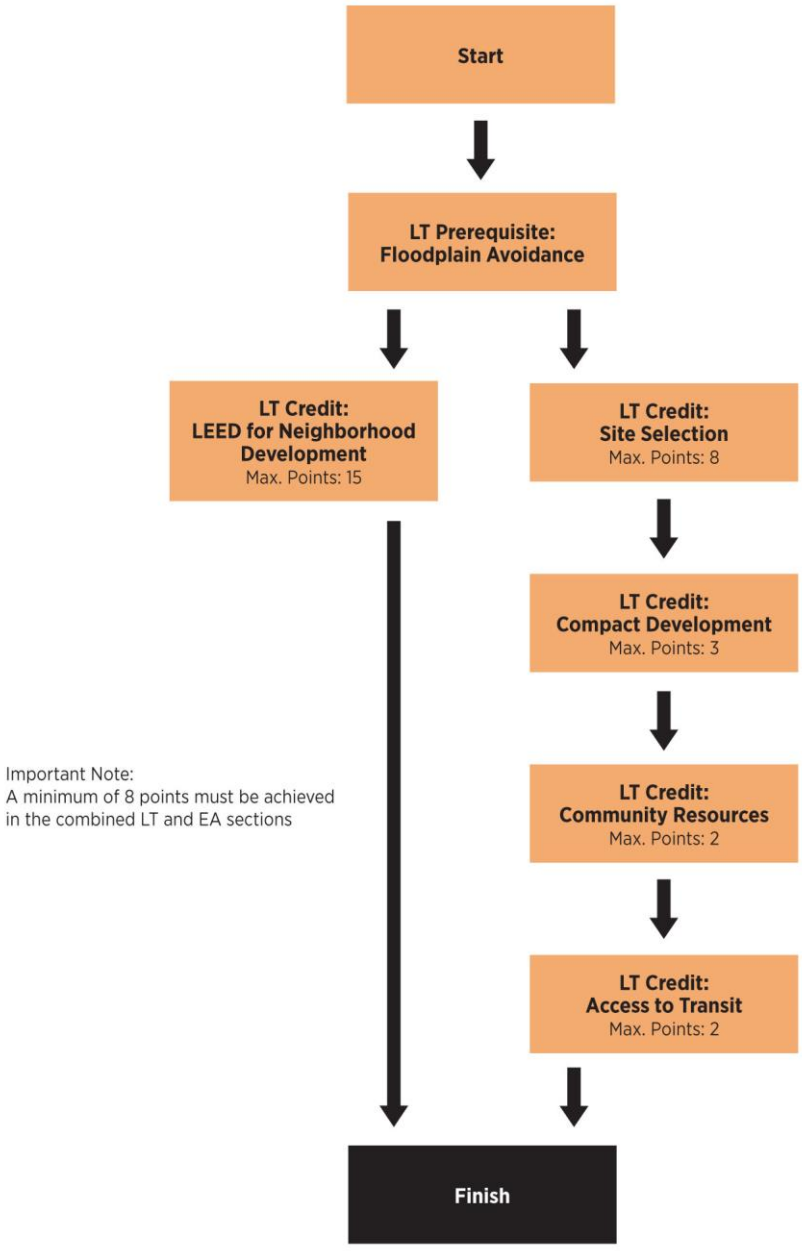
Before construction but after trades have been hired for the project, conduct at least eight hours of training (extending a full day or over several days) on the green aspects of the project and how the trades can contribute to achieving each LEED for Homes prerequisite and attempted credit. Focus on areas where trades have traditionally struggled to meet green building standards. Include at least the following trades in the training:

- plumbing;
- mechanical systems;
- insulation;
- framing; and
- air sealing.

Each trade may be present only for the relevant segment, but the builder's site supervisor must be present throughout so that he or she understands the quality control duties on LEED and green building best practices.

LOCATION AND TRANSPORTATION (LT)

Point floor: Earn at least 8 l points in the combined LT and EA sections.



Optional Pathways through the LT Category

LT PREREQUISITE: FLOODPLAIN AVOIDANCE

This credit applies to

- Homes
- Midrise

Intent

To reduce the environmental impact of the development footprint.

Requirements

HOMES, MIDRISE

Do not develop buildings on land that lies within a flood hazard area shown on a legally adopted flood hazard map (such as the Federal Emergency Management Agency (FEMA) 100 year flood plain) or otherwise legally designated by the local jurisdiction or the state, unless the building is designed and built in accordance with the flood provisions of applicable building code, the local floodplain management regulations, or, at a minimum, the National Flood Insurance Program Requirements. Projects outside of the United States may use a local equivalent program to NFIP if the program is equal to or more stringent.

Hardscapes and previously developed buildings are exempt from the above requirements.

LT CREDIT: LEED FOR NEIGHBORHOOD DEVELOPMENT

15 points
This credit applies to

- Homes (15 points)
- Midrise (15 points)

Intent

To minimize the environmental damage of land development practices by building homes in LEED for Neighborhood Development–certified communities.

Requirements
HOMES, MIDRISE

Locate the project within the boundary of a development certified under LEED for Neighborhood Development (Stage 2 or Stage 3 under the Pilot or 2009 rating systems, Certified Plan or Certified Project under the v4 rating system).

Projects attempting this credit are not eligible to earn points under other Location and Transportation credits.

LT CREDIT: SITE SELECTION

8 points

This credit applies to

- Homes (1-8 points)
- Midrise (1-8 points)

Intent

To encourage construction in environmentally preferable locations and avoid development of sensitive lands.

Requirements

HOMES, MIDRISE

Option 1. Sensitive Land Protection (3-4 points)

Path 1. Previously Developed (4 points)

Select a lot such that at least 75% of the total *buildable land* is *previously developed*.
OR

Path 2. Avoidance of Sensitive Land (3 points)

Do not develop new buildings, *hardscapes*, roads or parking areas on portions of sites that meet any of the following criteria:

- *Prime farmland.* The development footprint does not consist of *prime farmland, unique farmland*, or farmland of statewide or local importance as defined by the U.S. Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 or local equivalent for projects outside the United States.
- *Parkland.* 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);
- *Floodplain*. Land that lies within a flood hazard area shown on a legally adopted flood hazard map (such as the Federal Emergency Management Agency (FEMA) 100 year flood plain) or otherwise legally designated by the local jurisdiction of the state;
- *Habitat*. Land specifically identified as habitat for the following:
    - species listed as threatened or endangered under the U.S. Endangered Species Act or the state's endangered species act, or
    - species or ecological communities classified by NatureServe as GH (possibly extinct), G1 (critically imperiled), or G2 (imperiled), or
    - species listed as threatened or endangered specifies under local equivalent standards (in areas outside of the United States) that are not covered by NatureServe data.
- *Wetlands.* Land that is either (1) within 50 feet (15 meters) of any wetlands as defined by the 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 (2) within the setback distances from wetlands prescribed local, state, or national regulations, whichever is more stringent; or

- *Water bodies*. Land that is within 100 feet (30 meters) of a water body, defined as seas, lakes, rivers, streams, and tributaries that support or could support fish, recreation, or industrial use, consistent with the terminology of the Clean Water Act 40 CFR 122.2.

AND/OR

Option 2. Infill Development (2 points)

Select a lot such that at least 75% of the land within ½ mile (800 meters) from the project boundary is *previously developed* land. Water bodies and publicly owned parks are excluded from the calculation.

For projects within city limits of towns with populations of less than 20,000, select a lot where at least 75% of the land immediately adjacent to the project boundary is *previously developed* land. A bordering street itself does not constitute previously developed land; instead, it is the status of the property on the other side of the segment of the street that matters. Any fraction of the boundary that borders a water body is excluded from the calculation.

AND/OR

Option 3. Open Space (1 point)

Select a location within ½ mile (800 meters) of a publicly accessible or community-based *open space* that is at least ¾ acre (0.3 hectare), or create publicly available open space on the project site. The open space requirement can be met with either one large open space or two smaller spaces totaling ¾ acre (0.3 hectare).

AND/OR

Option 4. Street Network (1 point)

Locate the project in an area of high intersection density, defined as an area whose existing streets and sidewalks create at least 90 intersections per square mile (35 intersections per square kilometers). When determining the number of intersections, include the following:

- intersections within a ¼ mile (400 meters) radius of project boundary;
- streets and sidewalks that are available for general public use and not gated;
- sidewalk intersections provided they are a unique right of way (i.e., a sidewalk through a city park); and
- publicly accessible *alleys*.

Exclude the following:

- intersections in gated areas, which are not considered available for public use, with the exception of education and health care campuses and military bases where gates are used for security purposes;
- water bodies and public parks; and
- intersections leading only to a dead end or cul-de-sac.

AND/OR

Option 5. Bicycle Network and Storage (1 point)

Meet both of the following requirements:

BICYCLE NETWORK

Design or locate the *project* such that a *primary entry* and/or bicycle storage is within a 200-yard (180 meters) *walking distance* or *bicycling distance* from a *bicycle network* that connects to at least one of the following. All choices must be within 3 miles (4 800 meters) bicycling distance of the project boundary.

a. At least 10 uses (see LT Community Resources)
b. A school or *employment center*
c. *Bus rapid transit* stops, light or heavy rail stations, commuter rail stations and/or ferry terminals

If the network borders the project boundary, a safe, *all-weather route* must exist between the bicycle network and the project's bicycle storage and/or main entrance.

Planned bicycle trails or lanes may be counted if they are fully funded at the certificate of occupancy date and are scheduled for completion within one year of that date.

AND

BICYCLE STORAGE

Provide *short-term bicycle storage* capacity equal to 2.5% or more of all building occupants but no fewer than four storage spaces per building. *Short-term bicycle storage* must be within 100 feet (30 meters) of a *primary entry*.

Provide *long-term bicycle storage* capacity equal to 30% of all building occupants, but no less than one storage space per residential unit. *Long-term bicycle storage* must be within 100 feet (30 meters) of a *primary entry*.

Bicycle storage capacity may not be double counted; storage that is fully allocated to the occupants of non-project facilities cannot also serve project occupants.

A single family dwelling unit with enclosed garage meets the bicycle storage requirement.

LT CREDIT: COMPACT DEVELOPMENT

3 points
This credit applies to

- Homes (1–3 points)
- Midrise (1–3 points)

Intent

To conserve land and promote livability, transportation efficiency, and walkability by creating compact communities.

Requirements

HOMES, MIDRISE

Construct or renovate a building that meets the dwelling unit per acre of *buildable land* area *density* defined in Table 1.

Table 1. Points for housing density

Single-family and low-rise multifamily projects		Midrise multifamily projects		Points
DU/acre of buildable land	DU/hectare of buildable land	DU/acre of buildable land	DU/hectare of buildable land	
≥ 7	≥ 17	≥ 30	≥ 74	1
≥ 12	≥ 30	≥ 55	≥ 136	2
≥ 20	≥ 50	≥ 80	≥ 198	3

DU = dwelling units

LT CREDIT: COMMUNITY RESOURCES

2 points
This credit applies to

- Homes (1–2 points)
- Midrise (1–2 points)

Intent

To encourage daily walking and bicycling and to reduce *vehicle miles traveled* (VMT) and automobile dependence.

Requirements

HOMES, MIDRISE

Construct or renovate a project such that the building's main entrance is within a 1/2-mile (800 meters) *walking distance* from the building entrance of the following number of uses, as listed below.

Table 1. Points for proximity to uses

Uses	Points
4–7	1
8–11	1.5
≥ 12	2

The following restrictions apply:

- A single establishment counts as only one type of use (e.g., a retail store may be counted only once even if it sells products in several categories).
- No more than two establishments in each use type may be counted (e.g., if five restaurants are within the required distance, only two may be counted).
- The uses must represent at least two categories, exclusive of the building's primary use.
- Uses outside the project boundary must be in place upon occupation of the project.

Uses and Use Categories:

Food Retail
Supermarket
Other food store with produce

Community-Serving Retail
Clothing store or department store selling clothes
Convenience store
Farmers market
Hardware store
Pharmacy
Other retail

Services

Bank
Gym, health club, exercise studio
Hair care
Laundry, dry cleaner
Restaurant, café, diner (excluding establishments with only drive-throughs)

Civic and Community Facilities
Adult or senior care (licensed)
Child care (licensed)
Community or recreation center
Cultural arts facility (museum, performing arts)
Educational facility (including school, university, adult education center, vocational school, community college)
Family entertainment venue (theater, sports)
Government office that serves public on-site
Place of worship
Medical clinic or office that treats patients
Police or fire station
Post office
Public library
Public park
Social services center

Adapted from Criterion Planners, INDEX neighborhood completeness indicator, 2005.

LT CREDIT: ACCESS TO TRANSIT

2 points

This credit applies to

- Homes (1–2 points)
- Midrise (1–2 points)

Intent

To reduce pollution and land development effects from automobile use.

Requirements

HOMES, MIDRISE

Locate the project within a ¼-mile (400 meter) *walking distance* of bus or streetcar stops, or within a ½-mile (800 meter) walking distance of *bus rapid transit* stops, light or heavy rail stations, or ferry terminals. The transit service at those stops in aggregate must meet the minimums listed in Table 1 or Table 2.

- A bus or streetcar stop must serve a route that extends in opposite directions; the walking distance can be the average distance to the two stops.
- A single stop that serves as the terminal for a transit route can be counted.
- Trips in opposite directions are counted separately.
- Only one stop per route in a given direction can be counted.

Table 1. Minimum daily transit service for projects with multiple transit types (bus, streetcar, rail, or ferry)

Weekday trips	Weekend trips	Points
72	40	1
144	108	1.5
360	216	2

Table 2. Minimum daily transit service for projects with commuter rail or ferry service only

Weekday trips	Points
24	1
40	1.5
60	2

SUSTAINABLE SITES (SS)

Figure 1. Pathway through the SS category

SS PREREQUISITE: CONSTRUCTION ACTIVITY POLLUTION PREVENTION

This prerequisite applies to

- Homes
- Midrise

Intent

To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation, and airborne dust.

Requirements

HOMES, MIDRISE

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

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

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

Provide swales to divert surface water from hillsides.

Use tiers, erosion blankets, compost blankets, filter socks, berms, or comparable measures to stabilize soils in any area with a slope of 15% (6.6:1) or more that is disturbed during construction.

Prevent air pollution from dust and particulate matter.

Construction sites larger than 1 acre must conform to the erosion and sedimentation requirements of the 2012 U.S. Environmental Protection Agency Construction General Permit or local equivalent, whichever are more stringent.

SS PREREQUISITE: NO INVASIVE PLANTS

This prerequisite applies to

- Homes
- Midrise

Intent

To prevent the introduction of invasive species through landscaping.

Requirements

HOMES, MIDRISE

Introduce no *invasive plant species* into the landscape.

Invasive plant species vary by region. Consult the U.S. Department of Agriculture's GRIN Taxonomy for Plants database, the National Association of Exotic Pest Plant Councils, or local cooperative extension service or state or national exotic pest lists for plants in natural areas and wildlands. Not all nonnative species are considered invasive.

SS CREDIT: HEAT ISLAND REDUCTION

2 points
This credit applies to

- Homes (1–2 points)
- Midrise (1–2 points)

Intent

To minimize effects on microclimates and human and wildlife habitats by reducing heat islands.

Requirements

HOMES, MIDRISE

Ensure that at least 50% of *hardscapes* and roofs, but not including common roads that serve multiple buildings, on the project site meet one or more of the following requirements. Points are awarded according to Table 1.

Table 1. Points for percentage area with shading or nonabsorptive material

Percentage of hardscape area	Points
50–75%	1
> 75%	2

Option 1. Shading (1–2 points)

Locate trees or other plantings to provide shading of *hardscapes*. Shading should be calculated when the sun is directly overhead (noon on the summer solstice), based on ten years' growth after installation.

AND/OR

Option 2. Nonabsorptive Materials (1–2 points)
Install light-colored, high-albedo materials or vegetation-covered hardscapes. Acceptable strategies include the following:

- using ENERGY STAR qualified roof products in appropriately sloped applications (or performance equivalent for projects outside the U.S.);
- installing vegetated roofing;
- using open pavers (counting only the vegetation, not the pavers) or engineered grass pavers; and
- using paving materials with a *solar reflectance (SR)* of at least 0.28. If three-year aged value is not available, use materials with an initial SR of at least 0.33 at installation.

SS CREDIT: RAINWATER MANAGEMENT

3 points
This credit applies to

- Homes (1–3 points)
- Midrise (1–3 points)

Intent

To reduce rainwater runoff volume from the site.

Requirements

HOMES, MIDRISE

Projects that must comply with local requirements of the National Pollutant Discharge Elimination System (NPDES) must follow Case 2.

Case 1. Low Impact Development

Use low-impact development (LID) techniques to minimize the amount of stormwater that leaves the site. Examples of acceptable techniques include the following:

- planting areas with *native* or *adapted* plant material (e.g. trees shrubs);
- installing a vegetated roof;
- using permeable paving, consisting of porous above-ground materials (e.g., open pavers, engineered products), a base layer designed to drain water away from the home, and (often) a 6-inch-deep (150 millimeters) subbase; and
- installing permanent infiltration or collection features (e.g., vegetated swale, rain garden, rainwater cistern) that can handle 100% of the runoff from a two-year, 24-hour storm.

Single-family home projects may use Table 1 or Table 2 to determine points; *multifamily* projects must use Table 1.

To determine compliance for single-family and multifamily homes, calculate the percentage of the lot area, including the area under roof that is permeable or can direct water to an on-site catchment or infiltration feature.

Table 1. Points for permeable area, as percentage of total lot area

Percentage	Points
50–64%	1
65–79%	2
≥ 80%	3

As an alternative approach to determining compliance for single-family homes only, credit is given for reducing the total impermeable area compared to the ENERGY STAR reference home, as listed in Table 2.

Table 2. Conditioned floor area of reference home, by number of bedrooms

	1	2	3	4	5	6	7	8 or more
Floor area (square feet)	1,000	1,600	2,200	2,800	3,400	4,000	4,600	+ 600 ft^2 per additional bedroom
Floor area (square meters)	93	148	204	260	315	371	426	+ 55.6 square meters per additional bedrooms

Thresholds for total impermeable area are then calculated according to the values in Table 3, column 1.

Table 3. Points for reducing total impermeable area

Impermeable area (square feet)	Points
Reference home size * 1	1
Reference home size * 0.66	2
Reference home size * 0.33	3

Case 2. National Pollutant Discharge Elimination System (NPDES) Projects

Using low-impact development and green infrastructure to replicate *natural site hydrology*, *manage on-site* the runoff from the developed site for the percentile regional or local rainfall events listed in Table 4.

Use daily rainfall data and the methodology in the U.S. Environmental Protection Agency's Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects, under Section 438 of the Energy Independence and Security Act, to determine the percentile amount.

Table 4. Points for on-site management of water from rainfall events

Percentile rainfall event	Points
95th	2
98th	3

SS CREDIT: NONTOXIC PEST CONTROL

2 points
This credit applies to

- Homes (0.5–2 points)
  Midrise (0.5–2 points)

Intent

To minimize pest problems and risk of exposure to pesticides.

Requirements

HOMES, MIDRISE

Each measure is worth ½ point, except as noted.

- Install a steel mesh barrier termite control system (1 point).
- Install a physical termite barrier system (e.g., basaltic rock) approved by code (1 point).
- For below-grade walls, use solid concrete foundation walls, masonry walls with a course of solid block bond beam, or concrete-filled block.
- Install post-tension slabs.
- Treat all cellulosic structural material (e.g., wood framing) with a registered pesticide containing borates, following the manufacturer's directions for preconstruction treatment.
- Use noncellulosic material for all structural elements.
- Install ports or openings for all plumbing elements that penetrate the slab, to allow access for inspection and treatment of pest infestations.
- Install a registered termite bait system and provide for ongoing maintenance as required by the manufacturer.
- Design a minimum 6-inch (150 millimeters) inspection space between the surface of the planned landscape grade and nonmasonry siding.
- Seal all external cracks, joints, penetrations, edges, and entry points with appropriate caulking. Install rodent- and corrosion-proof screens (e.g., copper or stainless steel mesh) on all openings greater than ¼ inch (6 millimeters), except where code prohibits their installation (e.g., dryer vents).
- Design discharge points for rain gutters, air-conditioning condensation lines, steam vent lines, or any other moisture source such that discharge is at least 24 inches (600 millimeters) from the foundation.
- Design landscape features to provide a minimum 18-inch (450 millimeters) space between the exterior wall and any plantings.

  In addition, multifamily building projects must develop an integrated pest management policy that includes guidance for residents on pesticide use, housekeeping, and prompt reporting of pest problems; incorporate the policy in the Homeowner Education Manual.

WATER EFFICIENCY (WE)

Point floor: Earn at least 3 points in the WE section.

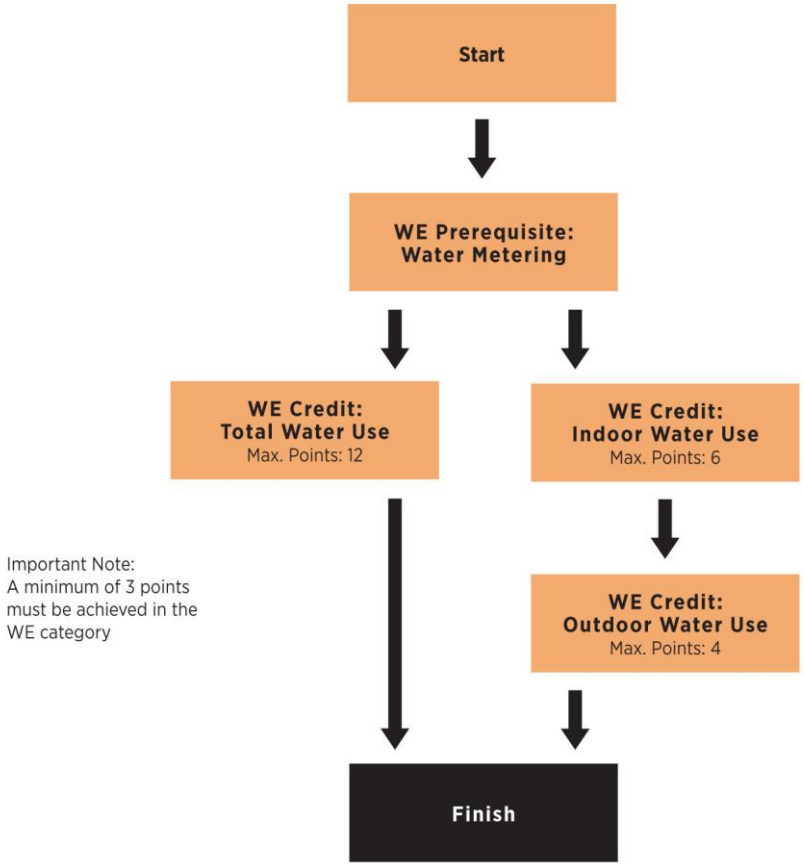


Figure 1. Optional Pathways through the WE Category

WE PREREQUISITE: WATER METERING

This prerequisite applies to

- Homes
- Midrise

Intent

To support water efficiency efforts by monitoring and benchmarking water use over time.

Requirements

HOMES, MIDRISE

Case 1. Single Family

Install a whole-house water meter. Single-family attached homes may share a whole-building water meter if landscaping is commonly managed and any units that will not achieve LEED certification are separately metered.

Encourage homeowners or tenants to share water usage data with USGBC via a USGBC-approved third-party.

Homes that use only well water and are not connected to a municipal water system are exempt from this prerequisite.

Case 2. Multifamily

Install a water meter or submeter for each unit or the entire building

Encourage homeowners or tenants to share water usage data with USGBC via a USGBC-approved third-party by describing the benefits of participation in the Homeowner Education Manual.

WE CREDIT: TOTAL WATER USE

12 points
This credit applies to

- Homes (1–12 points)
- Midrise (1–12 points)

Intent

To reduce demand for water through high-efficiency fixtures and efficient landscaping practices.

Requirements

Reduce total indoor and outdoor water consumption by at least 10% over standard practices.

For indoor water savings, use the Water Reduction Calculator to determine the average flush or flow rate for each fixture type and the estimated daily usage. The baselines for indoor water consumption are shown in Table 1.

Table 1. Indoor water baseline consumption (per person per day)

Fixture	Baseline flush or flow rate		Estimated fixture usage	Estimated water usage	
Shower (per compartment)	2.5 gpm	9.5 lpm	6.15 minutes	15.4 gallons	58.4 liters
Lavatory, kitchen faucet	2.2 gpm	8.3 lpm	5.0 minutes	11 gallons	41.5 liters
Toilet	1.6 gpf	6 lpf	5.05 flushes	8 gallons	30.3 liters
Clothes washer	9.5 WF	9.5 WF	0.37 cycles @ 3.5 ft^3 (@0.1 m^3)	15.1 gallons	57.1 liters
Dishwasher	6.5 gpc	24 lpc	0.1 cycles	0.7 gallons	2.4 liters

gpm = gallons per minute
gpf = gallons per flush
WF = water factor
gpc = gallons per cycle
lpf = liters per flush
lpm = liters per minute
lpc = liters per cycle

The water pressure in single-family buildings must not exceed 60 psi (415 kPa), with no detectable water leaks. Any installed water softeners must be demand initiated.

For outdoor water savings, use the EPA WaterSense Water Budget Tool to calculate the baseline landscape water consumption and the design landscape water consumption.

Implement the following measures to further reduce landscape water consumption. Add the savings associated with each of the following strategies to the reduction from the landscape water requirement, as calculated in the Water Budget Tool:

- Install smart scheduling technology. This strategy counts for a maximum reduction of 30% provided all landscape water use is controlled by a soil moisture sensor control system or a

weather-based irrigation control system.
- Use captured rainwater.
- Use reclaimed water.
- Use water treated on site or conveyed by a public agency specifically for nonpotable uses (water from naturally occurring surface water bodies, such as streams and rivers, and groundwater, such as well water, does not count).

Points are awarded according to Table 2.

Table 2. Points for reducing indoor and outdoor water use

Percentage reduction	Points
10%	1
15%	2
20%	3
25%	4
30%	5
35%	6
40%	7
45%	8
50%	9
55%	10
60%	11
65%	12

Projects attempting this credit are not eligible to earn points under other Water Efficiency credits.

WE CREDIT: INDOOR WATER USE

6 points
This credit applies to

- Homes (1-6 points)
- Midrise (1-6 points)

Intent

To minimize indoor demand for water through high-efficiency fixtures and fittings.

Requirements

HOMES, MIDRISE

Case 1. Single Family
Projects that install fixtures consuming more than 2.5 gallons per minute (9.5 liters per minute) per *shower compartment* must use WE Credit Total Water Use.

Each lavatory faucet or faucet aerator must be WaterSense labeled. The average rated flow volume across all lavatory faucets must not exceed 1.5 gallons per minute (5.6 liters per minute) for1 point or 1.0 gallons per minute (3.7 liters per minute) for 2 points.

Each showerhead fixture and fitting must be WaterSense labeled. The average rated flow volume per shower compartment must not exceed 1.75 gallons per minute (6.6 liters per minute) for 1 point or 1.5 gallons per minute (5.6 liters per minute) for 2 points.

Each toilet fixture and fitting must be WaterSense labeled. The average rated flush volume across all toilets must not exceed 1.1 gallons (4.1 liters) per flush (1 point).

Each clothes washer must be ENERGY STAR qualified or performance equivalent for projects outside the U.S. (1 point)

The water pressure in the house must not exceed 60 pounds per square inch (414 kPa), with no detectable water leaks.

For projects outside the United States, a local equivalent to WaterSense may be used.

Case 2. Multifamily and Midrise
Meet the above requirements for all *in-unit spaces* and *non-unit* (*residential-associated* and *nonresidential*) spaces. *Multifamily* and *midrise* projects are exempt from the water pressure testing criterion. No additional credit is awarded if the fixtures and fittings in nonunit spaces are more efficient than those of in-unit spaces.

WE CREDIT: OUTDOOR WATER USE

4 points
This credit applies to

- Homes (1-4 points)
- Midrise (1-4 points)

Intent

To reduce outdoor water consumption through efficient landscaping practices.

Requirements

HOMES, MIDRISE
Reduce the landscape area planted to *turf grass* by landscaping with plants that are *native* or *adapted* to the region. Points are awarded according to Table 1.

Table 1. Points for reducing turf grass and increasing native plantings, as percentage of total landscape area

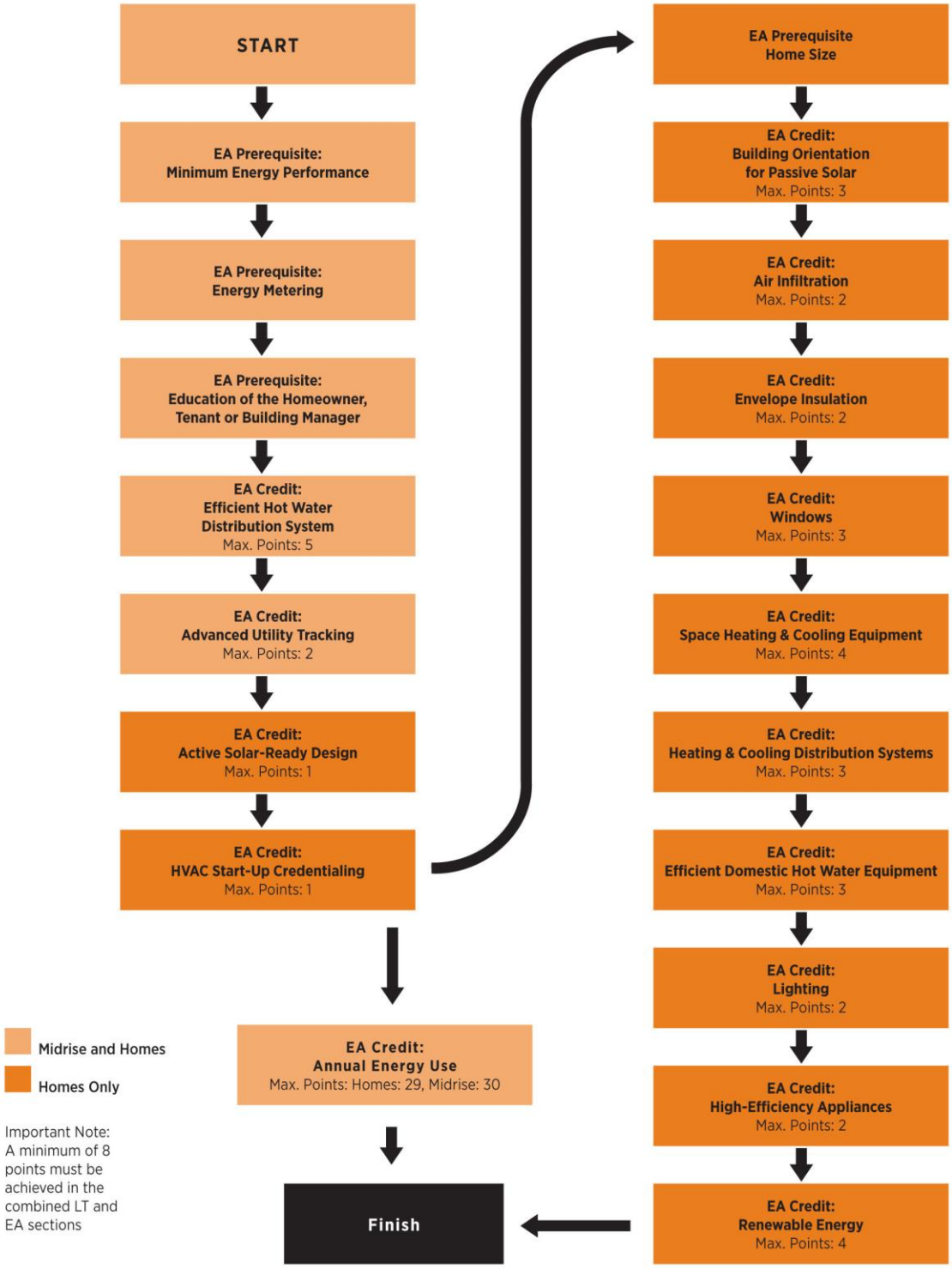
Turf grass area		Native or adapted plant area	Points
< 60%	and	> 25%	1
< 40%	and	> 50%	2
< 20%	and	> 75%	3
< 5%	and	> 75%	4

Lists of native plants are maintained by the Lady Bird Johnson Wildflower Center, the North American Native Plant Society, state agencies, and local cooperative extension service offices and others.

Project with pools and other *outdoor water features* must use WE Credit Total Water Reduction.

ENERGY AND ATMOSPHERE (EA)

Point floor: Earn at least 8 points in the combined LT and EA sections.



EA PREREQUISITE: MINIMUM ENERGY PERFORMANCE

This prerequisite applies to

- Homes
- Midrise

Intent

To improve the building's overall energy performance and reduce its greenhouse gas emissions.

Requirements

HOMES

Meet all of the following requirements:

1. Complete all mandatory measures of ENERGY STAR for Homes version 3.

   Achieve a HERS Index rating that meets or exceeds the ENERGY STAR HERS Index Target (or USGBC-approved equivalent for projects outside the U.S.). Certified passive house projects automatically meet the Thermal Enclosure System section of the Rater Design Review checklist.

2. At least one of the following appliances must be ENERGY STAR qualified (or performance equivalent for projects outside the U.S.) and installed in each dwelling unit:

   - refrigerator;
   - dishwasher; or
   - clothes washer.

3. All duct runs must be fully ducted (i.e., building cavities may not be used as ducts).

Existing portions of an existing building are given the following allowances:

Rater Design Review Checklist

3.1. Slab insulation is strongly encouraged but not required to meet or exceed 2009 IECC levels.

Rater Field Checklist 3.1 Attic insulation at the intersection of existing roof and existing exterior walls does not have to meet R-value requirements.

3.4. Advanced framing is not required on existing framed walls,

4.3. Existing sill plates on top of concrete are not required to be placed on a foam gasket.

Water Management System Builder Requirements

Water-Managed Site and Foundation

1.3. A capillary break under an existing slab is not required unless there are visible signs of moisture damage on the slab floor.

1.5. Exterior below-grade walls are not required to be damp-proofed on the exterior surface unless there are visible signs of moisture damage on the interior of the wall.

1.8 - Drain tiles surrounded with clean gravel and fabric filter are not required for existing slabs, unless there are visible signs of moisture damage on the slab floor

2, 3. Water-managed wall and roof assembly requirements are not required for existing walls or roofing unless there are signs of moisture damage related to vulnerabilities in the walls or roof.

MIDRISE

Meet both the whole-building energy simulation and commissioning requirements:

Whole-Building Energy Simulation

Demonstrate a 5% improvement over the baseline building performance rating. Calculate the baseline according to the building performance rating method of USGBC's residential midrise simulation guidelines, which is based on ANSI/ASHRAE/IESNA Standard 90.1–2010, Appendix G (with errata), or USGBC-approved equivalent standard for projects outside the United States, using a computer simulation model for the whole-building project.

Comply with the mandatory provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010 (with errata).

Comply with USGBC's residential midrise simulation guidelines.

Include all energy consumption and energy costs associated with the building project.

Compare the design case with a baseline building that complies with Standard 90.1–2010, Appendix G (with errata but without addenda).

AND

Commissioning

Option 1. Commissioning using ENERGY STAR Protocols. Meet the ENERGY STAR Qualified Multifamily High Rise Buildings Testing and Verification (T&V) Protocols.

OR

Option 2. Commissioning using Prescriptive Path.

Meet all of the following:

1. Reduced Heating and Cooling Distribution System Losses for In-unit HVAC

Limit the duct air leakage rate, testing for leakage to outside the unit or conducting a total duct leakage test. The tested leakage-to-outside rate must be less than 4.0 cfm25 per 100 square feet (1.2 cmm at 25 Pascals per 100 square meters) of conditioned floor area for each installed system. For units smaller than 1,200 square feet (110 square meters) tested leakage must be less than 6.0 cfm25 per 100 square feet (1.7 cmm at 25 Pascals per 100 square meters). Total duct leakage for in-unit systems must not exceed 8 cfm25 per 100 square feet (2.4 cmm at 25 Pascals per 100 square meters) of conditioned floor area. Testing is waived if the air-handler unit and all ductwork are visibly within the unit's envelope (i.e., no ducts are hidden in walls, chases, floors, or ceilings).

2. Fundamental Commissioning of Central HVAC Systems

Meet the performance testing and ongoing maintenance requirements of EA Prerequisite Fundamental Commissioning and Verification of LEED v4 for New Construction for central commercial heating, cooling, water heating and ventilation systems. The requirements include the following:

- Develop a system test procedure.
- Verify system test execution.
- Maintain an issues and benefits log throughout the commissioning process.

- Document all findings and recommendations and report directly to the owner throughout the process.
- Prepare and maintain a current facilities requirements and operations and maintenance plan documenting information necessary for efficient building operations.

3. Construction Document Specifications

Include the following details in construction and bid documents:

- Elements to be sealed (construction and bid documents). List all elements identified in ASHRAE 90.1–2010, Section 5.4.3.1, or applicable state or local codes, in addition to any site-specific elements identified during plan review, and include the items in the LEED for Homes multifamily midrise thermal enclosure inspection checklist (see below). Show locations to be sealed as well as acceptable methods and materials.
- Air barrier sheet (bid documents). Show the air barrier continuity through the various conditions of the exterior enclosure; this information can serve as an index to details.
- Compartmentalization sheet (bid documents). Show the continuity of fire and smoke barriers around each apartment and between corridors, stairs, and common areas; this information can serve as an index to details.

4. LEED for Homes Multifamily Midrise Thermal Enclosure Inspection Checklist

Inspect and verify each item on the checklist. The LEED checklist is based on the ENERGY STAR for Homes, version 3 (Rev. 02) thermal enclosure rater checklist, Sections 2, 3, and 5.

Certified Passive House projects automatically meet the thermal enclosure inspection checklist requirement.

EA PREREQUISITE: ENERGY METERING

This prerequisite applies to

- Homes
- Midrise

Intent

To support energy efficiency efforts by monitoring and benchmarking energy use over time.

Requirements

HOMES, MIDRISE

Case 1. Single Family

Install whole-house electric and gas meters, as applicable.

Encourage homeowners or tenants to share energy usage data with USGBC via a USGBC-approved third-party by describing the benefits of participation in the Homeowner Education Manual.

Case 2. Multifamily

Install an electricity meter or submeter for each residential unit and a gas meter for the entire building, or a gas meter or sub-meter for each unit. Single room–occupancy units, transitional and temporary housing, and designated supportive housing buildings do not need an energy meter in each unit but must have a whole-building energy meter.

Encourage homeowners or tenants to share energy usage data with USGBC via a USGBC-approved third party by describing the benefits of participation in the Homeowner Education Manual.

EA PREREQUISITE: EDUCATION OF HOMEOWNER, TENANT, OR BUILDING MANAGER

This prerequisite applies to

- Homes
- Midrise

Intent

To sustain the performance of the home by training its occupants in the operation and maintenance of LEED features and equipment.

Requirements

HOMES, MIDRISE

Provide to all individuals or organizations responsible for ongoing maintenance of the home (e.g., occupants, building managers, maintenance contractors) an operations and maintenance manual, binder, or CD that includes all the following items:

- the completed checklist of LEED for Homes features;
- copies of all ENERGY STAR for Home, version 3, checklists;
- product manufacturers' manuals for all installed equipment, fixtures, and appliances;
- general information on efficient use of energy, water, and natural resources;
- operations and maintenance guidance for any installed equipment, including space heating and cooling, mechanical ventilation, humidity control, radon protection, renewable energy, and irrigation, rainwater harvesting, or graywater systems (following 2009 EPA WaterSense Single-Family New Home Specifications, item 5.0, Homeowner Education);
- guidance on occupants' activities and choices, including cleaning materials and methods, water-efficient landscaping, integrated pest management, effects of chemical fertilizers and pesticides, irrigation, lighting selection, and appliance selection;
- information on local green power options; and
- information on sharing utility data with USGBC via a USGBC-approved third party.

In addition, conduct a minimum one-hour walkthrough of the home with the occupants. For buildings with building managers, include the building manager. The walkthrough must feature the following:

- identification of all installed equipment;
- instruction in how to use and operate the equipment; and
- information on its maintenance.

EA CREDIT: ANNUAL ENERGY USE

1-30 points
This credit applies to

- Homes (1–29 points)
- Midrise (1–30 points)

Intent

To improve the home's overall energy performance and reduce its greenhouse gas emissions.

Requirement

HOMES

Projects with *major energy users not included in the HERS Index*, including pools, spas, heated driveways, and heated garages, or other major energy users not included in the HERS index must use Option 1.

Option 1. LEED Energy Budget

Design and construct a building whose modeled annual energy usage is lower than the LEED energy budget. The LEED energy budget is based on the ENERGY STAR for Homes, HERS Index Target Procedure for National Program Requirements, version 3, with the following modifications:

- The size adjustment factor is always 1.
- The building is a slab-on-grade ranch whose floor area is equal to the ENERGY STAR reference home's conditioned floor area.
- There are no floors over unconditioned spaces.
- The gross exterior wall area is as shown in Table 1.
- There are two exterior half-lite doors, unshaded, one on the south wall, one on the west wall.
- Glazing is 15% of the floor area.
- The ceiling is insulated, and its gross area equals the conditioned floor area.
- The storage water heater has an energy factor of 0.59 for gas, 0.92 for electric.
- The thermal distribution system is 100% in the attic, above insulation.
- The LEED energy budget shall be displayed in MBtu/year, and is based on source energy.
- Any major energy users not covered by the energy model, including heated driveways, pools, spas, and heated garages, must be added to the annual energy consumption of the Rated Home.

Table 1. Exterior wall area of LEED reference home, by number of bedrooms

	1	2	3	4	5	6	7	8 or more
Area (square feet)	1,300	1,667	1,957	2,200	2,411	2,600	2,773	+ 150 ft^2 per additional bedroom
Area (square meters)	120	154	181	204	223	241	257	+ 14 square meters per additional bedroom

Individual units in multifamily buildings are compared to the LEED reference homes.

Points are awarded according to Table 2.

Table 2. Points for reducing energy usage below LEED energy budget

Percentage reduction	Points
1%	1
2%	2
3%	3
4%	4
5%	5
6%	6
7%	7
8%	8
9%	9
10%	10
12%	11
14%	12
16%	13
18%	14
20%	15
22%	16
24%	17
26%	18
28%	19
30%	20
32%	21
34%	22
37%	23
40%	24
50%	25
60%	26
70%	27
80%	28
90%	29

OR

Option 2. HERS Index with Home Size Adjuster

Design and construct a home whose modeled annual energy usage achieves a HERS index rating of 70 or better (or USGBC-approved equivalent for projects outside the U.S.). Points are awarded according to Table 3.

Table 3. Points for achieving HERS index ratings

HERS index	Points
70	5
69	6
68	7
67	8
66	9
65	10
64	11
63	12
62	13
60	14
58	15
56	16
54	17
52	18
50	19
45	20
40	21
35	22
30	23
25	24
20	25
15	26
10	27
5	28
0	29

AND

Earn 1 point for every 4% decrease in *conditioned floor area* compared with the ENERGY STAR for Homes, version 3, reference home (Table 4). Buildings that are larger than the reference home lose 1 point for every 4% increase in *conditioned floor area*.

Projects cannot exceed the maximum number of points in the EA section.

Table 4. Conditioned floor area of reference home, by number of bedrooms

	1	2	3	4	5	6	7	8 or more
Floor area (square feet)	1,000	1,600	2,200	2,800	3,400	4,000	4,600	+ 600 ft^2 per additional bedroom

Floor area (square meters)	93	148	204	260	315	371	426	+ 55.6 square meters per additional bedroom

For multifamily buildings, home size includes only *in-unit space*.

MIDRISE

Follow the criteria in EA Prerequisite Performance for Energy Star Homes to demonstrate a percentage improvement in the proposed building's performance compared with the baseline building performance of ASHRAE 90.1–2010, or USGBC-approved equivalent standard for projects outside the United States. Points are awarded according to Table 5.

Table 5. Points for reducing energy usage below ASHRAE baseline

Percentage reduction	Points
6%	1
7%	2
8%	3
9%	4
10%	5
11%	6
12%	7
13%	8
14%	9
15%	10
16%	11
17%	12
18%	13
19%	14
20%	15
22%	16
24%	17
26%	18
28%	19
30%	20
33%	21
36%	22
39%	23
42%	24
45%	25
48%	26
51%	27

54%	28
57%	29
60%	30

AND

Earn 1 point for every 4% decrease in conditioned floor area compared with the ENERGY STAR for Homes, version 3, reference home (Table 6). Buildings that are larger than the reference home lose 1 point for every 4% increase in conditioned floor area.

Projects cannot exceed the maximum number of points in the EA section.

Table 6. Conditioned floor area of reference home, by number of bedrooms

	1	2	3	4	5	6	7	8 or more
Floor area (square feet)	1,000	1,600	2,200	2,800	3,400	4,000	4,600	+ 600 ft^2 per additional bedroom
Floor area (square meters)	93	148	204	260	315	371	426	+ 55.6 square meters per additional bedroom

For multifamily buildings, home size includes only *in-unit space*.

EA CREDIT: EFFICIENT HOT WATER DISTRIBUTION SYSTEM

5 points
This credit applies to

- Homes (2-5 points)
- Midrise (2-5 points)

Intent

To reduce energy consumption and the burden on water supply and wastewater systems by increasing the efficiency of hot water distribution.

Requirements

HOMES, MIDRISE

Option 1. Efficient Hot Water Distribution (2 points)
Design and install an energy-efficient hot water distribution system, based on either maximum pipe length requirements (Path 1) or maximum pipe volume limits (Path 2). The source of hot water is assumed to be a water heater, boiler, circulation loop piping, or electric heat-traced piping. Multiple water heaters and multiple distribution systems may be used to comply with this credit.

Systems that use heat traces that serve a single unit or house are awarded only half credit. All heat traced piping must be insulated.

Path 1. Maximum Allowable Pipe Length

Do not exceed the maximum allowable pipe length from the source of hot water to the termination of the fixture supply pipe, as listed in Table 1a or Table 1b. If a branch consists of more than one size of pipe, use the largest size when determining the maximum allowable length.

Branch length requirements do not apply to cold water demand loads (e.g., toilets), tubs without showerheads, or stovetop pot-fillers.

Table 1a. Maximum length of pipe

Nominal pipe size (inch)	Maximum pipe or tube length	
	Hot water source is a water heater or boiler with no circulation loop or heat traced pipe or in multifamily buildings a central circulation loop or heat traced pipe (feet)	Hot water source is a circulation loop or heat traced pipe serving a single unit or house (feet)
1/4	50	16
5/16	50	16
3/8	50	16
½	43	16
5/8	32	12
¾	21	8
7/8	16	6
1	13	5

1 ¼	8	3
1 ½	6	2
2 or larger	4	1

Table 1b. Maximum length of pipe (SI)

Nominal pipe size (mm)	Maximum pipe or tube length	
	Hot water source is a water heater or boiler with no circulation loop or heat traced pipe or in multifamily buildings a central circulation loop or heat traced pipe (meters)	Hot water source is a circulation loop or heat traced pipe serving a single unit or house (meters)
6	15	5
8	15	5
9	15	5
13	13	5
16	10	4
19	6	2
22	5	2
25	4	2
32	2	1
38	2	1
50 or larger	1	0.3

OR

Path 2. Maximum Allowable Pipe Volume

Do not exceed a maximum volume of hot or tempered water of 64 ounces (1.89 L) from a water heater or boiler with no circulation loop or heat traced pipe or in multifamily buildings a central circulation loop or heat traced pipe to the fixture, or 24 ounces (0.71 L) for hot water from a circulation loop pipe or an heat-traced pipe serving a single unit or house to the fixture.

Pipe volume is the sum of the internal volumes of pipe, fittings, valves, meters, and manifolds between the source of hot water and the termination of the fixture supply pipe. To determine the volume, refer to Table 2, which lists the volumes for specific types of tubing.

Branch volume requirements do not apply to cold water demand loads (e.g., toilets), tubs without showerheads, or stovetop pot-fillers.

Table 2. Volume of water distribution pipes, by tubing type

Internal Volume of Various Water Distribution Tubing

Ounces of Water Per Foot Length of Hot Water Tubing								
Nominal Size (Inches)	Copper M	Copper L	Copper K	CPVC CTS SDR 11	CPVC SCH 40	PEX-Al-PEX ASTM F 1281	PE-AL-PE	PEX CTS SDR 9
⅜	1.06	0.97	0.84	N/A	1.17	0.63	0.63	0.64
½	1.69	1.55	1.45	1.25	1.89	1.31	1.31	1.18
¾	3.43	3.22	2.90	2.67	3.38	3.39	3.39	2.35
1	5.81	5.49	5.17	4.43	5.53	5.56	5.56	3.91
1 ¼	8.70	8.36	8.09	6.61	9.66	8.49	8.49	5.81
1 ½	12.18	11.83	11.45	9.22	13.20	13.88	13.88	8.09
2	21.08	20.58	20.04	15.79	21.88	21.48	21.48	13.86

Source: Modified from *2009 International Plumbing Code Table E202.1. International Code Council. January*

Conversions: 1 gallon (3.8 liters) = 128 ounces
1 ounce = 0.00781 gallons (0.0296 liters)
0.5 gallons (1.9 liters) = 64 ounces
0.6 gallons (2.3 liters) = 76.8 ounces

Paths 1 and 2, Pumps and Controls for Hot Water Circulation Loops

Circulating systems must meet the following requirements.

1. Circulating pump may not operate continuously, on a timer control, or on a water temperature (aquastat) sensors. Gravity and thermo-syphon circulation systems are prohibited.

2. Circulating pump must be demand activated by a momentary contact switch, motion sensor, flow switch, door switch or voice command.

3. After the pump starts, the controls shall allow the pump to operate until the water temperature in the return pipe rises not more than 10ºF (6 ºC) above the initial temperature of the water in the pipe. Controls shall further limit the water temperature to a maximum of 105ºF (40 ºC). Controls shall limit pump operation to not more than 5 minutes per activation in the event that both means of shutting off the pump have failed.

4. Circulating hot water systems must be provided with an *automatic* or readily accessible *manual* switch to turn off the hot water circulating pump when not in use.

OR

Option 2. Performance Test (3 points)

Case 1. Hot water source is a water heater or boiler with no circulation loop or heat traced pipe; or in multifamily buildings a central circulation loop or heat traced pipe.

To minimize wasted water before hot water is delivered, using EPA WaterSense testing procedures, verify that no more than 0.5 gallons (1.9 liters) of water is stored in any piping between the hot water source and any fixture, and that no more than 0.6 gallons (2.3 liters) of water is collected from the hot water fixture before hot water is delivered. Heat traces are only allowed in situations to prevent freezing.

Projects that meet WaterSense Labeled New Homes requirements automatically achieve this credit.

Case 2. Hot water source is a circulation loop or heat traced pipe serving a single unit or house

To minimize wasted water before hot water is delivered, using EPA WaterSense testing procedures, verify that no more than 0.25 gallons (1 liter) of water can be collected from the hot water fixture furthest from the recirculation loop,

Systems that use heat traces that serve a single unit or house are only awarded half credit. All heat traced piping must be insulated.

AND/OR

Option 3. Pipe Insulation (2 points)
Install at least R-4 insulation on all domestic hot water piping, including subslab pipes. Insulation on all piping elbows and tees must adequately insulate changes in direction.

Run buried piping in a slab or below grade through a protective, waterproof raceway, channel, sleeve, or path whose internal dimensions and changes of direction are large enough that the piping and insulation can be removed and replaced without damaging the piping’s dimensional integrity.

The waterproof sleeve is not required for below-grade piping if the insulation manufacturer stipulates that the pipe insulation will maintain its insulating value in underground applications in damp soil when installed according to the manufacturer's instructions. This exception does not apply to piping that runs through or under building slabs.

EA CREDIT: ADVANCED UTILITY TRACKING

2 points
This credit applies to

- Homes (1–2 points)
- Midrise (1–2 points)

Intent

To support energy efficiency efforts through real-time monitoring of energy and water use.

Requirements

HOMES, MIDRISE

Case 1. Single Family

Option 1. Electric and Water (1 point)

Meet one of the following:
Install a permanent energy-monitoring system that records at intervals of one hour or less and is equipped with the ability to transmit data to the homeowner or occupant at a remote location (e.g., computer, in-house display).
OR

If the project has an automatic in-ground irrigation system and the landscape irrigated area is larger than 1,000 square feet (93 square meters), install a submeter to monitor all irrigation system components.

AND/OR

Option 2. Third-Party Utility Reporting (1 point)

The homeowner must share all applicable utility data with USGBC via a USGBC-approved third-party before the project team submits its application for certification.

Case 2. Multifamily

Option 1. Electric and Water (1 point)

In each unit, install a permanent energy-monitoring system that records at intervals of one hour or less and is equipped with the ability to transmit data to the homeowner or occupant at a remote location (e.g., computer, in-house display).

OR

If the project has an automatic in-ground irrigation system and the landscape irrigated area is larger than 1,000 square feet (93 square meters), install a submeter to monitor all irrigation system components.

AND/OR

Option 2. Third-Party Utility Reporting (1 point)

Path 1. Whole-Building Master Meter

The building owner must share all applicable utility data with USGBC via a USGBC-approved third-party before the project team submits its application for certification.

OR

Path 2. Individual Unit Meters
At least 50% of unit owners or occupants must share all applicable utility data with USGBC via a USGBC-approved third-party before the project team submits its application for certification.

EA CREDIT: ACTIVE SOLAR-READY DESIGN

1 point
This credit applies to

- Homes (1 point)

Intent

To reduce energy consumption and greenhouse gas emissions by designing to maximize opportunities for solar design.

Requirements

HOMES

Option 1. Photovoltaic-Ready Design (1 point)

A project team that installs a photovoltaic (PV) system that meets the requirements of EA Credit Renewable Energy is not eligible for this credit.

Meet EPA's solar photovoltaic specifications for a renewable energy–ready home. Provide detailed information about such systems in the homeowner education manual so that future occupants can install an active PV system.

AND/OR

Option 2. Solar Direct Hot Water–Ready Design (1 point)

A project team that installs a solar direct hot water (DHW) system that meets the requirements of EA Credit Efficient Domestic Hot Water Equipment is not eligible for this credit.

Meet EPA's solar water heating specifications for a renewable energy–ready home. Provide detailed information about such systems in the homeowner education manual so that future occupants can install an active solar DHW system.

EA CREDIT: HVAC START-UP CREDENTIALING

1 point
This credit applies to

- Homes (1 point)

Intent

To reduce energy consumption by ensuring that heating and cooling systems operate at peak efficiency.

Requirements

HOMES

Have all heating, cooling, and ventilation systems commissioned by a technician with North American Technician Excellence certification, HVAC contractor credentialed by an EPA-recognized HVAC Quality Installation Training and Oversight Organization (H-QUITO) (or equivalent as defined by USGBC). The technician must complete the ENERGY STAR for Homes, version 3, HVAC system quality installation contractor checklist, or equivalent as defined by USGBC.

PRESCRIPTIVE PATH

EA CREDIT: EFFICIENT HOT WATER DISTRIBUTION SYSTEM

HOMES

See performance path.

EA CREDIT: SOLAR-READY DESIGN

HOMES

See performance path.

EA CREDIT: HVAC START-UP CREDENTIALING

HOMES

See performance path.

EA CREDIT: ADVANCED UTILITY TRACKING

HOMES

See performance path.

EA PREREQUISITE: HOME SIZE

Required - Bonus points

This prerequisite applies to:

- Homes

Intent

Reduce energy consumption and greenhouse gas emissions by designing more compact living spaces.

Requirements

HOMES

Earn 1 point for every 4% decrease in *conditioned floor area* compared with the ENERGY STAR for Homes, version 3, reference home (Table 1). Buildings that are larger than the reference home lose 1 point for every 4% increase in *conditioned floor area*.

Projects cannot exceed the maximum number of points in the EA section.

Table 1. Conditioned floor area of reference home, by number of bedrooms

Bedrooms	1	2	3	4	5	6	7	8 or more
Floor area (square feet)	1,000	1,600	2,200	2,800	3,400	4,000	4,600	+ 600 ft^2 per additional bedroom
Floor area (square meters)	93	148	204	260	315	371	427	+ 55 square meters per additional bedroom

For multifamily buildings, home size includes only *in-unit space*.

EA CREDIT: BUILDING ORIENTATION FOR PASSIVE SOLAR

3 points
This credit applies to

- Homes (3 points)

Intent

To reduce energy consumption and greenhouse gas emissions by designing to maximize opportunities for solar design.

Requirements

HOMES

Meet all of the following requirements:

- The south-facing glazing area is at least 50% greater than the sum of the glazing area on the east- and west-facing walls.
- The east-west axis of the building is within 15 degrees of due east-west.
- At least 90% of the south-facing glazing is completely shaded (by awnings, overhangs, plantings) at solar noon on the summer solstice and unshaded at noon on the winter solstice.

In areas south of 25 degrees of latitude or where topography significantly impacts insolation, orientation may be adjusted to meet local conditions provided the team provides documentation to demonstrate that its building orientation decision is based on solar and meteorological data for the site.

EA CREDIT: AIR INFILTRATION

2 points
This credit applies to

- Homes (1–2 points)

Intent

To minimize waste of energy caused by uncontrolled air leakage into and from conditioned spaces.

Requirements

HOMES

Case 1. Single Family
Meet the air leakage requirements shown in Table 1 or Table 2.

Case 2. Multifamily
Meet the air leakage requirements shown in Table 1 or Table 2.

Meet the requirements for leakage to outside the conditioned envelope for each dwelling unit, unless the whole building can be entirely and sufficiently depressurized by a blower door(s).

Table 1. Points for reducing air leakage, in ACH50

IECC climate zone				
1–2	*3–4*	*5–7*	*8*	*Points*
4.25	3.5	2.75	2.0	1
3.0	2.5	2.0	1.5	2

Table 2a. Points for reducing air leakage, in cfm50 per sf envelope area

Performance requirements *IECC climate zone*				
1–2	*3–4*	*5–7*	*8*	*Points*
.195	.16	.125	.0925	1
.1375	.115	.0925	.0675	2

Table 2b. Points for reducing air leakage, in cmm50 per 100 square meter envelope area

Performance requirements *IECC climate zone*				
1–2	*3–4*	*5–7*	*8*	*Points*
5.94	4.87	3.81	2.82	1
4.19	3.50	2.82	2.06	2

ACH = Air changes per hour
cfm = cubic feet per minute
ELR = envelope leakage ratio
IECC = International Energy Conservation Code

sf = square feet
cmm = cubic meters per minute

EA CREDIT: ENVELOPE INSULATION

2 points
This credit applies to

- Homes (1–2 points)

Intent

To conserve energy by selecting and installing insulation to minimize heat transfer and thermal bridging.

Requirements

HOMES

Select insulation whose R-value exceeds the requirements listed in the 2012 International Energy Conservation Code (IECC), Chapter 4, or local code, whichever is more stringent. Do not include thermal mass or infiltration effects in the R-value calculation. Points are awarded according to Table 1.

Table 1. Points for exceeding code requirements for R-value

Percentage improvement	Points
10%	1
20%	2

Install the insulation to meet the Grade I specifications set by the RESNET Home Energy Rating Standard.

EA CREDIT: WINDOWS

3 points
This credit applies to

- Homes (1.5–3 points)

Intent

To maximize the energy performance of windows.

Requirements

HOMES

Design and install windows, skylights, and glass doors whose ratings from the National Fenestration Rating Council exceed the requirements in the ENERGY STAR for Homes, version 3, prescriptive pathway, as shown in Tables 1–3. Use the average window ratings, average skylight ratings, and average exterior door ratings.

Determine the window-to-floor-area (WFA) ratio by calculating the total window area in the above-grade conditioned floor area. All skylight window areas count toward the WFA ratio. For decorative glass, the project team may exclude up to 0.75% of the WFA ratio from the calculations. If the WFA ratio is 15% or more, the following additional requirements apply:

- In climate zones 4–8, homes with a WFA ratio of 15% or more must meet a more stringent U-factor requirement:

  U-factor = (0.15 / WFA) * (U-factor from Table 1)

- In climate zones 1–3, homes with a WFA ratio of 15% or more must meet a more stringent solar heat gain coefficient (SHGC) requirement:

  SHGC = (0.15 / WFA) * (SHGC from Table 1)

Project teams that achieve EA Credit Building Orientation for Solar Design are exempt from the requirements for window SHGC.

Table 1. Points for exceeding baseline window ratings

	Climate zone					*Points*
	1, 2	*3*	*4*	*5–8*		
U-factor	≤ 0.45	≤ 0.30	≤ 0.26	≤ 0.26		1.5
SHGC	≤ 0.25	≤ 0.25	≤ 0.40	Any		
U-factor	≤ 0.30	≤ 0.26	≤ 0.22	≤ 0.22		3
SHGC	≤ 0.25	≤ 0.25	≤ 0.40	Any		

SHGC = solar heat gain coefficient

Table 2. Points for exceeding baseline skylight ratings

	Climate zone					
	1, 2	*3*	*4*	*5–8*		*Points*
U-factor	≤ 0.70	≤ 0.57	≤ 0.47	≤ 0.47		1.5
SHGC	≤ 0.25	≤ 0.25	≤ 0.40	Any		
U-factor	≤ 0.47	≤ 0.47	≤ 0.40	≤ 0.40		3
SHGC	≤ 0.25	≤ 0.25	≤ 0.40	Any		

SHGC = solar heat gain coefficient

Table 3. Points for exceeding baseline door ratings

	Opaque	*≤ 1/2 lite*	*> 1/2 lite*
U-factor	0.21	0.27	0.32
SHGC	N/A	0.30	0.30

SHGC = solar heat gain coefficient

EA CREDIT: SPACE HEATING AND COOLING EQUIPMENT

4 points
This credit applies to

- Homes (1–4 points)

Intent

To reduce energy consumption associated with the heating and cooling system.

Requirements

HOMES

Design and install HVAC equipment that is more efficient than the equipment required by the ENERGY STAR for Homes, version 3, prescriptive pathway. Points are awarded according to Table 1.

Any piping designed as part of a heat pump system to carry water that is well above (or below) the thermostatic temperature settings in the home must have R-4 or better insulation. Refrigerant piping must be insulated to R-6 or better on the air-conditioning mode suction line or the heat-pump mode discharge line.

Table 1. Points for HVAC equipment that exceeds Energy Star requirements

Climate zones 4–8							
	Central AC, air source heat pump	*Gas furnace*	*Boiler, oil furnace (gas, oil, diesel, propane)*	*Ground-source heat pump*			
				Open loop	*Closed loop*	*Direct expansion*	*Points*
Cooling	≥ 14 SEER			≥ 17.8 EER	≥ 15.5 EER	≥ 16.5 EER	1
Heating	≥ 10 HSPF	≥ 92 AFUE	≥ 87 AFUE	≥ 4.0 COP	≥ 3.6 COP	≥ 3.9 COP	1
Cooling	≥ 15 SEER			≥ 19.4 EER	≥ 17 EER	≥ 18 EER	2
Heating	≥ 10.5 HSPF	≥ 94 AFUE	≥ 90 AFUE	≥ 4.3 COP	≥ 4.0 COP	≥ 4.2 COP	2
Climate zones 1–3							
	Central AC, air source heat pump	*Gas furnace*	*Boiler, oil furnace (gas, oil, diesel, propane)*	*Ground-source heat pump*			
				Open loop	*Closed loop*	*Direct expansion*	*Points*
Cooling	≥ 15.5 SEER			≥ 17.8 EER	≥ 15.5 EER	≥ 16.5 EER	1
Heating	≥ 8.6 HSPF	≥ 90 AFUE	≥ 85 AFUE	≥ 4.0 COP	≥ 3.6 COP	≥ 3.9 COP	1
Cooling	≥ 16.5 SEER			≥ 19.4 EER	≥ 17 EER	≥ 18 EER	2
Heating	≥ 9.0 HSPF	≥ 92 AFUE	≥ 87 AFUE	≥ 4.3 COP	≥ 4.0 COP	≥ 4.2 COP	2

AC = air-conditioning
AFUE = annual fuel utilization efficiency
COP = coefficient of performance
EER = energy efficiency ratio
HSPF = heating seasonal performance factor
SEER = seasonal energy efficiency ratio

EA CREDIT: HEATING AND COOLING DISTRIBUTION SYSTEMS

3 points
This credit applies to

- Homes (2–3 points)

Intent

To minimize energy loss to thermal bridges and leaks in the heating and cooling distribution system.

Requirements

HOMES

Case 1. Forced-Air System

Option 1. Ductwork in Conditioned Space (3 points)
Duct leakage testing is waived if the following conditions are met:

- The air-handler unit and all ductwork are located entirely within conditioned spaces.
- The envelope is airtight; 2 points are earned in EA Credit: Air Infiltration.

Ductless systems with air circulation blowers qualify. This case is not available for multifamily projects whose ductwork runs through spaces between units: interstitial space is considered outside the thermal envelope of the unit.

OR

Option 2. Ductwork in Unconditioned Space (2 points)

Large Homes or Multifamily Units
For homes or multifamily units of 1,200 square feet (110 square meters) or more, limit the rate of duct air leakage to outside the conditioned envelope. For each installed system, the tested duct leakage rate must not exceed 3.0 cfm at 25 Pascals per 100 square feet (0.9 cmm at 25 Pascals per 100 square meters) of conditioned floor area

Small Homes or Multifamily Units
For homes or multifamily units smaller than 1,200 square feet (110 square meters), limit the rate of duct air leakage to outside the conditioned envelope. For each installed system, the tested duct leakage rate must not exceed 4.0 cfm at 25 Pascals per 100 square feet (1.2 cmm at 25 Pascals per 100 square meters) of conditioned floor area

Case 2. Hydronic System (2–3 points)
Keep the system (including boiler and distribution pipes) entirely within the conditioned envelope (2 points).

For an additional point, install an outdoor reset control that modulates distribution water temperature based on the outdoor air temperature (1 point).

EA CREDIT: EFFICIENT DOMESTIC HOT WATER EQUIPMENT

3 points
This credit applies to

- Homes (1–3 points)

Intent

To reduce the energy consumption associated with domestic hot water by improving the efficiency of the water heater.

Requirements

HOMES

Install an ENERGY STAR–qualified water heater (1 point), or install a solar water heater that, in combination with an ENERGY STAR water heater, meets at least 40% (2 points) or 60% (3 points) of the annual domestic hot water (DHW) load (Table 1).

Table 1. Points for high-efficiency water heater

	Points
ENERGY STAR water heater	1
EF or thermal efficiency greater than 0.9	1.5
EF or thermal efficiency greater than 1.8	2
Solar water heaters	
Solar water heater: ≥ 40% of annual DHW load	2
Solar water heater: ≥ 60% of annual DHW load	3

Projects outside the U.S. may use a performance equivalent to ENERGY STAR.

EA CREDIT: LIGHTING

2 points
This credit applies to

- Homes (0.5–2 points)

Intent

To reduce the energy consumption associated with interior and exterior lighting.

Requirements

HOMES

Case 1. Single Family

Option 1. Indoor Lighting (1.5 points)

Install high-efficacy lighting. Meet or exceed the requirements for lighting power density for hard-wired fixtures, as listed in Table 1.

Table 1. Points for reducing lighting power density

*Maximum lighting power density (*W/sf*)*		*Points*
W/sq. ft.	W/sq. m.	
0.72	7.7	0.5
0.60	6.5	1
0.48	5.2	1.5

The proposed fixtures used to calculate energy savings must be capable of meeting the recommended light levels (weighted average footcandles) in the Illuminating Engineering Society Lighting Handbook, 9th edition, for the given space type. Either calculate the needs for each space type, or use 16 as the weighted average footcandles for the home.

In calculating lighting power density, follow these guidelines:

- Use a lighting power density of 1.1 W per square foot (11.8 W per square meter) for rooms or portions of any rooms with less than the required hardwired lighting.
- Account for all hard-wired fixtures in the home, including the garage and exterior lights (whether affixed to the home or freestanding).
- Do not include portable table and floor lamps, appliance lights, or landscape lights.
- Include step lights and undercabinet and cabinet lights.
- For standard incandescent (a-line medium screw base) bulbs, assume 64 watts per socket.
- For LED and Xenon lights, use actual wattages.
- For fluorescent lighting, calculate wattage based on the assumptions in Table 2 or use the actual wattages installed.

Table 2. Assumptions for fluorescent bulb wattage

	Watts
CFL twist	14
Covered	14
CFL Candelabra	9
Incandescent	64

Incandescent Candelabra	40
MR16	40

AND/OR

Option 2. Exterior Lighting (0.5 point)
All exterior lighting must be Dark Sky qualified and have motion sensor controls, integrative photovoltaic cells, photosensors, or astronomic time-clock operation.

The following lighting is exempt: emergency lighting, lighting required by code for health and safety purposes, and lighting used for eye adaptation near covered vehicle entrances or exits.

Case 2. Multifamily

Option 1. Indoor Lighting (1.5 points)

Install high-efficacy lighting and/or lighting controls that achieve a reduction from the ENERGY STAR baseline. Complete the ENERGY STAR multifamily midrise worksheet for interior lighting.

Table 3. Points for reducing interior lighting from baseline

Percentage reduction	*Points*
35%	0.5
45%	1
55%	1.5

AND/OR

Option 2. Exterior Lighting (0.5 point)

Complete the ENERGY STAR multifamily midrise worksheet for exterior lighting. Reduce exterior lighting wattage by at least 50%.

All exterior lighting must be Dark Sky qualified.

EA CREDIT: HIGH-EFFICIENCY APPLIANCES

2 points
This credit applies to

- Homes (0.5–2 points)

Intent

To reduce energy consumption through installation of efficient appliances.

Requirements

HOMES

Install appliances from the list below. To receive credit for one type (e.g., refrigerator), every appliance of that type must meet the requirement.

- ENERGY STAR–qualified refrigerator(s) (1 point);
- ENERGY STAR–qualified ceiling fans (at least one in the living or family room and one per bedroom) (0.5 point);
- ENERGY STAR–qualified dishwasher(s) (0.5 point).

Projects outside the U.S. may use a performance equivalent to ENERGY STAR.

EA CREDIT: RENEWABLE ENERGY

4 points
This credit applies to

- Homes (1–4 points)

Intent

To encourage the installation and operation of renewable electricity generation systems.

Requirements

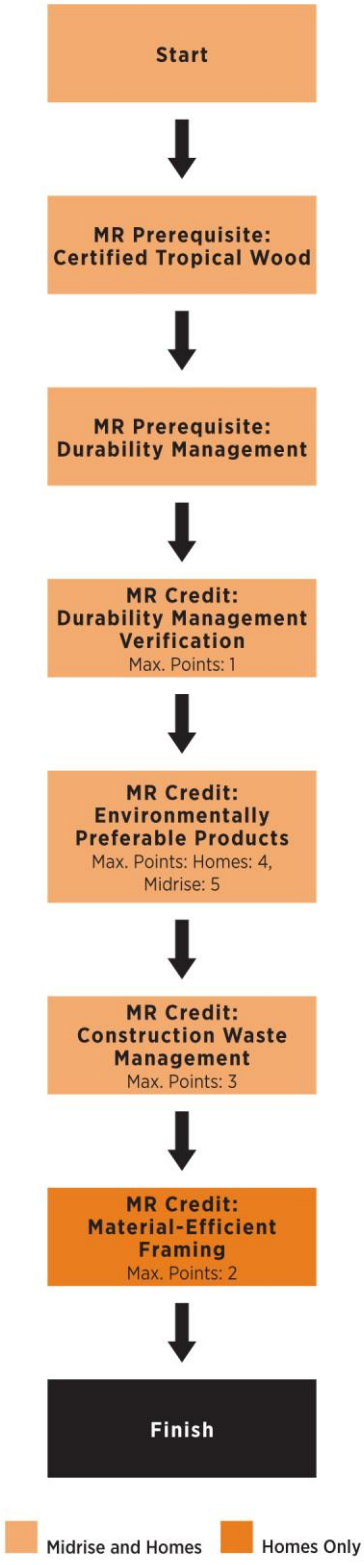
HOMES

Design and install a renewable electricity generation system. Receive 1 point for every 500 kWh produced per year by the system. The maximum allowable points for this credit is equivalent to the total points earned from all other EA credits. Renewable energy certificates (RECs) must be retained by the building owner.

Table 1. Points for electricity generation from renewable sources

Annual kWh	Required points in rest of EA	Points
500	1	1
1,000	2	2
1,500	3	3
2,000	4	4

MATERIALS AND RESOURCES (MR)



MR PREREQUISITE: CERTIFIED TROPICAL WOOD

This prerequisite applies to

- Homes
- Midrise

Intent

To encourage environmentally responsible forest management.

Requirements

HOMES, MIDRISE

All wood in the building must be nontropical, reused or reclaimed, or certified by the Forest Stewardship Council, or USGBC-approved equivalent.

For the purposes of this prerequisite, a tree species is considered *tropical* if it is grown in a location that lies between the Tropic of Cancer and the Tropic of Capricorn.

MR PREREQUISITE: DURABILITY MANAGEMENT

This prerequisite applies to

- Homes
- Midrise

Intent

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

Requirements

HOMES, MIDRISE

Meet the requirements of the ENERGY STAR for Homes, version 3, water management system builder checklist (with the exceptions for existing homes listed in EA Prerequisite Minimum Energy Performance). Midrise projects are exempt from this requirement.

Install all the applicable indoor moisture control measures listed in Table 1.

Table 1. Required interior moisture control measures for homes

Location or equipment	*Required measure*
Area directly above bathtub, spa, or shower (extending to ceiling), exposed wall or area behind fiberglass enclosure if wallboard is installed	Use nonpaper-faced backer board or paper-faced product or coating over wallboard that meets standard ASTM D 3273 standard
Kitchen, bathroom, laundry room, spa area	Use water-resistant flooring; do not install carpet
Entryway within 3 feet (900 mm) of exterior door accessible from ground	Use water-resistant flooring; do not install carpet (carpet tiles are permitted)
Tank water heater in or over living space	Install drain and drain pan, drain pan and automatic water shut-off or flow restrictor, or floor drain with floor sloped to drain
Clothes washer (or condensing clothes dryer) in or over living space	Install drain and drain pan, drain pan and automatic water shut-off or flow restrictor, or floor drain with floor sloped to drain
Conventional clothes dryer	Exhaust directly to outdoors

MR CREDIT: DURABILITY MANAGEMENT VERIFICATION

1 point
This credit applies to

- Homes (1 point)
- Midrise (1 point)

Intent

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

Requirements

HOMES, MIDRISE

Have the verification team inspect and verify each measure listed in the ENERGY STAR for Homes, version 3, water management system builder checklist.

MR CREDIT: ENVIRONMENTALLY PREFERABLE PRODUCTS

0.5-5 points
This credit applies to

- Homes (0.5–4 points)
- Midrise (0.5–5 points)

Intent

To increase demand for products or building components that minimize material consumption through recycled and recyclable content, reclamation, or overall reduced life-cycle impacts.

Requirements

HOMES, MIDRISE

Use building component materials that meet one or more of the criteria below. A material must make up 90% of the component by weight or volume, except as noted. A single component that meets Option 1 and Option 2 can earn points for each (0.5 point per item).

Option 1. Local Production
Use products that were extracted, processed, and manufactured locally for the following components. Meet the thresholds in Table 1:

- framing (0.5 point);
- aggregate for concrete and foundation (0.5 point);
- drywall or interior sheathing (0.5 point).

Table 1: Percentage of component to meet local credit

Maximum distance from extraction, processing and manufacturing to project site:	% of building component required to meet criteria (0.5 points per component)
Locally: 100 miles (160 km)	50%

For renovation projects, existing components meet the requirement for local production.

AND/OR

Option 2. Environmentally Preferable Products
Use products that meet one or more of the following criteria (0.5 points each). At least 90% of each compliant building component (listed in Table 2), by weight or volume, must meet one of the requirements below. A single component that meets more than one criterion does not earn additional credit.

- The product contains at least 25% reclaimed material, including salvaged, refurbished, or reused materials. For renovation projects, existing components are considered reclaimed. Wood by-products can be counted as reclaimed material. These include items from secondary manufacturers; felled, diseased, or dead trees from urban or suburban areas; orchard trees that are unproductive and cut for replacement; and wood recovered from landfills or water bodies.
- The product contains at least 25% *postconsumer* or 50% *preconsumer* content.
- Wood products must be Forest Stewardship Council (FSC) Certified, or USGBC-approved equivalent.
- *Bio-based materials.* Bio-based products must meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products, such as leather and other animal skin material.

- Concrete that consists of at least 30% fly ash or slag used as a cement substitute and 50% recycled content or reclaimed aggregate OR 90% recycled content or reclaimed aggregate.
- *Extended producer responsibility.* Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility.

Table 2. Maximum points for compliant building components

Component	Maximum points
Flooring - Base floor only (i.e., sealed concrete, no floor covering)	2
Floor covering	1
Insulation*	1
Sheathing	1
Framing	1
Drywall, interior finish	1
Concrete: cement and / or aggregate	1
Roofing	1
Siding	1
Additional components (install at least 3 of the following): • Doors (not including insulated doors or garage door) • Cabinets • Counters (kitchens and bathrooms) • Interior trim • Decking or patio material • Windows	1

* Excluding HVAC and pipe insulation.

MR CREDIT: CONSTRUCTION WASTE MANAGEMENT

3 points
This credit applies to

- Homes (0.5–3 points)
- Midrise (0.5–3 points)

Intent

To reduce construction waste generation and to reuse and recycle debris.

Requirements

HOMES, MID-RISE

Reduce total construction waste or divert from landfills and incinerators a large proportion of the waste generated from new construction. Use the tables below to calculate the percentage of waste avoided or *recycled* Exclude excavated soil, land-clearing debris from calculations. Include materials destined for alternative daily cover (ADC) in the calculations as waste (not diversion). Any waste-to-energy is not considered recycling for this credit.

Table 1. Baseline waste for LEED reference home

Bedrooms	*Conditioned floor area (sf)*	*Waste (lbs)*
1	1,000	4,200
2	1,600	6,720
3	2,200	9,240
4	2,800	11,760
5	3,400	14,280
6	4,000	16,800
7	4,600	19,320
8 or more	—	Area (sf) * 4.2

Table 1a. Baseline waste for LEED reference home

Bedrooms	*Conditioned floor area (sq. m)*	*Waste (kg)*
1	93	1 905
2	148	3 048
3	204	4 191
4	260	5 334
5	315	6 477
6	371	7 620
7	427	8 763
8 or more	—	Area (sq. m) * 20.5

For multifamily buildings, use the project's floor area for any *non-unit spaces*, and add it to the floor area of the LEED reference home calculated for each unit.

Calculate the waste generated by the project according to the following equation:

Project construction waste = Total waste - (Recycled waste * 0.25)

To convert volume to weight, assume 500 pounds per cubic yard (296 kg per cubic meter) of mixed construction waste, or use Table 2 to calculate the weights of specific waste products.

Table 2. Volume-to-weight conversion for construction and demolition debris

Material	LB/CY	TONS/CY	CY/TON	KG/cubic meter
Aluminum (scrap, whole)	175	0.09	11.1	103.8
Asphalt	1,380	0.69	1.4	818.7
Brass (scrap)	906	0.45	2.2	537.5
Brick (common hard)	3,024	1.5	0.67	1794
Cardboard (uncompacted)	100	0.05	20	59.3
Carpet & Padding (loose)	84	0.04	25	50
Concrete	1,855	0.92	1.4	1100.5
Copper (scrap)	1,094	0.56	1.8	649
Dirt (loose, dry)	1,890	0.94	1.1	1121.2
Drywall	500	0.25	4	296.6
Glass (broken)	2,160	1.1	0.91	1281.4
Metal (scrap)	906	0.45	2.2	537.5
Mixed C&D Debris	900	0.45	2.2	533.9
Mixed Waste/Trash	350	0.17	5.9	207.6
Rock (loose)	2,570	1.28	0.78	1631.5
Roofing (wood shake, shingle)	435	0.22	4.5	258
Tree Limbs & Stumps	1,080	0.54	1.9	640.7
Wood (scrap, loose)	330	0.17	5.9	195.7
Yard Trimmings (mixed)	108	0.05	20	64

Construction & Demolition Debris Weight Conversion Table			
MATERIAL	**LBS/CY**	**TONS/CY**	**CY/TON**
Aluminum (scrap, whole)	175 lbs/cy	0.09 tons/cy	11.1 cy/ton
Asphalt	1,380 lbs/cy	0.69 tons/cy	1.4 cy/ton
Brass (scrap)	906 lbs/cy	0.45 tons/cy	2.2 cy/ton
Brick (common hard)	3,024 lbs/cy	1.50 tons/cy	0.67 cy/ton
Cardboard (uncompacted)	100 lbs/cy	0.05 tons/cy	20 cy/ton
Carpet & Padding (loose)	84.4 lbs/cy	0.04 tons/cy	25 cy/ton
Concrete	1,855 lbs/cy	0.92 tons/cy	1.4 cy/ton
Copper (scrap)	1,094 lbs/cy	0.56 tons/cy	1.8 cy/ton
Dirt (loose, dry)	1,890 lbs/cy	0.94 tons/cy	1.1 cy/ton
Drywall	500 lbs/cy	0.25 tons/cy	4 cy/ton
Glass (broken)	2,160 lbs/cy	1.10 tons/cy	0.91 cy/ton
Metal (scrap)	906 lbs/cy	0.45 tons/cy	2.2 cy/ton
Mixed C&D Debris	900 lbs/cy	0.45 tons/cy	2.2 cy/ton
Mixed Waste/Trash	350 lbs/cy	0.17 tons/cy	5.9 cy/ton
Rock (loose)	2,570 lbs/cy	1.28 tons/cy	0.78 cy/ton
Roofing (wood shake, shingle)	435 lbs/cy	0.22 tons/cy	4.5 cy/ton
Tree Limbs & Stumps	1,080 lbs/cy	0.54 tons/cy	1.9 cy/ton
Wood (scrap, loose)	330 lbs/cy	0.17 tons/cy	5.9 cy/ton
Yard Trimmings (mixed)	108 lbs/cy	0.05 tons/cy	20 cy/ton

Source: Contra Costa Waste Authority

Table 3. Points for reducing construction waste below baseline

Percentage reduction	*Points*
10%	0.5
20%	1.0
30%	1.5
40%	2.0
50%	2.5
60%	3.0

MR CREDIT: MATERIAL-EFFICIENT FRAMING

0.5-2 points
This credit applies to

- Homes (0.5–2 points)

Intent

To conserve resources by reducing the use of unnecessary framing materials.

Requirements

HOMES

Implement any of the following advanced framing techniques for at least 90% of each component.

- Implement one of the following optimum value engineering measures in exterior walls and common walls (1 point):
    - Install no more than one horizontal 2x top plate on walls by aligning studs with joists and roof rafters.
    - Place window and door headers in the rim joist.
    - Install raised (directly beneath the top plate), single-ply headers not more than 2 inches nominal thickness in a 2x4 wall or 4 inches nominal thickness in a 2x6 wall, in accordance with International Residential Code 2012.
    - Install structural insulated panels (SIPs) for walls.

- Implement any two of the following for all interior and exterior walls (0.5 point):
    - Size headers for actual loads.
    - Use ladder blocking or drywall clips.
    - Use two-stud corners or California corners.

- Space interior wall studs greater than 16 inches o.c. (400 mm o.c.) (0.5 point).

- Space floor joists greater than 16 inches o.c. (400 mm o.c.) or SIPs (0.5 point).

- Space roof rafters greater than 16 inches o.c. (400 mm o.c.) or SIPs (0.5 point).

For renovation projects, existing components may be excluded from the calculation.

Modular, panelized, or other prefabricated wall or structural systems must comply with the requirements.

INDOOR ENVIRONMENTAL QUALITY (EQ)

Point floor: Earn at least 3 points in the EQ section.

Figure 1. Pathway through the EQ category

EQ PREREQUISITE: VENTILATION

This prerequisite applies to

- Homes
- Midrise

Intent

To reduce moisture problems and occupants' exposure to indoor pollutants from kitchens, bathrooms and other sources by exhausting pollutants to outside and ventilating with outdoor air.

Requirements

HOMES, MIDRISE

Case 1. Single Family

Meet all of the following requirements for local exhaust and outdoor air ventilation including the requirements of ASHRAE 62.2 – 2010, sections 4, 5 and 7 and Section 1503.4 of the 2009 International Residential Code (IRC), including:

1. **Local Exhaust**. Meet all the following requirements:

Design and install local exhaust systems in all bathrooms (including half-baths) and the kitchen to meet the requirements of ASHRAE Standard 62.2–2010, Sections 5 and 7 or local equivalent, whichever is more stringent. Sample requirements that relate to minimum intermittent local exhaust flow rates are shown in Table 1.

Exhaust air to the outdoors. Do not route exhaust ducts to terminate in attics or interstitial spaces. Recirculating range hoods or recirculating over-the-range microwaves do not satisfy the kitchen exhaust requirements.

Use ENERGY STAR–labeled bathroom exhaust fans in all bathrooms (including half-baths) or performance equivalent for projects outside the U.S. A HRV or ERV can be used to exhaust single or multiple bathrooms if it has an efficacy level meeting the ENERGY STAR Technical Specifications for Residential Heat-Recovery Ventilators and Energy-Recovery Ventilators (H/ERVs) Version 2.0 as certified by HVI.For exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (188 liters per second), provide makeup air at a rate approximately equal to the exhaust air rate. Makeup air systems must have a means of closure and be automatically controlled to start and operate simultaneously with the exhaust system.

Table 1. Minimum air-flow requirements for intermittent local exhaust

	Minimum air flow
Kitchen	100 cfm (47 liters per second); vented range hood required if continuous exhaust fan flow rate is less than 5 kitchen air changes per hour
Bathroom, half-bath	50 cfm (23 liters per second)

AND

2. **Whole House Mechanical Ventilation.** Design and install a whole-house mechanical ventilation system that complies with ASHRAE Standard 62.2–2010, Sections 4 and 7 or local equivalent,

whichever is more stringent. Whole house ventilation fans must be rated for sound at a maximum of 1.0 sone per ASHRAE 62.2–2010, Section 7.2.1. Remote mounted fans need not meet these sound requirements.

The ASHRAE options can be summarized as follows:

- Continuous ventilation. Meet the ventilation requirements. Simplified minimum air-flow requirements are shown in Table 2.
- Intermittent ventilation. Use ASHRAE Standard 62.2–2010, Equation 4.2, to demonstrate adequate ventilation air flow.
- Any passive ventilation system must be approved and verified by a licensed HVAC engineer as providing ventilation equivalent to that achieved by continuous ventilation systems.

Table 2a. Simplified minimum air-flow requirements (cfm) for continuous ventilation systems

Conditioned floor area (ft^2)	Bedrooms				
	0, 1	2, 3	4, 5	6, 7	> 7
≤ 1,500	30	45	60	75	90
1,501–3,000	45	60	75	90	105
3,001–4,500	60	75	90	105	120
4,501–6,000	75	90	105	120	135
6,001–7,500	90	105	120	135	150
> 7,500	105	120	135	150	165

Table 2b. Simplified minimum air-flow requirements (liters per second) for continuous ventilation systems

Conditioned floor area (m^2)	Bedrooms				
	0, 1	2, 3	4, 5	6, 7	> 7
≤ 139	14	21	28	35	42
140 – 279	21	28	35	42	49
280 – 418	28	35	42	49	56
419 – 557	35	42	49	56	63
558 – 697	42	49	56	63	70
> 698	49	56	63	70	77

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of this prerequisite.

Case 2. Multifamily

Design and install a whole-unit ventilation system for each individual dwelling unit that complies with the requirements of ASHRAE Standard 62.2–2010 (with errata) or local equivalent, whichever is more stringent, and all local exhaust requirements for Single Family section, above. Major components of the standard are summarized below.

- Provide outdoor air to each unit directly from the outdoors. Do not use systems that rely on transfer air from pressurized hallways or corridors, adjacent dwelling units, attics, etc.

- For continuous ventilation systems, meet the requirements of ASHRAE 62.2–2010 shown in Table 2, Continuous in-unit ventilation fans must be rated for sound at a maximum of 1.0 sone, per ASHRAE 62.2–2010, Section 7.2.1. Remote mounted fans need not meet these sound requirements.
- For intermittent ventilation systems, install fans to meet ASHRAE Standard 62.2–2010. The fan flow rate must be equal to the outdoor air flow requirements multiplied by the fan flow rate multiplier. The system must be designed such that it can operate automatically based on a timer. Fans must be rated for sound at a maximum of 1.0 sone. Remote mounted fans need not meet these sound requirements.
- 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 must not exceed 7.5 cfm per 100 square feet (38 liters per second per 100 square meters) of conditioned floor area. In very cold climates, mechanical supply-only systems must not exceed 7.5 cfm per 100 square feet (38 liters per second per 100 square meters). See ASHRAE 62.2–2010, Sections 4.5 and 8, for more details and climate categories.
- Locate air inlets that are part of the ventilation design at least 10 feet (3 meters) from known sources of contamination, such as a stack, vent, exhaust hood, or vehicle exhaust. Place the intake such that entering air is not obstructed by snow, plantings, or other material. Forced air inlets must be covered by screens to exclude rodents and insects (mesh not larger than ½ inch or 13 millimeters). See ASHRAE 62.2–2010, Section 6.8, for more details and a list of exceptions.

For all non-unit spaces, meet the minimum requirements of ASHRAE Standard 62.1–2010 or local equivalent, whichever is more stringent, Sections 4–7, Ventilation for Acceptable Indoor Air Quality (with errata).

Mechanically ventilated spaces must be designed using the ventilation rate procedure or the applicable local code, whichever is more stringent. Ventilation fans that penetrate rated assemblies may require radiation and fire dampers to meet local building and fire codes.

Naturally ventilated spaces must comply with ASHRAE Standard 62.1–2010, Section 6.4.

EQ PREREQUISITE: COMBUSTION VENTING

This prerequisite applies to

- Homes
- Midrise

Intent

To limit the leakage of combustion gases into the occupied space of the home.

Requirements

HOMES, MIDRISE

Do not install any unvented combustion appliances (ovens and ranges excluded).

Install a carbon monoxide (CO) monitor on each floor, hard-wired with a battery backup. In multifamily buildings, install a CO monitor on each floor of each unit.

For all fireplaces and woodstoves inside the building, provide doors that close or a solid glass enclosure. Interior fireplaces and woodstoves that are not closed-combustion or power-vented must pass BPI or RESNET combustion safety testing protocols to ensure that depressurization of the combustion appliance zone is less than 5 Pa.

Space- and water-heating equipment that involves combustion must meet one of the following:

- it must be designed and installed with closed combustion (i.e., sealed supply air and exhaust ducting);
- it must be designed and installed with power-vented exhaust; or
- it must be located in a detached utility building or open-air facility.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of this prerequisite.

EQ PREREQUISITE: GARAGE POLLUTANT PROTECTION

This prerequisite applies to

- Homes
- Midrise

Intent

To reduce occupants' exposure to indoor pollutants originating from an adjacent garage.

Requirements

HOMES, MIDRISE

Place all air-handling equipment and ductwork outside the fire-rated envelope of the garage.

Tightly seal shared surfaces between the garage and conditioned spaces, including all of the following:

- In conditioned spaces above the garage, seal all penetrations and all connecting floor and ceiling joist bays.
- In conditioned spaces next to the garage, weather-strip all doors, install carbon monoxide detectors in rooms that share a door with the garage, seal all penetrations, and seal all cracks at the base of the walls.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of this prerequisite.

EQ PREREQUISITE: RADON-RESISTANT CONSTRUCTION

This prerequisite applies to

- Homes
- Midrise

Intent

To reduce occupants' exposure to radon gas and other soil gas contaminants.

Requirements

HOMES, MIDRISE

Case 1. New Construction

If the building is in EPA radon zone 1 (or local equivalent for projects outside the United States), design and build with radon-resistant construction techniques, as prescribed by American Association of Radon Scientist and Technologists (AARST), Reducing Radon in New Construction of 1 & 2 Family (RRNC 2.0); EPA Building Radon Out; NFPA 5000, Chapter 49; International Residential Code, Appendix F; CABO, Appendix F; ASTM E1465; or a local equivalent, whichever is more stringent. Follow all the requirements listed in Indoor airPLUS, 2.1:

- Provide a capillary break per the Indoor airPLUS specifications.
- Provide an electrical outlet near vent piping in the attic to facilitate future fan installation.
- Install a 3- or 4-inch (or approximately 80- or 100- millimeters)diameter gas-tight vertical vent pipe with no bends greater than 45 degrees, connected to an open T-fitting in the aggregate layer, extending up through the conditioned spaces and terminating at least 12 inches (300 millimeters) above the roof opening.

The requirements for radon protection are automatically satisfied if the building is elevated by at least 2 feet (600 millimeters), with open air space between the building and ground. An enclosed vented crawlspace does not qualify. A garage under a building is an acceptable alternative.

For mixed-use buildings, nonresidential space is exempted.

Case 2. Renovation of Existing Building

If the building is in EPA radon zone 1 (or local equivalent for projects outside the United States), and if no slab work is being performed (i.e., an existing slab is not being demolished, and no new slab floor is being built), test the building for radon. If the results are greater than 4 pCi/L, install an active ventilation system. If the results are less than 4 pCi/L, no radon-resistant construction techniques are required.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of this prerequisite.

EQ PREREQUISITE: AIR FILTERING

This prerequisite applies to

- Homes
- Midrise

Intent

To protect occupants' health by reducing particulate matter from the air supply system.

Requirements

HOMES, MIDRISE

Install air filters with a minimum efficiency reporting value (MERV) of 8 or higher on all recirculating space conditioning systems, per ASHRAE 62.2–2010. Design ductwork and specify the central blower to account for the pressure drop across the filter. Air filter housings must be airtight to prevent bypass or leakage.

Nonducted systems are exempt from the minimum MERV 8 requirements but must have an internal air filter in the air-handling unit.

Install air filters rated MERV 6 or higher for mechanically supplied outdoor air for systems with 10 feet (3 meters) of ductwork or more, per ASHRAE 62.2–2010, Section 6.7.

Projects may use equivalent filtration media class of F5 or higher for MERV 8 and G4 or higher for MERV 6, as defined by CEN standard EN779—2002.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of this prerequisite.

EQ PREREQUISITE: ENVIRONMENTAL TOBACCO SMOKE

This prerequisite applies to

- Homes
- Midrise

Intent

To limit exposure of building occupants, indoor surfaces, and ventilation air distribution systems to environmental tobacco smoke.

Requirements

HOMES, MIDRISE

Multifamily projects only

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

Locate any exterior designated smoking areas, including balconies where smoking is permitted, at least 25 feet (7.5 meters) from entries, outdoor air intakes, and operable windows opening to common areas.

Prohibit on-property smoking within 25 feet (7.5 meters) 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.

EQ PREREQUISITE: COMPARTMENTALIZATION

This prerequisite applies to

- Homes
- Midrise

Intent

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

Requirements

HOMES, MIDRISE

Multifamily and Attached Single-Family Projects Only

Compartmentalize each residential unit to minimize leakage between units. Minimize uncontrolled pathways for environmental tobacco smoke and other indoor air pollutants between units by sealing penetrations in walls, ceilings, and floors 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. Weather-strip all exterior doors and operable windows to minimize leakage from outdoors.

Demonstrate acceptable sealing of residential units by a blower door test. Follow the procedure described by RESNET or the ENERGY STAR Multifamily High Rise Program Testing and Verification Protocols, Version 1.0, with an allowable maximum leakage of 0.23 cfm50 per square foot (0.07 cmm50 per square meter) of enclosure (i.e., all surfaces enclosing the apartment, including exterior and party walls, floors, and ceiling).

EQ CREDIT: ENHANCED VENTILATION

3 points
This credit applies to

- Homes (1–3 points)
- Midrise (1–3 points)

Intent

To minimize moisture problems and occupants' exposure to indoor pollutants through enhanced exhaust and ventilation systems.

Requirements

HOMES, MIDRISE

Option 1. Enhanced Local Exhaust (1 point)
Use one of the following strategies in every bathroom with a shower, bathtub, or spa (i.e., half-baths are exempt) to control the use of the local exhaust fan:

- an occupancy sensor;
- an automatic humidistat controller;
- a continuously operating exhaust fan; or
- a delay timer that operates the fan for at least 20 minutes.

AND/OR

Option 2. Enhanced Whole-House Ventilation (2 points)
Install a balanced whole-house ventilation system (not just exhaust only or supply only) that meets the minimum ventilation requirements of ASHRAE Standard 62.2–2010, Sections 4 and 7, or local equivalent whichever is more stringent. Program the system such that it does not exceed the standard's requirements by more than 10%.

For multifamily buildings, meet the above requirements for all in-unit residential spaces in both options 1 and 2.

EQ CREDIT: CONTAMINANT CONTROL

2 points
This credit applies to

- Homes (0.5–2 points)
- Midrise (0.5–2 points)

Intent

To reduce occupants' exposure to indoor airborne contaminants through source control and removal.

Requirements

HOMES

Option 1. Walk-off Mats (0.5 point)
At each *primary entryway* from the outdoors, design and install a permanent walk-off mat that is at least 4 feet (1.2 meters) long and allows access for cleaning (e.g., grating with catch basin). Permanent walk-off mats are required only for primary exterior entryways, but nonpermanent walk-off mats are strongly recommended for other entryways.

For regularly used common exterior entryways in multifamily buildings, install permanent systems that are at least 10 feet long (3 meters) in the primary direction of travel to capture dirt and particulates.

Acceptable entryway systems include permanently installed grates, grilles, and slotted surfaces that allow for cleaning underneath. Roll-out mats are acceptable only if maintained on a weekly basis by a contracted service organization.

AND/OR

Option 2. Shoe Removal and Storage (0.5 point)
Design a shoe removal and storage space near the primary entryway, separated from living areas. This space must be a permanent architectural feature and it must be large enough to accommodate a bench and at least two pairs of shoes per bedroom and must not have conventional carpet. Carpet tile is acceptable if it's specifically designed for entryway systems or similar use, including performance attributes equivalent to other acceptable entryway systems.

For multifamily buildings, design a shoe removal and storage space at each residential unit's primary entrance.

AND/OR

Option 3. Preoccupancy Flush (0.5 points)

At installation, seal all permanent ducts and vents to minimize contamination from construction. Remove seals after all phases of construction are completed.

After construction ends and before occupancy, flush the home with fresh air, according to the following guidelines:

- Remove any dust and debris from ducts.
- Flush the entire home for 48 hours, keeping all windows and interior doors open; the 48 hours may be nonconsecutive if necessary.

- 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.

For multifamily buildings, the requirements apply only to all in-unit spaces.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of Option 3.

AND/OR

Option 4. Air Testing (1 point)

After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline indoor air quality testing using protocols consistent with the methods listed in Table 1. Project teams must follow either the current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use.

Demonstrate that contaminants do not exceed concentration levels listed in Table 1.

Table 1. Maximum concentration levels, by contaminant and testing method

Contaminant			Maximum concentration	ASTM and U.S. EPA methods	ISO method
Particulates	**PM10** (for all buildings)		50 µg/m^3	EPA Compendium Method IP-10	ISO 7708
	PM2.5 (for buildings in EPA nonattainment areas for PM2.5, or local equivalent)		15 µg/m^3		
Ozone (for buildings in EPA nonattainment areas for Ozone, or local equivalent)			0.075 ppm	ASTM D5149 - 02	ISO 13964
Carbon monoxide (CO)			9 ppm; no more than 2 ppm above outdoor levels	EPA Compendium Method IP-3	ISO 4224
Total volatile organic compounds (TVOCs)			500 µg/m^3	EPA TO-1, TO-17, or EPA Compendium Method IP-1	ISO 16000-6
Formaldehyde			27 ppb	ASTM D5197, EPA TO-11, or EPA Compendium Method IP-6	ISO 16000-3
Target volatile organic compounds*	1	Acetaldehyde	140 µg/m^3		
	2	Benzene	3 µg/m^3	ASTM D5197; EPA TO-1, TO-17, or EPA Compendium Method IP-1	ISO 16000-3, ISO 16000-6
	3	Carbon disulfide	800 µg/m^3		
	4	Carbon tetrachloride	40 µg/m^3		
	5	Chlorobenzene	1000 µg/m^3		
	6	Chloroform	300 µg/m^3		
	7	Dichlorobenzene (1,4-)	800µg/m^3		
	8	Dichloroethylene (1,1)	70 µg/m^3		
	9	Dimethylformamide (N,N-)	80 µg/m^3		
	10	Dioxane (1,4-)	3000 µg/m^3		
	11	Epichlorohydrin	3 µg/m^3		
	12	Ethylbenzene	2000 µg/m^3		
	13	Ethylene glycol	400 µg/m^3		
	14	Ethylene glycol monoethyl ether	70 µg/m^3		
	15	Ethylene glycol monoethyl ether acetate	300 µg/m^3		
	16	Ethylene glycol monomethyl ether	60 µg/m^3		
	17	Ethylene glycol monomethyl ether acetate	90 µg/m^3		
	19	Hexane (n-)	7000 µg/m^3		

	20	Isophorone	2000 µg/m^3		
	21	Isopropanol	7000 µg/m^3		
	22	Methyl chloroform	1000 µg/m^3		
	23	Methylene chloride	400 µg/m^3		
	24	Methyl *t*-butyl ether	8000 µg/m^3		
	25	Naphthalene	9 µg/m^3		
	26	Phenol	200 µg/m^3		
	27	Propylene glycol monomethyl ether	7000 µg/m^3		
	28	Styrene	900 µg/m^3		
	29	Tetrachloroethylene (Perchloroethylene)	35 µg/m^3		
	30	Toluene	300 µg/m^3		
	31	Trichloroethylene	600 µg/m^3		
	32	Vinyl acetate	200 µg/m^3		
	33-35	Xylenes, technical mixture (m-, o-, p-xylene combined)	700 µg/m^3		

ppb = parts per billion; ppm = parts per million; µg/cm = micrograms per cubic meter

Conduct all measurements before occupancy but during normal occupied hours, with the building ventilation system started at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the test.

The number of sampling locations depends on the size of the building and number of ventilation systems but must include the entire building and all representative situations. Include areas with the least ventilation and greatest presumed source strength.

Collect air samples between 3 and 6 feet (900 and 1 800 millimeters) from the floor to represent the breathing zone of occupants over a minimum four-hour period.

Measure particulate concentrations by a gravimetric method. Hand-held or real-time instruments are not acceptable unless they are calibrated on site against the standard gravimetric method.

For each sampling point where the concentration exceeds the limit, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.

Refer to CA Section 01350, Appendix B, New Single-Family Residence Scenario, for air-testing guidance.

MIDRISE

Option 1. Walk-off Mats (0.5 point)

At each unit's primary entryway from the outdoors, design and install a permanent walk-off mat that is at least 4 feet (1.2 meters) long and allows access for cleaning (e.g., grating with catch basin).

For regularly used common exterior entryways in multifamily buildings, install permanent systems that are at least 10 feet (3 meters) long in the primary direction of travel to capture dirt and particulates. Acceptable entryway systems include permanently installed grates, grilles, and slotted surfaces that allow for cleaning underneath. Roll-out mats are acceptable only if maintained on a weekly basis by a contracted service organization.

AND/OR

Option 2. Shoe Removal and Storage (0.5 point)

In each unit, design a shoe removal and storage space near the entryway, separated from living areas. This space must be a permanent architectural feature, it may not have wall-to-wall carpeting, and it must be large enough to accommodate a bench and at least two pairs of shoes per bedroom.

AND/OR

Option 3. Preoccupancy flush (0.5 point)

The Preoccupancy Flush can be awarded if the requirements are only met for all in-unit spaces.

At installation, seal all permanent ducts and vents to minimize contamination from construction. Remove seals after all phases of construction are completed.

After construction ends and before occupancy, flush the home with fresh air, according to the following guidelines:

- Remove any dust and debris from ducts.
- Flush the entire home, keeping all interior doors open for 48 hours; the hours may be nonconsecutive if necessary.
- 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.

For multifamily buildings, the requirements apply only to all in-unit spaces.

AND/OR

Option 4. Air Testing (1 point)

After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline indoor air quality testing using protocols consistent with the methods listed in Table 1. Project teams must follow either the current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use.

Demonstrate that contaminants do not exceed concentration levels listed in Table 1.

Table 1. Maximum concentration levels, by contaminant and testing method

Contaminant			Maximum concentration	ASTM and U.S. EPA methods	ISO method
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	PM2.5 (for buildings in EPA nonattainment areas for PM2.5, or local equivalent)		15 µg/m^3		
Ozone (for buildings in EPA nonattainment areas for Ozone, or local equivalent)			0.075 ppm	ASTM D5149 - 02	ISO 13964
Carbon monoxide (CO)			9 ppm; no more than 2 ppm above outdoor levels	EPA Compendium Method IP-3	ISO 4224
Total volatile organic compounds (TVOCs)			500 µg/m^3	EPA TO-1, TO-17, or EPA Compendium Method IP-1	ISO 16000-6
Formaldehyde			27 ppb	ASTM D5197, EPA TO-11, or EPA Compendium Method IP-6	ISO 16000-3
	1	Acetaldehyde	140 µg/m^3		

Target volatile organic compounds*	2	Benzene	3 µg/m^3	ASTM D5197; EPA TO-1, TO-17, or EPA Compendium Method IP-1	ISO 16000-3, ISO 16000-6
	3	Carbon disulfide	800 µg/m^3		
	4	Carbon tetrachloride	40 µg/m^3		
	5	Chlorobenzene	1000 µg/m^3		
	6	Chloroform	300 µg/m^3		
	7	Dichlorobenzene (1,4-)	800µg/m^3		
	8	Dichloroethylene (1,1)	70 µg/m^3		
	9	Dimethylformamide (N,N-)	80 µg/m^3		
	10	Dioxane (1,4-)	3000 µg/m^3		
	11	Epichlorohydrin	3 µg/m^3		
	12	Ethylbenzene	2000 µg/m^3		
	13	Ethylene glycol	400 µg/m^3		
	14	Ethylene glycol monoethyl ether	70 µg/m^3		
	15	Ethylene glycol monoethyl ether acetate	300 µg/m^3		
	16	Ethylene glycol monomethyl ether	60 µg/m^3		
	17	Ethylene glycol monomethyl ether acetate	90 µg/m^3		
	19	Hexane (n-)	7000 µg/m^3		
	20	Isophorone	2000 µg/m^3		
	21	Isopropanol	7000 µg/m^3		
	22	Methyl chloroform	1000 µg/m^3		
	23	Methylene chloride	400 µg/m^3		
	24	Methyl *t*-butyl ether	8000 µg/m^3		
	25	Naphthalene	9 µg/m^3		
	26	Phenol	200 µg/m^3		
	27	Propylene glycol monomethyl ether	7000 µg/m^3		
	28	Styrene	900 µg/m^3		
	29	Tetrachloroethylene (Perchloroethylene)	35 µg/m^3		
	30	Toluene	300 µg/m^3		
	31	Trichloroethylene	600 µg/m^3		
	32	Vinyl acetate	200 µg/m^3		
	33-35	Xylenes, technical mixture (m-, o-, p-xylene combined)	700 µg/m^3		

ppb = parts per billion; ppm = parts per million; µg/cm = micrograms per cubic meter

Conduct all measurements before occupancy but during normal occupied hours, with the building ventilation system started at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the test.

The number of sampling locations depends on the size of the building and number of ventilation systems but must include the entire building and all representative situations. Include areas with the least ventilation and greatest presumed source strength.

Collect air samples between 3 and 6 feet (900 and 1 800 millimeters) from the floor to represent the breathing zone of occupants over a minimum four-hour period.

Measure particulate concentrations by a gravimetric method. Hand-held or real-time instruments are not acceptable unless they are calibrated on site against the standard gravimetric method.

For each sampling point where the concentration exceeds the limit, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.

Refer to CA Section 01350, Appendix B, New Single-Family Residence Scenario, for air-testing guidance.

EQ CREDIT: BALANCING OF HEATING AND COOLING DISTRIBUTION SYSTEMS

3 points
This credit applies to

- Homes (1–3 points)
- Midrise (1–3 points)

Intent

To improve thermal comfort and energy performance by ensuring appropriate distribution of space heating and cooling in the home.

Requirements

HOMES, MIDRISE

Case 1. Forced-Air Systems

Option 1. Multiple Zones (1 point)

Install a system with at least two space-conditioning zones with independent thermostatic controls. In houses with both a heating system and a cooling system, each must have at least two zones.

Single-family houses with less than 800 square feet (74 square meters) of conditioned floor area and multifamily buildings whose average unit size is less than 1,200 square feet (110 square meters) automatically meet the requirements of this credit.

AND/OR

Option 2. Supply Air-Flow Testing (1 point)
Have the total supply air-flow rates in each room tested using a flow hood with doors closed, or another acceptable method, per RESNET or ACCA Quality Installation Specifications.

Supply air-flow rates must be within +/- 20% (or +/- 25 cfm or 11 lps) of calculated values from ACCA Manual J.

Test multirate or multispeed HVAC systems at the rate for which they were designed. Supply air-flow requirements must meet the higher of the cooling or heating designed air flow for each room.

Ductless systems qualify for this credit.

AND/OR

Option 3. Pressure Balancing (1 point)

For each bedroom, demonstrate a pressure difference of less than 3 Pa (0.012 inch w.c.) with respect to the main body of the house when doors are closed and the air handler is operating on highest speed.

Case 2. Radiative Systems

Radiative systems include radiators, hot water baseboard systems, and other non-forced air heating and cooling systems.

Option 1. Multiple Zones (1 point)

Install an HVAC system with at least two zones with independent thermostat controls. Each zone must have a separate loop and separate pump controlled automatically by a thermostat control. For HVAC systems with radiators, see Option 2.

Houses with less than 800 square feet (74 square meters) of conditioned floor area and multifamily buildings whose average unit size is less than 1,200 square feet (110 square meters) automatically meet the requirements of this credit.

AND/OR

Option 2. Room-by-Room Controls (2 points)
Design the HVAC system with room-by-room thermostatic controls, such as flow-control valves on every radiator.

EQ CREDIT: ENHANCED COMPARTMENTALIZATION

1–3 points
This credit applies to

- Homes (1 point)
- Midrise (3 points)

Intent

To minimize the exposure of building occupants to indoor air pollutants by preventing the transfer of air between units.

Requirements

HOMES, MIDRISE

Perform a compartmentalization blower door test according to RESNET or the ENERGY STAR testing and verification protocols for multifamily midrise buildings, with an allowable maximum leakage of 0.15 cfm50 per square foot (0.04 cmm50 per square meter) of enclosure (i.e., all surfaces enclosing the apartment, including exterior and party walls, floors, and ceiling).

EQ CREDIT: COMBUSTION VENTING

2 points
This credit applies to

- Homes (1–2 points)
- Midrise (1–2 points)

Intent

To minimize the leakage of combustion gases into the occupied space of the home.

Requirements

HOMES, MIDRISE

Option 1. No Fireplace or Woodstove (2 points)
Do not install any fireplaces or woodstoves.

OR

Option 2. Enhanced Combustion Venting Measures (1 point)
For any wood- or pellet-burning stoves, install equipment that is EPA certified. For wood-burning fireplaces, install equipment that is EPA qualified. Provide power or direct venting.

For any natural gas, propane, or alcohol stoves, install equipment listed by an approved safety testing facility. The stove must have a permanently fixed glass front or gasketed door and an electronic pilot. Provide power or direct venting.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of Option 2.

EQ CREDIT: ENHANCED GARAGE POLLUTANT PROTECTION

1-2 points
This credit applies to

- Homes (1–2 points)
- Midrise (1 point)

Intent

To minimize occupants' exposure to indoor pollutants originating from an adjacent garage.

Requirements

HOMES

Case 1. Single Family

Option 1. Exhaust Fan in Garage (1 point)
Install in the garage an exhaust fan that is rated at least 75 cfm (35 liters per second) and meets ENERGY STAR cfm/w performance requirements.

The fan must vent directly to the outdoors and have an automatic timer control linked to an occupant sensor, a light switch, a garage door opening-closing mechanism, a carbon monoxide sensor that turns on the fan when ambient CO levels reach 35 ppm, or equivalent. The timer must be set to provide at least three air changes each time the fan is turned on.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of Option 1.

OR

Option 2. No Garage, or Detached Garage, or Carport (2 points)
Select one of the following strategies:

- Do not construct a garage.
- Install a detached garage, defined as a structure that does not share a wall with the home.
- Install a carport, defined as an open-air space with one complete wall, which may be shared with the home.

Case 2. Multifamily

Option 1. Exhaust Fan in Multicar Garage (1 point)
For a garage that accommodates more than three cars, follow the requirements in ASHRAE 62.1–2010. Exhaust the garage sufficiently to create negative pressure with respect to adjacent spaces with the doors to the garage closed. Provide self-closing doors and deck-to-deck partitions or a hard lid ceiling. The pressure differential with the surrounding spaces must be at least 5 Pascals (Pa) (0.02 inches of water gauge) when all doors are closed. The exhaust fan may either run continuously, or on a carbon monoxide sensor that turns on the fan when ambient CO levels reach 35 ppm.

OR

Option 2. Exhaust Fan in Small Garage (1 point)
For a garage that accommodates one, two, or three cars, install an exhaust fan that meets ENERGY STAR minimum efficacy levels (cfm/W)
; direct-exhaust fans must be 100 cfm (47 liters per second) or greater, and ducted exhaust fans must be 130 cfm (61 liters per second) or greater.

The fan must either run continuously or have an automatic timer control linked to an occupant sensor, a light switch, a garage door opening-closing mechanism, a carbon monoxide sensor that turns on the fan when ambient CO levels reach 35 ppm, or equivalent. Any timer must be set to provide at least three air changes each time the fan is turned on.

OR

Option 3. No Garage, or Detached Garage (2 points)
Select one of the following strategies:

- Do not construct a garage.
- Install a detached garage, defined as a structure that does not share a wall with the building.

MIDRISE

Option 1. Exhaust Fan on Controls in Garage (1 point)

For a garage that accommodates more than three cars, follow the requirements in ASHRAE 62.1–2010. Exhaust the garage sufficiently to create negative pressure with respect to adjacent spaces with the doors to the garage closed. Provide self-closing doors and deck-to-deck partitions or a hard lid ceiling. The pressure differential with the surrounding spaces must be at least 5 Pascals (Pa) (0.02 inches of water gauge) when all doors are closed. The exhaust fan may either run continuously, or on a carbon monoxide sensor that turns on the fan when ambient CO levels reach 35 ppm.

OR

Option 2. Detached Garage or No Garage or Carport (1 point)
If a garage is constructed, it may not share a wall with the building.

EQ CREDIT: LOW-EMITTING PRODUCTS

3 points
This credit applies to

- Homes (0.5-3 points)
- Midrise (0.5-3 points)

Intent

To reduce occupants' exposure to airborne chemical contaminants through product selection.

Requirements

HOMES, MIDRISE

In the interior of the home, use products that have been tested and found compliant with the California Department of Public Health Standard Method V1.1–2010, using CA Section 01350, Appendix B, New Single-Family Residence Scenario, for emissions testing guidance. At least 90% of a component must meet the requirements to earn credit.

For site-applied interior paints and coatings, meet the requirements of CA Section 01350 (0.5 point).

For flooring, meet the requirements of CA Section 01350 (0.5 point).

For insulation, meet the requirements of CA Section 01350 (0.5 point).

For site-applied adhesives and sealants, meet the requirements of CA Section 01350 (0.5 point).

For composite wood products be constructed from materials documented to have low formaldehyde emissions that meet the California Air Resources Board requirements for ultra-low-emitting formaldehyde (ULEF) resins or no-added formaldehyde based resins. Salvaged and reused architectural millwork more than one year old at the time of occupancy is considered compliant provided any site-applied paints, coatings, adhesives, and sealants meet the requirements. Wood structural panels conforming to DOC PS-1 or PS-2 and manufactured with moisture-resistant adhesive for "Exposure 1" or "Exterior" application as indicated on the panel by the trademark of an approved testing and grading agency are exempt. (1 point).

EQ CREDIT: NO ENVIRONMENTAL TOBACCO SMOKE

1 point
This credit applies to

- Midrise (1 point)

Intent

To minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to environmental tobacco smoke.

Requirements

MIDRISE

Prohibit smoking throughout the building, including within living units. The prohibition must be communicated in building rental or lease agreements or in condo or co-op association covenants and restrictions, and provisions for enforcement must be included.

INNOVATION (IN)

IN PREREQUISITE: PRELIMINARY RATING

This prerequisite applies to

- Homes
- Midrise

Intent

To maximize opportunities for integrative, cost-effective adoption of green design and construction strategies.

Requirements

HOMES, MIDRISE

As early as practicable, conduct a preliminary LEED for Homes meeting. As part of the meeting, create an action plan that identifies the following:

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

IN CREDIT: INNOVATION

5 points
This credit applies to
- Homes (1–5 points)
- Midrise (1–5 points)

Intent

To encourage exceptional performance for current credits and promote innovative performance in pioneering areas.

Requirements

HOMES, MIDRISE

To achieve all five innovation points, a project team must achieve at least one pilot credit, at least one innovation credit and no more than two exemplary performance credits.
Option 1. Innovation (1 point)
Achieve significant, measurable environmental performance using a strategy not addressed in the LEED Green Building Rating System.

Identify the following in writing:
- the intent of the proposed innovation credit;
- the proposed requirement for compliance;
- the proposed submittals to demonstrate compliance; and
- the design approach (strategies) used to meet the requirements.

AND/OR

Option 2. Pilot (1 point)
Attempt and achieve one pilot credit from the USGBC's LEED Pilot Credit Library.

AND/OR

Option 3. Additional Strategies (1–3 points)
- Innovation (1–3 points)
  Defined in Option 1 above.
- Pilot (1–3 points)
  Defined in Option 2 above.
- Exemplary Performance (0.5–2 points)
  Achieve exemplary performance in an existing LEED v4 prerequisite or credit that allows exemplary performance, as specified in the LEED Reference Guide, v4 edition. An exemplary performance point is typically earned for achieving double the credit requirements and/or achieving the next incremental percentage threshold of an existing credit.

IN CREDIT: LEED ACCREDITED PROFESSIONAL

1 point
This credit applies to

- Homes (1 point)
- Midrise (1 point)

Intent

To encourage the project team integration required by a LEED project and to streamline the application and certification process.

Requirements

HOMES, MIDRISE

At least one principal participant of the project team must be a LEED Accredited Professional (AP) with a specialty appropriate for the project.

REGIONAL PRIORITY (RP)

RP CREDIT: REGIONAL PRIORITY

4 points
This credit applies to

- Homes (1–4 points)
- Midrise (1–4 points)

Intent

To address geographically specific environmental, social equity, and public health priorities.

Requirements

HOMES, MIDRISE

Six Regional Priority credits have been identified by the USGBC regional councils and chapters as having special importance for the project's region. A database of these credits and their geographic applicability is available on the USGBC website, at http://www.usgbc.org.

One point is awarded for each Regional Priority credit achieved, up to a maximum of four.