Built Green Single-Family Handbook

Version 2021

BUILT GREEN®

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Photo: Seattle Home Photography.

TABLE OF CONTENTS

INTRODUCTION

This handbook contains specific, detailed interpretation information about how projects can meet each credit in the 2021 Single-Family/Townhome New Construction Checklist. For each credit the handbook identifies the party responsible for meeting the credit item, the intent behind the credit, the performance requirement, point breakdown, when the credit should be verified, cross references to other related credits or star-level requirements and resources.

ABOUT THE BUILT GREEN PROGRAM

Built Green is a holistic green home certification of the Master Builders Association of King and Snohomish Counties, developed in partnership with King County, Snohomish County, and other government agencies in Washington State. It was originally founded in 1999. Since then, over 21,000 projects and 40,000 housing units have been certified.

Built Green also serves as a network of architects, builders, developers, remodelers, subcontractors, product suppliers, lenders, and others involved in the green building industry. It is a resource on the human and environmental benefits of green building as well.

Built Green certifies residential construction of all kinds, with checklists for: single-family/townhomes, multifamily buildings, remodels, refits, and communities. Built Green's mission is to serve as the driving force for environmentally sound design, construction, and development practices in Washington's cities and communities.

BUILT GREEN PROCESS

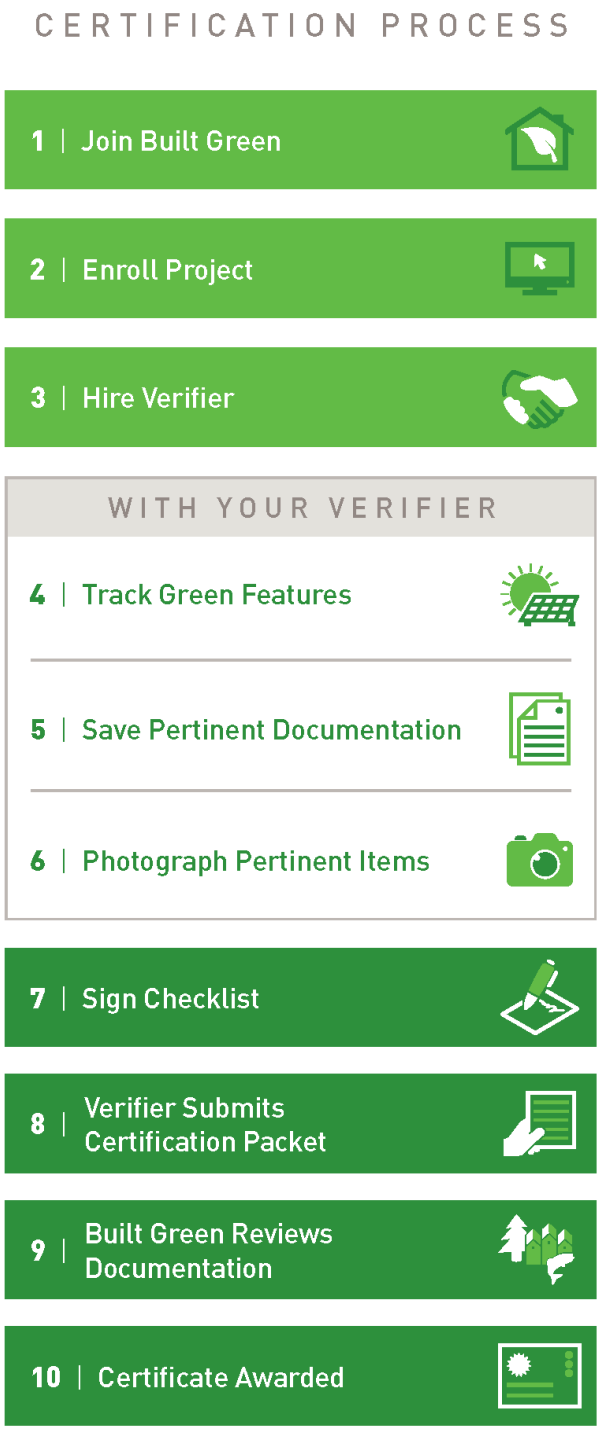
All companies seeking to certify their project must join Built Green as a member. Additionally, all projects must receive third-party verification. A list of approved verifiers and how to join can be found on builtgreen.net. To achieve a requisite star-level, the required Credit items and point thresholds for that level must be met. These are described in detail in this handbook.

Built Green Certification Program Administrators:

Western Washington (west of Cascades) Built Green projects and builders enroll with Master Builders Association of King and Snohomish Counties' Built Green program.

Eastern Washington (east of Cascades) Built Green projects and builders enroll with the Home Builders Association of Tri-Cities' Built Green program.

The following diagram outlines the certification process:



How to Use the Handbook

For ease of use, the 2021 Single-Family/Townhome New Construction Checklist directly corresponds with Handbook Sections 1–8. The checklists are key-coded to help you find information about each measure. The first number indicates what section to look in followed by a second number indicating the order in which it appears.

Here's how it works, using Credit 2-29 from the checklist as an example: The action "Use pervious materials for driveways, parking areas, walkways, and patios" is described in Section Two (Site and Water), and is the 29th measure under the section.

Credit # and Description

Responsible Party: Those who are responsible for ensuring the credit requirements are met in the finished project. This may be developer, design and/or construction personnel.

Intent: The desired outcome resulting from meeting the requirements of the credit. This may be educational for the project team but is also helpful for the verifier in determining if the intent has been met.

Performance Requirement: Describes what the project team must do, as definitively as possible, to earn points for the credit. This gives the project team something clear to aim at, and the verifier something specific to measure against.

Points Breakdown: Points available, and how to earn different levels.

When Verified: Guidance on the most effective time and method for verification, helping both project team and verifier to plan site inspections and review meetings. This is a way to help teams and verifiers scope their verification plans for a project—it is a guide, not an absolute.

Cross References: Referencing other relevant Credits in the checklist.

Resources: Specific, reliable resources for reference.

Project Enrollment and Checklist Considerations

Project Enrollment Online Process

Prior to enrolling a project with Built Green, the company or individual requester must become a Built Green Member. Once logged into your online Built Green account, you will be able to submit projects through the online Builder portal. Once the project is submitted, ensure that all enrollment fees have been paid, either by reviewing the payment confirmation screen or the emailed payment receipt. Each submitted project is manually enrolled by the Built Green team, which may take 24- 48 hours. Once our team has completed setting up the project's ID numbers and verified that the enrollment fees have

been processed, the project's enrollment letter will be emailed to the email address associated with the Built Green account that was used to submit the project and the verifier listed on the project. The enrollment letter is what you would provide to the local jurisdiction to comply with green building incentive or permit requirements.

Have a Membership with Your Local Homebuilders Association?

Built Green offers significant discounts on membership and project enrollments fees for homebuilder association members. If you are planning on enrolling at least 3-6 units over the course of your yearly membership, then becoming a member of your local homebuilders association before becoming a Built Green member could save you hundreds or thousands of dollars in project enrollment fees. Discounts are extended to any Washington state builders association members. Here are some examples:

- Master Builders Association of King and Snohomish Counties
- Master Builders Association of Pierce County
- Olympia Master Builders
- Building Industry Association of Whatcom County
- Skagit/Island Counties Builders Association
- Kitsap Building Association

Select the "This company is a member of a partner association" option on the Built Green membership application and list the association you have a membership with. The Built Green team will confirm your membership with that association and contact you to complete the membership setup process.

Project Enrollments

For projects that are building more than one dwelling unit per project site, the number of units to enroll depends on how each dwelling unit will be sold or identified with a distinct address. Certifications are associated to each dwelling unit with a distinct address. For projects with multiple dwelling units on the same development site (e.g., multiple townhomes or SFR/AADU/DADU projects) the number of units to enroll depends on how many units have distinct addresses and can be sold independently of each other.

Common Built Green enrollment scenarios for new construction projects:

If all dwelling units are being sold separately with distinct addresses: all units would be considered separate units for enrollment and certifications. This would require an enrollment of units equal to the number of dwelling units being built.

If the primary single-family residence and AADU are sold and addressed as one unit, and a DADU is sold as a separate unit with its own address: the SFR/AADU and DADU would be one unit

each and would be considered separate units for enrollment and certifications. This would require an enrollment of two units.

If the primary single-family residence, ADU, and DADU are sold and addressed as one unit: all units would be enrolled and certified under one enrollment and certification that covers all dwellings. This would require an enrollment of one unit.

Common Built Green enrollment scenarios for projects that include an existing residence as part of the project:

If an existing residence that is being remodeled and a new DADU is being constructed and both units are being certified: The existing residence would be enrolled and certified using the Built Green Remodel certification and the DADU would be enrolled and certified using the New Construction certification. This would require an enrollment of two projects with one unit each.

If a new DADU is being constructed, with a separate address, adjacent to the existing residence that is not being remodeled or certified: only the DADU would be enrolled and certified using the New Construction certification. This would require an enrollment of one unit.

Project Certification Checklists

Checklists may cover more than one dwelling unit by using a sample unit. The sample unit must be represented by the lowest scoring unit on the development site. To provide accurate information for homebuyers, the project's Built Green verifier shall make note in the checklist's comment section of any features represented in multiple non-sample units, that are not represented in the sample unit's score (i.e., cork floors in 4 of 6 units).

Separate Built Green checklists must be used for units when:

1. Significant features are not represented by the sample unit (e.g., Solar Panels, ADUs, significant use of salvaged materials, etc.)
2. Prior to the multiplier being applied the point subtotal differs by more than 10% from other units
3. A unit's floorplan square footage varies by more than 10% in size from the sample unit's floorplan size
4. A unit's house size requires the use of a different multiplier or material section requirement from the sample unit to conform with the Housing Size Matrix

SECTION ONE: REQUIREMENTS

REQUIRED CREDITS PER STAR LEVEL

3-Star Requirements

Credit #	Category	Credit
1-1		3rd party verification required by program approved Built Green Verifier
1-2		Conform to the House Size Matrix (Table 0-1)
1-3		Meet all applicable codes, regulations, and green building incentive requirements
1-4	**Points**	Achieve a minimum of 40 points in each of sections 2-5
1-5	**Site & Water**	Stabilize all construction entrances with quarry spall or crushed rock
1-6	**Site & Water**	No zinc galvanized ridge caps, copper flashing or copper wires for moss prevention (Credit 2-48)
1-7	**Site & Water**	Document a water efficiency score through WERS or WRI of 70 or less, or certify under WaterSense 2.0, or Model total water use reduction of at least 30% (Credit 2-51); OR Prescriptively all plumbing fixtures and appliances are low-flow (Credits 2-63 to 2-66) and emphasize drought-tolerant or native vegetation (food production excluded)
1-8	**Energy**	Performance modeled ERI of 62-56 (Credit 3-1); OR Performance modeled 6% improvement over 2018 WSEC (Credit 3-2); OR Document additional Prescriptive credits from 2018 WSEC R406.3 table worth 1.0pt or greater (Credit 3-5)
1-9	**IAQ**	CARB II compliant or better materials for cabinets and hard-surface flooring, Greenguard Gold or Formaldehyde-free certified insulation, and low-VOC paints and low toxic wet-applied interior finishes (Credits 4-19, 4-23, 4-24, 4-26) [see below]
1-10	**IAQ**	All spot fans under 110 CFM are 0.5 sones or less (Credit 4-50)
1-11	**Material**	Post jobsite recycling plan on site and maintain at least two bins on site (one for waste, one for recyclables) [see below]
1-12	**ESJ**	Achieve at least 15 points in Section 6: Equity and Social Justice
1-13	**OMH**	Provide a building owner's manual in accordance with Credit 7-1

CARB II compliant materials for cabinets and hard-surface flooring, Greenguard Gold or Formaldehyde-free certified insulation, and low-VOC paints and low-toxic wet-applied interior finishes

Responsible Party: Architect, Interior Designer, General Contractor

Intent: Protect worker and occupant health from harmful off-gassing from added formaldehydes, volatile organic compounds (VOCs), and other potentially toxic fumes and solvents.

Performance Requirement: Specify and use only CARB II, NAUF or ULEF compliant materials for cabinets and hard-surface flooring. Wall insulation must be Greenguard Gold or formaldehyde-free certified. Low- or Zero-VOC paints and low-toxic wet-applied finishes for all interior applications and finishes (see Credits 4-23 for full list of applicable wet-applied finishes).

When Verified: Review of product documentation and visually verify during intermediate and final construction inspections.

Cross References: 4-19, 4-23, 4-24, 4-26

Post jobsite recycling plan on site and maintain at least two bins (one for waste, one for recyclables)

Responsible Party: General Contractor

Intent: Control and minimize waste generated on site.

Performance Requirement: Produce a jobsite recycling plan, clearly post it on site, and draw attention to it at regular safety meetings. Plan shall describe project waste management goals, clearly communicate the construction team's responsibility for implementing the plan, what collection bins are provided, where they are located, what materials should and should not go in them, and penalties for contamination of bins. At a minimum, there will be one bin for mixed recyclables and one for waste (nonrecyclables).

When Verified: At every site visit

4-Star Requirements

Credit #	Category	Credit
1-14		Meet 3-Star requirements
1-15	**Points**	Achieve a minimum of 60 points in each of Sections 2-5
1-16	**Site & Water**	Emphasize landscaping with native, pollinator-friendly or drought tolerant plants
1-17	**Site & Water**	Document a water efficiency score through WERS or WRI of 60 or less, or Model total water use reduction of at least 40% (Credit 2-51); OR Prescriptively all plumbing fixtures and appliances are low-flow (Credits 2-63 to 2-66) and landscaping requires no potable water irrigation after establishment period (Credit 2-55)
1-18	**Site & Water**	Limit use of sod grass to 25% of landscaped area or less (Credit 2-35), or use drought-tolerant grass or ground cover (Credit 2-36).
1-19	**Energy**	Performance modeled ERI of 55-48 (Credit 3-1); OR Performance modeled 12% improvement over 2018 WSEC (Credit 3-2); OR Document additional Prescriptive credits from 2018 WSEC R406.3 table worth 2.0pt or greater (Credit 3-5)
1-20	**IAQ**	Detached or no garage or garage air sealed from house with automatic exhaust fan (Credits 4-20 and 4-21)
1-21	**IAQ**	CARB II compliant or better for all interior finish woodwork, subfloors, plywood and composite wood materials, CRI Green Label Plus or better for all installed carpeting (Credits 4-15, 4-19) (excludes structural lumber) [see below]
1-22	**Material**	Use at least one material or product with an HPD or EPD (Credit 4-12 or 5-97)
1-23	**Material**	Achieve a minimum recycling rate of 50% of waste by weight
1-24	**ESJ**	Create a project-specific ESJ plan (Credit 6-9) and achieve at least 20 points in Section 6: Equity and Social Justice; not all points may be from Universal Design credits
1-25	**OMH**	Provide Energy Efficiency Performance Summary report and Water Efficiency Performance Summary report (if applicable) in building owners manual (Credit 7-1)

CARB II compliant or better for all interior finish woodwork, subfloors, plywood and composite wood materials, CRI Green Label Plus or better for all installed carpeting

Responsible Party: Architect, Interior Designer, General Contractor

Intent: Protect worker and occupant health from harmful off-gassing from added formaldehydes, volatile organic compounds (VOCs), and other potentially toxic fumes and solvents.

Performance Requirement: Specify and use only CARB II, NAUF or ULEF compliant materials for all interior finish woodwork, subfloors, plywood, and composite wood materials. Structural lumber that is enclosed in the building envelope or not exposed to the interior of the home is excluded. All installed carpeting must be CRI Green Label Plus certified or better.

When Verified: Review of product documentation and visually verify during intermediate and final construction inspections.

Cross References: 4-15, 4-19, 4-23, 4-24, 4-26

5-Star Requirements

Credit #	Category	Credit
1-26		Meet 4-Star requirements
1-27	**Points**	Achieve a minimum of 100 points in each of sections 2-5
1-28	**Site & Water**	Amend disturbed soil with compost to a depth of 10 to 12 inches to restore soil environmental functions (Credit 2-25)
1-29	**Site & Water**	Use pervious materials for at least one-third of total area for driveways, walkways, and patios (Credit 2-29)
1-30	**Site & Water**	Document a water efficiency score through WERS or WRI of 50 or less, or Model total water use reduction of at least 50% (Credit 2-51)
1-31	**Site & Water**	Retain 30% of the trees located on site at the start of construction; *OR* achieve a Green Factor score of 0.6 or higher (Credits 2-13, 2-30, and 2-31)
1-32	**Energy**	Performance modeled ERI of 47 or less (Credit 3-1); *OR* Performance modeled 18% improvement over 2018 WSEC (Credit 3-2); *OR* Document additional Prescriptive credits from 2018 WSEC R406.3 table worth 3.0 pts or greater (Credit 3-5)
1-33	**IAQ**	Design a designated shoe-removal area and storage at primary entrance (Credit 4-58)
1-34	**Materials**	Achieve a minimum recycling rate of 70% of waste by weight
1-35	**Materials**	Calculate embodied carbon (Credit 5-99)
1-36	**Materials**	Use a minimum of 10 materials with salvaged or recycled content
1-37	**ESJ**	Achieve at least 25 points in Section 6: Equity and Social Justice

Net Zero Energy Label

Credit #	Category	Credit
1-38	**Points**	Meet any star-level requirements plus point minimum
1-39	**Energy**	Demonstrate net zero energy performance over the course of a year (Credits 3-3 or 3-4 and Credit 3-26)
1-40	**Energy**	Provide an energy performance disclosure waiver from Homeowner to Built Green

Conform to the House Size Matrix (Square Feet Limit Refers to Conditioned Space)

The most direct approach to resource efficiency is to build a smaller house. Larger homes tend to consume proportionally more materials because they include more features. Downsizing a conventionally framed house by 25% can save even more wood than substituting the most wood-efficient advanced framing. Smaller houses inherently reduce the embodied energy of a home (the total amount of energy used to extract, refine, produce, and distribute materials from their point of origin to installation and then ultimately to disposal). Small houses can be made space-efficient, functional, and livable through careful layout and design. Fortunately, there are excellent resources available on compact house design.

Besides the size of a house, the shape of a house is one of the main factors in construction expenses. Complicated angles, bump-outs, and shapes significantly increase the cost of the building. Also keep in mind it may cost less to build up than to build out, depending on local land and labor costs. Starting out with the most appropriate size and shape for your house reduces the costs of almost all aspects of construction, including waste disposal.

All Built Green projects must conform to the House Size Matrix, Table 0-1 below. The matrix is used to calculate the final point total for a project's Built Green checklist based upon the size and density of the house. House size is the interior conditioned space, excluding an attached additional dwelling unit. Smaller than average homes apply a multiplier to the overall total. Larger than average homes are required to account for the additional materials consumed and carbon emissions emitted over its construction and lifecycle with additional material section requirements.

For projects building multiple units on the same site or community, one checklist may be submitted to cover multiple units if the units' floor plans vary by less than 10% and conforms to the same house size multiplier and material section requirements. The House Size Multiplier must be calculated separately for each floor plan to confirm which units can be combined onto one checklist. Please see additional information in the *Project Certification Checklists* section below.

Built Green House Size Matrix

- House size to include all conditioned space of house except for an attached additional dwelling unit (ADU).
- For projects that have more than 6 bedrooms, use the total square foot of dwelling unit listed under the 6-bedroom column to determine the multiplier and the additional minimum points required.
- Smaller than average houses apply a multiplier for their overall points based on square foot size.
    - Larger than average houses are required to meet one of the following additional performance standards in terms of material use:
- Earn an additional percentage of the minimum of points required in the materials section by the star level requirements. The points are to be earned in addition to the minimum point value per star level.
- I.e., 4-Star requires 60 points to be earned in the materials section, a home that is 3800 SF with 4 bedrooms would need to earn a minimum of 81 points in material credits.
- Demonstrate a modelled 10% reduction of embodied carbon of the house, see Credit 5-99.

2021 House Size Matrix

	No. of Bedrooms						Multiplier	Add. Min. Points Req in Materials Section	Embodied Carbon Reduction Required
	1	2	3	4	5	6			
Sq. Ft.	<500	<700	<900	<1300	<1900	<2400	1.20	N/A	N/A
	501- 800	701-1000	901-1200	1301-1750	1901-2350	2401-2700	1.15	N/A	N/A
	801-1200	1001-1400	1201-1800	1751-2350	2351-2950	2701-3500	1.10	N/A	N/A
	1201-1600	1401-1800	1801-2400	2351-3000	2951-3600	3501-4300	1.05	N/A	N/A
2005 Avg. Size in King Co.	***1600***	***1800***	***2400***	***3000***	***3600***	***4300***	1.00	N/A	N/A
(outside of Seattle)	1601-1800	1801-2000	2401-2700	3001-3400	3601-4000	4301-4700	1.00	+25%	10%
	1801-2000	2001-2200	2701-3000	3401-3800	4001-4400	4701-5100	1.00	+35%	10%
	2001-2200	2201-2400	3001-3300	3801-4200	4401-4800	5101-5500	1.00	+45%	10%
	>2200	>2400	>3300	>4200	>4800	>5500	1.00	+55%	10%

House size based on interior square foot size, to include all conditioned space of house except for an attached additional dwelling unit

Smaller than average houses apply the multiplier to calculate their *overall* points.

Larger than average houses are required to either earn an additonal percentage of the minimum star level points in the materials section OR demonstrate a 10% reduction in embodied carbon (see Credit 5-99).

SECTION TWO: SITE AND WATER

SITE SELECTION

2-1: Locate site within one of the Urban Growth Area (UGA) designated areas

Responsible Party: Developer

Intent: Developable land in Washington is set by the Growth Management Act (GMA). Passed in 1990, the GMA requires the adoption of multi-county planning policies to guide growth within urban growth areas (UGA). These policies enable coordination and provide consistency among metropolitan counties to address related regional issues and bind regional policies.

The primary goal of the GMA is to increase urban infill and reduce sprawl. Urban infill sites have environmental and social benefits. They reduce development pressure on outlying areas, protecting lands that serve important ecological or agricultural functions; reduce reliance on cars, improving air quality and reducing greenhouse gas emissions; and can lead to the cleanup and reuse of formerly economically viable but now abandoned sites, including those contaminated with hazardous substances.

Performance Requirement: Project site must be located in a designated UGA as determined by the Washington State UGA Map listed in the resources of this credit.

Points: 2 points

When Verified: Visually verified at completion of design.

Resource:

WA State UGA Map: https://geo.wa.gov/datasets/7ec97be7bec2443e92ad948b3d967a26_0

2-2: Build on a previously developed lot (infill lot, greyfield, or EPA-recognized Brownfield)

Responsible Party: Developer

Intent: Optimize the use of existing infrastructure (including services and transit), avoid infrastructure extensions, and protect undeveloped productive agricultural land and natural habitat.

> *Infill lots:* Developed areas with municipal water and sewer, electricity, and roads already available, excluding lots in designated critical areas or overly steep slopes. Increasing density in already developed areas helps to decrease sprawl and its

negative environmental impacts, while promoting more housing choices and community connectivity.

In cases where a building already exists on the lot additional environmental and social benefits and Built Green credits are obtained by reusing the existing structure(s) onsite through renovation, adaptive reuse, or relocating them to another site for reuse, see Credit 5-9. However, if renovation, reuse, or relocation are not possible due to the building being structurally unsound, then deconstruction, salvage, and recycling demolition materials shall be utilized instead of traditional demolition, see Credits 5-10 through 5-18. The credit is not intended to promote the razing of sound structures to make way for larger single structures. Restoring homes on infills, or relocating them, as opposed to razing an existing home to build a new, larger home significantly reduces embodied carbon emissions, protects habitat, and takes advantage of public transportation infrastructure.

Greyfield: Any site previously developed with at least 50% of the surface area covered with impervious material. The redevelopment of a Greyfield site can be daunting, but local or national incentives exist to reward builders who go through the process. Incentives may include the elimination of development-related fees, contributions from the local government in the development of offsite improvements, and tax breaks. For more information, contact the Congress for the New Urbanism, Urban Land Institute, American Planning Association, or the International Council of Shopping Centers.

EPA-Recognized Brownfield: The U.S. Environmental Protection Agency (EPA) characterizes Brownfields as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." The EPA estimates that there are 450,000 such sites around the country. Grants, loans, and training are available through the EPA's Brownfield Initiative that assists builders and developers in the remediation and development of Brownfield sites.

Remediation of a Brownfield lot results in the environmental restoration of a polluted site, a transformation that makes an abandoned site habitable. Like Greyfield and infill development, Brownfield development provides an efficient use of land and infrastructure while allowing for the preservation of open space and wildlife habitat.

Performance Requirement: Demonstrate the lot boundary is within 100 feet of existing water, sewer, and electrical service, and does not extend main gas line.

Infill lots already have access to municipal water and sewer, electricity, and roads, but excludes lots in designated critical areas or overly steep slopes. Land development and infrastructure installation must have been completed at least five years before the project site was acquired by the owner.

In cases where a building already exists on the lot, Built Green encourages renovation of the existing structures if possible, or removal of the structure to another site to allow optimization of zoning allowances. If the building is not structurally sound, then deconstruction, salvage, and recycling of materials becomes the secondary goal.

This credit is not applicable for homes in newly developed communities on greenfield sites. May be combined with Credit 2-1 for locating in an Urban Growth Area.

Points: 5 points

Cross Reference: 2-1, 5-9 through 5-18, 5-102

When Verified: Visually verified at completion of design.

Resources:

Right Type, Right Place: Assessing the environmental and economic impact of infill residential development through 2030: https://www.next10.org/sites/default/files/2019-06/right-type-right-place-web.pdf

Smart Growth, Brownfields, and Infill Development: https://www.epa.gov/smartgrowth/smart-growth-brownfields-and-infill-development

U.S. EPA, Brownfields Cleanup, Redevelopment, and Grants: https://www.epa.gov/brownfields

Brownfield and greyfield redevelopment toolkit: https://connectourfuture.org/tools/brownfieldgreyfield-redevelopment-toolkit/

2-3: Build in a Built Green® Certified Community, or similarly certified community

Responsible Party: Developer

Intent: Build in a Built Green certified community or similarly certified development, such as LEED for Neighborhood Development (LEED ND), or LEED for Cities and Communities. The Built Green Communities program and other similar programs promote voluntary land-use and community design guidelines which minimize environmental impact and promote responsible community design to benefit all citizens. Objectives include preserving natural resources, low-impact design, balancing open space and density, reducing infrastructure costs through efficient design, reducing automobile usage,

encouraging cost-effective, innovative ideas and technologies, and creating diverse housing options.

Performance Requirement: Built Green Communities certificate or LEED for Communities certificate for the neighborhood where the project is located. If the project is part of a development that is pursuing the Built Green Communities certification but has not yet earned it, provide the Built Green Communities project enrollment number and a preliminary Communities checklist. Also accepted are projects located in neighborhoods where the local jurisdictional code or neighborhood's HOA requires Built Green certification (e.g., Issaquah Highlands neighborhood).

Point Breakdown:

10 points: New homes located in an established/certified Built Green Community; or new developments with less than 20 units

30 points: New developments of 20-100 units

40 points: New developments of over 100 units

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Resources:

Built Green Communities: https://builtgreen.net/certification/#checklistandhandbook

LEED ND: https://www.usgbc.org/leed/rating-systems/neighborhood-development

2-4: Build in a low impact development (e.g., Salmon-Safe certified development)

Responsible Party: General Contractor, Landscape Architect, Civil Engineer

Intent: Low Impact Development (LID) is a stormwater management strategy that uses various land planning and design practices and technologies to simultaneously conserve natural resource systems and reduce infrastructure costs. LID allows land to be developed, but in a cost-effective manner that helps mitigate potential environmental impacts. LID uses Best Management Practices (BMPs) that replicate pre-development hydrologic conditions.

Salmon-Safe's urban development certification program is a third-party verified certification intended to promote ecologically sustainable land management that protects water quality and aquatic biodiversity. The Salmon-Safe certification program focuses on salmonid species (i.e., salmon and trout) and their habitat requirements. Salmonid species are key indicator species in the Pacific Northwest and their conservation is entwined with the health of ecosystems that include a variety of aquatic and upland wildlife species. Therefore, this evaluation focuses on the following biological components of the ecosystem

that most affect salmonids and the ways these components can be protected: (1) water quality, (2) water quantity, (3) instream habitat, (4) riparian habitat, and (5) fish passage.

Performance Requirement: Obtain Salmon-Safe certification for the development site, or if part of an existing Salmon-Safe Certified neighborhood/community development provide the Salmon-Safe certificate for the neighborhood in which the project is located. May be combined with Credit 2-3.

Points: 20 points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Resources:

Salmon-safe certification: https://salmonsafe.org/get-certified/

Washington Stormwater Center: https://www.wastormwatercenter.org/low-impact-development/

The Low Impact Development Center, Inc.: www.lowimpactdevelopment.org

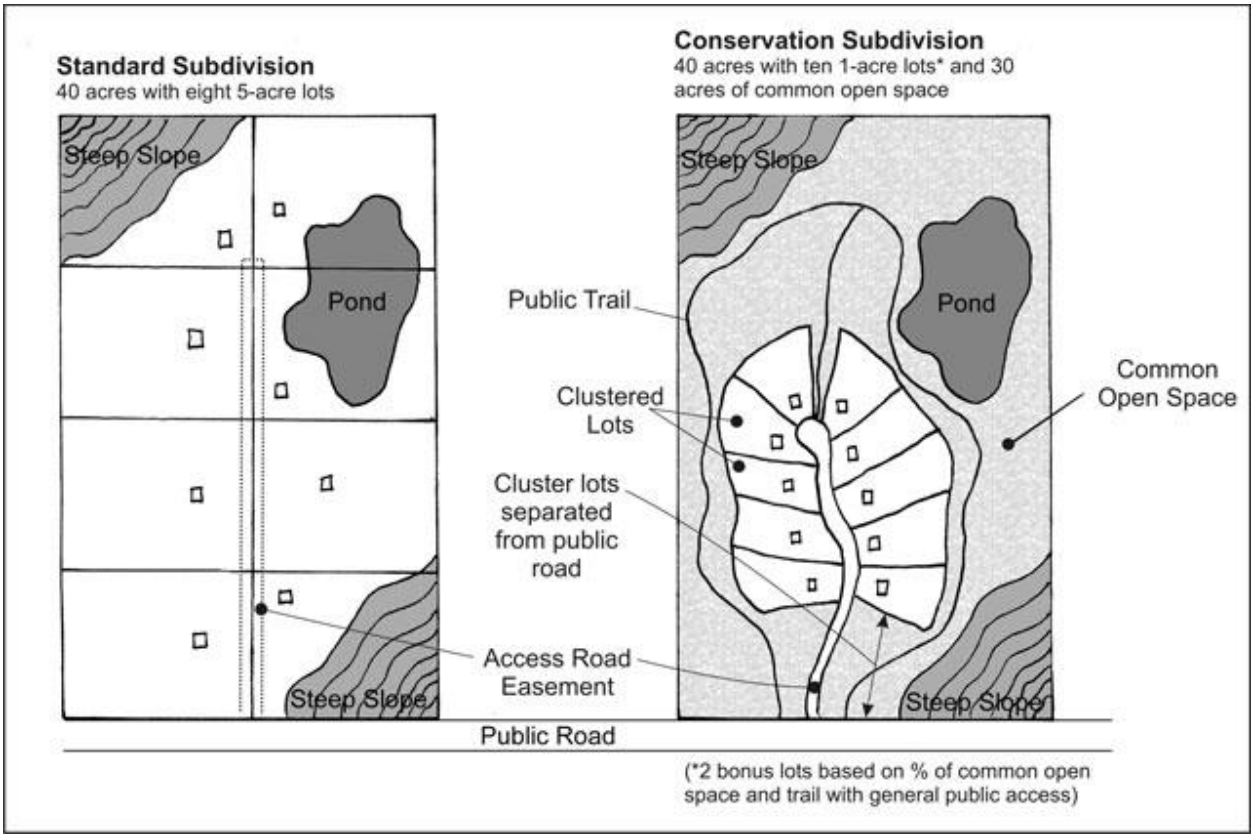
Washington State Nursery & Landscape Association LID Resources: https://www.wsnla.org/page/lowimpactdevelopment

2-5: Build in a rural cluster development (RCD)

Responsible Party: Developer, Architect

Intent: Large-lot (10-acre) zoning has been the conventional way to minimize population density and retain rural character in rural areas. This method, while effective at controlling population density, has divided our rural lands with little sensitivity to its effects on rural resources and the natural environment. Large-lot zoning, combined with a lack of adequate road standards, has also created many miles of poorly maintained private roads, making fire and emergency access difficult.

Rural residential clustering provisions provide an alternative to conventional large-lot zoning. Rural clustering encourages the grouping of homes on areas of the site best suited for development, while retaining the remainder of the site for open space. Appropriately designed cluster developments can preserve active agricultural uses and forestry while protecting sensitive environmental areas.



Per the 2010 Crowder, et al v. Spokane County decision, if a county chooses to allow rural cluster development, the county must do so in a manner that is consistent with rural character and provides appropriate rural densities that are not characterized by urban growth. The rural cluster can create smaller individual lots than would normally be allowed in a rural area, but only so long as there is a significant area of compensating open space that is “permanently” protected or protected "in perpetuity."

Performance Requirement: Development’s site plan needs to show a rural residential cluster layout of lots and structures and designated protected open space.

Points: 4 Points

When Verified: Visually verified at completion of design.

Resources:

Washington Counties Rural Cluster Subdivision land use regulations: http://mrsc.org/Home/Explore-Topics/Planning/Development-Types-and-Land-Uses/Rural-Land-Use-Regulation-Development.aspx#cluster

Planned Unit Developments - Real World Experiences: https://mrsc.org/Home/Stay-Informed/MRSC-Insight/November-2012/Planned-Unit-Developments-Real-World-Experiences.aspx

LOT DESIGN

2-6: Complete a natural resources inventory and review site development plan under the direction of qualified professional (e.g. botanist, arborist, landscape architect). Prioritize protection of natural resources/areas during construction.

Responsible Party: General contractor, Landscape Architect

Intent: The National Resources Inventory (NRI) is defined by the Natural Resources Conservation Services as "a statistically based sample of land use and natural resource conditions and trends on U.S. nonfederal lands."

The inventory is designed to:

- Determine the current or future use, needs or, protection of natural or man-made resources
- Provide scientific basis for decision-making with respect to both regulatory and nonregulatory approaches
- Preserve natural resources
- Show the location and extent of existing resources, such as farmlands, surface and ground waters, and related features

The inventory shall be used to inform the decision process during site development planning with the intent of prioritizing conservation of existing and established trees and vegetation, and protection of existing natural resources and processes. Areas and resources identified as critical or significant will be protected during construction.

Performance Requirement: Inventory and site development review must be performed during the design phase and prior to demolition and site clearing. Qualified professionals are defined as an ISA certified arborist, ecoPRO Certified Sustainable Landscape Professional, or ASLA licensed landscape architect. For larger sites with scopes of tress/timber, consult a SAF Certified Professional.

Points: 3 Points

When Verified: Visually verified at completion of design.

Resources:

EcoPro Guiding Principles and Best Management Practices (see Sustainable Best Practices to consider for inclusion in the development plan): https://ecoprocertified.org/wp-content/uploads/2019/01/2-ecoPRO-Guiding-Principles-Best-Management-Practices-REVISED-10-2018.pdf

Find an ISA Arborist: https://www.treesaregood.org/findanarborist/findanarborist

ASLA Firm Finder: https://my.asla.org/my-asla/directories/firm_search.aspx

Find an ecoPro: https://ecoprocertified.org/find-an-ecopro/

Society of American Foresters Certified Professionals: https://www.eforester.org/Main/Certification_Education/Certified_Forester/Find_a_Certified_Professional/Main/Certification/Find_a_Certified_Professional.aspx

2-7: Implement a plan to conserve the elements identified by the resource inventory as high priority resources

Responsible Party: General Contractor, Landscape Architect

Intent: Implement a development plan to conserve the features identified by the resource inventory as high-priority resources. See Credit 2-6 for full details and intent of the development plan.

Performance Requirement: Create a protection plan for priority natural resources/areas during construction. Provide landscape site plan or photos and descriptive narrative that describes what existing resources were identified and prioritized and how they were protected during construction.

Points: 5 Points

When Verified: Protection plan verified during design. Preservation measures visually verified during intermediate construction and final inspections.

Cross Reference: 2-6, 2-11 through 2-18

2-8: Long-term erosion effects are reduced through improving the site conditions and implementation of terracing, retaining walls, landscaping, and restabilization techniques.

Responsible Party: General Contractor, Civil Engineer, Landscape Architect

Intent: Urban runoff and construction site erosion have been identified as significant sources of pollution for surface water quality. Sediment deposits destroy fish spawning areas, resulting in the loss of sensitive or threatened fish species; adversely impact aquatic insects which are at the base of the food chain; reduce channel capacity; and decrease the overall quality of lakes, streams, and wetlands. Sedimentation can cause flooding; require

additional water treatment; pose safety and nuisance issues on roadways; and increase cost of construction and maintenance.

Improving site conditions to reduce long term erosion effects greatly reduces one source of surface water pollution. Possible restabilization strategies to improve site conditions include:

- Terracing
- Retaining walls
- Bio-structural landscaping
- Increasing site's stormwater infiltration and storage capacities

Performance Requirement: Documentation photos or landscape plan recording the strategies implemented to improve site conditions to reduce erosion. Existing structures or conditions are not applicable unless they are improved or enhanced for long-term performance.

Points: 6 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 2-14, 2-15, 2-22, 2-25, 2-27, 2-29

Resources:

"Bio-structural" Erosion Control: https://botanicgardens.uw.edu/wp-content/uploads/sites/7/2013/12/BiostructuralErosionControlMenashe.pdf

WSDOT Temporary Erosion and Sediment Control Manual, 2019: https://www.wsdot.wa.gov/publications/manuals/fulltext/M3109/TESCM.pdf

Defensible Space Precautions

2-9: Landscape fire buffer zone(s) around house to reduce ignition sources; not applicable to urban or non wildland-urban interface sites

Responsible Party: General contractor or Landscape Architect

Intent: As climate change progresses it is lengthening Washington's natural fire season beyond historical patterns and fires are growing in frequency and size. In 2015, Washington state suffered the most destructive wildfire season in its history with over 1 million acres burned and thousands of residents evacuated from their homes. 2020 captured the record for most individual wildfires in state history, with 377 buildings (181 homes) destroyed and 713,000 acres burned. Climate models show that wildfire conditions will only become more frequent and dangerous as global temperatures rise over the coming decades.

Homes built at the interface between wildlands and developed areas face the threat of wildfires. While wildfires are a natural part of Inland Northwest ecosystems, they can destroy life and property. There are many ways that home designers, builders, and owners can prevent homes from igniting.

Possible strategies to create fire buffer areas include:

- Installing foundation plantings: low growing, free of dead material, well-watered
- Using grey water or reclaimed water to keep landscaped areas well-watered. (Check with local municipalities for water re-use regulations.)
- Maintaining and watering fire-resistant plants and lawn
- Using hardscape features for firebreaks around the home: driveways, gravel, concrete, or paved walks and patios
- Using raised beds made from non-flammable materials (rocks, brick)
- Using gravel instead of bark mulch against structures and under decks
- Storing firewood 30–100 feet away from any structure; keeping vegetation away from pile
- Replacing wooden patio furniture with furniture made from nonflammable materials (metal and glass)
- Replacing wood shake roofs with fire resistant materials

Performance Requirement: Strategies taken to reduce ignition are directed to the area immediately surrounding a home, i.e., the home ignition zone. Defensible space zone: minimum 30-foot buffer, (up to 100-foot for steeper ground). Unless a lot is located in a wildlife-urban interface area, homes located within the Urban Growth Area (UGA) are not applicable.

Points breakdown: 1 Point per strategy implemented, 3 Points maximum.

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Resources:

Plant material suggestions for the Inland West (University of Idaho: Moscow Idaho): https://www.uidaho.edu/-/media/UIdaho-Responsive/Files/Extension/topic/forestry/Fire-Protect-Brochure-2010.pdf?la=en&hash=728EA223597E993153E02C36B70B25BBAAD2F3D1

Building in the Time of Wildfires: https://builtgreen.net/blog-detail/builtgreenblog/2021/08/12/building-in-the-time-of-wildfires

Wildfire Season—Hope For the Best, Be Prepared For the Worst: https://builtgreen.net/blog-detail/builtgreenblog/2021/08/03/wildfire-season-hope-for-the-best-be-prepared-for-the-worst

2-10: Reduce fire danger and ignition sources by removing underbrush and unhealthy vegetation on site (perform all measures listed in handbook); not applicable to urban or non wildland-urban interface sites

Responsible Party: General contractor or Landscape Contractor

Intent: Reducing the amount of unhealthy vegetation around a home will reduce the amount of possible fuel and ignition sources for wildfires. Research shows that a high-intensity wildfire burning 100–200 feet away will not ignite a home's wood walls. Consult with the local fire district, Department of Natural Resources (DNR), Firewise, or other recognized fire authority for a recommended vegetation plan.

Create a fire-resistant landscape for the entire property:

- Remove highly flammable brush, dead trees, and shrubs from at least 100 feet around all structures.
- Clean pine needles, leaves, and debris from roof, gutters, decks, and yards.
- Compost or recycle yard debris instead of burning vegetation.
- Prune all dead branches and limbs of trees 6–15 feet from ground. Leave at least 50% of the live branches on tree.
- Eliminate ladder fuels (vegetation structured like rungs of a ladder such as leaves, grasses, small shrubs, large shrubs, and trees).

Performance Requirement: Implement a landscape plan that includes all fire-resistant landscaping strategies for the entire property. Unless a lot is located in a wildlife-urban interface area, homes located within the Urban Growth Area (UGA) are not applicable. Provide a pre-fire season maintenance checklist for homeowners to maintain their property's fire resistance.

Points: 3 Points

When Verified: Visually verified at final inspections.

Resources:

Building in the Time of Wildfires: https://builtgreen.net/blog-detail/builtgreenblog/2021/08/12/building-in-the-time-of-wildfires

Wildfire Season—Hope For the Best, Be Prepared For the Worst: https://builtgreen.net/blog-detail/builtgreenblog/2021/08/03/wildfire-season-hope-for-the-best-be-prepared-for-the-worst

PROTECT SITE'S NATURAL FEATURES

2-11: Preserve at least 25% existing and established native vegetation as landscaping; not including trees

Responsible Party: General contractor, Landscape Architect

Intent: Maintaining ecological and hydrological function on the site. Retaining mature native and climate adaptive vegetation in a landscape (rather than removing and then replanting) reduces landscape maintenance, fertilizer, and pesticide use while also providing excellent erosion, sediment, dust, and pollution control.

Performance Requirement: Preserve existing native and climate-adaptive species on 25% or more of the vegetated area of the finished project.

During building layout, identify existing native plants, including trees and understory plants that you want to save. Identify and remove any non-native and invasive species as part of the preservation plan. Precautions during site preparation include the following:

- Define protected areas on plans and field-stake or flag onsite. Identify or flag non-clearing buffers, open spaces, and setbacks from streams, wetlands, and steep slopes as indicated on plat maps.
- Clear only actual areas needed to install driveways, parking areas, and building foundations.
- Review site areas to be graded with excavation crew to ensure compliance with preservation plan.
- Provide fencing for critical areas, such as tree root zones, to prevent crushing or filling.
- If trees only (not understory) are designated for protection, hand clearing of understory will help protect tree roots. Be careful, however, about exposing some trees by clearing around them—they may become hazards in strong winds or rain. Check with an arborist.
- Check grading operations frequently to prevent accidental damage to marked areas.
- Never park heavy equipment or store heavy materials under trees.

Any existing vegetation that is transplanted and relocated onsite is counted under Credit 2-32. Points for tree preservation are allocated in credits 2-12 through 2-15.

Points: 3 Points

When Verified: Verified at completion of landscape design. Visually verified during intermediate construction and final inspections.

Cross Reference: 2-8, 2-12, 2-13, 2-14, 2-15, 2-19, 2-32

2-12: Take extra precautions beyond code to protect trees during construction, including critical root zones

Responsible Party: General contractor, Landscape Architect

Intent: Mature, healthy trees moderate surface temperatures, thereby reducing building heating and cooling requirements. Specifically, they can increase savings on energy bills by providing shade in summer and wind protection in winter. Trees also reduce stormwater runoff, reducing urban peak runoff, stabilizing soils, and preventing air pollution. All of which have great economic value to cities. Another benefit is that trees provide habitat for local wildlife. Studies show that a single mature tree can provide nearly $300 annually in energy and resource value in terms of cooling, erosion and pollution control, and wildlife shelter. Trees may also protect some of your site's critical features like stream buffer zones.

In general, homes with mature trees sell for more money and at faster rates. According to 1,350 real estate agents surveyed by Bank America Mortgage, more than 50% believe trees have a positive impact on potential buyers' impressions of homes and neighborhoods. Additionally, 84% felt that a home with trees would be as much as 20% more salable. A NAHB survey reported that 43% of homebuyers paid up to $3,000 more, and 27% spent

Tree Type	Potential Problems/Recommended Strategy
Dogwood Douglas Fir Maple Red Alder Western Hemlock Western Red Cedar	They may not adjust to environmental changes as easily as other species. Keep disturbance of these trees to a minimum.
Pacific Silver Fir	If very tall, they can tip over easily. Watch height.
Douglas Fir Western Hemlock	Thinning increases the possibility of tipping over. Keep stands of these trees dense.
Cottonwoods Maples Willows	Water-seeking roots—These trees thrive well in high moisture areas but keep away from sewer lines and filter fields.
Grand Fir Noble Fir Pacific Dogwood Pacific Silver Fir Red Alder Sitka Spruce Western Hemlock Western Red Cedar	Keep stands of these trees dense, whether one type or mixed varieties. These trees are very prone to disease caused by thinning or damage to any part of the trees.

over $5,000 extra for wooded lots. Studies in some regions of the country have found trees add as much as 30% to the selling price of lots.

Performance Requirement: Consult an ISA Certified Arborist or SAF Certified Forester to evaluate and select valuable trees for preservation. Keep all excavations, equipment, and debris away from trees at a minimum distance of the canopy's dripline. When possible or for Historical trees increase the protection radius to two times the size of the canopy from the tree trunk. If you must cut roots, cut as few as possible, and cut them cleanly. Preserve most of the important feeder roots. Tie signs on trees to be saved, clearly indicating the tree's monetary value (cost of replacement). Charge subcontractor for tree damage based on these dollar values (optional).

If a tree must be transplanted, onsite or offsite, once the tree is removed, get the root ball into a moistened burlap sack as soon as possible and rebury the roots. The roots begin to dry out almost immediately. Keeping the roots moist, preferably with the soil intact, helps minimize the impact of transplanting.

Points: 3 points

When Verified: Visually verified during intermediate construction and final inspections.

Cross Reference: 2-15

Resources:

Tree Protection on Construction and Development Sites (OSU): https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em8994.pdf

Find an Arborist: https://www.treesaregood.org/findanarborist/findanarborist

2-13: Retain healthy trees on site

Responsible Party: General Contractor, Landscape Architect

Intent: Mature, healthy trees moderate surface temperatures, thereby reducing building heating and cooling requirements. Specifically, they can increase savings on energy bills by providing shade in summer and wind protection in winter. Trees also reduce stormwater runoff, reducing urban peak runoff, stabilizing soils, and preventing air pollution. All of which have great economic value to cities. Another benefit is that trees provide habitat for local wildlife. Studies show that a single mature tree can provide nearly $300 annually in energy and resource value in terms of cooling, erosion and pollution control, and wildlife shelter. Trees may also protect some of your site's critical features like stream buffer zones.

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Performance Requirement: Consult an ISA Certified Arborist or SAF Certified Forester to evaluate existing trees. The arborist must perform, at minimum, a basic visual exam of trees and provide a health and risk assessment for all existing trees. Based upon the report, all trees selected to be preserved must have been assessed to be in at least "good" health and structural condition with no imminent likelihood of failure. May not be combined with Credit 2-14.

Points breakdown: 1 point per 20% preserved, 5 points maximum.

When Verified: Verified at completion of landscape design. Visually verified during intermediate construction and final inspections.

Cross Reference: 1-31, 2-12

2-14: Retain 75% of trees that are Significant, Exceptional, or Historical trees. No cutting or removal of critical roots in dripline.

Responsible Party: General Contractor, Landscape Architect

Intent: Mature trees sequester and store more carbon within their timber than smaller, newly planted trees. By removing mature trees much of the embodied carbon they store is released into the atmosphere, further contributing to climate change. Larger trees also provide greater cooling and air filtration in urban areas wherein impervious surfaces and automobile exhaust lead to heat island effects and poorer air quality. Some mature trees may have existed for so long that there is a shared historical or cultural significance attached to the tree.

Built Green definitions for tree designations:

> *Significant*: All trees 6 inches or greater in diameter, measured 4.5 feet above the ground
>
> *Exceptional*: All trees 12 inches or greater in diameter, measured 4.5 feet above the ground
>
> *Historical*: All trees 24 inches or greater in diameter, measured 4.5 feet above the ground; or because of its unique historical, ecological, or aesthetic value constitutes an important community resource

These definitions may differ from local jurisdictions, so check local tree ordinances for compliance definitions.

Performance Requirement: Consult an ISA Certified Arborist or SAF Certified Forester to evaluate existing trees, identifying specific trees that are Significant, Exceptional, or Historical. The arborist should perform, at minimum, a basic visual exam of trees and provide a health and risk assessment for all existing trees. Based upon the report, all trees selected to be preserved must have been assessed to be in at least "good" health and structural condition with no imminent likelihood of failure. For any preserved Historical trees, Credit 2-12 is required to be implemented. Trees represented in this credit cannot be double counted, or combined, with trees represented in Credit 2-12 or 2-15.

Points breakdown:

5 Points: 75% preserved

10 points: 100% preserved

When Verified: Verified at completion of landscape design. Visually verified during intermediate construction and final inspections.

Cross Reference: 2-12

2-15: Retain a tree grove consisting of multiple healthy trees with at least 12" DBH growing together

Responsible Party: General contractor, Landscape Architect

Intent: Built Green defines an Urban Tree Grove, located on a lot two acres or less, as three (3) or more trees 12 inch in diameter or greater that form a continuous canopy and root structures. On lots more than two (2) acres in size a Rural Tree Grove is defined as eight (8) or more trees 12 inch in diameter or greater that form a continuous canopy and root structures. Street trees and linear-spaced hedging trees are not applicable as a tree grove. These definitions may differ from local jurisdictions, so check local tree ordinances for compliance definitions.

Performance Requirement: Consult an ISA Certified Arborist or SAF Certified Forester to evaluate existing trees, identifying any existing tree groves. The arborist should perform, at minimum, a basic visual exam of trees and provide a health and risk assessment for all existing trees. Based upon the report, any tree groves selected to be preserved must have been assessed to be in at least "good" health and structural condition with no imminent likelihood of failure. Points cannot be accumulated with multiple tree groves.

Points: 10 Points

When Verified: Verified at completion of landscape design. Visually verified during intermediate construction and final inspections.

Cross Reference: 2-12

2-16: If building near wetlands, shorelines, bluffs, and other critical areas, preserve & protect beyond code or local requirements

Responsible Party: Developer, General contractor

Intent: Numerous federal, state, and local laws affect the use and protection of wetlands and other critical areas. Because of considerable variation in local regulations, you should contact your local planning department to determine what actions constitute going beyond code.

Wetlands and riparian areas provide essential cover, feeding, nesting, and breeding habitat for many species of fish and wildlife. They provide critical hydrological functions by acting as a sponge, buffering the effects of storms on creeks. This buffering effect allows peak velocities to be reduced during storm events and provides base flows during dry times. Wetlands can also act as a natural recharge area for groundwater.

Performance Requirement: Protect wetlands and riparian areas from sediment using appropriate best management practices such as compost slope mulching and silt retention berms. Leave a vegetated buffer zone, a minimum of 100 feet wide on each side along streams or other water bodies unless approved plans indicate larger buffers are required. (Check with your local jurisdiction for buffer size requirements.)

Steep slopes are inherently unstable areas. Careful management of site drainage is probably the most cost-effective approach to minimizing bluff hazards. Even when circumstances dictate significant structural stabilization efforts, site drainage remains an essential component of proper management. Throughout the construction process, maintain erosion control measures (see Credit 2-21). Numerous federal, state, and local laws affect the use and protection of wetlands and other critical areas. Because of the considerable variation in local regulations, you should contact your local planning department for requirements.

Points: 3 Points

When Verified: Verified at completion of site design. Visually verified during intermediate construction and final inspections.

Cross Reference: 2-21

Resources:

Shorelines and wetland protection, Washington Department of Ecology: https://ecology.wa.gov/Water-Shorelines

Slope Stabilization Erosion Control Using Vegetation: A Manual of Practice for Coastal Bluff, Washington State Department of Ecology: https://apps.ecology.wa.gov/publications/SummaryPages/9330.html

Vegetation Management: A Guide for Puget Sound Bluff Property Owners. Washington State Department of Ecology: https://apps.ecology.wa.gov/publications/documents/9331.pdf .

2-17: Set aside, in perpetuity, percentage of buildable site for habitat conservation to support wildlife habitat; not to be disturbed during construction

Responsible Party: Developer or Owner, General Contractor

Intent: Setting aside undisturbed areas helps preserve soil, water, and vegetation. Undisturbed areas stabilize soils and filter sediments from stormwater runoff before they enter waterways. They also allow rainwater to stay onsite and soak into the ground, recharging groundwater, instead of running off site. In addition, they provide a cost-effective head start on landscaping. Preserving natural features can add landscape beauty, enhance fish and wildlife habitat, and reduce noise. To ensure the full benefit of this measure, set-aside areas should be protected by covenant.

Coordinate with the civil engineer and equipment operators to let them know about this goal and to help you come up with creative solutions. Review the set-aside plans with subs, especially grading and excavation crews.

Performance Requirement: This credit requires that you set aside a percentage of the buildable site that will not be cleared, graded, or developed. Land area set aside, including any critical habitat areas, must be protected in perpetuity with a Conservation Easement or equivalent covenant. Talk to local Community Land Trust organizations or parks services for conservation easement or donation options. Agricultural zoning or designation is not applicable.

Area should be full protected during construction—no vehicles or lay down areas, or sediment onflow. Invasive species should be removed to the extent feasible.

Points breakdown:

Point Allocation	5 Points	8 Points	10 Points
Lots <0.25 Acres	10%	15%	20%
Lots up to 1 Acre	20%	30%	40%

Lots 1 to 5 Acres	**35%**	**50%**	**70%**

When Verified: Set-aside area verified during design. Set-aside area and protection measures visually verified at intermediate inspection and at substantial completion. Conservation Set Aside easement reviewed no later than substantial completion of construction.

Cross Reference: 2-16, 2-18

Resources:

National Conservation Easement Database: https://www.conservationeasement.us/resources/

Washington Land Trusts: https://walandtrusts.org/

The Land Trust Alliance: https://www.landtrustalliance.org/

The Nature Conservancy: https://www.nature.org/en-us/

The Trust for Public Land: https://www.tpl.org/

2-18: Previously compromised environmentally sensitive areas are restored to pre-development state

Responsible Party: Developer, General Contractor, Landscape Architect

Intent: As part of a thorough natural resources inventory (credit 2-6) compromised environmentally sensitive areas will be identified and assessed for their state of function. A developer/general contractor should engage the Salmon-Safe certification process or a licensed landscape architect with experience in habitat restoration early in site development planning.

Historically, wetlands, streams, shorelines, bluffs, and other critical areas were not always as well protected as they are today. Development disrupts soil structures, habitats, and hydrological functions. Streams and watersheds were paved over and channeled underground in constructed waterways. Trees and vegetation were removed from riparian zones impacting stream water quality. Using habitat restoration and low-impact design strategies will restore the natural functions of these areas.

Restoration involves a range of activities that may occur in existing or former wetlands and their buffers. Restoration typically involves improving ecological processes, providing habitat for target species, or reestablishing historic conditions. Examples of restoration include:

- Removing or breaching a dike or levee to reconnect a floodplain or reestablish tidal influence
- Re-meandering or daylighting a channelized stream
- Planting trees and shrubs in riparian areas to provide canopy cover
- Planting native vegetation to restore native plant communities
- Adding large woody debris to a stream or riparian area
- Filling ditches to restore hydrology
- Fencing livestock out of sensitive areas

Performance Requirement: Restore compromised environmentally sensitive areas to their pre-developed state by restoring soil, water function, and vegetation to mimic natural systems. Design work should be completed by someone with training and expertise in ecological restoration.

Points: 5 Points

When Verified: Restoration area and plan verified during design. Restoration area and protection measures visually verified at intermediate inspection and at substantial completion.

Cross Reference: 2-4, 2-6, 2-7

Resources:

Citizen's Guide to Wetland Restoration: Approaches to Restoring Vegetation Communities and Wildlife Habitat Structure in Freshwater Wetland Systems: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=50000Q5O.TXT

Aquatic Lands Habitat Restoration Program: https://www.dnr.wa.gov/habitat-restoration

Low Impact Design

2-19: Avoid soil compaction by limiting heavy equipment use to building footprint and construction entrances

Responsible Party: General Contractor

Intent: Maintain the hydrological performance of the site. Compacted soils are less able to absorb water, resist plant root penetration, and lack the porosity needed for adequate aeration. As a result, they tend to increase stormwater runoff, which disrupts the natural water cycle and stream dynamics.

Performance Requirement: Develop and implement a soil protection plan; clearly identify areas where heavy equipment is allowed with construction fencing and signage; and communicate penalties for anyone operating equipment outside those areas.

Limit compaction of site soils by restricting and clearly marking heavy equipment use areas between the months of October and March. On the jobsite, limit all vehicle traffic to designated areas, restrict parking vehicles onsite, and make arrangements so particularly heavy vehicles (concrete trucks, cranes, etc.) don't require large turnaround areas. An alternate access road should be used for construction vehicles. To protect exposed soils from excess traffic, locate equipment storage and job shack areas for easy access. If pervious pavement is planned for the driveway, that area's subsoil should not be compacted more than 92% prior to pavement installation.

Points: 3 Points

When Verified: Visually verify during intermediate construction inspections, with review of plan.

2-20: Use an alternative foundation system that minimizes volume of foundation material and disturbance to soil and/or to water flow, for at least 50% of the foundation

Responsible Party: General Contractor, Architect or Structural Engineer

Intent: Low impact foundation systems or integrated pre-cast footings requires little to no excavation, and provide the following benefits:

- Preserves site topsoil
- Avoids expensive and time-consuming erosion preventions measures and drainage controls
- Maintain historic stormwater flows and natural topography of the site
- Affords an opportunity to help preserve salmon streams

PIN foundation systems do not require traditional site excavation; instead, their footprint system involves pouring concrete into custom-designed forms that create a home's foundation, then driving 5-to-9-foot-long steel pins diagonally through both sides of the concrete to anchor it securely to the ground. The advantage of the foundation system is that the original soil is preserved without being disturbed. If incorporated early in the planning stage, the reduction of site development costs coupled with an increase in environmental compliance will result in a positive permitting process.

Post and Pier foundations also offer the environmental benefit of minimizing excavation. Large beams run under the home's floor joists and are held up by posts. Each post rests on a separate concrete footing or pier. Be sure to consider seismic effects in design.

Performance Requirement: Alternative foundation system must be used for minimum of 50% of building's foundation. Document with photo of the system.

Points: 5 Points

When Verified: Review of design and product documentation. Visually verified during intermediate construction.

Cross Reference: 5-35

Resources:

Types and advantages of pier foundations: https://civiltoday.com/geotechnical-engineering/foundation-engineering/deep-foundation/119-what-is-a-pier-foundation-details-types-advantages-location

How pin foundations work: https://www.diamondpiers.com/how-it-works

2-21: Install and maintain temporary erosion control devices that significantly reduces sediment discharge from the site beyond code requirements

Responsible Party: General Contractor, Civil Engineer

Intent: Avoid stormwater-related problems (erosion and increased runoff during construction), which can cause physical, chemical, and biological degradation of receiving waters, delay construction, add costs, and damage public and private properties downstream.

In large development projects, specific measures for stormwater collection, storage, and treatment are required as part of the permitting process. The following are environmentally friendly approaches for any size development.

- Use compost barriers or berms, or silt control fencing at appropriate locations (choose filter fabric with proper porosity and ability to trap sediments for type of soil and its location). Studies by the Washington State Department of Transportation and others have found properly constructed compost berms to be more effective and less costly than fabric fences for silt control.
- Install stabilized construction entrance (quarry spall or crushed rock). See Credit 2-19*, Avoid Soil Compaction by Limiting Heavy Equipment Use to Building Footprint and Construction Entrances.*
- Protect adjacent and downstream properties from adverse effects of increased runoff.
- Mulch exposed soils or use plastic sheeting. See Credit 2-43, *Preserve and cover topsoil on site for reuse.*
- Install temporary straw bale erosion and sedimentation control check dams in ditches during construction.
- Compost or hydroseed exposed areas as soon as possible.

Using compost for erosion control may not be permitted in all jurisdictions (check with your local code enforcers and stormwater management officials first). Slightly coarse to coarse

types of compost are well suited for holding surface soil in place even during heavy rainfall. See Credit 2-22, Use compost or biodegradable materials to stabilize disturbed slopes, for more information on using compost.

Performance Requirement: Develop and implement a Temporary Erosion and Sedimentation Control (TESC) Plan that exceeds minimum requirements (by including redundant, back-up BMPs, for example) and actively monitor and maintain all BMPs throughout the project.

Points: 2 Points

When Verified: Review Erosion Control Plan prior to the start of construction. Visually verified at intermediate and final inspections.

Cross Reference: 2-4, 2-22, 2-23

Resources:

King County Residential Site Plan; Temporary Erosion & Sedimentation Control (TESC) Template: https://kingcounty.gov/~/media/depts/permitting-environmental-review/dper/documents/forms/Site-Plan-TESC-Template-Residential-11x17.ashx?la=en

King County, Erosion and Sediment Control Requirements: https://kingcounty.gov/depts/local-services/permits/infosheets-forms/permit-application-forms-title.aspx#E

WSDOT Temporary Erosion and Sediment Control Manual, 2019: https://www.wsdot.wa.gov/publications/manuals/fulltext/M3109/TESCM.pdf

2-22: Use compost or biodegradable materials to stabilize disturbed slopes

Responsible Party: General Contractor, Civil Engineer

Intent: Minimize erosion and increased runoff during construction and improve soil quality and health.

Performance Requirement: This credit is only available on sites with defined slopes greater than 20%. Apply compost to cover the entire exposed soil surface, extending approximately 3 feet over the top of the slope or meshing into existing vegetation. The compost application rate will vary depending upon degree of slope, soil type, and compost characteristics. As a rule of thumb, however, a 3 to 4-inch layer of compost will effectively control erosion on a slope of up to 45% for between one and three years. If slope is greater than 50% (2 horizontal to 1 vertical), do not use compost blanket; slope should be terraced with retaining walls.

Composts containing particles that range in size (½ inch or greater) will produce a more stable mat. Stable, relatively dry yard trimmings compost will also filter and bind pollutants from stormwater, reintroduce organic material, and enhance water retention/infiltration. Avoid very coarse composts if the slope is to be landscaped or seeded. In environmentally sensitive areas or where water quality is a concern, use only compost made from yard trimmings, uncontaminated wood by-product-based materials, or well-stabilized biosolids.

Points: 1 Point

When Verified: Visually verified during intermediate inspections.

Cross Reference: 2-21

2-23: Stabilize disturbed areas within 14 days that are complete or will be left unworked for greater than 21 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP)

Responsible Party: General Contractor

Intent: Minimize erosion and increased runoff during construction and improve soil quality and health. Bare soil will erode due to wind and water.

Performance Requirement: Seed, replant, or cover exposed soils with compost, mulch, vegetation, and/or matting as soon as practical. Use wildflower seeds appropriate for this region for color and interest, such as along driveways. All disturbed areas should be treated in some way with landscaping, site features, or erosion control devices.

Points: 3 Points

When Verified: Review Erosion Control Plan prior to the start of construction. Visually verified at intermediate and final inspections.

Cross Reference: 2-21, 2-22

Resources:

King County, Erosion and Sediment Control Requirements:
https://kingcounty.gov/depts/local-services/permits/infosheets-forms/permit-application-forms-title.aspx#E

WSDOT Temporary Erosion and Sediment Control Manual, 2019:
https://www.wsdot.wa.gov/publications/manuals/fulltext/M3109/TESCM.pdf

2-24: Limit grading to 15 feet around structures, septic, ground-source heat pump fields, except for driveway access

Responsible Party: General Contractor, Civil Engineer

Intent: Soil that is compacted or contaminated by construction activity may become lifeless, see Credit 2-19. Designing for minimal grading helps retain healthy soil and natural water infiltration processes.

Performance Requirement: Where grading is unavoidable, carefully remove and stockpile existing topsoil, see Credit 2-43, replacing it after rough grading. This credit is difficult to achieve on infill lots. In this case, apply 4 Inch of compost to amend soils, see Credit 2-22. Avoid disrupting existing drainage patterns and minimize grade changes where possible. Grading for stormwater control should direct water to planted areas to minimize irrigation needs.

Points: 4 Points

When Verified: Visually verify during intermediate construction inspections, with review of plan.

Cross Reference: 2-19, 2-22, 2-43

2-25: Amend disturbed soil with compost or suitable soil amendments to a minimum depth of 10" to restore soil environmental functions

Responsible Party: General Contractor, Civil Engineer or Landscape Contractor

Intent: Improve soil quality and hydrological function. Compost amendments improve water infiltration and retention, reduce summer irrigation demand, and improve landscape health.

Test soil through a reputable soil lab to get data about the site soil's chemical and physical condition, as well as its biological health. These labs will provide specific recommendations for optimum soil amendment. Amendments may include sand or gravel for improved drainage, lime or other pH modifiers, or organic manure or compost to improve nutrient availability. Compost amendments reduce summer irrigation demand, reduce stormwater runoff and erosion, improve soil quality, and improve turf aesthetics.

Compost should be mature and stable. Ask your supplier for "Grade A" compost as defined by the Washington State Department of Ecology's Compost Guidelines. Mature composts settle less, provide stable nutrient sources, bind metals, and provide higher levels of beneficial organisms.

Performance Requirement: Prepare a Soil Management Plan. Amend soil to a depth of 10 inch or more with mature, stable compost. As a rule of thumb, a 2 to 1 ratio of existing soil to compost, by loose volume, will achieve the desired organics level of 8% to 13% by soil weight. The final depth of the amended soil will be between 10 and 12 inches, depending upon the equipment you use.

Points: 4 Points

When Verified: Review and provide soil receipts. Visually verified during intermediate construction and final inspections.

Cross Reference: 1-28

Resources:

Washington State Department of Ecology's Compost Guidelines: https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Organic-materials/Managing-organics-compost

Washington Organic Recycling Council (website provides information on soil health and function, includes resource list for compost specifications, erosion control, and case studies): http://www.soilsforsalmon.org/

Grow Smart, Grow Safe: https://www.growsmartgrowsafe.org/NaturalYardCare/SoilAmendments

2-26: Reuse topsoil on site

Responsible Party: General Contractor, Civil Engineer or Landscape Contractor

Intent: Native topsoil is best adapted to the site. Limit importing topsoil as much as possible. "New" topsoil is not adapted to your site and thus cannot offer the same nutrient structure, disease resistance, or hydrologic capabilities.

Performance Requirement: Stockpile topsoil removed during grading for use during final landscaping. The top layer of soil is the most valuable and should be separated and used again onsite as a top layer in grading planting areas. However, bare soil will erode due to wind and water. Protect stockpiled topsoil from erosion by covering with mulch (preferred) or plastic (less preferred because it can cause rapid runoff) until ready for reuse. Surround all stockpiles with a silt fence or compost berm and inspect regularly for proper coverage or sign of erosion, especially after a large storm. Screen soil to remove debris before redistributing for final grading and landscaping.

If you do have extra topsoil remaining after final grading and landscaping, consider mixing it with non-organic and inert material to be used as fill (make sure fill materials are clean). Also, you can use it in the construction of slopes, or sell it to homeowners, landscapers, or other businesses for reuse.

Absolutely no topsoil should be disposed of in low areas or wetlands. Disposing of topsoil in lowlands or wetlands threatens water quality and quantity and endangers wildlife habitat.

Points: 2 Points

When Verified: Visually verified during intermediate construction and final inspections.

2-27: Use a stormwater management system that allows minimum of 50% of site to recharge groundwater on site

Responsible Party: Architect, General Contractor, Civil Engineer, Landscape Architect

Intent: Reduce stormwater runoff and soil erosion that can pollute local waterways. Increase soil hydration to increase function and recharge local groundwater supplies. Groundwater is a resource that may have only minimal direct impact on a particular site, but its purity is an important issue downslope where it seeps to the surface or is pumped out of the ground as potable water. Groundwater is "recharged" from surface waters infiltrating into natural recharge areas. It is important to understand the hydrology of your site so as not to interfere with these areas.

Low-impact design (LID) strategies are the most cost-effective water management systems that allow for groundwater recharging. Below are infiltration-focused LID strategies (many will also qualify for other site and water credits):

- Mulching
- Supplementing native soil with compost
- RainWise gardens and bioswales
- Permeable hardscapes
- Vegetated roofs where outflow is infiltrated onsite
- Infiltration planters
- Retention basins and diversion ponds
- Dry wells
- Rainwater storage vaults that allow infiltration
- Rainwater collection and reuse onsite
- Greywater irrigation systems
- Check dams and terracing
- Rain chains that drain into landscaping

Some stormwater management systems may infiltrate into soil but are designed only to reduce peak flow rates, and do not allow for groundwater recharge, instead under drains are used to direct the infiltrated stormwater to the local stormwater drainage system. A common example of this are flow-through planters that slow and absorb some of the stormwater, but are designed with underdrains to direct the remaining stormwater to drainage infrastructure.

Performance Requirement: Request a site-specific soil infiltration test (using ASTM D-3385 protocols) to be included in the geotechnical engineer's soil report, this is not typically

standard. With site-specific soil infiltration information, infiltration systems can be accurately modeled and sized for cost-effective performance, even for type D soils with infiltration rates of less than 0.5 inches/hour.

The civil engineer or landscape architect needs to provide the stormwater infiltration and management performance calculation with the site's expected percentage of onsite water management provided by the infiltration systems. Systems shall be designed using Dynamic modeling to manage, at minimum, a 50-year storm event's hourly rainfall intensity pattern over a 24-hour period. Non-infiltrating water management systems are not applicable, this includes flow-through planters that are designed to outflow to storm drain infrastructure and not infiltrate to site.

Some LID strategies, such as rainwater and greywater reuse systems, may require special code approvals or design guidelines than outlined in this credit. Please check with your local jurisdiction for their design or code requirements.

Points breakdown: Minimum of 50% of stormwater managed onsite through infiltration systems is required, and 1 point per 10% after that. 10 points maximum.

5 Points: 50% of stormwater managed onsite through infiltration systems

10 Points: 100% of stormwater managed onsite through infiltration systems

When Verified: Review infiltration and management performance calculation at completion of design. Visually verify implementation of Best Management Practices (BMPs) during intermediate construction and final inspections.

Cross Reference: 2-18, 2-25, 2-28, 2-29, 2-30, 2-31, 2-39, 2-54, 2-56

Resources:

Stormwater Management Manual for Western Washington (2019): https://apps.ecology.wa.gov/publications/documents/1910021.pdf

Stormwater Management Manual for Eastern Washington (2019): https://apps.ecology.wa.gov/publications/documents/1810044.pdf

Seattle Stormwater Code and Manual: http://www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/stormwater-code

2-28: Install vegetated roof system (e.g. green roof) to reduce impervious surface

Responsible Party: General Contractor, Civil Engineer or Landscape Architect

Intent: Vegetated roof systems (e.g., green roofs) are best suited for low-slope roofs. They are designed to protect the roof, enable rooftop plantings, provide energy benefits, and

provide initial water quality benefits. Green roofs can detain over 50% of rainwater from a typical storm, reducing peak flow rates and improving water quality.

Multilayered green-roof systems are thicker than conventional roofs. Space must be allocated for the unusual insulation and roofing membranes. A green roof includes a synthetic waterproof membrane, a drainage layer, a thin soil layer (2 to 4 inches), and a cover with specific plant species adapted to the extremes of a rooftop environment. A thick sod of native grasses interspersed with wildflowers can be a wonderful architectural element and provide habitat for wildlife.

Green roofs can be very low maintenance and self-sustaining without need of irrigation, fertilizers, or pesticides. The initial cost might be higher than a good-quality conventional roof, but they last about twice as long so have a relatively low lifecycle cost. They also help to reduce building heat gain and urban heat islands. Additionally, the plantings sequester carbon dioxide and other air pollutants. Consult an expert on installation and maintenance needs.

Performance Requirement: Minimum of 10% of the available roof area is dedicated to a vegetated roof system. Available roof area is considered the total roof area that is compatible with the installation of a vegetated roof system and excluding space necessary for exhaust piping, or mechanical systems. If the vegetated roof system is designed in a way that allows it to manage more stormwater than its physical footprint on the roof you may use the percentage of the roof's managed stormwater to determine the amount of points earned, rather than the physical area it takes up; e.g., if a green roof's footprint accounts for 20% of available roof space but is designed to manage 40% of the roof's stormwater, it would earn 4 points. If roof water is infiltrated onsite this credit may be combined with Credit 2-28. Combine with Material Credit 5-87 for carbon sequestering vegetated green roof system for additional points.

Points breakdown: 1 point per 10% of roof area that is covered by the green roof, maximum of 10 points.

When Verified: Review of sizing calculations. Visually verify installation at final inspection

Cross Reference: 2-28, 5-87

2-29: Use pervious materials for driveways, parking areas, walkways, and patios; must meet minimum ASTM infiltration testing requirements to earn credit

Responsible Party: General Contractor, Civil Engineer, Pervious Pavement Installer

Intent: Pervious paving materials help to restore and maintain water hydrology of the site. Pervious paving materials may initially cost more than conventional paving materials (such

as asphalt), but with proper design most conventional stormwater conveyance systems are eliminated. Applicable of pervious paving options include:

- Pervious concrete
- Permeable pavers or permeable interlocking concrete pavers (PICP)
- Porous asphalt
- Uncompacted gravel or crushed stone[1]
- Open-cell concrete block pavers or grass pavers[1]
- Cast-in-place slab pavers or "Hollywood" driveway design[2]
- Non-grouted natural stone or wood pavers[3]
- Flexible porous mat using recycled composite materials[3]

Material Notes:

1. Gravel, crushed stone, and grass pavers are not considered pervious for areas with routine vehicle traffic (e.g., driveways, drivelanes, or parking areas). These materials and pavement systems will compact under repeated vehicle traffic. Additionally, grass pavers require watering in dry months to maintain their aesthetic appeal. Use these materials for walkways and other light-traffic areas.
    a. Exception: If the uncompacted gravel or crushed stone is reinforced with either an open-cell concrete block paver or a cellular containment product then it is considered pervious in vehicle traffic areas. Look for cellular containment systems that contain 100% recycled content.
2. A Hollywood driveway is made of two long strips of pavement for car support. The area between should be vegetated (preferably with a low-grow turf or walkable groundcover) or filled with uncompacted gravel or stone. Vegetated strips provide some infiltration of runoff, sediment filtering, and pollutant removal.
3. Not rated for vehicle loads

Pervious pavement design considerations:

Require a site-specific soil infiltration test (using ASTM D-3385 protocols) to be included in the geotechnical engineer's soil report—this is not typically standard. With site-specific soil infiltration information, the permeable pavement system can be accurately sized to optimize cost-effectiveness, even for type D soils with infiltration rates of less than 0.5 inches. The base/subbase thickness is determined for structural traffic loads and water storage hydrologic sizing using dynamic modeling over time. Using conventional static volume system modeling will result in a costly oversized baserock reservoir layer and unnecessary underdrains. If an underdrain is required for code approval, position the perforated pipe at least 4 inches above the bottom of the reservoir baserock layer to allow

for water storage and infiltration. Perforated pipe placed at the bottom of the baserock bed or a trench will not allow for storage and infiltration.

"Disconnecting" impervious surfaces onsite is as important as the materials you select. Avoid situations in which one impervious surface drains onto another impervious surface, which magnifies stormwater runoff problems. Try to separate impervious surfaces with areas of turf, other vegetation, or gravel. Do not allow any roof drains, vegetated areas, or asphalt paved surfaces to drain onto the surface of pervious pavements. Runoff from these areas carry sediment that will greatly decrease pavement's infiltration rate and increase maintenance. Shedding asphalt fines is the only thing that will permanently clog previous pavements. Check dams in the reservoir base layer may be utilized on steeper slopes to aid infiltration, but pervious pavements should not be used on slopes greater than 15%.

Many jurisdictions have strict requirements for paving materials for city sidewalks, until pervious pavements are more widely accepted by jurisdictions as a public sidewalk material they are excluded from the area of consideration of this credit. For those interested in the Built Green Communities checklist and including permeable sidewalks or roads in the project be sure to check with the city's civil engineer for requirements and approved materials.

Performance Requirement: All pervious pavements should be designed using Dynamic modeling to manage, at minimum, a 50- or 100-year storm event's hourly rainfall intensity pattern over a 24-hour period. Test pavement's infiltration rate at final inspection of pavement prior to vehicle traffic use. All pavement systems need to be tested using the material's appropriate ASTM infiltration testing protocol and meet the following infiltration performance requirement to be considered pervious surfacing:

> *Pervious Concrete*: ASTM C-1701—Typical infiltration rate should be between 700–1500 inches of water/hr, with a minimum accepted rate of 350 inches. Three tests per 10,000 sq. ft. for multiple structure developments or two (2) tests per 5,000 sq. ft. for single structure developments (excluding DADUs); results should be averaged. Test locations should be at least 10 feet from each other. No test may be under 100 inches of water/hr. Qualified testers shall be certified as a NRMCA Certified Pervious Concrete Technician or higher.
>
> *Permeable Pavers or PICP:* ASTM C-1781—Minimum infiltration rate of 10 inches of water/hour, or per manufacturer's performance specifications. Three tests per 10,000 sq. ft. for multiple structure developments or two (2) tests per 5,000 sq. ft. for single structure developments (excluding DADUs), results should be averaged. Test locations should be at least 10 feet from each other. No test may be under five (5) inches of water/hr.

Porous Asphalt: ASTM C-1701 - Typical infiltration rate should be between 700-1500 inches of water/hr, with a minimum accepted rate of 350 inches. Three tests per 10,000 sq. ft. for multiple structure developments or 2 tests per 5,000 sq. ft. for single structure developments (excluding DADUs), results should be averaged. Test locations should be at least 10' from each other. No test may be under 100 inches of water/hr.

All other pervious paving materials should perform at the manufacturer's minimum infiltration performance specifications or better.

List the infiltration test results in the checklist comments section. Only those areas that meet required infiltration rates may be counted towards the percentage of pervious hardscape.

Points breakdown: 2 points per 33% of hardscapes use pervious materials, maximum of 6 points.

When Verified: Review civil engineers infiltration calculations at completion of design. Review pavement infiltration testing results and visually verified at final inspections.

Cross Reference: 1-29, 2-27, 2-49

Resources:

Pervious concrete specifications, maintenance, and design details: http://www.bayareaperviousconcrete.com/resources

Interlocking Concrete Pavement Institute technical resources: https://icpi.org/technical-center

Porous Asphalt Technical information: https://www.wastormwatercenter.org/wp-content/uploads/Module-3.3-Porous-asphalt-10-20-14-1-slide.pdf

Seattle, SPU Allowable Permeable Pavement Wearing Course Materials: https://www.seattle.gov/Documents/Departments/SDCI/Codes/StormwaterSPUAllowablePermeablePavement.pdf

Landscape Plan

2-30: Achieve a Seattle Green Factor Score for urban or infill under 1 acre

Responsible Party: General Contractor, Civil Engineer, Landscape Architect

Intent: The Seattle Green Factor is a program that requires new development to meet a landscaping target using a menu of landscaping strategies that have been assigned

variable points based on their efficacy. The Green Factor is designed to improve the amount and quality of urban landscapes, while allowing greater flexibility for developers and designers to meet open space requirements.

The Green Factor encourages layering of vegetation in areas visible to the public and in the public rights-of-way directly adjacent to new development. The program works using a simple spreadsheet that assigns variable points for different landscaping options. The values range from a factor of 0.2 to a factor of 1.0. The worksheet helps applicants calculate their project's score, allowing them to try different combinations of features to reach the requirement.

In addition to being attractive, new green elements in the landscape will improve air quality and help reduce energy consumption, cooling the city in the summer and insulating it in the winter. They will also reduce stormwater runoff, decreasing water pollution, and public infrastructure costs. Many of the Green Factor strategies will also earn additional Built Green site and water credits.

Performance Requirement: Demonstrate compliance by using landscape plans and the Green Factor Scorecard calculator to calculate and document the Green Factor Score for the project site. Provide the landscape plan with Green Factor Scorecard included on the plan.

Points breakdown:

1 point: score of 0.6

2 points: score of 0.7

3 points: score of 0.8

4 points: score of 0.9

5 points: score of 1.0

When Verified: Design documents and Green Factor calculation should be reviewed prior to construction. Landscape should be visually verified when fully installed.

Cross Reference: 1-31, 2-13, 2-14, 2-15, 2-27, 2-29, 2-39

Resources:

Seattle Green Factor: https://www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/seattle-green-factor

2-31: Bonus: Use of Green Factor Scorecard outside of Seattle

Responsible Party: General Contractor, Civil Engineer, Landscape Architect

Intent: Seattle's Green Factor scorecard is a score-based worksheet that increases the amount of and improves the quality of landscaping in new development. It can be downloaded for free and utilized by projects outside of Seattle, see Credit 2-30 for full list of benefits.

Performance Requirement: For projects located outside of Seattle which do not have a Green Factor requirement, complete Credit 2-30 to earn additional points.

Points: 3 points

When Verified: Design documents and Green Factor calculation should be reviewed prior to construction. Landscape should be visually verified when fully installed.

Cross Reference: 1-31, 2-13, 2-14, 2-15, 2-27, 2-29, 2-39

Resources:

Seattle Green Factor: https://www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/seattle-green-factor

2-32: Replant or donate removed vegetation for immediate reuse

Responsible Party: General Contractor, Landscape Architect or Contractor

Intent: Plants and trees to be removed for construction can often be transplanted and reused for landscaping on, or off, site. Consult with a landscape architect, horticulturist, or arborist to determine which plants are good candidates for transplanting and reuse.

If transplanting vegetation onsite, replant as soon as possible and make sure you follow appropriate procedures, so plants survive. If you can't replant immediately, protect the root ball while waiting to replant and water as needed. If transplanting trees and roots must be cut, cut as few roots as possible and cut them cleanly. Immediately after removing the tree, transfer the root ball into a moistened burlap sack and rebury the roots. This action keeps roots from drying out, minimizing the impact of transplanting. Preserve most of the important feeder roots.

For reuse offsite, your landscape architect or contractor may be able to reuse unwanted vegetation on other sites or you can let local neighbors know there are plants available. Some nurseries and nonprofit organizations involved in restoration projects will salvage native plants from development sites.

Performance Requirement: Tag plants for reuse or donation. Harvest them during site clearing, taking care to protect sensitive root structures inside the plant's dripline. Wrap root ball in burlap. Until they can be replanted in the final landscape, protect roots by transferring them into temporary nursery containers (covering roots with soil) or replant in a protected area of the site. Water plants regularly.

Points: 2 Points

When Verified: Review documentation on plant donations or visually verify on site replanting during construction.

Cross Reference: 2-6, 2-11

Resources:

How to move shrubs before construction: https://www.thisoldhouse.com/21124347/how-to-move-shrubs-before-construction

2-33: Use plants salvaged from another site

Responsible Party: General Contractor, Landscape Architect or Landscape Contractor

Intent: Preserve the ecological value of mature plants. The landscape architect can reuse plants/trees identified through the natural resources inventory from other areas in the development. The general contractor or landscape contractor can work with other local builders or landscapers to secure vegetation being removed from other sites for reuse.

Performance Requirement: Install mature plants that have been salvaged from on or offsite, either through a plant salvage program or through direct collaboration with the owner.

Points: 2 Points

When Verified: Review documentation of plants source (photos or receipts) and visually verify mature plants at final inspection.

Cross Reference: 2-6, 2-32

2-34: Grind land clearing wood and stumps for reuse

Responsible Party: General Contractor

Intent: Cost-effective way to reduce jobsite waste and amend the soil. Can also be used to protect stockpiled topsoil. For builders working on multiple sites or large developments, grinding land cleared wood waste can be a cost-effective way to reduce jobsite waste and provide opportunities to reuse the material as mulch on or offsite. Mulch can renew the soil by improving water and nutrient retention and can also be used to protect stockpiled topsoil.

Performance Requirement: Use a chipper and/or tub grinder onsite to convert land clearing waste to mulch for erosion control. Always meet dust control requirements. Check with local jurisdiction for dust control requirements for construction projects. Note: If

grinder operates at a site for more than 30 days in a 12-month period, a permit may be required to operate. Check regulations in your area.

Points: 3 Points

When Verified: Visually verify in early construction or photo documentation.

Cross Reference: 2-26, 2-39

2-35: Limit use of turf grass, or use no turf grass; includes sidewalk strip and setback areas

Responsible Party: Landscape Architect, General Contractor

Intent: In the summer, up to 50% of the water used by municipal systems is for outdoor irrigation. The increased demand in summer coincides with a drop in reservoir and stream levels when precipitation dramatically decreases, putting tremendous pressure on local water supplies. Limiting outdoor space dedicated to thirsty turf grass can significantly conserve water and reduce ever-increasing water utility bills for homeowners. Design turf areas only where they will be functional and well adapted to the site. Specifically, place turf in areas expected to be used for playing or gathering spaces. Heavily trafficked walkways may not be suitable for turf grass as the soil compacts over time requiring more maintenance and water to maintain.

Lawns work well in sun to light shade, with well-drained soils and on level or slightly sloped areas. Don't plant lawns in heavy shade or in areas with saturated soils or heavy slopes. Soil conditions can significantly affect lawn establishment, see Credit 2-25. Always keep turf away from the water's edge because of the increased likelihood of chemical contamination and erosion potential as well as reduction of habitat and shading for wildlife. Finally, design the lawn in a shape that can be efficiently watered, i.e., in a way that matches the irrigation system design. For example, use an oval shape to accommodate sprinkler sprays or pop-up irrigation sprays.

Although turf grass is a traditional component of residential landscaping, it is not necessary for a beautiful and luxurious landscape. In fact, a landscape that uses drought-tolerant grasses and ground covers, including existing vegetation along with well-constructed new plantings, can offer a beautiful, low-maintenance alternative to the "traditional" fare.

Performance Requirement: Install landscaping other than turf grass for a percentage of the landscaped area. All landscaped areas, including public right-of-way areas (e.g., sidewalk strips and setbacks), are included to determine the percentage of area that turf grass was used. Clump grass, legume and wildflower mixes that will be mowed no more than twice per year are an acceptable alternative but should not be used for the entire non-turf area.

Turfgrass Water Conservation Alliance (TWCA) Qualified drought-tolerant turf grasses are considered drought-tolerant and should be claimed in Credit 2-36. Additionally, they are not counted in the maximum percentage requirement for 4- and 5-star requirements.

Points breakdown:

3 points: Per 25% of landscaped area that does not include turf grass.

12 points: No turf grass

When Verified: Review grass species specified in landscape plan and landscape area calculations at completion of design. Review receipts for species planted and visually verify at final inspection.

Cross Reference: 1-18, 2-51, 2-55, 6-26

Resources:

TWCA qualified turf products: https://www.tgwca.org/list-of-qualified-products.html

2-36: Use drought-tolerant grass type or ground-covering plants

Responsible Party: Landscape Architect, General Contractor

Intent: When planting a new lawn, select a grass mix that is suitable for the sun conditions and the lawn's intended use. The species should grow slowly, have a minimum established root length of two (2) feet, and require less-frequent mowing. Use locally adapted rye-fescue seed blends and plant in deep well-conditioned soil. Be aware that if planted in shallow or poor soil they will require more water and are not considered drought-tolerant. Mixes containing clover, bent grass, yarrow, chamomile, and English daisies are another option where an informal-looking lawn fits the landscape. These blended mixes are extremely drought-tolerant, offer visual variety, and are very pollinator-friendly.

Turfgrass Water Conservation Alliance (TWCA) Qualified drought-tolerant turf grasses are considered options for projects that prefer turf grass installation over seeding. These drought-tolerant grass species are third-party tested for drought tolerance and low maintenance. See the resources below for their qualified products list.

Regardless of the type of grass you choose, always plant densely. Thick, dense, and thatched well-established lawns absorb and infiltrate rainwater better than thinly planted plots. Soil conditions can significantly affect lawn establishment, see Credit 2-25.

Drought tolerant groundcovers can be used as an alternative to grass, providing function and more visual interest in the landscape. Groundcovers are simply plants that are used to cover an area of bare ground. Although groundcovers are generally considered creeping or spreading plants, other plants, when planted densely enough, can be used in the same

fashion. Water-conserving groundcovers can be herbaceous perennials or woody plants, generally under 24 inches in height. They can have interesting textures, colors, and flowers. Some ground covers can even be used in light-traffic walkways or around pavers stones as a low maintenance alternative to grass, known as "stepables."

Performance Requirement: To be considered drought-tolerant the grass species or seed blend should grow slowly, have a minimum established root length of two (2) feet, and require less frequent mowing. All turf grasses must be qualified by TWCA as drought-tolerant. May be combined with Credits 2-37 and 2-38.

Points: 2 Points

When Verified: Review grass and ground cover species specified on landscape plan and landscape area calculations at completion of design. Review receipts for species planted and visually verify at final inspection.

Cross-Reference: 1-18, 2-37, 2-38, 2-51, 2-55, 6-26

Resources:

TWCA qualified turf products: https://www.tgwca.org/list-of-qualified-products.html

Drought Tolerant "stepables": https://www.stepables.com/1/All_Drought-Wise_Drought_Tolerant_STEPABLES.html

2-37: Landscape with drought-tolerant plants; bonuses for at least 50% native plants or 100% native

Responsible Party: Landscape Architect, General Contractor

Intent: In the summer, up to 50% of the water used by municipal systems is for outdoor irrigation. The increased demand in summer coincides with a drop in reservoir and stream levels when precipitation dramatically decreases, putting tremendous pressure on local water supplies.

Examples of water saving landscaping techniques you can utilize include:

- Using established vegetation (see Credit 2-11)
- Limiting turf areas, choosing appropriate turf types and planting in suitable areas (see Credit 2-35)
- Clustering plants with similar water requirements ("water-use" zones)
- Planting native species that will adapt well to the site
- Planting species from other geographic areas with similar climates
- Planting certain species from Mediterranean climates (check with your local nursery for ideas)

The Pacific Northwest has hundreds of attractive plants that require very little water once they are established. Ask your local nursery or landscaping contractor for information about the water-efficient trees, shrubs, perennials, and groundcovers they supply. Keep in mind that some low-water-use plants may have certain needs, such as shade, which when not met can lead to increased water use.

Constructed landscapes that mimic ecological habitat models can decrease life cycle maintenance costs, enhance wildlife survival, and blend edges of adjoining existing vegetation. To mimic ecological habitat models, emulate natural succession by planting large deciduous trees with smaller conifers to gradually develop canopy. Deciduous trees generally perform better in south-facing areas, while conifers are better suited near streams or on the north side of the plot.

Use native plants in the constructed landscape. They:

- Are diverse in color, form, and texture offering a wide variety to fit any design.
- Are adapted to our climate—rainy wet winters and dry summers. After initial one to two seasons of irrigation, many native plant species become established and require little to no irrigation.
- Are adapted to our naturally occurring low levels of nutrients.
- Are resistant to local insects and diseases, which allow for minimizing fertilizer and pesticide use.
- Provide habitat for local wildlife.

Landscapes can also be xeriscaped, which means that once established the landscape will survive without any watering. Xeriscaping has become popular in dry areas over recent years and increasingly more resources are available on it.

Performance Requirement: At least 90% of retained existing and newly installed landscaping must be appropriate to the topography, timing of sunlight, soil types, and be drought-tolerant or low-water-use. Additional points may be earned if plants are also native species. For new plantings use only plants labeled as “pollinator-safe” or “bee-friendly” that are free of detectable levels of systemic insecticides. May be combined with Credits 2-36 and 2-38.

Points breakdown: Points cannot be combined with each other.

1 point: Landscape with drought tolerant plants

2 points: Landscape with drought tolerant plants, at least 50% being native plants

3 points: Landscape with 100% native drought tolerant or low-water plants

When Verified: Review landscape plan plant list and landscape area calculations at completion of design. Visually verify at final inspection.

Cross Reference: 2-11, 2-35, 2-36, 2-38

Resources:

Washington Native Plant Society Plant Lists: https://www.wnps.org/plant-lists

RainWise Planting Plan: https://eatyouryard.com/wp-content/uploads/2015/11/RainWise-Planting-Plan-1.pdf

Native Plants in the Coastal Garden: A Guide for Gardeners in BC and the Pacific Northwest, April Pettinger with Brenda Costanzo. - Rev. ed. - North Vancouver, B.C.: Whitecap Books, 2002. ISBN:1552853314

Real Gardens Grow Natives: Design, Plant & Enjoy a Healthy Northwest Garden, Eileen M. Stark. - Seattle: Skipstone, an imprint of Mountaineers Books, 2014. ISBN:9781594858666

2-38: Landscape with at least 25% pollinator-friendly vegetation

Responsible Party: Landscape Architect, General Contractor

Intent: In the Pacific Northwest, hummingbirds, bees, butterflies, moths, flies, wasps, and beetles are examples of native pollinators that feed on the sugary flower nectar and/or protein-rich pollen of flowering plants. Pollinators are in serious decline due to habitat loss and fragmentation, pollution, pesticides, non-native species, and climate change. Pollinators are essential for healthy habitats and food production (both rural farms and urban gardens), and they are suffering from loss of habitat and food sources.

With the rise of turf lawns across urban spaces, void of native flowering grasses and vegetation, many pollinators are struggling in food deserts. While a lot of focus in landscaping has been on conserving water, many of those drought tolerant plants, such as tall grasses, sedges, or leafy groundcovers, are not food sources to native pollinators. While those landscapes provide beautiful outdoor spaces that conserve water and help mitigate stormwater, they still represent a loss of habitat for resident and migratory pollinators.

The Pacific Northwest has hundreds of attractive plants that not only require very little water once they are established, but also provide food for pollinators. Ask your local nursery or landscaping contractor for information about pollinator-friendly plants that meet your site conditions.

Examples of some pollinator-friendly best practices:

- Use a lawn grass blend that includes clover, bent grass, yarrow, chamomile, or English daisies.
- Allow some dandelions to grow (first foods for bees waking up from hibernation).
- Overlap bloom times throughout the season to provide a continuous sequence of nectar and pollen resources from spring to autumn.

- Only use natural pest control methods and organic fertilizers.
- Plant native species.
- Provide dead wood and small unmanicured areas for shelter and breeding.

Performance Requirement: At least 25% of all onsite vegetation provides a food source or lifecycle process for pollinators. For new plantings use only plants labeled "pollinator-safe" or "bee-friendly" that are free of detectable levels of systemic insecticides. May be combined with 2-37. To allow pollinators to benefit from the vegetation, one of the following credits is required:

Credit 2-40, establishing an integrated pest management plan to minimize chemical use of pesticides and fertilizers is necessary

Credit 7-1, information about the importance of using environmentally- and bee-friendly pest controls and fertilizers is included in the homeowner's manual.

Points: 2 Points

When Verified: Review landscape plan plant list and landscape area calculations at completion of design. Visually verify at final inspection.

Cross Reference: 2-37, 2-40, 7-1

Resources:

Native Pollinator Habitat Restoration Guide: https://www.earthcorps.org/wp-content/uploads/The-Native-Pollinator-Habitat-Restoration-Guide-EarthCorps.pdf

Pollinator planting guides by zip code: https://www.pollinator.org/guides

2-39: Mulch planting beds with at least 3 inches of organic mulch

Responsible Party: General Contractor, Landscape Contractor

Intent: If the new landscape isn't already densely planted, mulching is the next best solution to reduce the number of weeds and makes weed removal easier (which in turn, helps minimize herbicide use). Mulching provides soil nutrients, increases the capacity of the soil to retain moisture, moderates soil temperature, and limits soil erosion.

Non-woody mulches, compost, cut grass clippings, or leaves are best for annuals. Woody mulches, wood chips or bark, work best with perennial shrubs and trees. However, limit the use of bark mulch as much as possible, and never use it in areas that drain directly into storm sewers or open water. Bark produces a toxic leachate that can end up in water supplies.

Performance Requirement: Mulch all landscape beds with a minimum of 4 inches of organic mulch. Not applicable to sites where this is required by local code.

Points: 1 Point

When Verified: Visually verified during final inspection.

Cross Reference: 2-27, 2-30, 2-31, 2-34

2-40: An integrated pest management plan to minimize chemical use of pesticides and fertilizers is established

Responsible Party: Landscape Architect, General Contractor

Intent: To protect surface and groundwater from high concentrations of nutrients in stormwater runoff, which can cause algal blooms, reduce water quality, and impede aquatic lifecycles. To protect pollinators that are in significant decline by the increased use of pesticides.

Integrated pest management (IPM) is a sustainable approach to pest and vegetation control that utilizes regular monitoring to find pest problems and to determine if, and when, action is needed. The IPM approach emphasizes physical, mechanical, cultural, and biological methods to keep insect, animal, or vegetation problems low enough to prevent intolerable damage, annoyance, or public safety hazards.

Use mulch, pull weeds, fertilize lawns, use water spray or sticky traps, clean up diseased leaves or try a variety of other biological, cultural, or physical controls. When chemical controls are necessary, they should be the least toxic or least hazardous available and used only when no other control methods would be effective or practical.

Performance Requirement: Design the landscape with integrated pest management and pesticide-free gardening practices in mind. For new plantings use only plants labeled as “pollinator-safe” or “bee-friendly” that are free of detectable levels of systemic insecticides. Provide recommended management and maintenance plan to the property owner or homeowner. May be included as a part of the Homeowner’s Kit for additional points, see Credit 7-1.

Points: 4 Points

When Verified: Integrated pest management plan visually verified at final inspections.

Cross Reference: 2-4, 2-38, 7-1

Resources:

Integrated pest management: https://www.growsmartgrowsafe.org/IPM

Garden without Pesticides: https://www.growsmartgrowsafe.org/NaturalYardCare/GardenWithoutPesticides

Pollinator Partnership – Pesticide resources: https://www.pollinator.org/learning-center/pesticides

2-41: Provide compost-amended planting area for food production

Responsible Party: General Contractor, Landscape Architect

Intent: Home gardens provide numerous social and health benefits. Studies have shown that home gardens help address food insecurity and malnutrition, provide additional benefits for resource-poor families, and delivers valuable ecosystem services. In recent years there has been growing interest in strengthening and intensifying local food production to mitigate the adverse effect of global food shocks and food price volatilities. Consequently, home gardens are now seen as a strategy to increase household food security and nutrition.

Performance Requirement: Provide designated and easily identified space for food production. When selecting and planning for the planting areas, consider using the following best practices:

- Pick a spot with at least 6 hours of good daytime light and access to water.
- Use contaminant-free soil.
- Consider using a raised garden bed, which allows owner to control the soil and nutrient blend (see Credit 6-31).
- Do not leave nutrient-rich soil uncovered and cover food production area with mulch or landscape fabric to prevent weed growth prior to owner occupation (see Credit 2-42).

Points: 2 Points

When Verified: Visually verified at final inspections.

Cross Reference: 2-42, 6-31

Eliminate Water Pollutants During Construction

2-42: When construction is complete, leave no disturbed areas uncovered or unstabilized

Responsible Party: General Contractor

Intent: Prevent topsoil degradation and dust and erosion contributing to air and water pollution. All disturbed areas should be treated in some way with landscaping, site features, or erosion control devices. Bare soil will erode due to wind and water.

Performance Requirement: Seed, replant, or cover exposed soils with compost, mulch, vegetation, and/or matting as soon as practical. Use wildflower seeds appropriate for this region for color and interest, such as along driveways.

Points: 2 Points

When Verified: Visually verified at final inspections.

Cross Reference: 2-39, 2-41

2-43: Preserve and cover topsoil on site for reuse

Responsible Party: General Contractor, Civil Engineer or Landscape Contractor

Intent: Maintaining the hydrological and ecological function of the site. Native topsoil is the top layer of organic soil at the site. Undisturbed native topsoil is valuable because it has developed on the site over time and is well adapted to the climate and local vegetation. Even when disturbed and then redeposited, it will regain optimal performance sooner than imported soil. Imported topsoils are not as well adapted to your site and will not develop optimal nutrient structure, disease resistance, or hydrologic capabilities for several years.

Performance Requirement: Prepare a Soil Management Plan. Retain native topsoil in place and uncompacted as much as possible. When it must be removed to expose structural soil, it should be separated, stockpiled, and reused onsite as a top layer in grading planting areas, see Credit 2-26. Protect stockpiled topsoil from erosion by covering with compost or mulch, surround with a reusable silt fence, and inspect regularly for proper coverage or sign of erosion until ready for reuse. Amend all disturbed soil with compost of suitable soil amendments to improve soil quality and hydrological function, see Credit 2-25.

If you do have extra topsoil left over after final grading and landscaping, consider mixing it with non-organic and inert material to be used as fill (make sure fill materials are clean). Also, you can use it in the construction of slopes, or sell it to homeowners, landscapers, or other businesses for reuse.

Absolutely no topsoil should be disposed of in lowlands or wetlands. Disposing of topsoil in lowlands or wetlands threatens water quality and quantity and endangers wildlife habitat.

Points: 3 Points

When Verified: Review soil management plan prior to site clearing and grading. Visually verified during intermediate construction inspections.

Cross Reference: 2-19, 2-21, 2-25, 2-26

2-44: Establish and post clean up procedures for spills to prevent illegal discharges

Responsible Party: General Contractor, Subcontractors

Intent: Prevent runoff from spills from contaminating the site, local waterways, and surrounding stormwater systems. Requirements for cleaning spills or releases vary with the material. All project site workers should be familiar with cleanup procedures for the materials they use regularly.

Performance Requirement: Establish and clearly post cleanup procedures for spills. Include components of a safety program that considers the range of potential spills and establishes appropriate emergency actions. Make sure everyone, especially subcontractors, is aware of your procedures by posting them prominently in a central location and referring to them regularly during safety meetings. At a minimum, signs shall be posted in English and Spanish (or another language appropriate to the workforce on the jobsite).

Points: 1 Point

When Verified: Visually verified during intermediate construction inspections.

Resources:

Pollution Prevention Plan: https://ecology.wa.gov/Regulations-Permits/Reporting-requirements/Dangerous-waste-reporting-requirements/Pollution-prevention-plan

Reporting Releases of Hazardous Substances: https://apps.ecology.wa.gov/publications/SummaryPages/RTC94133.html

2-45: Produce no hazardous waste

Responsible Party: Architect, General Contractor, Subcontractors

Intent: Hazardous waste is very difficult to dispose of in a way that does not cause adverse environmental or health effects. Avoid using hazardous materials and substances whenever possible to avoid creating hazardous waste, increase worker safety, and reduce costly disposal and spill cleanups. Look for materials and products that are not listed on the Red List, have Health Product Declarations (see Credit 4-12) or Environmental Product Declarations (see Credit 5-97), or are certified or labeled as safer product choices (see Credits 4-3, 4-19, 4-24, 5-24).

Performance Requirement: Use only materials and products that produce no hazardous waste for the entirety of the project. Add requirements for use of non-hazardous alternative materials, when available, to Specifications. If use of hazardous materials cannot be avoided, due to lack of safer alternative materials or products, all resulting

hazardous waste should be handled and disposed of in a manner that reduces its threat to the greatest possible extent.

Create a Good Jobsite Housekeeping Plan. Make sure everyone, especially subcontractors, are aware of it by posting it prominently in a central location and referring to it regularly during safety meetings. At a minimum, signs shall be posted in English and Spanish (or another language appropriate to the workforce on the jobsite).

Points: 3 Points

When Verified: Visually verified during intermediate construction inspections.

Cross Reference: 4-12, 4-19, 4-24, 5-24, 5-97

Resources:

Pollution Prevention Plan: https://ecology.wa.gov/Regulations-Permits/Reporting-requirements/Dangerous-waste-reporting-requirements/Pollution-prevention-plan

Assessing chemicals and their alternatives: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Preventing-hazardous-waste-pollution/Safer-alternatives/Tools-for-assessing-chemicals-and-alternatives

Safer alternatives to toxic chemicals: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Preventing-hazardous-waste-pollution/Safer-alternatives#Training

The Red List: https://living-future.org/declare/declare-about/red-list/

2-46: Use slow-release organic fertilizers to establish vegetation

Responsible Party: General Contractor or Landscape Contractor

Intent: To protect surface- and groundwater from high concentrations of nutrients in stormwater runoff, which can cause algal blooms, reduce water quality, and impede aquatic lifecycles.

Performance Requirement: All fertilizer used to establish newly installed landscaping shall meet the following labelled requirements as defined by the Washington State Department of Agriculture:

Slow release – At least 60% of the available nitrogen should be water insoluble, pelletized, or slow release (excluding any coated urea).

Points: 2 Points

When Verified: Review of product documentation and visually verified during intermediate construction and at final inspection.

Cross Reference: 2-4

Resources:

Grow Smart, Grow Safe:
https://www.growsmartgrowsafe.org/NaturalYardCare/SoilAmendments

2-47: Use non-toxic outdoor materials for landscaping (stone, salvaged materials, non-treated wood)

Responsible Party: General Contractor or Landscape Architect

Intent: Protect soil health and runoff water quality by eliminating toxins in the landscape

Performance Requirement: At least 75% (by cost or square footage) of landscaping structural and retaining materials should be either non-toxic (stone, concrete, naturally rot-resistant wood) or low-toxic (inert plastics, untreated ferrous metals, borate-treated wood).

Points: 1 Point

When Verified: Installed materials visually verified at final inspection, with review of product documentation as needed.

Cross Reference: 5-88, 5-89, 5-90, 5-92, 5-93, 5-94

2-48: Do not use zinc galvanized ridge caps, copper flashing, or copper wires for moss prevention

Responsible Party: Architect, General Contractor

Intent: Zinc galvanized ridge caps, copper flashing, copper wires, and shingles impregnated with copper or zinc granules are sometimes installed on roofs to discourage moss and other growth. However, they are of environmental concern because the zinc and copper will leach from these products into stormwater. Once a part of the water cycle, they can accumulate to toxic levels in the food chain.

Performance Requirement: Moss and algae can most effectively be removed using a stiff corn broom on a hot summer day. Avoid the use of pressure washers to remove moss and algae, since these can damage shakes and shingles, reducing their effectiveness and service life.

Points: 2 Points

When Verified: Visually verified at final inspections.

Cross Reference: 1-6, 7-7

HEAT ISLAND MITIGATION

2-49: Use light colored hard surfacing: Horizontal hard surfacing materials are installed with a Solar Reflectance Index of 29 or greater for min 75% surface area (includes hardscaping and roofs)

Responsible Party: General Contractor, Architect or Civil Engineer

Intent: Heat islands are created when urban surfaces, such as hardscapes, absorb solar radiation. A review of research studies and data by the EPA found that in the United States, the heat island effect results in daytime temperatures in urban areas about 1–7°F higher than temperatures in outlying areas and nighttime temperatures about 2–5°F higher. Darker, lower-reflective materials (e.g., asphalt, dark-stained or painted concrete, pressure treated or dark stained wood, or plastic lumber products) absorb more heat from the sun. Roads and parking lots paved with black asphalt concrete and other dark materials can become up to 70°F hotter than the more reflective, white surfaces. As hard surfaces and pavements get hot, they heat the surrounding air and contribute to the heat island effect. Dark-colored roofs also heat the air around the building, contributing to increased temperature near air intakes and urban heat island effect.

High Albedo, light-colored, and cool roofs are all terms used to describe an alternative roofing strategy that lowers the absorption of solar energy, reduces surface temperatures, and decreases heat transfer into a building. Typically, they are white and are made of either metal, single-ply membrane, or elastomeric coating over a conventional roof. These roofs reduce internal air temperature and the need for mechanical air conditioning in two ways: first, by reflecting solar gain, then by providing cooler roof intake air.

Reflective, light-colored hard surfacing and cooling paving materials minimize solar heat gain and the subsequent transfer of this heat to the surroundings. Lighter-colored materials have higher solar reflectance, so they absorb less of the sun's energy and stay cooler. Conventional concrete materials that are left with natural finish or stained/painted with a whiter color provide higher solar reflectance.

Pervious pavements are less able to absorb and store heat than conventional pavements. The lower density of the material (15–25% void spaces) reduces heat storage capacity. In hotter weather, the open void structure of the pervious pavement allows water to filter into the subgrade, resulting in a cooler earth temperature that then cooling the pavement through evaporation. These factors allow pervious pavement systems to approach natural ground cover in heat-absorbing and storage capacity. In addition, the lighter colors of some pervious pavement systems further reduce the heat-absorbing capacity of the pavement. In cooler weather the air-and-water exchange between the pavement and the subgrade allows the warmer earth temperatures to warm the pavement faster which helps thaw snow and ice.

Performance Requirement: Install roofs, hard surfacing, and pavements that have a high solar reflectance for a minimum of 75% of the structure and surfacing.

Points: 2 Points

When Verified: Visually verified at final inspections.

Cross Reference: 2-29

2-50: Species and locations for tree planting are identified that will provide summer shading of the dwelling and parking areas to moderate temperatures.

Responsible Party: Landscape Architect

Intent: Properly placed trees within the landscape can be as effective as other home improvements in reducing heating and cooling costs. Good selection and placement of trees within the landscape can help cool your house in summer and allow the sun to warm the house in winter.

Effective tree placement will allow the winter sun to warm the roof and walls of your house. Placing deciduous trees that lose their canopy in the winter on the south side of the house allows solar access to these areas during winter as well as shade in summer.

Using landscaping to create microclimates that either allow or prevent wind, light, or water from reaching certain areas of the property can benefit onsite structures. Energy-conscious landscaping design can result in reduced operational costs for the homeowner, greater comfort, and less energy use. Deciduous trees placed south and west of the home can reduce heating and cooling loads by providing shading during hot summer days and allowing winter sun to penetrate windows. According to the U.S. Forest Service, trees properly placed around buildings (see Figure 2-2) can reduce air conditioning needs by 30 % and save 20–50% of energy used for heating. Well-placed windbreaks of evergreens can reduce a building's heating bill by up to 20%. Examples of energy-saving design include:

- Maximum southern exposure with most windows facing south
- Plantings on the east and northeast to filter the sun without blocking the light
- Plantings on the south to create shade and channel breezes in summer without obstructing sun in winter
- Midrange-colored materials for driveways, walkways, and parking spaces to reflect sun in summer and absorb and re-radiate heat in winter
- Paved areas located away from south windows and shaded with plantings

See Figure 2-2 on following page for illustration of this intent.

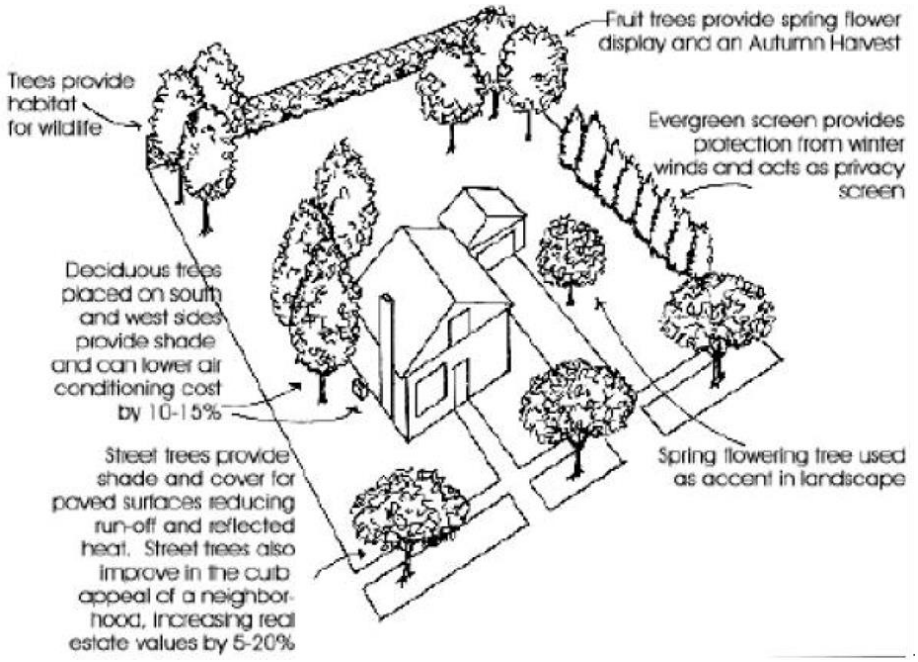


Figure 2-2 Tree Placement to Reduce Heating/Cooling Loads Naturally

(Source: Cool Communities, www.coolcommunities.org)

Performance Requirement: Preserve existing trees or plant trees that will provide summer shading of the dwelling and paved areas. If the site and structure orientation have the potential for solar PV generation, only plant new trees that will allow for future roof solar installation on the south-facing portion of the roof when fully grown. It is not the intent of this credit to prioritize solar PV potential over retaining mature existing trees.

Points: 5 Points

When Verified: Visually verified at final inspections.

Cross Reference: 2-13, 2-14, 2-15, 3-10

Resources:

Urban Shade Trees: http://www.coolcommunities.org/urban_shade_trees.htm

Water Conservation

Occupant Water Reduction

Climate change, population growth, and increasing development are placing ever more pressure on Washington's potable water sources. Warmer winters are reducing annual snow pact levels and causing melting earlier rather than later in the dry summer months.

Summers are also increasingly drier and hotter. All these climatic changes will put significant strain on water supply and increase costs for those most vulnerable.

The case for water conservation was laid out succinctly by the International Living Future Institute (ILFI) in its 2021 report, *A Decision-Maker's Guide to Cost-Effective Residential Potable Water Reduction in Seattle, WA:* "Water-related utility rates in the city of Seattle are among the highest in the nation and will continue to rise over time. For a city that receives consistent rainfall for eight to nine months of the year, this may come as a surprise. According to Circle of Blue, Seattle's water, sewer, and stormwater rates are amongst the four highest in the nation and are higher than any city in California... Utility rates continue to rise every year as the city of Seattle grows, and Seattle Public Utilities must upgrade their infrastructure to meet the expanding demand. Seattle's 2020 rates increased by 3.7 percent and are expected to increase at a similar rate in the future. Homes and buildings with inefficient water use will have higher monthly bills as a result, potentially creating hardship and financial instability, especially for low-income residents. Small investments in water-efficient fixtures and additional investments in water reuse systems can reduce potable water usage and utility bills by 30 to 70 percent, depending on the building scale and rates charged by the utility. In some cases, water use reduction can result in savings of up to $500 annually per household—a significant amount that can justify the initial investment in water-saving infrastructure."

Potable water reduction strategies can increase a building's resilience in the event of municipal water system failure or drought and ensure that our watersheds remain healthy and supportive of both human and ecological needs in the future. ILFI provided the following summary matrix for potable water reductions strategies for single-family homes based upon their 10 decision-making criteria:

Table 2. Analysis of Potable Water Reduction Strategies for Single Family Homes

SINGLE FAMILY HOMES										
System Type	**Equipment Cost**	**Installation Cost**	**O&M Cost**	**Ease of Installation**	**Ease of Permitting**	**Space Requirements (sq.ft)**	**% of Potable Water Savings**	**Paypack Period**	**Marketing + Storytelling Potential**	**Resiliency**
Low-flow Fixtures	No additional cost	No additional cost	None	Easy	N/A	0	**17%**	0	Low	Low
Rainwater for Irrigation	$4,000	$1,000	$300	Easy	Easy	140	**9%**	28	High	Medium
Graywater for Irrigation	$3,000	$300	$400	Easy	Easy	20	**14%**	35	Medium	Low
Rainwater for Toilet Flushing	$15,000	$5,000	$3,000	Medium	Medium	90	**16%**	36	High	High
Graywater for Non-Potable	$5,000	$500	$50	Medium	Not permittable	20	**43%**	5	Medium	Medium

(Source: ILFI, A Decision-Maker's Guide to Cost-Effective Residential Potable Water Reduction in Seattle, WA: https://www2.living-future.org/potable-water-reduction)

To maximize water and financial savings, single-family home builders are encouraged to invest in low-flow or vacuum-flush toilets (and/or capture rainwater from an adjacent garage or shed, if applicable), capture rainwater for toilet flushing, and install a greywater irrigation system. ***This combination of strategies is calculated to result in a 47% potable water savings per year.***

Moreover, water reuse systems are extremely expensive and disruptive to install into an existing home and are only feasible during a major remodel of the home. So, it is critical to consider stubbing-in or installing water reuse systems when the home is being built to reduce the burden of implementing these systems now, or in the future, as water becomes more scarce and expensive. If water conservation is not prioritized now, in the coming decades it could be a significant limiting factor to development—impacting human health, equity, ecosystems, and the residential building industry's ability to thrive.

Developers and General Contractors must select between either a performance or prescriptive pathway to reduce occupant water use on their Built Green projects.

PERFORMANCE PATHWAY

2-51: Document a Water Efficiency Rating through WERS or WRI of 70 or less; OR Document at least 30% reduction in total water use, using a baseline of 53 gallons per occupant per day for indoor use. (Food production excluded)

Responsible Party: Builder, Plumbing Engineer, Landscape Architect, Verifier

Intent: Climate change is making historic precipitation patterns less reliable and droughts more frequent in Washington. While we can't predict which years will see drought, we know that climate change will increase pressures on existing water resources for both people and wildlife. In order to better measure our efforts and impacts in this area we have developed a performance pathway to demonstrate and communicate the impact water-conscious design can have in a measurable way.

Just like using energy performance models that predict and measure a home's energy efficiency (e.g., HERS), a water efficiency score can do the same for a home's water consumption. Having a measurable water use reduction metric is beneficial for builders, homeowners, and Built Green. Builders and realtors will be able to effectively communicate the expected water bill savings they are providing to potential buyers. Homeowners will be better equipped to compare prospective homes by their expected cost of upkeep. Built Green will be able to accurately measure the water savings of all Built Green homes and draw on those metrics to help local jurisdictions develop more green building incentives for our members.

> *Water Efficiency Rating Score* (WERS) calculates indoor water use empirically, based on the estimated loading from the main plumbing fixtures, clothes washers and

pipe priming, while taking into account their associated efficiencies. WERS also includes the ability to account for outdoor water use, which includes rainwater and greywater catchment calculations. Requires a WERS qualified verifier.

Water Rating Index (WRI), introduced in 2020 by National Green Building Standard (NGBS), indicates a property's total indoor and outdoor water use compared to a baseline. Only NGBS Green Verifiers with specialized training are eligible to score and verify for a home's features for a certified WRI score.

WaterSense 2.0 ensures that homes are at least 30 percent more water-efficient than a comparable home using typical new construction and meet homeowner expectations for performance. Requires a WaterSense approved Home Certification Organization and Verifier. The WRI is one of the approved certifications to achieve Watersense 2.0 certification. This is only applicable to projects pursuing Built Green 3-star certification.

Just like with the Home Energy Rating System (HERS) and the Energy Rating Index (ERI), scores are calculated and verified through 3rd party verifiers and given a value between 0-100; a lower score through WERS and WRI demonstrates higher efficiency.

Performance Requirement: Use one of the following modeling options to document the required reduction in total water use. Food production areas are excluded. Rainwater harvesting and greywater systems can be utilized to offset potable water consumption.

Modeling options:

1. Certify through Water Rating Index (WRI) or Water Efficiency Rating Score (WERS). Provide final WRI or WERS score summary report. Built Green 3-Star projects may certify under WaterSense 2.0 to document 30% reduction. See Credit 2-52 for additional points available for these modeling pathways.
2. Submit an Excel file that includes the following three worksheets: Built Green Indoor Water modeling worksheet [indoor use], EPA WaterSense Water Budget Tool, and WA Dept of Ecology Water Harvesting Calculator [outdoor water use]. Total water use from all worksheets is used to determine reduction from baseline. For indoor water use, reduction must be from a baseline of 53 gallons/person/day. For outdoor use, reduction must be from a baseline of irrigated turf grass for all exterior landscaping.

Points Breakdown:

20 points: WERS/ WRI of 70 or less; EPA WaterSense 2.0 Certification; or 30% reduction of total water use

50 points: WERS/ WRI of 60 or less; or 40% reduction of total water use

80 points: WERS/ WRI of 50 or less; or 50% reduction of total water use

When Verified: Review preliminary modeling at completion of design. Visually verify water-saving strategies during intermediate construction and final inspections. Report final water use reduction calculations after final inspections.

Cross Reference: 1-7, 1-17, 1-30

Resources:

Certification Modeling Pathways:

WERS Certification and calculator: https://www.wers.us/

Water Rating Index (NGBS): https://www.homeinnovation.com/services/certification/green_homes/certified_water_rating

2020 National Green Building Standard guidebook (Appendix D - pg. 245): https://www.nahbclassic.org/fileUpload_details.aspx?contentID=272893

2020 NGBS Appendix D Water Rating Index interpretation guidance: https://www.homeinnovation.com/-/media/Files/Certification/Green_Building/NGBS-Interpretation-2020-NGBS-Appendix-D-WRI.pdf

EPA WaterSense Certification, Version 2.0: https://www.epa.gov/watersense/homes-specification#version2homes

Built Green Modeling Pathway:

EPA WaterSense Water Budget Tool: https://www.epa.gov/watersense/water-budget-tool

Washington Department of Ecology Rainwater Harvesting Calculator: https://fortress.wa.gov/ecy/wrdocs/WaterRights/wrwebpdf/ecy_rwcalc.xlsm

Built Green Indoor Water modeling spreadsheet: https://builtgreen.net/certification/#checklistandhandbook

2-52 Bonus: achieve EPA WaterSense 2.0 certification or Water Efficiency Rating Score (WERS or WRI) certification of 70 or less

Responsible Party: Builder, Verifier

Intent: Just like using energy performance models that predict and measure a home's energy efficiency (e.g., HERS), a water efficiency score can do the same for a home's water consumption. Having a measurable water use reduction metric is beneficial for builders, homeowners, and Built Green. Through 3rd party certification builders and realtors will be able to effectively communicate the expected water bill savings they are providing to

potential buyers. Homeowners will be better equipped to compare prospective homes by their expected cost of upkeep. Built Green will be able to accurately measure the water savings of all Built Green homes and draw on those metrics to help local jurisdictions develop more green building incentives for our members. Incorporating an independent certification provides an additional level of quality assurance to the water efficiency score of a home.

Performance Requirement: Achieve additional certification through WERS or WRI with a score of 70 or less or EPA WaterSense 2.0. Provide certificate in verification packet.

Points: 10 points

When Verified: Review project enrollment with WERS, WRI or EPA WaterSense 2.0 at completion of design. Water efficiency score or certificate verified at project completion.

Cross Reference: 1-7, 1-17, 1-30, 2-51

Resources:

WERS Verifiers, Certification, and calculator: https://www.wers.us/

Water Rating Index (NGBS): https://www.homeinnovation.com/services/certification/green_homes/certified_water_rating

EPA WaterSense Certification, Version 2.0: https://www.epa.gov/watersense/homes-specification#version2homes

PRESCRIPTIVE PATHWAY

2-53: Pre-plumb for greywater reuse for irrigation

Responsible Party: General Contractor or Plumbing Engineer

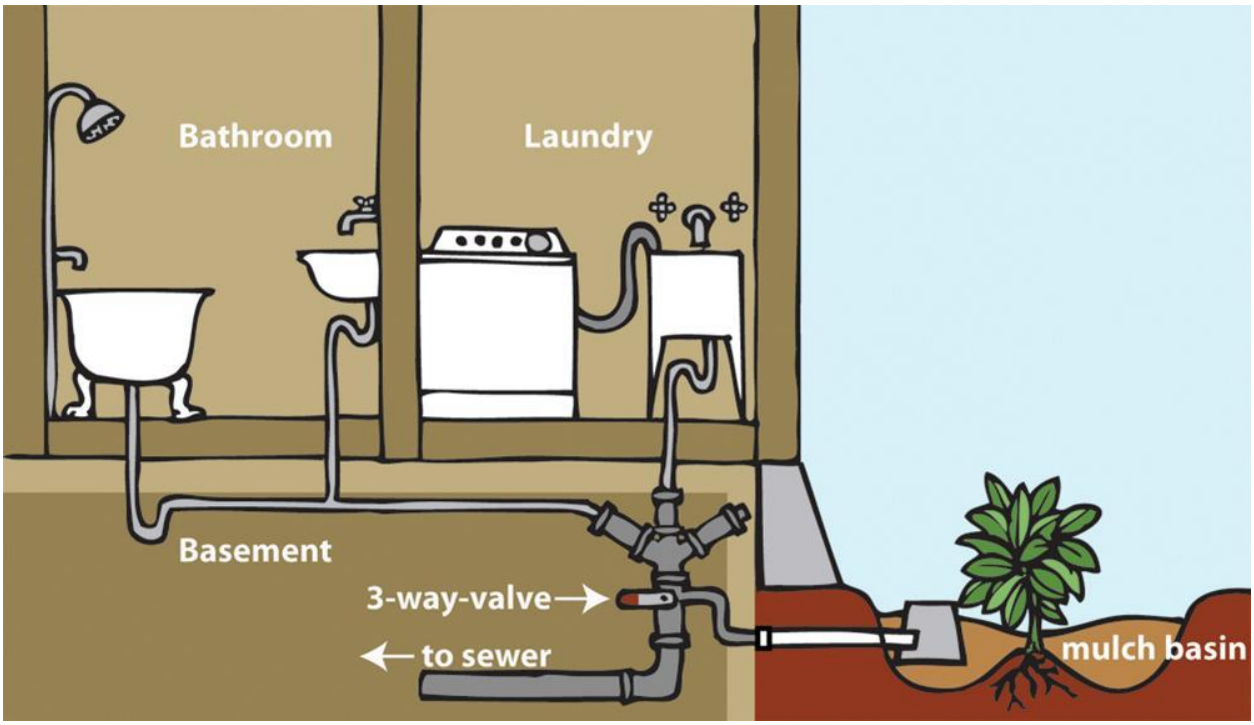
Intent: Greywater is all wastewater generated in the house from laundries, showers, and sinks; excluding toilet wastewater which is identified as blackwater. Greywater can be redirected for reuse as a nutrient-rich irrigation source, which conserves water.

Washington Department of Health further defines the following tiers of greywater and their allowed system designs:

Project Type	Source of Greywater	Storage	Quantity	Treatment and Distribution
Tier One	LIGHT GREYWATER • Lav/Bathroom Basins (sinks) • Showers • Bath tubs • Clothes washing machines	None	Less than 60 gallons per day per irrigation system - limit 2 per building	No treatment - gravity (Exception: Treatment is required when used in a public location such as a playground, school, church, or park)
Tier Two*		Less than 24 hours per day	Less than 3,500 gallons per day	No treatment - even distribution (typically by pressure)
Tier Three*	DARK GREYWATER • Non-laundry utility sinks • Kitchen sinks and dishwasher • All greywater combined that has NOT come in contact with wastewater from a toilet or urinal	No limit	Less than 3,500 gallons per day	Treatment Required - even distribution (typically by pressure)

To use greywater for irrigation, a dual plumbing system must be installed to separate it from dark greywater and blackwater generated from toilet flushing. The greywater system is operated seasonally and utilizes indoor switches to direct the greywater to either a

subsurface irrigation system (during irrigating months) or to the municipal wastewater system (during non-irrigating months). See Emerald Star case study in Credit 2-54.



(Source: http://scceh.com/Home/Programs/WaterResources/WaterConservationProgram/Graywater.aspx)

For single-family homes, permitting greywater systems for irrigation is relatively easy; the same cannot be said for use of greywater indoors for non-potable water use (e.g., toilet flushing), see credit 2-69. However, systems do still require compliance with stringent local and state regulations. Greywater irrigation systems are generally required to be subsurface, although some local jurisdictions permit above ground irrigation. Factors affecting the approval and use of greywater irrigation systems include soil depth and characteristics as well as drainage and flooding patterns. Other guidelines include setbacks for greywater irrigation lines from property or potable water line. Please check with your local health department for specific code and permitting requirements.

Note: If you choose to plumb for greywater irrigation, you should also consider providing plumbing to use rainwater or greywater for toilet flushing, see Credit 2-69.

In Seattle, ILFI's modeled 800 sq. ft. roof of a single-family residence could collect enough rainwater to seasonally flush toilets or meet irrigation demand, but not both. Compared to rainwater harvesting systems, greywater systems provide a steady and reliable source of water for irrigation through dry summer months and do not demand large amounts of storage space on compact sites. Using rainwater for toilet flushing (see Credit 2-69 and 2-70) and greywater for irrigation offers a more substantial financial incentive for homebuyers, because it will reduce both household water fees and sewer utility fees, and

because the sewer utility fees are based on indoor winter water use. However, for particularly large landscaping areas, or for areas where greywater cannot be used (e.g., food producing gardens), adding a supplemental rainwater harvesting system can add additional irrigation capacity and will provide further occupant water reductions, see Credit 2-56. Consult a water systems engineer to accurately size the greywater system to reflect the water savings goals while maintaining reasonable cost. Tools such as Ecotrope's Cistern Sizing tool are good for project design teams to start with.

Performance Requirement: Install all necessary greywater plumbing and systems that are located in-wall or require demolition of building structures for installation. Also include a pre-plumbed connection for future irrigation on the exterior of the building. Plumbing for the exterior subsurface irrigation system is not required. May be combined with Credit 2-54 in cases where a greywater system is pre-plumbed and a rainwater harvesting system is installed or vice versa. Requires information be provided to property owners about the pre-plumbed greywater system and what it would take to install the full grey water system, see Credit 7-2.

Points: 8 Points

When Verified: Greywater system reviewed at completion of design. Visually verified at during intermediate construction inspections.

Cross-Reference: 2-54, 2-56, 2-69, 7-2

Resources:

WA Water Reuse Permit Map: https://living-future.org/wp-content/uploads/2019/01/permit-map-Washington.pdf

ILFI A Decision-Maker's Guide to Cost-Effective Residential Potable Water Reduction in Seattle, WA: https://www2.living-future.org/potable-water-reduction

General Information about Greywater Irrigation (Santa Cruz, CA): http://scceh.com/Home/Programs/WaterResources/WaterConservationProgram/Graywater.aspx

WA Dept of Health-Greywater Reuse: https://www.doh.wa.gov/communityandenvironment/wastewatermanagement/greywaterreuse

Ecotrope Cistern Sizing Tool: http://ecotope.com/cistern-sizing-tool/

2-54: Install greywater system for irrigation

Responsible Party: General Contractor, Plumbing Engineer, Landscape Contractor

Intent: See Credit 2-53, *Pre-plumb for greywater reuse for irrigation* for discussion of greywater and related requirements. By providing a fully installed and operational greywater system Developers/Builders provide instant cost-effective potable water reductions and savings to property owners and residents. This is a very attractive sales feature in expensive municipal water markets.

Consult a water systems engineer to accurately size the greywater system to reflect the water savings goals while maintaining reasonable cost. Tools such as Ecotrope's Cistern Sizing tool are good for project design teams to start with. To be operational, the greywater system would be hooked up to the irrigation system. The irrigation system ideally would be supplied using a gravity-fed system but can also be supplied using storage tank(s) and a small-scale pressurized pump system. In cases where you would be using collected rainwater, hook up the irrigation system to the cistern(s), see Credit 2-56.

Emerald Star Case Study

In a West Seattle Built Green Emerald Star certified home, built by TC Legend Homes, the homeowners installed a simple greywater reuse system (a branched drain system with no filter or storage) that is used to irrigate parts of their yard. The system consists of two independent parts. The main floor bathroom's water drains to the backyard, and the upper floor bathroom drains to the front yard, using separate valves that can be (de)activated via a switch in each of the bathrooms. The system uses a simple, gravity-based, branched-drain design with subsurface pipes that feed eight mulch basins in the front yard and two mulch basins in the backyard. The system is typically in operation from April until September, corresponding to Seattle's dry season. Maintenance effort and cost are negligible as there are no filters, tanks, or pumps involved. In 2020, the homeowners have documented that, with the combined rainwater harvesting and greywater systems, they have reduced their water use over 90% and $900 per year in water utility bills.

Performance Requirement: Install an operational greywater and/or rainwater collection system to provide irrigation for site landscaping. May be combined with Credit 2-56. Requires information be provided to property owners about the greywater system, how it works, required maintenance, and considerations for soaps and other chemicals that could be harmful to landscaping and water quality, see Credits 7-2, 7-4, and 7-9.

Points: 10 Points

When Verified: Greywater system reviewed at completion of design. Visually verified at during intermediate construction and final inspections.

Resources: 2-53, 7-2, 7-4, 7-9

WA Dept of Health-Greywater Reuse: https://www.doh.wa.gov/communityandenvironment/wastewatermanagement/greywaterreuse

Ecotrope Cistern Sizing Tool: http://ecotope.com/cistern-sizing-tool/

2-55: Install landscaping that requires no potable water for irrigation after initial establishment period (approx. 1 yr, trees 3 years, food production excluded)

Responsible Party: General Contractor, Landscape Architect, Plumbing Engineer

Intent: Reduce potable water use for landscaping. Establishment period is defined as one (1) year for vegetation and three (3) years for newly planted trees. Food producing landscaping is exempt.

Plant vegetation that is native to the area or suitable for our climate and rainfall characteristics. You should amend soil with compost to help establish good soil conditions to establish new plants; proper placement of individual plants in the landscape can reduce supplemental watering needs. Add hardscape and mulch or bark to areas as landscape features that do not require watering. For initial establishment irrigation, consider using greywater, see Credit 2-53.

Performance Requirement: 100% of landscaping either requires no watering after establishment period or greywater or rainwater systems are installed for ongoing watering. Landscape designer must provide written statement of design intent to meet this requirement, must confirm the installation meets the design intent, and provide landscape maintenance requirements for the establishment and post-establishment periods. If using non-potable water for irrigation, landscape designer must also calculate landscape irrigation demand, and show that rainwater harvest/storage, and/or greywater treatment capacity is sufficient to meet demand.

Educate the homeowner on landscape maintenance requirements for the establishment and post-establishment periods, when and how to remove any temporary irrigation systems after the initial plant establishment period; and provide Operations & Maintenance requirements for any water reuse systems installed, see Credits 7-1 and 7-9.

Points: 12 points

When Verified: Landscape and irrigation plans reviewed at completion of design. Visually verified during intermediate construction and final inspections.

Cross Reference: 1-17, 2-53, 2-54, 2-56, 7-1, 7-9

2-56: Install rainwater collection system (cistern) for reuse

Responsible Party: General Contractor, Landscape Architect or Plumbing Engineer

Intent: Washington's rainy winters provide an abundant source of freshwater that can be utilized in homes to reduce occupant water use of potable water sources. Let the homeowner know that rainwater supply is not intended for potable use (e.g., drinking water). Rainwater collection systems for non-potable water reuse for irrigation are easily permitted, but do not provide as much financial incentives to builders or property owners and are not as reliable of a water source as greywater during dry months unless very large cisterns are utilized. This can be challenging on space-strapped urban sites. Reuse of rainwater to flush toilets during the wetter seasons provides both a financial benefit and high marketability to potential buyers and is a more cost-effective and space-efficient approach to occupant water reduction. Additionally, this type of rainwater reuse system does require a specific permit and some level of plan review, but is possible for single-family homes, unlike greywater systems for non-potable water use indoors.

Rainwater collection for potable water use is allowed but is considered an "exception" to code and requires case-by-case approval and compliance with stringent local and state health regulations. Check with your local municipality for rainwater collection regulations.

A rooftop rainwater collection system consists of a suitable roof and gutter system, a storage tank(s), and a simple filtration system. The irrigation system can be supplied using the tank(s) and a small-scale pressurized pump system. Depending on system size they can provide significant quantities of irrigation water. Whether a rooftop cistern will be sufficient to meet all of the irrigation demands during the dry season will depend on landscape irrigation requirements and the system's storage capacity. Consult a water systems engineer to accurately size the greywater system to reflect the water savings goals while maintaining reasonable cost. Tools such as Ecotrope's Cistern Sizing tool are good for project design teams to start with.

Individual cisterns can be located beneath each downspout, or the desired storage volume can be provided in one, or multiple, large cistern(s) that collect rainwater from several sources. Pre-manufactured residential-use cisterns come in sizes ranging from 55 to 5,000 gallons. Cisterns should be located above ground to reduce installation costs and to ease maintenance or replacement.

For collecting rainwater from roof areas:

- Use appropriate roofing materials such as metal, tile, or fiber cement. Lead-containing materials, such as flashing, should not be used in catchment roofs. Likewise, ensure that no zinc, moss prevention measure such as galvanized ridge

caps, copper flashing, or copper wires are used. Asphalt composition roofs should not be used for collecting water for watering any food producing plants.
- Construct cistern or tank storage sized for the rainfall amount and roof size, with appropriate overflow devices. Cisterns can be made of concrete, ferro-cement, stone, or prefabricated metal, plastic, or fiberglass. Use only watertight, opaque materials and provide a cover.
- Provide an overflow route to direct excess flows away from building and in such a manner as to avoid impact to downstream properties.
- Install gutters and downspouts sized for the roof and rainfall intensity.
- Install screening devices or roof washers to filter out leaves, debris, and sediment that can clog the system.

Performance Requirement: Install at least one 200-gallon (or more) rainwater collection system that can be used for non-potable water purposes on-site. Requires property owners be educated on how the system works and required maintenance, see Credits 7-1, 7-2, and 7-7. May be combined with credits 2-54 and 2-70.

Points breakdown: 1 point per 200 gallons of storage capacity, 10 points maximum.

When Verified: Rainwater harvesting system reviewed at completion of design. Visually verified at during intermediate construction and final inspections.

Cross Reference: 2-54, 2-70, 7-1, 7-2, 7-7

Resources:

WA Water Reuse Permit Map: https://living-future.org/wp-content/uploads/2019/01/permit-map-Washington.pdf

ILFI A Decision-Maker's Guide to Cost-Effective Residential Potable Water Reduction in Seattle, WA: https://www2.living-future.org/potable-water-reduction

Ecotrope Cistern Sizing Tool: http://ecotope.com/cistern-sizing-tool/

2-57: Irrigation system is designed by a professional in accordance with EPA WaterSense requirements (or equivalent) and installed in accordance with EPA WaterSense Program or equivalent

Responsible Party: General Contractor or Landscape Architect

Intent: Reduce water consumption for landscape irrigation through appropriate irrigation system design. Irrigation professionals certified by a WaterSense labeled program can help you reduce your water consumption, save money, and maintain a healthy and beautiful landscape by maximizing the efficiency of your irrigation system.

Performance Requirement: Irrigation system is designed by a certified EPA WaterSense professional, or equivalent professional. EPA WaterSense certification also meets the intention of this credit.

Points: 2 Points

When Verified: Visually verify at final inspection, with review of designer credential and controller documentation. Commissioning of irrigation system by the designer or a third party WaterSense auditor, prior to turnover, is highly recommended.

Resources:

WaterSense - Irrigate with a Pro: https://www.epa.gov/watersense/irrigation-pro

WaterSense certified professionals: https://www.epa.gov/water-sense/find-pro

2-58: Evapotranspiration-based irrigation controller with a rain sensor

Responsible Party: General Contractor or Landscape Contractor

Intent: "Smart Controller" is a recent term used to describe a controller that is capable of adjusting the watering time by itself in response to current environmental conditions. The smart controller determines current conditions by means of historic weather data for the local area, soil moisture sensor (water potential or water content), weather station, or a combination of these.

Evapotranspiration-based irrigation scheduling is based on Evapotranspiration (ET), that combines the effects of soil evaporation and plant transpiration rates; and water lost from the root zone due to ET is replenished to meet plant water requirements.

Performance Requirement: For each irrigation zone install Evapotranspiration-based irrigation controller with a rain sensor as part of the site's permanent irrigation system. May not be combined with Credit 2-55.

Points: 2 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

2-59: Soil moisture sensor-based irrigation controller

Responsible Party: General Contractor or Landscape Contractor

Intent: "Smart Controller" is a recent term used to describe a controller that is capable of adjusting the watering time by itself in response to current environmental conditions. The smart controller determines current conditions by means of historic weather data for the local area, soil moisture sensor (water potential or water content), weather station, or a combination of these.

Soil moisture-based irrigation controllers, also known as soil moisture sensors (SMSs), are one option to help homeowners and businesses achieve water-efficient irrigation scheduling. By detecting the amount of moisture in the ground beneath the landscape, SMSs override scheduled irrigation when plants don't need water, helping reduce water waste and promote plant health.

Performance Requirement: Each irrigation zone has a solenoid valve on it that is controlled via wire by an irrigation controller that monitors soil moisture as part of the site's permanent irrigation system. The irrigation controller is either a mechanical or electrical device that signals a zone to turn on and keeps it on for a specified amount of time. May not be combined with Credit 2-55.

Points: 2 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Resources:

EPA Watersense Soil Moisture Irrigation Controllers: https://www.epa.gov/watersense/soil-moisture-based-irrigation-controllers

2-60: Install a leak detection system with excess water flow shutoff

Responsible Party: General Contractor, Plumbing Engineer or Contractor

Intent: Prevents unnecessary water consumption due to leaks or open taps, saving money and preventing costly damage to property.

Performance Requirement: Install a leak detection system at all primary water systems (e.g., water heater, dishwasher, ice maker, washing machine, kitchen sink, showers/baths and irrigation (if installed) with point-of-use or whole-house excess water flow shutoff valve. Include operational information to homeowner as part of the Homeowner's Kit, see Credit 7-1.

Points: 2 Points

When Verified: Visually verified at final inspections.

Cross Reference: 7-1

2-61: Plumbing system with all plumbing fixture fittings (faucets & showerheads) located such that the volume of the water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (1.42 liters) (86.63 cubic inches) (.38 gallons)

Responsible Party: General Contractor, Plumbing Engineer or Contractor

Intent: As houses have grown in size so have the lengths and numbers of hot water distribution lines. The longer the lines the more water and energy are wasted as the occupant waits for hot water to be delivered to them. In homes the time-to-tap wait can be 90 seconds or more. A family of four that uses a low-flow 1.75GPM showerhead will waste over 2,000 gallons a year.[1] The ideal hot water distribution system would minimize the time-to-tap. To do this, it would have the smallest possible volume of water in the pipe from the source of hot water to the fixture. Small diameter flexible pipes are run from a manifold with branched outlets located near the water heater directly to the fixtures, thereby reducing the volume of water in the individual pipe.

Another consideration for an ideal water distribution system: all the hot water outlets would be close to the water heater that serves them, and there might be more than one water heater per building. For a given layout of hot water locations, the system will have the shortest buildable trunk line, few or no branches, the shortest buildable twigs, and the fewest plumbing restrictions. However, having multiple water heaters in a single structure is not efficient in terms of materials and may not be any more energy-efficient depending on the home's size and layout. It would also increase maintenance costs for the owner in the future. This strategy should only be considered for large homes that could realize a benefit from multiple water heaters. Most standard-sized homes should instead locate water heaters, like ducted furnaces, in a more central location to decrease the length of trunk lines and reduce volume of water in those lines. To reduce required piping materials and time-to-tap times to the greatest extent use a zoned trunk and branch design for the layout of water pipes.

Installing a recirculation pump for the domestic hot water will further increase energy and water efficiency, see Credit 2-71. If hot water lines are zoned, circulation pumps will need to be installed for each zone.

Performance Requirement: Use central core plumbing by locating the water heater within 15 feet of all hot water fixtures, including bathrooms, kitchen, and laundry. Use 3/8 piping for sinks and 1/2 piping for other fixtures.

Points: 8 Points

When Verified: Reviewed at completion of design. Visually verified during intermediate construction inspections. Conduct or verify the commissioning report at final inspection.

Cross Reference: 2-71

Resources:

[1] Assumption: 1.75 GPM, 90-second time-to-tap, 4 showers per week for 4 people.

Efficient Hot Water Piping: https://www.garykleinassociates.com/PDFs/15%20-%20Efficient%20Hot-Water%20Piping-JLC.pdf

Protocol for Evaluating the Layout of a Hot Water Distribution System: https://www.garykleinassociates.com/PDFs/Protocol%20for%20Evaluating%20a%20HWDS%202014-10-10.pdf

HIGH PERFORMANCE HOT WATER SYSTEMS: https://www.garykleinassociates.com/PDFs/07%20-%20A%20Series%20on%20High%20Performance%20Hot%20Water%20Systems%20-%20Parts%201-3.pdf

2-62: When installing low-flow fixtures, minimize 90 degree bends in PEX plumbing; farthest faucet to have the minimum rated PSI for faucet

Responsible Party: General Contractor or Plumbing Engineer or Contractor

Intent: Low-flow fixtures are a cost-effective and critical strategy to reduce occupant water use. Unfortunately, many traditional water distribution systems are not optimizing water flow to all of these fixtures. Occupants that experience poor water pressure typically blame the low-flow fixture when it's actually the distribution system that is causing it to underperform. So they replace the fixtures with higher flow fixtures or remove the water-saving aerators to obtain the comfortable experience they desire. This eliminates the potential water savings and creates materials inefficiency and waste.

When we describe water, we say it flows not bends. Water moves most efficiently when it does not have to bend in unnatural 90-degree angles. Every time water is forced to turn these sharp angles it loses pressure. If distribution lines are optimized to provide at least the minimum specified PSI to all low-flow fixtures, occupants will be less likely to replace them and save on water.

Instead of using L-shaped fittings that create sharp 90-degree bends, use bend supporters or clamps to create curves wider than 90 degrees so water can flow more naturally through plumbing and lose less pressure as it travels.

Performance Requirement: Minimize the use of sharp 90-degree bends in PEX plumbing and ensure the faucet farthest from its water supply has the minimum PSI the faucet is rated for.

Points: 10 Points

When Verified: Reviewed at completion of design. Visually verified during intermediate construction inspections. Conduct or verify the commissioning report at final inspection.

Resources:

Protocol for Evaluating the Layout of a Hot Water Distribution System: https://www.garykleinassociates.com/PDFs/Protocol%20for%20Evaluating%20a%20HWDS%202014-10-10.pdf

HIGH PERFORMANCE HOT WATER SYSTEMS: https://www.garykleinassociates.com/PDFs/07%20-%20A%20Series%20on%20High%20Performance%20Hot%20Water%20Systems%20-%20Parts%201-3.pdf

2-63: Install bathroom faucets with 1.5 GPM or less or 1.0 GPM or less, must be EPA Watersense labelled

Responsible Party: General Contractor, Architect, Plumbing Engineer

Intent: Low-flow fixtures are the most cost-effective and critical strategy to reduce occupant water use. They provide the perception of greater flow through aerating the water stream or by creating a laminar flow (essentially a hollow cylinder of water that appears to be solid).

Consumer performance complaints regarding reduced flow rates are most often associated with the "feel" of the water coming from the faucet and clogging associated with equipment that reduces flow rate with small hole screening. Faucets with flow rates less than 2.5 GPM with the "feel" of higher flow and guaranteed against clogging are now available. Remember that not all brands are created equal, so talk to your supplier.

Performance Requirement: Requires all installed bathroom faucets have a flow rate of 1.5 GPM or less and WaterSense labelled. Points for different flow rates cannot be combined and are determined by the flow rate representing the majority of faucets.

Points breakdown:

2 points: Bathroom faucets with 1.5-1.2 GPM

3 points: Bathroom faucets with 1.0 GPM or less

When Verified: Reviewed at completion of design. Visually verified during intermediate construction inspections. Conduct or verify the commissioning report at final inspection.

2-64: Install bathroom showerheads with 1.75 GPM or less or 1.5 GPM or less, must be EPA Watersense labelled

Responsible Party: General Contractor, Architect, Plumbing Engineer

Intent: Since showers are where the average household consumes significant hot water every day, they are ideal for cutting hot water use. Showerheads today achieve low-flow with restrictors that can be easily removed by a plumber or user, allowing the flow to be

significantly increased—thus circumventing the regulations. Another way people have circumvented requirements is by installing multiple showerheads and body-wash nozzles in one shower system or by creating rain-like water sculptures that manufacturers claim are not showers at all.

Consumer performance complaints regarding reduced flow rates are most often associated with the "feel" of water coming from the faucet and clogging associated with equipment that reduces flow rate with small hole screening. Faucets with flow rates less than 2.5 GPM with the "feel" of higher flow and guaranteed against clogging are now available. Remember that not all brands are created equal, so talk to your supplier.

The best showerheads today have been designed for water efficiency from the ground up. Some models rely on the Venturi effect to aerate droplets and create the feel of a forceful shower while using relatively little water—as little as 1.5 GPM (5.7 LPM); a challenge here is to keep the aeration from making the droplets too small. Other manufacturers have gone even further in showerhead redesign, creating a pulsed shower with large droplets. Look for water-saving showerheads or valves that allow occupants to pause the water stream without losing their temperature setting.

To prevent poor occupant experience with low-flow showerheads consider optimizing the hot water distribution system by reducing distribution time and pressure loss from hot water heater (credits 2-61 and 2-62), insulating hot water pipes and installing a recirculation pump (Credit 2-71).

Performance Requirement: Requires maximum flow rate for all installed showerheads to have a flow rate of 1.75 GPM or less and WaterSense labelled. Points for different flow rates cannot be combined and are determined by the flow rate representing the majority of showerheads. No more than 2 showerheads may be installed per shower.

Points breakdown:

1 point: Showerheads with 1.75 GPM or less

2 points: Showerheads with 1.5 GPM or less

When Verified: Reviewed at completion of design. Visually verified during intermediate construction inspections. Conduct or verify the commissioning report at final inspection.

2-65: Install kitchen faucets with less than 2.0 GPM, must be EPA Watersense labelled

Responsible Party: General Contractor, Architect, Plumbing Engineer

Intent: Due to the need to fill kitchen pots with water, a higher allowance for kitchen faucets has been adopted. In kitchens, flow controllability tends to be a more significant water-saving feature, see Credits 6-22 and 2-67.

Performance Requirement: Requires maximum flow rate for all installed kitchen faucets to have a flow rate of 2.0 GPM or less and EPA WaterSense labelled. Points cannot be combined for multiple faucets.

Points: 1 Point

When Verified: Reviewed at completion of design. Visually verified during intermediate construction inspections. Conduct or verify the commissioning report at final inspection.

Cross Reference: 6-22, 2-67

2-66: Install high-performance low-flush (0.8 GPF) or dual-flush toilets (0.8/1.28 GPF), must be EPA Watersense labelled

Responsible Party: General Contractor, Architect, Plumbing Engineer

Intent: Federal law mandates all new toilets use no more than 1.6 gallons per flush (GPF). Toilet flushing is the largest single use of water (up to 40% of residential water use), and water savings from the new standard is significant compared to the older models that used 3 to 5 GPF. Much has changed since the federal law took effect, and new high-efficiency and ultra-high-efficiency toilets (UHETs) offer a powerful flush with even less water. In fact, some of the newest UHET models use as little as 0.8 gallons, though 1.28 GPF is now common.

High-efficiency toilets today are available with gravity-flush, pressure-assist, and flushometer–valve mechanisms and achieve excellent performance with minimal water per flush. Dual-flush toilets allow for occupants to select water use based upon their needs, thus reducing water without compromising the experience. High-performance low-flush toilets offer even greater water savings and the benefit of simpler user experience, plumbing, and maintenance.

Many municipal water providers offer rebates for high-efficiency toilets. Check your local water utility for available water-saving rebates.

Performance Requirement: Install high-performance low-flush toilets with EPA WaterSense label; 0.8 GPF maximum for single flush toilets or a 0.8/1.28 GPF maximum for dual-flush toilets.

Points breakdown: 1 point per toilet installed. Maximum 4 points.

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Resources:

Saving Water Partnerships Toilet Rebates: https://www.savingwater.org/rebates/

2-67: Self-closing valve, motion sensor, metering, or pedal-activated faucet is installed to enable intermittent on/off operation

Responsible Party: General Contractor, Architect, Plumbing Engineer

Intent: Significant savings can be achieved with faucets— and especially kitchen faucets and showerheads—by installing a foot- or knee-operated control so that users can turn the water on and off without using their hands (and while retaining the desired temperature mix). A less expensive option is a simple tap-touch or lever control on the faucet itself that allows the user to temporarily reduce, or turn off, the flow with a simple flick of the finger or brief touch.

While motion sensors that turn on the flow when a user's hands are properly positioned might seem like a convenient water-saving feature, studies have shown that they often increase water use, because they turn on unnecessarily or stay on longer than needed. If motion sensor faucets are installed, they will need to be commissioned to ensure the sensor is configured to only turn the fixture on when someone is at the sink and that it does not stay on too long after user no longer needs it.

Performance Requirement: Install fixtures in high-use areas that enable intermittent or hands-free on/off operation.

Points breakdown:

1 point: per bathroom or utility sink faucets

3 points: Kitchen faucet or showerheads

When Verified: Visually verified at final inspection.

Cross Reference: 6-22

2-68: Install composting toilets

Responsible Party: General Contractor, Architect

Intent: Most composting toilets work by mixing waste with sawdust, wood chips, or other dry material. The waste soaks up moisture to get to an ideal carbon-nitrogen ratio that, combined with the right temperature, drainage, aeration and ventilation, reduces the volume of waste so it can be used in outdoor compost.

Composting toilets are often preferred for their water- and energy-saving abilities as well as their low cost and maintenance. They can eliminate the need for tying into a main sewer

line or installing a septic system, great for tiny homes or DADUs. The waste is also a nutrient-rich fertilizer for gardens and landscaping. Green Living Ideas notes that a composting toilet can save more than 6,500 gallons of water annually.

Performance Requirement: Install at least one composting toilet that is certified by the National Sanitation Foundation (NSF).

Points: 10 Points

When Verified: Visually verified at final inspection.

Resources:

Water Conserving On-Site Wastewater Treatment Systems: https://www.doh.wa.gov/Portals/1/Documents/Pubs/337-016.pdf

Composting toilet options (2021): https://www.bobvila.com/articles/best-composting-toilet/

2-69: Stub-in plumbing to use greywater or rainwater for indoor reuse

Responsible Party: General Contractor, Plumbing Engineer

Intent: Greywater reuse for non-potable indoor water use (e.g., flushing toilets) provides the highest rate of water savings (an estimated 43%) and is the most cost-effective means for occupant water reduction in single-family homes with the fastest payback period. The International Living Future Institute's 2020 regulatory review of greywater reuse systems for non-potable use found that, "In order to use treated greywater for any non-potable indoor demand, such as toilet flushing, the project will need to follow the Washington State Building Code and secure permits from the local building or plumbing department. Washington State Building Code includes Chapter 15 (WAC 51-56-1500) for 'Alternate Water Sources for Non-Potable Applications.' This code allows for the use of treated greywater inside a building for toilet flushing if the water meets the Washington Class A reclaimed water standard. Therefore, treating greywater to reuse back inside the building for toilet flushing would require a more complex treatment system than treating greywater for landscape irrigation. Another important requirement under Section 1501.1 of the 2018 Uniform Plumbing Code is that an indoor non-potable reuse system cannot be located in single-family homes or townhomes…the [Washington State] Department of Health has not issued any rules stating that the systems can be installed at that scale, which essentially removes their ability to permit a greywater to non-potable system."

Although the use of greywater for toilet flushing is not currently allowed by the residential code, this is expected to change in the future as potable water resources in our region become even more limited. Organizations, like ILFI and green building certification programs like Built Green will be advocating for the issuance of new rules around reuse of

greywater for non-potable indoor uses. Additionally, these systems are now permitted with a variance on a case-by-case basis for multifamily projects.

(Source: ILFI, A Decision-Maker's Guide to Cost-Effective Residential Potable Water Reduction in Seattle, WA: https://www2.living-future.org/potable-water-reduction)

An alternative to greywater reuse is rainwater harvesting for non-potable water reuse indoors, which is permitted under current code. It is more costly than greywater systems and requires more equipment and space to operate but can still generate significant water savings (an estimated 16%); even more when paired with a greywater reuse system for irrigation. A rainwater reuse system for non-potable indoor water use consists of a rainwater harvesting system (roof and storage cisterns), filtration system, and dual plumbing to all toilets to supply both rainwater and municipal water sources. Due to the diminishing returns on storage capacity and cost, for most urban single-family homes it is recommended that to focus on sizing the systems to provide toilet flushing during the wetter months (October through April). Consult a water systems engineer to accurately size the greywater/rainwater system to reflect the water savings goals while maintaining reasonable cost. Tools such as Ecotrope's Cistern Sizing tool are a good place to start for project design teams.

Performance Requirement: Rainwater harvesting for indoor non-potable reuse requires dual plumbing that will connect to the storage tanks (cisterns), and filtration system. For this credit install all necessary greywater/rainwater plumbing and systems (valves) that are located in-wall or require demolition of building structures for installation. Also include a pre-plumbed connection for future connection to cisterns on the exterior of the building. If pre-plumbing for a rainwater collection system, see roofing and cistern sizing and space requirements in Credit 2-56. Consult a water systems engineer on planning future placing

of cisterns for site and plumbing layout planning. Cisterns and mechanical filtration systems are not required to meet the intent of this credit, only that space and internal infrastructure for the equipment is provided.

Note: If you choose this Credit, you should also consider providing plumbing for the use of a greywater for irrigation system, see Credit 2-53, *Pre-plumb for greywater reuse for irrigation*.

Points: 8 Points

When Verified: Greywater or rainwater harvesting system reviewed at completion of design. Visually verified during intermediate construction and final inspections.

Cross Reference: 2-53, 2-56

Resources:

WA Water Reuse Permit Map: https://living-future.org/wp-content/uploads/2019/01/permit-map-Washington.pdf

ILFI, A Decision-Maker's Guide to Cost-Effective Residential Potable Water Reduction in Seattle, WA: https://www2.living-future.org/potable-water-reduction

Ecotrope Cistern Sizing Tool: http://ecotope.com/cistern-sizing-tool/

2-70: Install greywater or rainwater system for indoor reuse

Responsible Party: General Contractor, Plumbing Engineer

Intent: See Credit 2-69, *stub-in plumbing for greywater or rainwater for indoor reuse*, for discussion of greywater and related requirements. By providing a fully installed and operational greywater system Developers/Builders provide instant cost-effective potable water reductions and savings to property owners and residents. This is a very attractive sales feature in expensive municipal water markets.

Consult a water systems engineer to accurately size the greywater system to reflect the water savings goals while maintaining reasonable cost. Tools such as Ecotrope's Cistern Sizing tool are good for project design teams to start with. To be operational, the greywater or rainwater system would be hooked up to provide water for indoor use. To be operational all necessary equipment and systems need to be in place for occupants to use at time of occupation.

Performance Requirement: Install an operational greywater and/or rainwater collection system to provide for non-potable water uses indoors. If using a rainwater system, it may be combined with Credit 2-56. Requires information be provided to property owners about the greywater system, how it works, required maintenance, and considerations for soaps

and other chemicals that could be harmful to landscaping and water quality, see Credits 7-2, 7-4, and 7-9.

Points: 10 Points

When Verified: Greywater or rainwater harvesting system reviewed at completion of design. Visually verified at during intermediate construction and final inspections.

Cross Reference: 2-53, 2-56, 7-2, 7-4, 7-9

Resources:

WA Dept of Health-Greywater Reuse: https://www.doh.wa.gov/communityandenvironment/wastewatermanagement/greywaterreuse

Ecotrope Cistern Sizing Tool: http://ecotope.com/cistern-sizing-tool/

2-71: Install a recirculating pump for domestic hot water w/ timer

Responsible Party: General Contractor or Plumbing Engineer

Intent: Recirculating pumps have the potential to solve the time-to-tap problem of a long wait for hot water at a distant fixture while simultaneously saving energy, water, and money. Recirculating pumps rapidly pull hot water from a water heater, while simultaneously sending cool water from the hot water lines back to the water heater to be reheated and reused. Demand systems can be controlled by the push of a button, a timer, or motion sensor. Pumps with timers and motion sensors allow users to conveniently balance comfort with water and energy savings. Recirculation systems that operate continuously can potentially use more energy due to pumping requirements and losing hot water energy in the pipes, than the energy saved by reducing hot water waste.

Full Recirculating Pump System: With this option, an additional pipe that is designated for hot water is installed in the home's plumbing. This system creates a loop from the water heater to the faucet and back again, the unused hot water is drawn back through this loop by the pump. When the hot water faucets are turned on, hot water is delivered quickly because no water was left in the pipes to get cold. Many pumps are designed with sensors and timers. The sensor shuts the pump off once hot water has made a complete loop. A timer allows a user to control when the pump is active, like during morning showers, and they can set it to automatically shut off this system or set it on a "vacation" mode.

Recirculating Pump Comfort System: This is a cost-effective solution for homeowners who are frustrated with the wait for hot water but are unable to install the first option. The Comfort System can bring hot water quickly to areas in their home that usually take a long time. For example, if their water is far away from a shower or kitchen, the recirculating pump will

solve this problem with no additional pipe. This lowers the initial cost. These pumps typically cost somewhere in the $500–$800 range, though exceptions do apply.

See Credit 2-61 for high-performance plumbing design and layout strategies that can reduce the time-to-tap wait even further. Savings thousands of gallons of water and homeowners hundreds of dollars annually.

Performance Requirement: Connect recirculating pump's temperature sensor to the faucet farthest from the water heater. The pump should include either motion sensors at high-use fixtures or timers that will turn the pump off when hot water is not needed. If hot water lines are zoned, circulation pumps will need to be installed for each zone.

Points: 3 points

When Verified: Visually verified at final inspection.

Cross Reference: 2-61

Water Quality

2-72: Install a chemical and salt free water softener system

Responsible Party: General Contractor or Plumbing Engineer

Intent: Hard water can cause residue buildup on fixtures and faucets. Calcium and magnesium chemicals in hard water prevent soaps and detergents from lathering, which leads to buildup. Over time, scale can build up in plumbing and appliances, which decrease their longevity. Chemicals released from conventional water supply can lead to long-term health issues. A water softener system can reduce these problems as well as save money in the long term.

Conventional water softener systems consist of chemical or salt treatments. Research shows that these chemicals and salts show up in local water bodies, affecting water quality. Alternative systems or "no waste" systems generally forego trying to remove calcium and magnesium from water in favor of simply realigning molecules into larger crystals so they don't fall out of solution and cause pipe buildup. They do this by forcing water to pass through a tube with a rough alloy surface inside of it—the roughness of the surface (and the material it is made out of) encourages molecules to form into crystals. The larger crystals don't clog up pipes, drains, toilets, etc., and the water stays healthy and, unlike hard water, doesn't interfere with soap lathering.

Performance Requirement: Install a chemical- and salt-free water softener system for homes that only have access to hard water. Not applicable to projects that are connected to a municipal water supply that provides soft water.

Points: 2 Points

When Verified: Visually verified at final inspection.

2-73: Install washlet or bidet toilet seats or pre-wire for washlet seat

Responsible Party: Architect, General Contractor, or Plumbing and Electrical Engineer

Intent: When you use a traditional toilet, you're not just flushing away waste—you're also flushing paper, which contributes to deforestation. Even recycled content, sustainably harvested, or non-tree toilet paper requires energy and water to produce and contributes to climate change. Toilet paper also breaks down in the sewage system, becoming a sludge, and requires more processing by sewage treatment facilities to clean the water. Solid waste and sludge that is not removed by the cleaning process must be disposed of in landfills or incinerators. By mostly cleansing with water, many bidet and washlet users find they need less, or no, toilet paper, reducing material waste and a source of sludge in our sewage system.

Performance Requirement: Either pre-wire a junction box or wire an electrical outlet within three feet of toilets to ease future installation of washlet seats by owners; or install washlet or bidet toilet seats for occupant use. If the bidet seat selected does not provide heated water, no electrical is required.

Points breakdown: Maximum of 4 points

1 point: Per pre-wired junction box or electrical outlet installed near toilets for future washlet seat

2 points: Per washlet or bidet toilet seat installed

When Verified: Visually verified at final inspection.

2-74: Provide compost or worm bins instead of a food garbage disposal

Responsible Party: General Contractor

Intent: There are both environmental costs and benefits when using a garbage disposal.

Environmental costs:

- Waste from garbage disposals can overburden old municipal sewage systems. Americans throw away more than 25 percent of the food we prepare, according to the Environmental Protection Agency. Garbage disposals can double the volume of non-liquid material that goes down the drain, displacing food waste from land to water. Many sewer systems around the country are more than 100 years old and operating beyond their design capacity--resulting in more than 40,000 overflows of sewage treatment systems each year. When these old

systems fail, they can release raw sewage containing high levels of nitrogen, chemical contaminants, and microbial pathogens into local waterways—causing harm to ecosystems, animals, and humans.

- Food waste also increases septic tank maintenance. If you have a septic system, using a garbage disposal can mean emptying it twice as often. According to the EPA, half of all septic systems are at least 30 years old. As many as 20 percent or more are malfunctioning in some way, and 10 percent or more back up onto the ground surface or into homes each year. Failing septic systems are the third most common cause of ground water contamination.
- Waste from garbage disposals can clog your drain or worse. Old plumbing systems can easily be overburdened. You'll want to check on the condition and capacity of your pipes before deciding to use a disposal. A disposal uses more water. While garbage disposal are not going to have a large impact on your household's electricity use, they do require running water to move the waste down the drain—about 700 gallons per year.

Environmental benefit:

- Disposals can reduce the amount of solid waste that ends up in landfills and incinerators. A few municipalities, like Tacoma, are actually encouraging consumers to install garbage disposals, especially in places where water is plentiful, the sewage treatment infrastructure has been expanded and modernized, and landfill space is scarce. The food scraps are turned into energy through a biological process known as anaerobic digestion, in which bacteria and other microbes feast on decomposing food that releases methane. The methane is then used to produce electricity for wastewater treatment facilities.

Composting is an old technique that has made a comeback in recent years. The process turns organic wastes (such as grass clippings and food waste) into humus, which is vital to soil fertility. About thirty percent of household waste is compostable.

Worm bins are one technique that is growing in popularity. They are appropriate for treating primarily vegetative food waste and small amounts of grass clipping. By providing homeowners with a compost or worm bin, you promote this form of waste reduction. In addition, you provide the homeowner with an organic alternative to chemical fertilizers typically used to boost soil fertility. Finally, this organic stream is not added to the sewer system because it doesn't require sink disposal units.

Performance Requirement: Build in a convenient method of collecting food waste in the kitchen. A covered "waste box" can be installed next to the sink. Food waste can then be dropped through a chute into the bin underneath. Additionally, new ready-made food

chutes are now available that can be inserted into the kitchen cabinetry. Incorporate a composting bin into the built-in kitchen recycling center, see Credit 5-95.

Build or provide an outdoor composting bin that residents can use to compost their food waste onsite, even if there is municipal composting available. For sites with multiple homes a communal compost bin can help support communal gardening by residents, while also saving space on the site (see Credit 6-31). Provide a handout or reference link in their Homeowner's Kit on how to start at-home composting, see Credit 7-9.

Points: 3 Points

When Verified: Visually verified at final inspection.

Cross reference: 6-31, 5-95, 7-9

Environmental Design Concepts

2-75: Provide a covered front porch

Responsible Party: Architect

Intent: Front porches help extend living space outdoors, connecting private and public spaces. Among other functional uses, such as providing summer shade, porches enhance neighborhood safety by providing "eyes on the street." Allowing the porch to encroach slightly into the front setback makes the area more visually interesting for pedestrians without reducing the size of the backyard. Covered porches also contribute to better indoor air quality. The protected area under a covered porch reduces the amount of air pollutant particles tracked into the home in two ways. First, covered porches accumulate less debris and second, well designed covered porches also allow for shoes to be removed and stored outside.

Performance Requirement: Build a covered front porch that provides at least one of the benefits described in the intent. Consider incorporating a built-in exterior walk-off area (Credit 4-57) or bench for shoe removal into the front porch area (Credit 4-59).

Points: 3 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 6-32, 4-57, 4-59

2-76: Position garage so it is not in front of house, while minimizing impervious driveway area

Responsible Party: Developer, General Contractor, Architect

Intent: The best place to put the garage is behind the house (where it began as a carriage house). Alley access, if that's part of a new development or an element of the infill lot you selected, reduces the dominance of cars and driveways in the front of the house, providing more visually interesting and safer sidewalks, see Credit 6-32.

However, if alley access is not part of your development, you can place the garage door openings to the side or back of the house to present a consistent look for the front of the house. The driveway can easily lead to a side or back entrance. If there are grading changes required at the front of the house that requires the use of stairs to access the front of the home, in many cases stepless entries can be created through the garage or side entrances and may even be beneficial.

Performance Requirement: To receive points for this credit, you cannot locate the garage in the front, or in any way facing the street. Developments with multiple structures that share a parking area, and may not have garages, are eligible for this credit if the same intent is applied to the shared parking area.

Points: 3 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 6-32

2-77: Minimize or eliminate the garage

Responsible Party: Developer, General Contractor, or Architect

Intent: Minimizing garage size may help to encourage people to consider alternate transportation methods like mass transit, biking, or walking. It also helps to reduce the focus on having multiple cars.

Performance Requirement: Reduce the size or eliminate garage.

Points breakdown:

2 points: for 2-car garage

5 points: for 1-car garage or no garage

When Verified: Reviewed at completion of design. Visually verified at final inspection.

2-78: Driveways or parking are shared between multiple units

Responsible Party: Developer, General Contractor, or Architect

Intent: Reduction of driveway materials is a benefit that saves you time, money, and materials. With less pavement being added to the project, you reduce impact to both the

side and soil by increasing permeable surfaces and reducing the heat island effect which absorbs and re-emits the sun's heat to the site's natural landscape.

Performance Requirement: Developments with multiple units share a driveway and communal parking area. This is also applicable to developments where garages are built as long as the main driveway and turning areas to the garages are shared by all units.

Points: 4 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

2-79: Bury utility lines in common trenches

Responsible Party: General Contractor, MEP Engineer or Civil Engineer

Intent: Joint trenching can save your project money. Instead of clearing several paths, one for each contractor coming to install an underground utility, a construction project need only create one. This translates into time shaved off a project's completion and reduced costs. Besides reduced construction costs and relieving underground congestion of utilities, joint trenching makes it easier to know where not to dig, making landscaping simpler. It's also easier to find the trench for repairs. Planning property improvements is simpler, too, because there is only one trench to work around. One trench for all utilities means less environmental disturbance. Additionally, in places where there isn't a lot of available ground or where digging is difficult, joint trenching provides a solution.

Performance Requirement: Utilities connected to buildings are buried in common trenches shared by different utilities.

Points: 2 Points

When Verified: Visually verified during intermediate construction and final inspections.

2-80: Utilities are installed using one or more alternative means such as tunneling instead of trenching, use of smaller (low ground pressure) equipment, or geomats to spread the weight of construction equipment, shared utility trenches or easements, and placement of utilities under streets instead of yards

Responsible Party: General Contractor, MEP Engineer or Civil Engineer

Intent: Installing utilities traditionally is very disruptive to the site's natural processes, disrupting topsoil, compacting soil, and reducing permeability.

The tunneling has the following advantages:

- It can be more economical than the open-cut trench method as depth increases
- Surface life or ground activities like transportation are not disturbed with tunneling

- Ensures high-speed construction with low power consumption
- Reduces noise pollution

Low-ground-pressure equipment is heavy equipment specially designed to spread the weight of the equipment over a larger area. This allows it to move across terrain that is too soft for regular heavy equipment.

Geomats are resistant to adverse environmental effects. Open surface encourages root germination, quick vegetation of slopes and thus guarantees erosion control. Geomats protect slopes and horizontal surfaces notwithstanding the soil foundation.

Joint trench utility installation can save you both time and money with your project. It allows your utility companies to collaborate and share the same trench for:

- Natural gas
- Electricity
- Telephone
- Cable television

Placing the utilities under the street instead of the yard can save time and money in the long run. If one of the site's utilities needs to be replaced you don't have to go through the residents' lawns, disturbing the site and vegetation within the yard.

Performance Requirement: Utilities are installed using one or more alternative means listed in the credit intent.

Points: 5 points

When Verified: Visually verified during intermediate construction and final inspections.

2-81: Use dark sky compliant fixtures to minimize night glare (no point allowed if required by local code)

Responsible Party: General Contractor, Architect

Intent: Nocturnal animals sleep during the day and are active at night. Light pollution radically alters their nighttime environment by turning night into day. Glare from artificial lights can also impact wetland habitats that are home to amphibians such as frogs and toads, where artificial lights interfere with reproduction and can lead to population reductions. Birds that migrate or hunt at night navigate by moonlight and starlight. Artificial light can cause them to wander off course and toward the dangerous nighttime landscapes of cities.

Performance Requirement: Use only dark-sky-compliant outdoor lighting. Credit not applicable to sites in jurisdictions that require this.

Points: 1 Point

When Verified: Visually verified at final inspections.

2-82: Proximity to bike amenities within 1 mile

Responsible Party: Developer

Intent: Riding a bicycle 10km each way to work each day will save about $1,700 per year in transport costs. Also, bicycle parking is usually free, easily accessible, and more convenient than car parking. Benefits of riding a bike in your community means fewer cars which can lead to a safer road environment. Children can take advantage of slower and less dangerous traffic to ride bicycles as well. With community benefits also comes environmental benefits. Bicycle riding uses minimal fossil fuels and is a pollution-free mode of transport. Bikes reduce the need to build, service, and dispose of cars and conserves roadway and residential space, thereby providing opportunities for less concrete and more plant life in urban areas.

Bike Amenities that increase bike ridership:

- Bicycle and bicycle-repair shops
- Protected bike lanes on busier commuting routes
- Bicycle boulevards (low-speed street which has been "optimized" for bicycle traffic)
- Off-street multi-use trails
- Bike parks
- Lockable bike parking/storage for both residents and visitors

Performance Requirement: Development site located within 1 mile of at least two bike amenities. Check to see if the local jurisdiction has a map of bike routes and infrastructure.

Points: 3 Points

When Verified: Visually verified at final inspection.

Resources:

High-Quality Bike Facilities Increase Ridership and Make Biking Safer: https://nacto.org/2016/07/20/high-quality-bike-facilities-increase-ridership-make-biking-safer/

Washington Bike Maps: https://wabikes.org/growing-bicycling/resources/bike-maps/

Extra Credit for Site and Water

2-82: Extra credit for innovation in Site and Water, subject to approval by Built Green Program Manager

You may submit a site or water saving strategy or system, not specifically called out in this Section, for consideration for an Extra Credit for Innovation. All extra credits are subject to approval by the Built Green Program Manager. If approved, add up to 10 points to your Section total.

SECTION THREE: ENERGY EFFICIENCY

PERFORMANCE PATHWAY

3-1: Document an Energy Rating Index (ERI) of 62 or less, before PV solar generation is included

Responsible Party: Architect, Energy Consultant, MEP Engineers

Intent: Improve the energy performance of buildings by simulating performance and assessing the cost/benefit of energy conservation measures. The Energy Rating Index (ERI) is a scale with numbers that range from 0 (to represent Net Zero Energy) to 100 (to represent the approximate efficiency of a home built to the 2006 IECC). Each number on the ERI scale represents a 1% change in the relative energy efficiency of the building. Each point higher is 1% less efficient, and each point lower is 1% more efficient. Using ERI for compliance allows more flexibility in how builders obtain energy efficiency in their projects than prescriptive energy code credits. It also makes it easier for homeowners and realtors to compare and appraise green homes across different markets and certifications.

Performance Requirement: Follow RESNET/ANSI Standards, IECC ERI Guidance, and see Built Green 2018 WSEC Energy Modeling Guidelines. Required documentation: summary modeling report showing the pre-solar ERI and post-solar ERI (if applicable). The base ERI requirement of 62 or less must be met before any additional gains to ERI from PV solar are included. Cannot be combined with credits 3-2 or 3-5.

Points Breakdown:

30 points: ERI 62-56

60 points: ERI 55-48

90 points: ERI 47 or less

When Verified: The energy model should be completed at the earliest feasible opportunity in order to help inform design decisions. The energy model output reports that document energy savings should be reviewed and verified once the design is finalized. In many cases this may be close to substantial completion, as in cases of “as-built” changes to the equipment specs.

Resources:

Built Green 2018 WSEC Energy Modeling Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

Implementation Guidelines for the ERI Performance Path: https://www.resnet.us/wp-content/uploads/Implementation-Guidelines-for-the-ERI-Performance-Path.pdf

RENET Standards Technical Requirements: https://standards.resnet.us/#t=minhers_adv%2FCh_3%2FTechnical_Requirements.htm&rhsearch=Table%204.5.2(1)&rhhlterm=Table%204.5.2(1)&rhsyns=

Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using an Energy Rating Index: https://www.resnet.us/wp-content/uploads/PDS-01-of-BSRRESNETICC-301-2014-Addendum-D-201x.pdf

Standard for Grading the Installation of HVAC Systems: http://www.resnet.us/wp-content/uploads/archive/resblog/2019/03/WD02_RESNETACCA_310-2019-03-24_clean.pdf

Standard for Testing Airtightness: https://www.resnet.us/wp-content/uploads/ANSIRESNETICC_380-2019_vf1.24.19_cover%5E0TOC-2.pdf

The IECC Energy Rating Index and HERS Index: What's the Difference?: https://www.resnet.us/articles/the-iecc-energy-rating-index-and-hers-index-whats-the-difference/

3-2: Document a minimum of 6% reduction in annual energy consumption using UDRH and approved energy modeling software, before PV solar generation is included

Responsible Party: Architect, Energy Consultant, MEP Engineers

Intent: Improve the energy performance of buildings by simulating performance and assessing the cost/benefit of energy conservation measures. This performance pathway is primarily designed to align with processes for local building and utility incentive programs.

Performance Requirement: Follow Built Green 2018 WSEC Energy Modeling guidance for the performance pathway, current NEEA User Defined Reference Homes (UDRH), and REM/Rate libraries. Required documentation: summary performance report showing percentage of reduction in consumption over the UDRH baseline model. The base 6% reduction in consumption must be met before any reductions from PV solar are included. Cannot be combined with credits 3-1 or 3-5.

Points Breakdown:

30 points: Minimum 6% reduction to annual energy consumption over 2018 WSEC

60 points: Minimum 12% reduction to annual energy consumption over 2018 WSEC

90 points: 18% or more reduction to annual energy consumption over 2018 WSEC

When Verified: The energy model should be completed at the earliest feasible opportunity in order to help inform design decisions. The energy model output reports that document energy savings beyond code should be reviewed and verified once the design is finalized. In many cases, this may be close to substantial completion, in case of "as-built" changes to the equipment specs.

Resources:

Built Green 2018 WSEC Energy Modeling Guidelines: https://builtgreen.net/certification/#checklistandhandbook

REM/Rate v15.7.1 Library Set: https://betterbuiltnw.com/resources/performance-path-v15-7-1-user-defined-reference-homes-udrh-1

Northwest Modeling Requirements v21.0: https://betterbuiltnw.com/resources/northwest-modeling-requirements-v21-0-rem-rate-v15-7-1

User-Defined Reference Homes (UDRH): https://betterbuiltnw.com/resources/rem-rate-v15-7-1-library-set

3-3: Bonus: Built Green Net Zero Certified; requires an ERI or HERS of 0 or lower

Responsible Party: Architect, Energy Consultant, Verifier

Intent: Design and construct homes that consume no grid-supplied energy on a net annual basis. A Net Zero Energy (NZE) home combines state-of-the-art, energy-efficient construction and appliances with renewable energy systems such as solar water heating and electricity, resulting in a house that produces as much or more power than it consumes. Generally, NZE homes are connected to the utility grid, with energy consumption measured on an annual basis, allowing for excess energy produced to be sold back to the utility. NZE homes optimize climate-specific design, passive solar heating and cooling, solar thermal and solar electric systems (active solar), and energy-efficient construction, appliances, and lighting. The goal of this strategy is performance-based, so you must use other credits in this section, as well as other sections from the checklist, as part of your plan to achieve NZE consumption rate for the home. For instance, geothermal heating might help the house achieve NZE along with photovoltaic power generation, an advanced shell design, a super-high-efficiency distribution system, and exceptional ventilation to reduce cooling loads.

Building a NZE home is possible with Inland Northwest climate conditions but requires significant upfront planning to ensure the home's ultimate performance. Coordination with the local utility regarding the potential for feeding and selling excess energy into the grid is also required. To guarantee that the home achieves NZE performance, consult with a Built Green verifier early in the design process.

Performance Requirement: Follow RESNET/ANSI Standards, IECC ERI Guidance, and see Built Green 2018 WSEC Energy Modeling Guidelines. Required documentation: summary modeling report showing pre-solar ERI and post-solar ERI. ERI must be 0 or lower. HERS scores of 0 or less will also be accepted. NZE homes must not include any use of combustible fuels inside the home, see Credit 3-26. Cannot be combined with Credit 3-4.

Points: 20 points

When Verified: Modeling verified at completion of design phase. Energy measures verified during construction and at completion.

Cross Reference: 1-39, 3-1, 3-26

Resources:

Built Green 2018 WSEC Energy Modeling Guidelines: https://builtgreen.net/certification/#checklistandhandbook

What are Zero Energy Homes: https://zeroenergyproject.org/buy/zero-energy-homes/

Built Green Net Zero Energy Label: https://builtgreen.net/blogdetail/builtgreenblog/2018/01/17/spotlight-on-the-built-green-net-zero-energy-label

Presentation on the What, Why, and How of Net Zero Energy Homes: https://builtgreen.net/blog-detail/builtgreenblog/2018/08/15/solar-power-happy-hour

How to Design a Net-Zero Home: https://www.architecturaldigest.com/story/how-todesign-a-net-zero-home

Net-Zero Energy Homes Pay Off Faster Than You Think: https://insideclimatenews.org/news/10122018/net-zero-energy-efficiency-homeinfographic-solar-pay-off-years-midwest-detroit-chicago-columbus/

3-4: Bonus: Net-positive energy produced; requires an ERI or HERS of -5 or lower

Responsible Party: Architect, Energy Consultant, Verifier

Intent: Use industry approved standards and processes to showcase a modeled Net Positive Energy (NPE) home. NPE homes produce more energy from onsite renewable energy sources on average than they import from external energy sources over the course of a year. The additional energy can help offset the energy required for charging one or two electric vehicles, further reducing the homeowner's carbon footprint.

Performance Requirement: Follow RESNET/ANSI Standards, IECC ERI Guidance, and see Built Green 2018 WSEC Energy Modeling Guidelines. Required documentation: summary modeling report showing the pre-solar ERI and post solar ERI. ERI must be -5 or lower.

HERS scores of -5 or less will also be accepted. NPE homes must not include any use of combustible fuels inside the home , see Credit 3-26. Cannot be combined with credit 3-3.

Points: 30 points

When Verified: Modeling verified at completion of design phase. Energy measures verified during construction and at completion.

Cross Reference: 1-39, 3-1, 3-26

Resources:

Built Green 2018 WSEC Energy Modeling Guidelines: https://builtgreen.net/certification/#checklistandhandbook

Pathways to Positive Energy Homes: https://zeroenergyproject.org/buy/positive-energy-homes/

Prescriptive Pathway

3-5: Earn a minimum of 1.0 additional credits on R406.3 table, less than 50% of WSEC credits may come from PV solar generation

Responsible Party: Architect, Energy Consultant, MEP Engineers

Intent: Provides a prescriptive approach to incorporating above-code energy and carbon reductions. Theoretically, each additional 1.0 energy efficiency credit earned from table R406.3 represents an additional 6% savings in building energy use.

Performance Requirement: Section Appendix RA/RB "Optional Energy Efficiency Measures" section of the 2018 WSEC (page 98 of code PDF language). Provide a table of which energy credits from table R406.3 were earned, including total amount of credits earned. Show the details in the construction documents, pictures, and receipts as applicable. Less than 50% of WSEC credits may come from PV solar generation, and the size of the system (in kWh) must be documented. Cannot be combined with credits 3-1 or 3-2.

Points Breakdown:

30 points: 1.0 credit additional to 2018 WSEC or SEC requirements

60 points: 2.0 credits additional to 2018 WSEC or SEC requirements

90 points: 3.0 credits additional to 2018 WSEC or SEC requirements

When Verified: Visually verify documents during design, as-builts during pre-drywall, commissioning, and final inspection.

Resources:

2018 Washington State Energy Code Residential:
https://sbcc.wa.gov/sites/default/files/2021-01/2018%20WSEC_R%20Final%20package2.pdf

Built Green 2018 WSEC Energy Modeling Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

Additional Certifications

3-6: Home is ENERGY STAR® Homes certified or DOE Zero Energy Ready Home Certified

Responsible Party: Energy Consultant

Intent:

> *ENERGY STAR New Homes* is a joint program of the Environmental Protection Agency (EPA), the Department of Energy (DOE), and the NW Energy Efficiency Alliance to promote smart consumer choices for products, building upgrades, and homes that go beyond local codes to save money while preventing pollution.
>
> *DOE Zero Energy Ready Homes* are verified by a qualified third-party and are at least 40—50% more energy efficient than a typical new home. This generally corresponds to a Home Energy Rating System (HERS) Index Score in the low- to mid-50s, depending on the size of the home and region in which it is built.

Performance Requirement: Provide project's Energy Star Homes or DOE certificate. Certificates cannot be used as compliance with Built Green energy efficiency requirements or in lieu of performance or prescriptive performance pathways.

Points Breakdown:

5 points: Energy Star Homes Certified

10 points: DOE Zero Energy Ready Home Certified

When Verified: Review of certification documentation and visually verified at final inspection.

Resources:

Energy Star Homes Program: https://www.energystar.gov/newhomes

DOE Net Zero Energy Homes Program: https://www.energy.gov/eere/buildings/zero-energy-ready-homes

3-7: Register project with RESNET or Utility Program of equal or greater quality assurance

Responsible Party: Energy Consultant, RESNET Rater

Intent: Increase quality assurance (QA) for energy performance modeling on all Built Green projects. QA provides a framework to ensure program standards are met and closes the feedback loop in order to assess and improve program processes. Built Green benefits from increased QA by maintaining and growing its program integrity and trust among local jurisdictions and state lawmakers. This allows Built Green to effectively advocate for green building incentives for our members. It also paves the way for Built Green certification to be used as code compliance to meet local plan reviews, inspection, and state energy codes—simplifying permitting and project closeout and saving the Developer/Builder valuable time and money.

The Home Energy Rating System (HERS) Index is an industry standard that measures a home's energy efficiency with a score. A certified Home Energy Rater assesses the energy efficiency of a home, assigning it a relative performance score. The lower the number, the more energy efficient the home. The U.S. Department of Energy has determined that a typical existing home scores 130 on the HERS Index, while a standard new home is awarded a rating of 100. For example, a home with a HERS Index Score of 70 is 30% more energy efficient than a standard new home. RESNET's modeling protocols are a nationally recognized system for inspecting and calculating a home's energy performance and provides an additional level of QA for the building's performance to developers, builders, certification programs, and jurisdictions. RESNET requires 1% of field QA for all RESNET registered projects.

Washington State Utility Commission requires minimum of 5% field QA. So alternative QA programs would need to meet this requirement. Please check with to see if your local utility program provides at least 5% field QA.

Performance Requirement: Provide project's HERS Index scorecard. Excluding credits 3-3 and 3-4 for net zero and net positive energy compliance, HERS scores cannot be used as compliance with Built Green energy efficiency requirements or in lieu of performance or prescriptive performance pathways. Alternatively, use a utility program that requires at least 5% field QA (utility program must be approved by Built Green prior to use).

Points: 3 Points

When Verified: Review of program documentation and visually verified at final inspection.

Resources:

RESNET HERS Index: https://www.hersindex.com/hers-index/

Washington State HERS Raters: https://www.hersindex.com/resnet-hers-raters/?state=WA

Additional Energy Efficiency Credits

3-8: Take PTCS Commissioning trainings from Bonneville Power Administration's Performance Tested Comfort Systems team. University of Washington offers courses on refrigeration handling in the HVAC realm that, when taken, qualify for this credit

Responsible Party: HVAC Commissioning Agent or Verifier

Intent: Paul Hawken's book, Drawdown, calculates and rates the environmental and financial impacts of addressing carbon output across various sectors. According to Drawdown, the number one action we can take to fix our greenhouse gas problem is reducing the impact of high-global-warming-potential (GWP) refrigerants.

According to the Bonneville Power Administration, heating and cooling systems consume nearly half of the energy used in a home. By upgrading to a high-efficiency heat pump system and addressing any leaks in the duct system, you can minimize heating and cooling costs. Yet not all technicians are equal when it comes to HVAC efficiency. When a heat pump is commissioned by a Performance Tested Comfort Systems (PTCS) certified technician, it helps ensure it is installed at the highest level of performance for home comfort and energy savings. A PTCS certified technician is trained to properly size your system and recommend the best equipment for your home, install heat pumps and seal ducts to standards significantly above code, and voluntarily submit work completed to third-party inspections. This ensures that systems are properly installed and capable of performing at the level of efficiency, comfort, and durability they're designed to achieve.

Along with the benefits of a quality installation, PTCS certified work also gives you access to financial benefits such as utilities incentive programs and tax credits.

Performance Requirement: Provide certification of completion of course(s) that includes the date of completion. Training must be completed prior to commissioning work to be performed on the units. Courses taken through the University of Washington require prior approval from Built Green Program Manager to be accepted.

Points: 2 points

When Verified: Training course(s) or PTCS technician certification must be completed prior to the HVAC technician's active role on the project.

Resources:

The Cost of Comfort: Climate Change and Refrigerants:
https://www.buildinggreen.com/feature/cost-comfort-climate-change-and-refrigerants

Performance Tested Comfort Systems: https://ptcs.bpa.gov/About.aspx

PTCS Certification for Builders: https://www.bpa.gov/EE/Sectors/Residential/Pages/PTCS-Participation-and-Certification.aspx

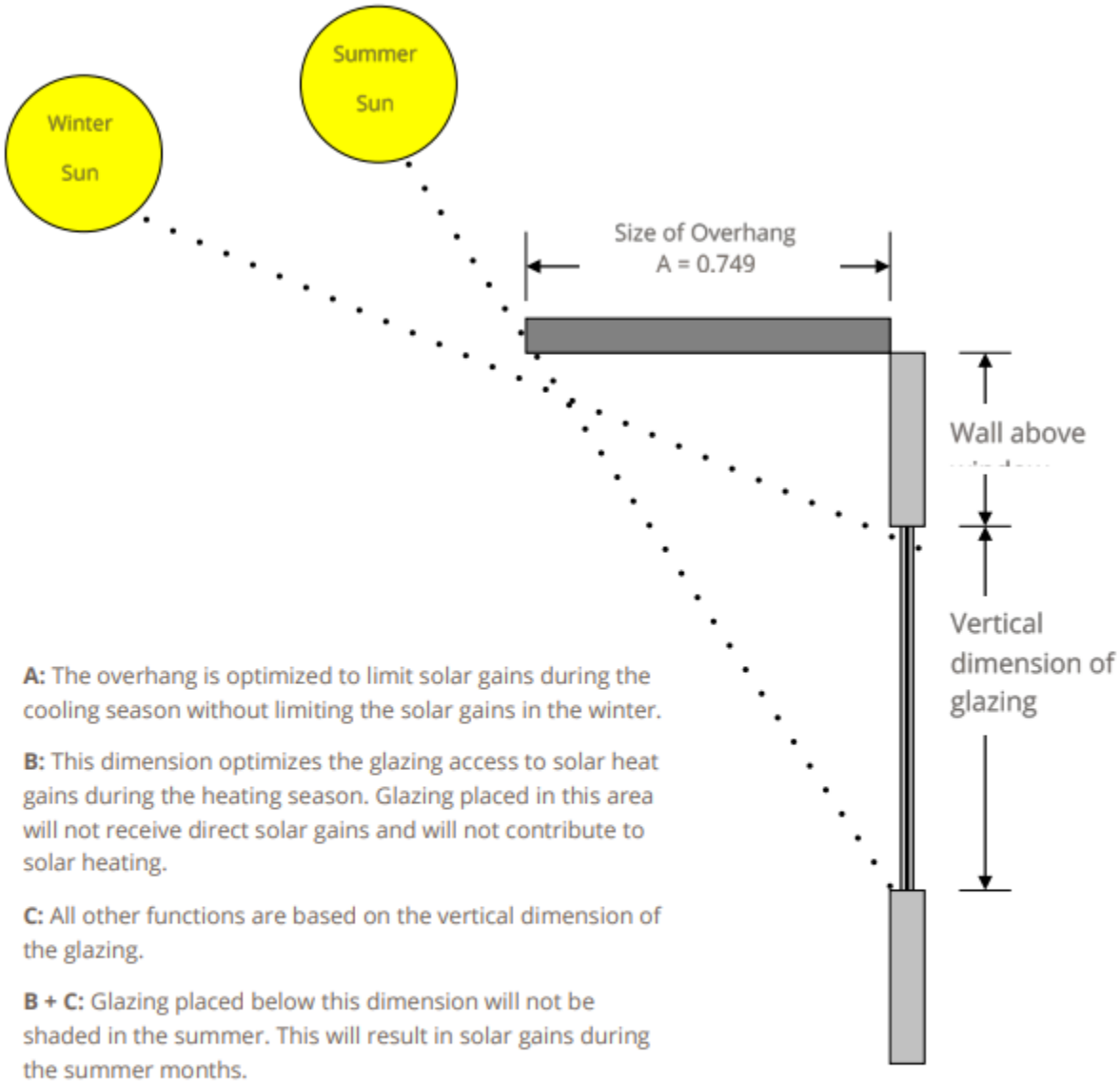
PTCS training for current certified RESNET raters: https://portal.resnet.us/?returnUrl=https%3A%2F%2Fportal.resnet.us%2FTP

3-9: Passive solar design, basic or advanced features installed

Responsible Party: Architect, Energy Consultant

Intent: Houses today are more energy efficient than ever before. However, the vast majority of new homes still ignore a lot of energy-saving opportunities—opportunities available in sunlight falling on the house, in landscaping, breezes and other natural onsite elements, and in the structure and materials of the house itself, which, with thoughtful design, could be used to collect and use free energy. Passive solar (the name distinguishes it from "active" or mechanical solar technologies) is simply a way to take maximum advantage of these opportunities.

Basic features include building strategies that prevent excessive solar gains in the summer while allowing the sun to enter the home during the heating season.



(Source: Washington State University Cooperative Extension Energy Program)

Advanced passive solar is performance-based. You should document a reduction in total space conditioning for heating and cooling, then demonstrate how the home will stay within a reasonable temperature range. If you choose not to demonstrate the total reduction in space conditioning energy, keep in mind that passive solar designs from the 1970s do not work with contemporary glazing products. Also, combining passive solar

design with advanced framing may require adjusting solar techniques to work with the tightness of this framing system.

Advanced passive solar design features may include orienting windows to maximize passive solar, designing thermal mass correctly to correlate with window design, and providing east and west shading.

To make the best use of passive solar, orient the majority of the building's glazing within 22 degrees of due south. Due south can be located with a simple compass. Remember to make the correction for magnetic north, which is 21 to 22 degrees east in the Puget Sound area. Obviously, this assumes there will be windows on the south side; for solar heating benefit, these should not be obstructed in winter. To prevent overheating, window glass on the south side of the building should not exceed 8% of the floor area. However, window area can be increased significantly (and solar performance enhanced) if there is accessible thermal mass in the space to absorb excess heat. Building components that can add mass to the home include concrete floors, tile, extra drywall, and to some extent, wood flooring. Consider installing skylights in a south-facing roof with blinds to control the heat.

Use glazing with solar heat gain coefficient (SHGC) equal to or less than 0.35 or provide natural shading with landscaping. East and west shading strategies help protect against overheating the home. Optimal shading is provided by exterior shading architectural features, trees, and other natural landscaping. They block the heat before it gets to the window. In addition, low-e windows made using specially coated or tinted glazing reduce the window's SHGC. They block the heat gain without rejecting too much visible light. For comparison, standard clear glass has a SHGC of 0.85. Special low-e coatings/tinting can produce windows with SHGC down to 0.38, depending upon the treatment. These can be especially useful if the home has an attractive view to the west.

Performance Requirement: Implement Basic to Advanced passive solar strategies below. Must include all items under each category. Strategies should impact at least 70% of a building's conditioned floor area.

Basic:

- East/west orientation of building
- Optimized glazing ratio that correlates with any thermal mass present on south and east side of building
- Properly sized overhangs

Advanced:

- Orient the majority of the building's glazing within 22 degrees of due south.
- South side of the building should not exceed 8% of the floor area, unless there is accessible thermal mass in the space that can absorb excess heat.

- Use glazing with solar feat gain coefficient (SHGC) less than 0.35 or provide natural shading with landscaping on east and south sides of building.

Points Breakdown:

3 Points: Basic features implemented

5 Points: Basic and Advanced features implemented

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 3-11, 7-2

Resources:

Passive Solar Home Design: https://www.energy.gov/energysaver/energy-efficient-home-design/passive-solar-home-design

Cost-effective Passive Solar Design: https://www.greenbuildingadvisor.com/article/cost-effective-passive-solar-design

Reassessing Passive Solar Design Principles: https://www.greenbuildingadvisor.com/article/reassessing-passive-solar-design-principles

Passive Solar Design Strategies: Guidelines for Home Building*: https://www.nrel.gov/docs/legosti/old/17346.pdf

**Some technical specifications may be out of date, but the strategies are still relevant. Make sure to comply with current energy code and Built Green requirements for air sealing, ventilation, and R-values and U-factors for insulation and glazing.*

3-10: Model solar design features using approved modeling software

Responsible Party: Architect, Energy Consultant

Intent: During design phase, model both passive and active solar design features using approved modeling software (e.g., REMRate) to help determine the effectiveness of incorporating these solar strategies into your project. Passive solar strategies should be considered early on, prior to mechanical systems design, to take advantage of the cost-effective energy reductions and comfort they provide.

Modeling active solar design (solar PV) features during the design phase will inform how orientation and roof design impact the project's solar PV potential, regardless of the developer/builder's intention to install a system. Including the solar PV generation potential as part of design will provide greater value and an opportunity for future property owners to install an efficient solar PV system. This is especially true for any developer/builder

designing a NZE Ready home. Provide the Solar PV model and estimated potential as part of the Homeowner Kit and education.

Performance Requirement: Please check Built Green's 2018 WSEC Energy Modeling Guidelines for approved modeling software. Model the solar production with PV Watts from the National Renewable Energy Laboratory and place production values into approved modeling software. If the project is participating in a utility generation or NZE program, please work with that utility as they may have additional or separate reporting requirements. Built Green will accept solar generation estimates from utility programs in lieu of PV Watts. Provide the Solar PV model and estimated potential to the property owner as part of the homeowner packet and education.

Points: 3 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 3-9, 3-11, 7-2

Resources:

Built Green 2018 WSEC Energy Modeling Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

3-11: Design and implement passive cooling system (no A/C; radiant cooling or passive cooling system)

Responsible Party: Architect, Energy Consultant

Intent: The best option is to initially design the home to make the best use of natural ventilation and passive cooling techniques (see credit 3-9, on Passive Solar Design).

An operable skylight can be used to create controlled natural ventilation, allowing warm air that has risen to the top of the house to escape, and drawing up cool air from below. However, skylights can be a source of unwanted solar heat gain and/or thermal loss, so location should be carefully selected by weighing the benefits against the reduction in envelope performance.

By employing passive cooling techniques, which are based on the interaction of the building and its surroundings, in modern buildings you can reduce the size and cost of the equipment. Highly effective passive cooling designs can even eliminate the need for mechanical cooling equipment in the project-reducing operational expenses and carbon footprint of the occupants. The four major passive cooling strategies include:

> *Natural ventilation* depends solely on air movement to cool occupants. Window openings on opposite sides of the building enhance cross ventilation from breezes, as do openings in tall spaces (stacks) in building ceilings. With openings near the top

of the stack, warm air can escape while cooler air enters the building from openings near the ground. Ventilation requires the building to be open during the day to allow airflow. While operable skylights can be used to control natural ventilation, they can also be a source of unwanted solar heat gain and thermal loss. If skylights are used, locations must be considered carefully.

High thermal mass depends on the ability of materials in the building to absorb heat during the day. Then at night as temperatures cool the mass releases the stored heat, preparing it to absorb heat again the next day.

High thermal mass with night ventilation relies on the daily heat storage of thermal mass combined with night ventilation that cools the mass. The building must be closed during the day and opened at night to flush out the heat.

Before adopting a passive cooling strategy, you must be sure that it matches and responds to specific site climate conditions.

Performance Requirement: Implement passive cooling strategies to eliminate mechanical A/C cooling equipment or employ a radiant cooling or passive cooling system. Any skylight or clerestories used for this credit must be operable and have a U-factor smaller or equal to 0.48 and solar heat gain coefficient smaller or equal to 0.32.

Points: 5 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 3-9, 3-18, 7-2

Resources:

Build It Solar offers numerous solar techniques, including passive cooling techniques: http://www.builditsolar.com/Projects/Cooling/passive_cooling.htm

3-12: Centrally locate heating/cooling system to reduce the size of the distribution system

Responsible Party: Architect, MEP Engineer, General Contractor

Intent: Locating the furnace in a central, well-insulated mechanical closet can save energy by reducing delivery distance and heat loss. (It can also conserve material use by requiring less ducting.) Make sure you provide sufficient make-up air.

Performance Requirement: Locate central heating/cooling system in a central and insulated space of the building. May not be combined with 3-14.

Points: 1 Point

When Verified: Visually verified during intermediate construction inspections.

3-13: Submit design using ACCA Manual D, J, and S or BetterBuiltNW HVAC Sizing Tool for the sizing and selection of space conditioning and distribution systems; or submit compliance with Grade I of RESNETs Standard 310-2020

Responsible Party: Energy Consultant, MEP Engineer

Intent: Ensure that all installed heating, ventilation, and cooling equipment is properly sized, designed, and commissioned to a unified standard of performance. Performance is predicated on proper design within equipment tolerances.

Performance Requirement: Provide ACCA Manual J, D, and S reports to Verifier or BetterBuiltNW's HVAC ST report. Manufacturer selection tools typically qualify for the Manual S component of this requirement, but Manual J and D must be completed with ACCA or BetterBuiltNW approved software.

Points: 2 points

When Verified: Visually verified during intermediate construction inspections.

Resources:

BetterBuiltNW HVAC Sizing Tool: https://betterbuiltnw.com/hvac-sizing-tool

ACCA Approved Software: https://www.acca.org/standards/approved-software

3-14: Use ductless distribution system (e.g. hydronic, radiant, ductless mini splits)

Responsible Party: Architect, MEP Engineer

Intent: Forced-air heating systems continuously circulate air through a home's ducts and registers, thoroughly dispersing pet dander, dust, mold spores, and other allergens throughout the structure. By contrast, radiant heating systems don't circulate air at all, and thus don't keep allergens airborne—a particularly important consideration for adults and children with allergies, asthma, and other conditions that can be exacerbated by indoor pollution. Moreover, duct losses can account for more than 30% of energy consumption for space conditioning, especially if the ducts are in an unconditioned space such as an attic or crawl space. Ductless distribution systems have no ducts, thereby avoiding the energy losses associated with ductwork of central forced-air systems.

The main advantages of mini splits are their small size and flexibility for zoning, or heating and cooling individual rooms. Many mini split models can handle multiple indoor air handling units connected to one outdoor heat pump unit. The number depends on how much heating and cooling is required for the building or each zone (which in turn is affected by how well the building is insulated). Each of the zones will have its own

thermostat, so you only need to condition that space when it is occupied, saving energy and money.

Infrared radiant heating panels warm people and objects in a room directly. They can also prevent mold from forming on the walls, as they heats the walls directly and keep them dry. Infrared panels are most effective when mounted on the ceiling, which involves mounting the panel with screws, connecting it to a power source, and then to an external wall-mounted thermostat. Since they do not heat the air, they do not affect humidity levels, which is a benefit in drier, colder climates. Many panels are designed to blend seamlessly into any space to stay out of sight and out of mind.

In-floor radiant heating systems deliver heat through a building's floors, they can be loops of charged cable (resistance wire) or closed loop hydronic tubes filled with water connected to a boiler. Hydronic floor heating systems are up to 30% more efficient than forced-air systems. Water conducts heat more effectively than air, which quickly loses heat without a constant source. That means less energy is required to maintain water at a particular temperature over time. When installed in concrete slab floors the system takes advantage of concrete's ability to absorb and distribute heat uniformly and remove a leading contributor to occupant discomfort. In-floor radiant heating systems don't have any visible components that take up floor or wall space in a home's living area and reduce the amount of square footage available for decorations, furniture, storage, and other usage.

Performance Requirement: Install ductless distribution system(s) as the unit's primary heating/cooling system. It is highly recommended to install heating system zonal controls for these types of systems (see credit 3-15).

Points: 2 points

When Verified: Reviewed at completion of design. Visually verified during intermediate construction and final inspections.

Cross Reference: 3-15, 4-53

Resources:

Ductless Mini-Split Air Conditioners: https://www.energy.gov/energysaver/ductless-mini-split-air-conditioners

What Is a Radiant Heating System – Costs, Benefits & Drawbacks: https://www.moneycrashers.com/radiant-heating-system-costs-benefits/

3-15: Install a heating system with zonal controls

Responsible Party: MEP Engineer, HVAC Installer

Intent: Zonal controls drastically improve energy efficiency, by only delivering conditioned air into rooms or areas that are currently occupied. These controls avoid the energy-guzzling issue of standard and central systems that condition unoccupied rooms. Occupants get the heating or cooling they want, only where they want it, reducing overall energy waste. This means increased occupant comfort, for far less energy and cost.

Performance Requirement: Install zonal controls for the centrally-located ducted heating system or where zonal heating systems are installed.

Points: 2 Points

When Verified: Visually verified at final inspection.

Cross Reference: 3-14

3-16: Install a whole-house heat recovery ventilator or energy recovery ventilator; with minimum ASE or SRE of 70% and with distribution to every bedroom in main body home

Responsible Party: MEP Engineer, HVAC Installer

Intent: Heat Recovery Ventilator (HRV): This device not only provides fresh air for homes, but also transfers the conditioned temperature contained in the exiting stale air to precondition the incoming fresh air. This saves significant amounts of energy and reduces the greenhouse gas (GHG) emissions created when heating or cooling unconditioned fresh air.

Energy Recovery Ventilator (ERV): like HRVs, ERVs are designed to recycle energy from the building's exhaust air to precondition the outside air with the ventilation air's temperature. But unlike HRVs, ERVs also reduce incoming humidity. This preconditioning of outside air reduces the load the HVAC unit must handle, and hence reduces the required capacity of the mechanical equipment. In cold winter climates, an ERV system transfers the humidity from the air being expelled to the incoming fresh (and dry) air to always keep the ambient internal humidity level at a reasonable value (between 40 and 60%). In summer, the ERV's humidity transfer is reversed with humidity in outside air removed before the air enters the home. This saves energy by reducing the load on air conditioning systems and/or dehumidifier.

If the home is located in a climate that is humid in winter (above 60% relative humidity) then an HRV is the better choice, as it would get rid of excess humidity, while an ERV would tend to keep it at a high level. If the opposite is true and the climate is dry in winter, then an ERV would be a better choice as it helps retain humidity, eliminating the need (and cost) for generating it through other means.

The energy savings from HRVs and ERVs pays for the rest of the initial investment within a relatively short timeframe—the payback period ranges from three months to three years for most systems, depending on the system's size and the building's geographic location.

Apparent Sensible Effectiveness (ASE) and Sensible Recovery Efficiency (SRE) are testing terms used to describe the temperature rise of the outdoor air passing through an HRV. It provides a measurement that includes motor heat, cross leakage and casing gain, and temperature rise of outdoor air / temperature difference between indoor and outdoor air. It is expressed as a percentage, with higher numbers representing better performance.

Performance Requirement: Install a whole-house heat recovery ventilator or energy recovery ventilator; with minimum ASE or SRE of 70%, Energy Star labeled, and with distribution to every bedroom in the main-body home.

Points: 5 Points

When Verified: Visually verified at intermediate or final inspection.

Cross Reference: 7-2

Resources:

Choosing Between an HRV and an ERV: https://www.ecohome.net/guides/2276/choosing-between-an-hrv-and-an-erv/

How We Chose Our Heat-Recovery Ventilator: https://www.buildinggreen.com/blog/how-we-chose-our-heat-recovery-ventilator

The Facts about Energy Recovery Ventilators: https://www.architectmagazine.com/technology/products/the-facts-about-energy-recovery-ventilators_o

Sustainable Innovation in Heat Recovery Ventilation: https://sustain.ubc.ca/news/sustainable-innovation-heat-recovery-ventilation

3-17: Install CO_2 heat pump for water heating

Responsible Party: MEP Engineer, General Contractor, HVAC Installer

Intent: Over the past 35 years, refrigerants have come under fire—both for their impact on the Earth's protective ozone layer and for their global warming potential (GWP). Modern refrigerants that have replaced previously common refrigerants, like hydrochlorofluorocarbon HCFC-22 (R-22), are much better from an ozone-depletion standpoint, but they are still very significant greenhouse gases (high GWP). As heat pumps become more and more standard in high-performance homes, Washington state

lawmakers and local jurisdictions are moving to reduce the GWP of refrigerants through restrictions on refrigerant types or requirements to reduce refrigerant system leaks.

A CO_2 heat pump makes effective use of standard-grade heat pump technology related to refrigeration and air conditioning systems, where energy is driven from the atmosphere and passed on to water in the form of heat. The difference is that it utilizes a much more Ozone-friendly refrigerant- carbon dioxide (CO_2). An additional benefit is that some models of CO_2 heat pumps can be utilized for both air conditioning and domestic water heating—please check with the manufacturer for availability and technical specifications.

At the time of writing this handbook there were a limited number of manufacturers making these CO_2 heat pumps; US-based SANCO2 and Japanese-based Mayekawa. We anticipate that as the technology advances more manufacturers will be providing these lower GWP refrigerant heat pump options.

Performance Requirement: Install a CO_2 heat pump for domestic water heater and/or air conditioning.

Points: 6 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Resources:

A Heat Pump Using Carbon Dioxide as the Refrigerant: https://www.greenbuildingadvisor.com/article/a-heat-pump-using-carbon-dioxide-as-the-refrigerant

SANCO2- Eco2 Systems: https://www.eco2waterheater.com/

Mayekawa CO2 Heat pumps: https://www.mayekawa.com/products/heat_pumps/

3-18: Use clerestory for natural lighting

Responsible Party: Architect

Intent: Clerestory windows are a row of windows near the top of a wall or above eye level. They bring light in high parts of the room and illuminate the ceiling. The reflected light from the ceiling is a soft, indirect light and mimics skylights. They also allow light to penetrate deeper into room than windows set at a standard height, especially when used in combination with adjacent light-colored overhangs and light-colored ceilings. Operable clerestory windows can provide a multifunctional feature that also provides passive cooling (see Credit 3-11). Compared to skylights, clerestory windows do not penetrate the thermal envelope of the building's roof, so they can provide the same benefits, but without a significant loss in envelope performance.

Performance Requirement: For at least 90% of clerestory glazing install clerestory windows that have a U-factor equal or less than 0.28.

Points: 2 Points

When Verified: Visually verified at final inspection.

Cross Reference: 3-11

3-19: All electrical circuit panels, junction boxes and outlets and switches that penetrate the building's thermal envelop use cold weather or air-sealed electrical boxes

Responsible Party: MEP Engineer, Electrical Subcontractor

Intent: Weatherproof electrical junction and receptacle boxes effectively seal out weather, increasing air-tightness of the thermal envelope and preventing moisture from penetrating and subsequently shorting out the connections.

Weatherproof junction boxes are the ideal fit for safeguarding electrical components from harmful external elements. These boxes are typically sealed enclosures built for mounting to roof overhangs, exterior walls, decks, and other surfaces. These boxes are utilized in installing light fixtures and outdoor receptacles.

Performance Requirement: All electrical circuit panels, junction and receptacle boxes that penetrate the building's thermal envelope use weatherproof or air-sealed boxes.

Points: 2 Points

When Verified: Visually verified during intermediate construction and final inspections.

3-20: Install no recessed can lights that penetrate the building's thermal envelope

Responsible Party: Architect, MEP Engineers, General Contractor

Intent: Recessed downlights are commonly used in residential kitchens, hallways, and bathrooms, and in many office and commercial settings. Traditional recessed can lights use incandescent or halogen bulbs that require heat venting that in turn creates thermal bridges in a building’s thermal envelope. These thermal bridges and reduced air-tightness further reduce energy efficiency. LED technology decreases downlight wattage and allows for recessed can lights to either be fully sealed units or insulated along with the building envelope.

Performance Requirement: Install only recessed lights that do not penetrate the building’s thermal envelope, LED lamps preferred.

Points: 2 Points

When Verified: Visually verified during intermediate construction.

3-21: Provide an outdoor clothesline

Responsible Party: Architect, General Contractor

Intent: An outdoor clothesline truly offers occupants many great benefits such as saving money, saving energy, increasing the lifespan of clothing, contributing to the overall fresh appearance of clothes, and helping the environment as well.

Performance Requirement: Install an outdoor clothesline. It may be shared between multiple units.

Points: 1 Point

When Verified: Visually verified at final inspections.

3-22: Install induction range or cook top

Responsible Party: General Contractor

Intent: With an induction range, none of the energy is wasted on heating the cooking surface or the air around the pan. While electric-coil and gas ranges heat the surface beneath the pan or the air around it, induction ranges rely on an electromagnetic field that heats the pan directly on a molecular level, cutting out the intermediary. This heating process is also safer, as the cooktop never gets as hot as a flame or a coil. Up to 90% of the electric energy is converted to heat inside the cooking vessel. For natural gas, up to 60% of the cooking heat is lost to the stovetop or the kitchen's air, resulting in efficiency as low as 40%. For electrical resistance cooking, up to 45% is lost to escaping heat, resulting in around 55% efficiency. With induction cooking you can have a pot of boiling water for your favorite noodles in just four minutes—what a luxury! Consumers are increasingly becoming educated on the benefits and convenience of induction cooking and now consider it a desirable kitchen asset.

In terms of health and indoor air quality, gas stoves contribute some of the same fumes found in car exhaust. Burning natural gas produces nitrogen dioxide, or NO_2, and sometimes also carbon monoxide, both of which are invisible and odorless. According to a 2019 report by the Rocky Mountain Institute, homes with gas stoves can contain approximately 50 to 400 percent higher concentrations of NO_2 than homes with electric stoves, often resulting in levels of indoor air pollution that would be illegal outdoors. Gas ranges require much higher ventilation requirements and costly equipment.

Natural gas also poses a myriad of issues for the environment. Fossil fuels of any kind are not a part of a net zero or net positive energy future. The carbon emissions and environmental damage created during natural gas's extraction and burning processes do

not reduce carbon emissions to the extent required to avoid the worst climate change outcomes.

In the past, induction ranges have been more expensive than other cooktops. However, there are now more modestly priced units in the market, making them more affordable and comparable to the price of many other stovetops.

Performance Requirement: Install an induction range as the only type of cooking range in the unit's kitchen.

Points: 4 Points

When Verified: Visually verified at final inspection.

Cross Reference: 7-2

Resources:

RMI, Gas Stoves: Health and Air Quality Impacts and Solutions: https://rmi.org/insight/gas-stoves-pollution-health/

Kill Your Gas Stove-It's bad for you, and the environment: https://www.theatlantic.com/science/archive/2020/10/gas-stoves-are-bad-you-and-environment/616700/

Dousing a Love Affair with Gas Stoves: https://builtgreen.net/blog-detail/builtgreenblog/2021/10/29/dousing-a-love-affair-with-gas-stoves

Why Go Induction: https://www.forbes.com/sites/sherikoones/2019/02/11/why-go-induction/

3-23: Install energy monitoring device in home

Responsible Party: Energy Consultant, MEP Engineer, Electrical Subcontractor

Intent: Information is a powerful tool that can help occupants monitor how their behaviors affect their energy use and their utility costs. With home energy management systems, occupants can manage their smart home (see Credit 6-27) in a way that's easier, securer, and more visible to achieve more control over power consumption in the home. Research has established that these systems are extremely useful in achieving energy and cost savings. This is because they allow for more efficient energy consumption and convenience, which lowers carbon emissions and, subsequently, energy costs.

Consult your MEP engineer or energy consultant to determine which type of energy monitoring device or system is appropriate for the size and scope of the project.

Performance Requirement: Install an energy monitoring device in the unit that shows energy use for all primary energy-consuming systems in the home (e.g., appliances, heating/cooling, water heating, lighting, and plug loads). The preferred model should provide robust data security and privacy features as well as a user-friendly interface and feature set. Educate the property owner or occupant on how to operate the device and utilize the information it provides. Include the user manual with the Homeowner kit (see Credit 7-2).

Points: 3 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 6-27, 7-2

Resources:

A Comprehensive Guide to Home Energy Management Systems: https://sustainable-now.eu/guide-to-home-energy-management-systems/

3-24: Per unit Level II EV charging: Pre-wire a dedicated 240V line and 50 amp circuit, install dedicated EV charging compatible receptacle, or install an EV charging station

Responsible Party: General Contractor, MEP Engineer, Electrical Subcontractor

Intent: As the cost of electric vehicles (EV) falls and more models are introduced to market, EV are rapidly becoming a significant portion of new vehicle purchases. Retrofitting a home for EV charging is much less materials efficient than installing during construction. In the case of many urban infill projects, homeowners may not have a garage or a dedicated place to install the required EV charging infrastructure. By pre-wiring dedicated circuits and junction boxes and installing vehicle charging stations (capable of level II charging) while the home is being built, we reduce the barriers to EV ownership and increase the marketability of Built Green properties to EV owners.

There also may be incentives and credits available through federal, state and local incentives; please check DSIRE for the most up-to-date incentive information related to EV charging technologies.

Performance Requirement: This credit is intended to be applied per unit, not selectively over multiple units in the same development with private parking spaces/garages. The exception to this is a charging station located in a development's communal parking area as an amenity available to all residents. Check local codes for additional EV charging requirements and electrical specifications. Include information on these systems in the Homeowner's Kit, see Credit 7-2.

EV-Capable: pre-wire a dedicated 240V branch and minimum 50 amp circuit for EV supply equipment that is terminated at a junction box (install a junction box cover) in order to allow for future installation of EV supply equipment. Label reserved breaker spaces and covered junction box "Reserved for EV Charging."

EV-Ready outlet: Install a dedicated 240V branch and minimum 50amp circuit for EV supply equipment that is terminated at an EV charging compatible receptacle. Check with local electrical codes, EV charging cable manufacturers, or prospective homeowner for the required technical specifications for the receptacle that best suits the needs of the intended EV that will be charged.

EV charging station installed: Install one or more Level II vehicle charging stations in the garage or shared parking area per manufacturer's specifications. Consult with prospective homeowner to determine which charging station will best suit the intended EV to be charged. Shared charging stations may be free to tenants or a pay station charger. Charging stations may have single or dual charging capacity, both types are only counted as a single charging station.

(Source: Energy Trust of Oregon)

Points Breakdown: Maximum of 10 points.

2 Points: Per pre-wired EV charging junction box, maximum 2 per unit

5 Points: Per EV-outlet installed, maximum 2 per unit

10 Points: Install a level II residential EV charging station

When Verified: Visually verified during intermediate construction and final inspections.

Cross Reference: 7-2

Resources:

Energy Trust of Oregon: EV Ready and EV Charging Residential Installation Requirements: https://insider.energytrust.org/wp-content/uploads/Net-Zero-and-EHS-Requirements-Guide.pdf

King County Ordinance (2020-0417) relating to electric vehicle parking regulations in residential and nonresidential development in unincorporated King County: https://mkcclegisearch.kingcounty.gov/LegislationDetail.aspx?ID=4697304&GUID=FEE1A37D-69D5-4AD1-881D-F86ECC8AEF13&Options=&Search=&FullText=1

What Is the Difference Between EV Capable, EV Ready, and EV Installed?: https://www.chargedfuture.com/ev-capable-ev-ready-and-ev-installed/

Energy Star - Building Electric Vehicle Ready Homes: https://www.energystar.gov/sites/default/files/asset/document/ENERGY_STAR_Building%20Electric%20Vehicle-Ready%20Homes_OnePager.pdf

Database of State Incentives for Renewables & Efficiency (DSIRE): https://www.dsireusa.org/

3-25: Per unit PV solar systems: make PV-ready, make installed PV system storage-ready or install solar batteries

Responsible Party: General Contractor, MEP Engineer, Electrical Subcontractor

Intent: While the idea of a solar battery for one's home is appealing; the price tag can outweigh the potential benefits for many homeowners. However, that reality is quickly changing. As the amount of residential solar production increases some US energy markets are introducing time-of-use billing or moving to eliminate or reduce net-energy metering. These scenarios provide an economic incentive to future-proof a home with a solar-plus storage system. Building in system resiliency for future battery upgrades could provide reassurance that offsets homeowner doubts in uncertain policy markets. Hybrid inverters, with the innate ability to switch between grid-tied and islanding power, can offer customers flexible operational modes for various states of use. For example, customers with inverters can use them for grid-tied net metering today with the option of adding a battery for clean backup power tomorrow.

Setting aside financial incentives, another good reason for batteries is back-up power, or as a more reliable alternative to a fossil-fuel back-up generator. A grid-tied system will not provide power to a home during a power outage caused by storms or earthquakes. The one exception to this is a hybrid inverter which provides a small amount of power only when the sun is out. To keep a refrigerator, lights and furnace blower running when the grid goes down, solar PV by itself can't do it and a battery bank is required. Unfortunately, batteries can add thousands of dollars in cost and are manufactured with heavy metals or rare-earth minerals. Most urban power outages only last a few hours so a smaller battery back-up to keep the fridge, lights, and emergency communications on may make more sense. The size of the back-up battery bank will be determined by the property owner's budget and individual power requirements.

For homeowners that want to future-proof their solar PV system and home, or desire some level of energy independence or resiliency, may want to take advantage of the Federal Investment Tax Credit (ITC) that provides a 26% personal tax credit for the cost of a solar PV system (including inverter and storage) until December 31, 2022 (subject to change). The residential portion of this tax credit incentive is scheduled to end by 2024 (subject to change). There also may be other incentives and credits available through federal, state and local incentives; please check DSIRE for the most up-to-date incentive information for solar PV technologies.

Performance Requirement:

A unit is considered Solar PV ready with the following components and systems in place:

1. Perform a site assessment to determine optimum location for future PV solar panels, see Credit 3-10. The optimum location may, or may not, be on the main structure, but could be on a detached garage or carport.
2. A 36-by-36-inch area of wall space with code workspace clearance as near the electrical panel as possible must be reserved for the future mounting of solar equipment (e.g., an inverter, combiner panel and disconnect). If the reserved area is located on the exterior of the house, this area must be protected from sun exposure.
3. A three-quarter inch or larger nonflexible metal conduit must be installed from an accessible attic/roof area at the Solar Roof Area to the space reserved for the inverter near the electrical panel. Each end of this conduit must be terminated in a 4-by-4-inch recessed deep metal box mounted 36 inches off the finished floor with a metal cover clearly labeled “Reserved for solar”.
4. All conduit and electrical boxes must be labeled, secured, and supported according to code requirements and in accordance with their performance ratings. Conduit should have three or fewer 90 degree turns from the beginning to the termination. Conduit must include a pull string.
5. Electrical panel that will be powered by solar must be sized to accommodate a minimum 40-amp solar feed and room must be reserved for a 40-amp double pole breaker on the opposite end from the main service feeder for the future solar. The reserved breaker must be clearly labeled “Reserved for solar.”
6. A sign or label must be clearly posted on or near the electrical panel stating, “This home is solar ready.”
7. All structural and electrical accommodations shall be documented on the building plans.

A solar PV system that is storage-ready is comprised of the following electrical components and systems:

1. A subpanel for designated protected loads must be installed as part of construction and must be sized to accommodate the loads being served plus the inverter and the battery energy storage system (BESS). The protected loads subpanel must be fed from a breaker located on the opposite end from the main service feeder on the electrical panel. The protected loads subpanel must include reserved breaker space on the opposite end from the main service feeder for a 40-amp double pole breaker

as described in the solar electric requirements above and must also include reserved breaker space for a 50-amp double pole breaker for the future energy storage system. The reserved breaker spaces on the subpanel must be clearly labeled “Reserved for Storage” and “Reserved for Solar.”

2. In addition to the reserved breaker space for storage and solar, the protected loads subpanel must include at a minimum the following circuits:
    a. Lighting circuits for the primary living area
    b. Outlet circuits for the primary living area
    c. Lighting circuits for the kitchen
    d. Outlet circuits for the kitchen including the circuit intended for the refrigerator
    e. Do not include dedicated circuits on the subpanel for electric range, cooktop, dishwasher, garbage disposal and/or microwave
3. A 48-by-72-inch area of wall space located next to the protected loads subpanel must be reserved for the future mounting of solar equipment, battery energy storage system (BESS) equipment and controls. If located on the exterior of the house, this area must be protected from sun exposure.
4. A 1-inch or larger flexible metal conduit must be installed from the bottom of the protected loads subpanel and the conduit must be terminated in a 4-by-4-inch recessed deep metal box with a metal cover clearly labeled “Reserved for storage.”
5. A sign or label must be clearly posted on or near the protected loads subpanel indicating “This home is Solar + Storage Ready.”

(Source: Energy Trust of Oregon)

Solar PV systems that are designed to utilize an electric vehicle’s battery as an emergency power source for the home are considered storage-ready for the consideration of this credit.

A solar PV system is considered solar-plus storage if the system installed includes operational solar batteries and all components to run the solar PV system disconnected or “islanded.” Hybrid Inverters should be used for solar storage systems that are connected to a utility grid.

Points Breakdown: Maximum of 15 points.

5 Points: Unit is solar PV ready

10 Points: Installed solar PV system is solar plus storage ready

15 Points: Installed solar PV system includes storage batteries

When Verified: Visually verified during intermediate construction and final inspections.

Cross Reference: 3-10, 7-2

Resources:

Homeowner's Guide to the Federal Tax Credit for Solar Photovoltaics: https://www.energy.gov/sites/prod/files/2020/01/f70/Guide%20to%20Federal%20Tax%20Credit%20for%20Residential%20Solar%20PV.pdf

What is a "storage-ready" solar installation?: https://news.energysage.com/storage-ready-solar-installation-inverters/

How to future-proof PV systems with a storage-ready inverter: https://solarbuildermag.com/featured/future-proof-pv-systems-storage-ready-inverter/

Solar + storage for resiliency: https://www.energysage.com/solar/solar-energy-storage/storage-resiliency/

All about Battery Storage: https://www.a-rsolar.com/learn/battery-storage-home/

Energy Trust of Oregon: Solar Ready & Solar + Storage Ready Residential Installation Requirements (pg 17-24): https://insider.energytrust.org/wp-content/uploads/Net-Zero-and-EHS-Requirements-Guide.pdf

Database of State Incentives for Renewables & Efficiency (DSIRE): https://www.dsireusa.org/

3-26: No combustion fuels used in the home - 100% electric

Responsible Party: Architect, General Contractor, MEP Engineer

Intent: Washington state has mandated that the state energy code must reach net zero energy by 2030. Many local jurisdictions are already considering requirements for electrification or natural gas bans for all new construction. As of March 15, 2021, Seattle's Green Building Standard and priority green expedited permitting programs require 100% electrification.

This can be achieved by removing fossil fuels from a home's energy use and replacing appliances that are currently powered by fossil fuels with electricity-powered appliances. The benefits of this replacement include healthier and safer homes, saving both money and energy, reduction of carbon emissions in the home and in the outside environment, and local clean energy jobs.

While building electrification has promising benefits for residents and for the state, it must be pursued equitably—ensuring that all communities can benefit and are not left behind with polluting and increasingly expensive gas appliances. This is especially true for communities of color and underserved populations that suffer higher rates of poor indoor

and outdoor air quality and are disproportionately impacted by higher instances of asthma, see Credit 6-12.

Performance Requirement: No fixed combustion fuel burning infrastructure or equipment to be installed to and in the unit. Non-fixed furniture and equipment may use combustion fuels if located outdoors (e.g., grills, fire pits, back-up generators). This is a requirement for all NZE and NPE homes, see Credits 3-3 and 3-4. Not applicable for sites located in jurisdictions with code-required electrification or a fossil-fuel ban for new construction (excludes green building incentive program requirements).

Points: 8 Points

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 1-39, 3-3, 3-4, 4-51, 6-12

Resources:

Zero Carbon Policy Toolkit: https://shiftzero.org/toolkit/

Equitable Building Electrification- A Framework for Powering Resilient Communities: http://greenlining.org/wp-content/uploads/2019/09/Greenlining_EquitableElectrificationReport_2019_WEB.pdf

RMI, The Impact of Fossil Fuels in Buildings: https://rmi.org/insight/the-impact-of-fossil-fuels-in-buildings/

3-27: Participate in local utility's green power electricity program for renewable electricity sources (covers minimum 25% of energy used)

Responsible Party: Developer, General Contractor

Intent: Reduce the use of fossil-fuel derived electricity.

Performance Requirement: Developer or General Contractor must enroll in the utility's renewable energy program to cover a minimum of 25% of the project's construction meter electricity consumption.

Points: 7 points

When Verified: Verify utility bill documentation at time of final inspections.

Extra Credit for Energy Efficiency

3-28: Extra credit for innovation in Energy Efficiency

You may submit an energy saving strategy or system, not specifically called out in this Section, for consideration for an Extra Credit for Innovation. All extra credits are subject to approval by the Built Green Program Manager. If approved, add up to 10 points.

SECTION FOUR: HEALTH AND INDOOR AIR QUALITY

OVERALL

4-1: Certify the home with a third-party verified program emphasizing indoor air quality (e.g., EPA Indoor airPLUS®)

Responsible Party: Developer, Architect or Verifier

Intent: Indoor airPLUS is a voluntary partnership and labeling program that helps new home builders improve the quality of indoor air by requiring construction practices and product specifications that minimize exposure to airborne pollutants and contaminants. Clean air is good for everyone's health, but it can be especially important to those who have chronic respiratory conditions.

Performance Requirement: Provide EPA Indoor airPLUS certificate. Evidence of certification in progress may be accepted in lieu of final certificate. Another third-party verification of indoor air quality performance may be obtained with prior approval by the Built Green Program Manager.

Points: 5 points

When Verified: Document review at time of project completion.

Resources:

EPA Indoor airPlus: https://www.epa.gov/indoor-air-quality-iaq

4-2: Design for soundproof area in home

Responsible Party: General Contractor, Architect

Intent: More homeowners are looking for spaces conducive to working from home, including quiet environments for conducting virtual meetings or phone calls. Reducing noise pollution in bedrooms provides more restful sleep, which increases comfort and quality of life, and offers a host of positive health benefits. Transit-oriented developments should consider implementing sound proofing strategies where traffic and transit noise pollution can cause discomfort to residents and lower property values.

Noise transmission through shared walls is a common concern of homebuyers considering townhomes and row houses. Soundproofing shared walls between units increases comfort, privacy, and property value.

Performance Requirement: Provide a soundproof area in home or soundproof shared walls between units.

Points: 3 points

When Verified: Reviewed at completion of design. Visually verify during construction or final inspection.

JOBSITE OPERATIONS

4-3: Use less-toxic cleaners (e.g., EPA Safer Choice, Green Seal Certification)

Responsible Party: General Contractor, Subcontractors

Intent: Reduce worker and occupant exposure to potentially harmful chemicals and reduce chemical degradation of nearby aquatic systems.

Cleaners and solvents can be sources of hundreds of potentially harmful chemicals. Review manufacturers' Material Safety Data Sheets (MSDS) before you buy. Avoid products with health hazards ratings higher than "1." In addition, avoid as much as possible products with ingredients that the MSDS classifies as toxic (poisonous), flammable, caustic (causes burns), or chemically reactive. Leftovers of these products will be hazardous waste, see Credit 2-45.

Performance Requirement: Create a green housekeeping plan for construction clean-up. Use environmentally friendly alternatives, including biodegradable products and those that are zero-VOC or low-VOC (no- to low-volatile organic compounds). Look for products from EPA Safer Choice lists or with a Green Seal or equivalent certification label.

Points: 1 Point

When Verified: Review of green housekeeping plan during construction.

Cross Reference: 2-45

Resources:

EPA Safer Choice: https://www.epa.gov/saferchoice/learn-about-safer-choice-label

Greenseal certification: https://greenseal.org/

Certified Clean Air Choice Cleaners:
https://www.aqmd.gov/home/programs/business/business-detail?title=cacc&parent=certified-products

4-4: Take measures to avoid problems due to construction dust (perform all measures below)

Responsible Party: General Contractor, Subcontractors

Intent: Reduce health and safety risks for builder and trades workers and prevent long-term adverse health impacts. Research carried out in both the UK and the US showed that long term exposure to this type of dust can produce chronic lung conditions. There are three main types of construction dust, all harmful to health:

> *Silica Dust* – also known as respirable crystalline silica or RCS. Silica dust is generated when working on materials such as rocks, concrete, bricks, mortar, and sandstone. Silica dust is too fine to see with the naked eye, but it can penetrate deeply into the lungs and damage lung tissue, leading to fatal or debilitating respiratory diseases.
>
> *Wood Dust* – created when working on softwood, hardwood, and wood-based products like MDF and plywood. Wood dust is a carcinogen which causes cancer as well as asthma. The Health and Safety Authority (HSA) in the UK estimates that people working in the wood industry are four times more likely to develop asthma than other workers. Hardwood dust and formaldehyde are proven cancer-causing agents, with hardwood dust causing a rare form of nose cancer.
>
> *Low Toxicity Dust* – created when working on materials containing very little or no silica. The most common include gypsum (e.g., in plasterboard), limestone, marble, and dolomite.
>
> *Wildfire smoke* – An ever-increasing threat to worker health due to increased wildfires across the western region.

Performance Requirement: Must perform all measures listed below to earn this credit. Ideally, the HVAC system should not be used during construction to void potential contamination of the system. Using temporary space heaters is feasible and generally doesn't cost more. Preventive measures to avoid subsequent problems resulting from construction dust include:

- Seal all ductwork to protect from dust and other contaminants during construction.

- Cover all duct openings and air handlers/fans during construction, both staged and installed, and mask floor registers after installation to prevent debris from accumulating prior to move-in.
- Vacuum up dirt, dust, and wood shavings as you go.
- Vacuum stud bays before sheet-rocking
- Use wet sanding for gypsum board assemblies; or if dry sanding, use vacuum-assisted drywall sanding equipment.
- Vacuum the floors before final flooring installation.
- Isolate areas of work to avoid contamination of clean spaces.
- If using the HVAC system, install construction filters—change them after construction is complete, then flush and change them again (mechanical contractors can do this). A MERV of 8 at each return air grill if handlers must be used during construction.
- Provide N-95 masks to workers on days with wildfire smoke present and shorten work days or increase the number of breaks with access with cleaner, filtered air.

Points: 2 points

When Verified: Visually verified at intermediate construction and final inspections.

Cross Reference: 4-5, 4-7, 4-8

Resources:

Construction Dust Health and Safety:
https://www.elcosh.org/document/3689/d001228/Construction+Dust.html

Building in the Time of Wildfires: https://builtgreen.net/blog-detail/builtgreenblog/2021/08/12/building-in-the-time-of-wildfires

4-5: Implement comprehensive dust control plan as described

Responsible Party: General Contractor, Subcontractors

Intent: Dust is an increasing concern in this area. Dust is generated by the surrounding landscape and wind to some extent, but exacerbated by soil disturbance, grading, wind tunnels, or declining habitat and vegetation.

Performance Requirement: A comprehensive dust control plan addresses dust concerns both during construction and after the occupant has moved in. Check with local jurisdiction for dust control requirements for construction projects. To earn points for this credit, each of the following must be completed:

- Do not use diesel fuel for dust control on the construction site and roads.
- Do not install any wood burning fireplaces (see Credit 3-26).
- Set aside a percentage of the site to be left undisturbed, emphasizing protection of critical areas, wildlife habitat, and dust control, for at least 25% of the site (see Credit 2-17).
- Limit grading to 15 feet around structures, septic, ground-source heat pump fields, except for driveway access (See Credit 2-24).
- Limit grading to an average of 20ft outside building footprint.
- Apply a green dust control joint compound.
- Use pervious materials for driveways, parking areas, walkways, and patios (see Credit 2-29). Protect pervious surfaces from accumulating dust and tracked-on debris, soil, and mulch that will lead to clogging.
- Install a Merv 12 or better filter (see Credit 4-44).

Points: 3 points

When Verified: Construction

Cross Reference: 2-17,2-24, 2-29, 3-26, 4-4, 4-44

Resources: Washington Department of Ecology publication to assist in dust prevention strategies: https://apps.ecology.wa.gov/paris/DownloadDocument.aspx?id=229076

4-6: Use moisture meter to ensure moisture levels are 19% or less in walls, 12% or less in floors before closing up, installing drywall, and finishing floors

Responsible Party: General Contractor

Intent: Reduce the risk of moisture-related indoor air quality and durability issues during building occupancy.

Performance Requirement: Use a moisture meter to make sure moisture content of sheathing and framing materials does not exceed 19% in walls; sub-floors should be below 12% in floors before closing up, installing drywall, and installing finish floors. If readings exceed these levels, dehumidify before installing insulation and drywall. Do not use unvented combustion-type heaters or the home's heating system during construction. Heating options includes using a dehumidifier or an electric heater.

Points: 2 points

When Verified: Visually verified at intermediate construction and final inspections.

Cross Reference: 4-12

4-7: Block all duct ports upon installation and do not use the ducted HVAC

Responsible Party: General Contractor, HVAC Contractor

Intent: During construction, debris often enters through the registers to collect in the ducting. Unless removed, fine particles from the debris, which can be respiratory irritants, can circulate within the ducts and re-enter the spaces through the registers, and can lead to reduced HVAC system life. Just before occupancy a professional duct cleaning company should thoroughly clean and vacuum ducts and replace filters from construction, see Credit 4-8.

Performance Requirement: During construction block all duct ports/registers and do not use the ducted HVAC during construction.

Points: 2 points

When Verified: Visually verified at final inspection.

Cross Reference: 4-5, 4-8

4-8: Clean duct and furnace thoroughly just before owners/tenants move in

Responsible Party: General Contractor or HVAC Contractor

Intent: During construction, debris often enters through the registers to collect in the ducting. Unless removed, fine particles from the debris, often respiratory irritants, can circulate within the ducts and re-enter the spaces through the registers.

Performance Requirement: Just before occupancy a professional duct cleaning company should thoroughly clean and vacuum ducts, and replace filters from construction. Requires implementation of Credit 4-7, block all duct ports upon installation and do not use the ducted HVAC.

Points: 3 points

Cross Reference: 4-7

When Verified: Visually verified at final inspection.

4-9: No smoking inside of any building or within 25 ft. (or more) radius of exterior of any building

Responsible Party: General Contractor

Intent: The Centers for Disease Control and Prevention (CDC) reports that a staggering 34.3% of construction workers use some form of tobacco. A report published by Emerald Group sought to quantify the smoking habits of construction workers. It was found that, on average, a tobacco-using construction worker smoked about six cigarettes in an eight-hour shift. This added up to 73 non-working minutes, an incredible 15.2 percent loss in productivity. That's before you even consider the health impacts of smoking and associate costs. As the report states, "This productivity loss is much higher than productivity losses through increased sick leaves or wage penalties for smokers found in the literature."

Performance Requirement: Allow no one to smoke inside any building or within 25 ft. radius of exterior of any building. Require either a smoke-free site or provide a designated smoking area that also includes a cigarette butt recycling container, see Credit 5-102.

Points: 2 points

When Verified: Visually verified at intermediate construction and final inspections.

Resources:

Dangerous And Wasteful: Smoking On Construction Sites Part 1: https://cotneycl.com/dangerous-and-wasteful-smoking-on-construction-sites-part-1/

Terracycle Cigarette Waste Recycling: https://www.terracycle.com/en-US/brigades/cigarette-waste-recycling

4-10 Train subs in implementing a healthy building jobsite plan for the project and contractually require compliance

Responsible Party: General Contractor

Intent: Workers need to be trained to recognize and avoid unsafe working conditions. To implement a healthy building jobsite plan, it is important to enlist the support and cooperation of your subcontractors, especially those that will be cutting or sanding particle-shedding materials or applying adhesives and caulks indoors (for example, insulation installers, drywallers, flooring installers, countertop installers, finish carpenters, framers, plumbers, and HVAC contractors). Before the job begins and during onsite work, coordinate with them regarding:

- Using precautions to avoid problems due to construction dust and wildfire smoke (see Credit 4-4)
- Using low toxic and non-hazardous materials (See Credits 2-45, 4-3, 4-23, 4-27)
- Venting out the building during and after each application of finish

- Preventing moisture accumulation and entrapment in the structure during construction that could cause mold growth or other damage during the life of the structure; using only electric or vented heaters, or dehumidifiers, if needed, to dry out the building during construction (See Credit 4-6)
- Prohibiting smoking in the structure enclosure (see Credit 4-9)
- Coordinating closely with HVAC and electrical contractors for installation of whole house ventilation and quiet spot ventilation in wet areas (see Credits 3-16, 4-51, 4-55)
- Making sure any toxic materials such as asbestos or lead are handled properly (See Credit 2-45)
- Implementing a jobsite "no-idle zone policy" for all equipment and vehicles not in active use (see Credit 4-11)

Performance Requirement: Prior to subcontractors starting work, train them on implementing a healthy building jobsite plan for the project, including the items listed in the above Intent section. Hold regular "toolbox talks" and require relevant subcontractors to attend. All subcontractors on the jobsite should be informed and trained on the building jobsite plan; provide translation or translated documents as needed.

Points breakdown:

4 Points: Training subs prior to start of work

8 Points: Training provided and subs contractually required to comply

When Verified: Review of healthy jobsite plan and visually verified during intermediate construction and final inspections.

Cross Reference: 2-45, 3-16, 4-3, 4-4, 4-9, 4-11, 4-23, 4-27, 4-51, 4-55

Resources:

ToolBox Talk Topics: https://lni.wa.gov/safety-health/safety-training-materials/toolbox-talks

4-11 Implement a "no-idle zone policy" for equipment and vehicles not in active use

Responsible Party: General Contractor

Intent: Prevent unnecessary idling and resulting emissions. Idling of non-road equipment wastes an average of one gallon of fuel per hour, increases wear and tear on the engine, and harms the vehicle's operator and the people who live and work near the construction

site. Eliminating unnecessary idling saves money, increases the life of your equipment, and helps everyone breathe easier!

- Diesel exhaust includes sooty particles layered in heavy metals and toxic gases including formaldehyde and benzene.
- Diesel exhaust can contain up to 40 hazardous substances including many of Washington's worst toxic air pollutants.
- Diesel's sooty particles (PM 2.5) are more toxic than particles from wood smoke or car exhaust.
- Soot ranges in size from a sand grain to "nano-particles" so small they can move from lungs to the bloodstream.

Consider using alternative fuel or electric construction equipment and vehicles (see Credit 5-101).

Performance Requirement: Enforce a policy that does not allow construction vehicles to idle for more than five (5) consecutive minutes if the vehicle is not in motion. Examples include cars, trucks, hydraulic lifts, cranes, cement mixers, cherry pickers, boom lifts, excavation tools, skid steers, or similar equipment. Post signage, and involve and train subs.

Points: 2 points

When Verified: Review policy and verify practice onsite during intermediate construction inspections.

Cross Reference: 5-101

Resources:

Concerns about Adverse Health Effects of Diesel Engine Emissions: https://apps.ecology.wa.gov/publications/documents/0802032.pdf

DIRT ON DIESEL 2016: https://www.oregonlegislature.gov/dembrow/workgroupitems/5-27%20OEC%20Dirt%20on%20Diesel%20Report%202016.pdf

Layout & Material Selection

How we finish and furnish our homes can impact the quality of the home's indoor environment. This means selecting products that are environmentally friendly, healthy, and low in formaldehyde and volatile organic compounds. It also means using less carpet and other textiles and installing more flooring and other surfaces that are smooth and easy to clean.

Resources:

AIA Healthier Materials Protocol: https://www.aia.org/resources/198731-healthier-materials-protocol

Materials Library Entry Criteria & Selection Guide: https://www.hpd-collaborative.org/msr-design-free-design-materials-action-packet/

4-12: Use products with a Health Product Declaration (HPD)

Responsible Party: Architect, General Contractor

Intent: A Health Product Declaration (HPD) provides a standardized way of reporting the material contents of building products, and the health effects associated with these materials. The HPD Open Standard is a voluntary technical specification that reports product contents and associated health information. The HPD Open Standard was developed by manufacturers, architects, designers, specifiers, contractors, and scientists. HPDs enable manufacturers to disclose information ranging from meeting minimum requirements to full disclosure and transparency. The HPD Open Standard is managed by the HPD Collaborative (HPDC), a nonprofit member organization representing the Architecture/Engineering/Construction (AEC) industry.

Performance Requirement: Include HPDs as part of material selection criteria, then select and use products with HPDs on the project.

Points breakdown: 1 point per product with a Health Product Declaration. Maximum 5 points.

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 1-22

Resources:

HPD Project Team Guide: https://www.hpd-collaborative.org/hpd-user-guide/

HPD Public Repository: https://www.hpd-collaborative.org/hpd-public-repository/

4-13: Use only pre-finished flooring

Responsible Party: Architect, General Contractor

Intent: A pre-finished floor is finished at the factory where there are typically more stringent ventilation practices. The factories often provide a tougher and more durable

finish than can be obtained with site-applied finishes and will also have completed most of off-gassing prior to installation. Pre-finished flooring also offers added benefits such as not generating as much dust and odors associated with onsite sanding and finishing of an unfinished product, and faster install.

Ask your green building supplier for pre-finished flooring finished with durable, plant-based, natural oil-based, water-based, and/or low toxic finishes that are third-party certified for indoor air quality (see Credit 4-19) or sustainable material sourcing, see Section 5 Finish Flooring credits. Look for spot-repairable finishes that reduce the necessity of entire-room sanding to refinish.

Performance Requirement: Install prefinished flooring for all non-carpeted flooring surfaces.

Points: 3 points

When Verified: Visually verified at final inspection.

4-13: No carpet installed

Responsible Party: Architect

Intent: Synthetic carpet off-gases when it is new. Once installed, a carpet acts like a filter for anything in the air, trapping particulates and pollutants. Anything carried onto a carpet on shoes or wheels can also become lodged in it. Hydrocarbons from a street or pesticides from a yard can enter the carpet matrix. Outdoors, ultraviolet sunlight eventually breaks down these chemicals, but inside there is nothing to remove them. Frequent and effective vacuuming can reduce the accumulation of such contaminants, but not even hot-water extraction can eliminate them all.

VOCs can be adsorbed onto carpet fibers, stored there for an indefinite time, and eventually released back into the air. Thus, carpet that is exposed when an area is painted, for example, can become loaded with VOCs from the curing paint. These VOCs can then add to the overall pollutant level in the space for an extended period of time, long after the paint has cured and stabilized. Carpets are also an ideal environment for dust mites, which consume flakes of dead human skin and leave highly allergenic excrement. Wet carpet is an ideal breeding ground for another allergen: mold and mildew.

For these reasons, this program encourages eliminating or reducing carpeting in homes. Solid surfaces are easier to clean than carpet and keep vacuuming, which stirs up dust even under ideal conditions, to a minimum. Hard surface floors are also more durable than

carpet, so they cost less per year of use. See Section 5 Finish Floor credits for flooring alternatives.

Performance Requirement: No carpet was installed in the unit.

Points: 12 points

When Verified: Visually verified at final inspection.

4-15: If using carpet, specify products certified by third-party for indoor air quality

Responsible Party: Architect

Intent: New synthetic carpets emit volatile organic compounds (VOCs) when installed. The Carpet and Rug Institute has developed testing and labeling programs to aid in the selection of low-emitting carpet, adhesives, and cushion materials. Carpet bearing the CRI Green Label Plus indicates that:

- The manufacturer voluntarily participates in these programs and is identified by an assigned number on the label.
- The manufacturer is committed to developing ways to minimize any adverse effects on indoor air quality.
- A representative sample of the product type is tested by an independent laboratory and meets stringent requirements for low chemical emissions. For specific requirements see Resource Section for link to requirement criteria.
- Green guard Environmental Institute also offers a third-party certification program for Indoor Air Quality that qualifies products as low emitting interior building materials. See the Resources Section for more information.

Performance Requirement: Specify and install carpet using CRI Green Label Plus certified materials (carpet, pad, and adhesives). Ask the retailer or product manufacturers to provide product information that includes a carpet-specific Green Label.

Points: 2 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 1-21

Resources:

CRI Green Label Plus: https://carpet-rug.org/testing/green-label-plus/

4-16: Install low pile or less allergen-attracting carpet and pad

Responsible Party: Architect

Intent: Synthetic carpet off-gases when it is new. In addition, carpeting acts as a highly effective reservoir for allergens such as dirt, pollen, mold spores, dust mites and other microbes. Moreover, as carpet wears out, the surface yarn breaks down and becomes house dust. For that reason, this program encourages eliminating carpeting in homes, see Credit 4-14.

The program recognizes carpet's popularity and functionality but suggests selecting carpet that supports better indoor air quality, a low pile type installed with natural wool or recycled content padding. Preferably, select a carpet made from natural fibers, primarily wool (see Credit 5-42) which is less attractive to dust mites and mold. Also look for recycled-content nylon carpets (see Credit 5-43); the processed materials used in them tend to be less toxic than virgin synthetics. Finally, avoid dark colors and carpets that include a lot of chemical treatments; dark-colored carpets contain more toxins than light-colored carpets because they require more dye. Many wool carpets contain no dyes at all.

Also, carpet should never be applied to a concrete slab unless provisions for a moisture/vapor retarder or insulation have been incorporated in the slab that will keep the carpet warm and dry. If not, moisture can migrate through the floor and cause mold growth under the carpet.

The program recommends using CRI Green Label Plus certified carpeting materials (see Credit 4-15) and installing by dry method (see Credit 4-18). If an adhesive must be used, choose a low-odor, low-VOC, water-based product. Never use solvent-based carpet adhesive.

Performance Requirement: Where carpet is specified, install low pile or less allergen-attracting carpet and pad.

Points: 2 points

When Verified: Visually verified at final inspection.

Cross Reference: 4-15, 5-42, 5-43

Resources:

Carpeting, Indoor Air Quality, and the Environment:
https://www.buildinggreen.com/feature/carpeting-indoor-air-quality-and-environment

4-17: Limit use of carpet to one-third of home's square footage

Responsible Party: Architect

Intent: Synthetic carpet off-gases when it is new. In addition, carpeting acts as a highly effective reservoir for allergens such as dirt, pollen, mold spores, dust mites and other microbes. Moreover, as carpet wears out, the surface yarn breaks down and becomes house dust. See Credit 4-14 for full details.

The program recognizes carpet's popularity and functionality but recommends limited the amount of carpeting. The program recommends using CRI Green Label Plus certified carpeting materials (see Credit 4-15) and installing by dry method (see Credit 4-18). If an adhesive must be used, choose a low-odor, low-VOC, water-based product. Never use solvent-based carpet adhesive. See Section 5 Finish Floor credits for flooring alternatives.

Performance Requirement: Limit installation of carpet to one-third of home's square footage.

Points: 3 points

When Verified: Visually verified at final inspection.

Cross Reference: 4-15, 4-18

4-18: If using carpet, install by dry method

Responsible Party: General Contractor

Intent: Adhesives used to install the carpet to the floor are a significant source of odor and air pollution. Tack strips or velcro-like systems (i.e., TacFast) eliminate this problem.

Performance Requirement: Where carpet is specified, install using tackless strips around the perimeter, over a cushion that is stapled to the subfloor.

Points: 3 points

When Verified: Visually verified during intermediate construction and final inspections.

4-19: A minimum of 85 percent of installed hard-surface flooring complies with the emission concentration limits of CDPH 01350 as certified by a third-party program (e.g., Floor Score, Greenguard-Gold, Red List Free)

Responsible Party: Architect, General Contractor

Intent: New hard-surface flooring off-gases when it's new. The main contributor to off-gassing is the composition of the finished flooring material, including the finishes, sealants, and adhesives used to construct it. Certified products must comply with requirements of the state of California's Department of Public Health (CDPH) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.2 (2017)" (also known as California Section 01350).

The Resilient Floor Covering Institute (RFCI) represents resilient flooring manufacturers in North America, including those who make cork, vinyl, linoleum, and rubber flooring. The industry association works to help designers, architects, facilities managers, homeowners, and others evaluate resilient flooring products.

When a product bears Greenguard certification, it meets strict chemical emissions limits and has been tested for more than 10,000 chemicals. Greenguard certifications indicate that a product is safe for indoor use.

Accepted third-party certifications and their labels:

UL -Greenguard Gold:

Resilient Floor Covering Institute- Floorscore:

International Living Future Institute- Red list Free:

Performance Requirement: Minimum of 85% of installed hard-surface flooring is certified by a third-party program to accord with the emission concentration limits of CDPH 01350. Certifications must be product-specific. See intent for approved certifications.

Points: 6 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 1-9, 1-21

Resources:

CDPH 01350: https://www.calrecycle.ca.gov/greenbuilding/specs/section01350

4-20 Garage air-sealed from house with automatic exhaust fan

Responsible Party: General Contractor, HVAC Designer

Intent: Studies show that carbon monoxide, sometimes produced in significant levels when automobiles are started, can enter the home from the attached garage. Implementing air-sealing strategies eliminates this potential source of indoor air pollution by "disconnecting" the garage from the main house.

Air sealing the garage from the house involves:

- Using caulk or foam to seal all holes in walls and the ceiling between the house and garage.
- Using the Airtight Drywall Approach (ADA) in the walls and ceiling shared by house and garage. ADA is an advanced sealing package that goes beyond basic practice.
- Making sure that the door between the house and garage is weather-stripped and is fitted with a threshold that creates a tight seal with the door.
- Installing an automatic exhaust fan in the garage. Consider the energy consumption and noise pollution when selecting a fan and installation of a shut-off timer.

Performance Requirement: Implement all air-sealing strategies listed in the credit intent.

Points: 5 points

When Verified: Visually verified at intermediate or final inspection.

Cross Reference: 1-20

4-21: Detached or no garage

Responsible Party: Architect

Intent: Studies show that carbon monoxide, sometimes produced in significant levels when automobiles are started, can enter the home from the attached garage. Detaching or eliminating the garage altogether eliminates this potential source of indoor air pollution and one of the most common ignition sources for house fires. For detached garages consider installing an automatic exhaust fan with shut-off timer to support healthier indoor air quality inside the garage.

Performance Requirement: Unit has detached garage or no garage.

Points: 10 points

When Verified: Visually verified at final inspection.

Cross Reference: 1-20

4-22: Fully insulate attached garage to minimize condensation-based mold growth

Responsible Party: General Contractor

Intent: Garages are typically not insulated because, unless the space is heated, the cost and materials use will offset any energy and comfort benefits. However, sources of heat and moist air (refrigerators, freezers, washer and dryers, automobiles, etc.) are often found in garages. During cool seasons, the temperature differential across an uninsulated envelope may be sufficient to produce condensation. This might lead to mold growth, potentially resulting in degraded air quality in the garage and, if attached to the house without proper air sealing, in the home.

Performance Requirement: Insulate to R-12, or R-21 if space is heated, and install insulated garage doors.

Points: 2 points

When Verified: Visually verified during intermediate construction and final inspections.

4-23: Inside the house and walls, use only low-VOC, low-toxic, water-based, solvent-free sealers, grouts, mortars, caulks, adhesives, stains, pigments, and additives on all wet-applied applications

Responsible Party: General Contractor

Intent: Protect workers and occupants from potential negative respiratory health impacts. Many construction products used to finish, seal or adhere materials off-gas trace amounts of volatile organic compounds (VOCs) for months following application, which can cause upper respiratory irritation in occupants. Zero-VOC or low-VOC water-based adhesives, finishing, and sealing products are generally safer to handle, can be cleaned up with water, and produce little or no off-gassing. For most indoor applications, there is almost no difference in performance traditional and low-VOC products. Many low-VOC products are comparable in price to conventional products. See Credit 4-26 for more detail on concerns regarding VOCs in paints.

An accepted industry standard for low-VOC adhesives and sealants is the State of California, South Coast Air Quality Management District (SCAQMD) Rule #1168. See resources for acceptable VOC limits for adhesive and sealants. GreenGuard Gold certified products are also accepted.

Performance Requirement: Compliant materials should be used for 100% of an application when wet-applied on site. Compliant materials are either GreenGuard Gold certified or conform to SCAQMD Rule #1168 VOC limits.

Points: 6 points

When Verified: Product data sheets reviewed during procurement, and visually verified during intermediate construction and final inspections.

Cross-Reference: 1-9, 4-26

Resources:

SCAQMD Rule #1168, Table 1 VOC Limits (amended 2017): http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1168.pdf?sfvrsn=9

Certified Clean Air Solvents: https://www.aqmd.gov/home/programs/business/business-detail?title=certified-clean-air-solvents&parent=certified-products

4-24: Use NAUF or ULEF materials for at least 90% of insulation and woodwork

Responsible Party: General Contractor, Architect

Intent: Urea-formaldehyde in the indoor environment can cause health problems for occupants, including headaches and flu like symptoms, and sick building syndrome. Some shelving, window trim, door trim, base molding, and other interior trim and wood products may also use urea-formaldehyde glue as a binder. With an off-gassing half-life of about 10 years, urea-formaldehyde continues to off-gas formaldehyde for years after application.

Specialty medium-density fiberboard (MDF), particle board (PB), and hardwood plywood (HWP), including veneer and composite core products, are certified by Scientific Certification Services (SCS) for wood fiber content and for having no added formaldehyde (lab tested to 0.05 ppm); i.e., CARB ATCM 93120 compliant. Products manufactured using polyurea resin in place of the urea-formaldehyde resin commonly used in MDF and particleboard can be used for these applications. Some finish contractors do not like working with MDF products for trim and molding applications because it is so brittle. Consider MDF for flat trim areas such as mantles, wall panels, and wainscoting. Plaster options are also available. Look for plywood and composites used in flooring and cabinetry products that use NAUF or ULEF resins or adhesives as binders.

Specify the following designations or certifications on insulation and wood products:

NAUF: No added urea-formaldehyde

ULEF: Ultra-low-emitting formaldehyde

Performance Requirement: Use NAUF or ULEF materials for at least 90% of insulation and woodwork; see point breakdown for applicable applications and associated points. CARB II compliance does not meet the intent of this credit.

Points breakdown: May be earned individually or combined for a total of 15 points.

3 Points: Insulation

2 Points: Finish work, including shelving, window and door trim, and base molding

2 Points: Interior use plywood and composites of exterior grade or with no added urea formaldehyde

5 Points: Flooring material (carpet excluded)

3 Points: Cabinets with low-toxic finish

When Verified: Review of product documentation and visually verified during intermediate construction and final inspections.

Cross Reference: 1-9, 1-21

Resources:

CARB ATCM 93120 standard: https://ww2.arb.ca.gov/our-work/programs/composite-wood-products-program

4-25: Use polyethylene piping for plumbing and electrical conduit. No PVC piping

Responsible Party: General Contractor, Electrician, Plumber

Intent: The use of Polyvinyl chloride (PVC) plastics, that contain high levels of phthalate plasticizers, in the home are related to increased rates of asthma and allergies in children. In the event of a fire, burning PVC creates toxic smoke. The manufacturing of PVC plastics releases toxic amounts of chlorine and dioxin gases into the atmosphere, contributing to

poor air quality and global warming. By-products of PVC production are extremely hazardous and long-lived pollutants, shown to cause a range of serious health hazards from even low-level exposures. Dioxin is a potent carcinogen and there is no known safe dosage level.

Copper plumbing is another traditional plumbing material. However, if the water supply is slightly acidic or alkaline, copper plumbing can corrode and release copper ions into drinking water, which is potentially harmful to health. Polyethylene piping (PEX) has lower environmental impact than copper and PVC. Due to the strip-mining process required to obtain copper ore, PEX used with brass emits less greenhouse gases than all kinds of copper. Polyethene is an industrial byproduct of oil and natural gas production.

Performance Requirement: Use polyethylene piping (PEX) for all plumbing and electrical conduits (including exterior drainage). No PVC piping to be used on the project site.

Points: 3 Points

When Verified: Visually verified during intermediate construction and final inspections.

Resources:

Environmental Impacts of Polyvinyl Chloride Building Materials: https://s3.amazonaws.com/hbnweb.prod/uploads/files/environmental-impacts-of-polyvinyl-chloride-building-materials.pdf

4-26: Use low- or non-VOC and non-toxic interior paints and finishes on large surface areas or all interior surfaces; 150 flat, < 50 for non-flat

Responsible Party: General Contractor, Architect

Intent: Solvent-based paints are traditionally considered the most durable, but they produce toxic emissions when curing and require the use of hazardous solvents for cleanup. In addition, they off-gas trace amounts of volatiles (gases) for months following application, which can cause upper respiratory irritation in occupants. Choose your colors carefully as darker colors inherently contain higher VOC content because of added pigments.

Zero-VOC or low-VOC water-based paints are generally safer to handle, can be cleaned up with water, and produce little or no off-gassing. For most indoor applications, there is almost no difference in performance between solvent-based and water-based paints. Many low-VOC paints are comparable in price to conventional paint.

Low-VOC, water-based paints may still contain toxic ingredients, however. Although these toxic ingredients are not generally an air quality problem for occupants, they may be hazardous to painters and people involved in manufacturing of the paint. In addition, hazardous ingredients can degrade the natural environment during production and after disposal. They may also leave an odor for a much longer period. Fortunately, several locally available, water-based paints perform well and are low-toxic—they do not contain heavy metals or organic compounds. Most suppliers have a good selection of Zero-VOC and low-VOC products. You have to ensure the low-VOC paint is also low-toxic.

Low-toxic, clear sealers are also available to use as finishes for woodwork. Water-based or plant oil-based varnishes, polyurethanes, and other finishes for hardwood floors are very durable and much safer to handle than traditional products. Low-toxic solvents, water-based strippers, and all-natural thinners are also locally available.

If you have clients who may be highly chemical-sensitive, consult with them on brand and chemical ingredient tolerances; see references for a few brands to consider. Look for products that include a Declare label, see Credit 5-24. Alternatively, use materials with natural finishes that do not require paint—wood, plaster, concrete, tile or glass, see Credit 5-56.

A sample of brands to consider for clients with high chemical-sensitivities:
Ecos Paints: https://www.ecospaints.net/
AFM Safecoat: http://afmsafecoat.com/
Rubio Monocoat wood stains and finishes: https://www.rubiomonocoatusa.com/

Performance Requirement: GreenSeal products meet these standards. The VOC concentrations of the paint and finish products shall not exceed:

- Non-Flat paints/finishes: 150 VOC weight in grams/liter of product (minus water)
- Flat interior paints/finishes: 50 VOC weight in grams/liter of product (minus water)

Points breakdown:

3 Points: for large surface areas

5 Points: for all interior surfaces

When Verified: Review of product documentation and visually verified during intermediate construction and final inspections.

Cross Reference: 1-9, 5-24

Resources:

Low VOC Architectural Coatings: https://www.aqmd.gov/home/rules-compliance/compliance/vocs/architectural-coatings/super-compliant-coatings

Moisture Control

4-27: Slope crawlspace and foundation grade toward perimeter for drainage, supply drainage lines out to exterior footing drains, and install polyfilm vapor barrier sealed to stem walls

Responsible Party: General Contractor, Civil Engineer

Intent: Although a crawl space foundation is not intended as living space, it is highly desirable to keep it dry. Stormwater that stands or seeps around crawlspace, slab, foundation, or basement can lead to moisture damage, dampness, and mold growth. Effective surface drainage is always recommended, and in many cases subsurface drainage systems may be desirable. The goal of surface drainage is to keep water away from the foundation by sloping the ground surface and using gutters and downspouts for roof drainage.

Performance Requirement: Backfilled dirt around the footprint of a building should slope down and away for a distance of at least 5 feet to ensure surface runoff away from structure. Down spouts should feed into infiltration trenches or other drainage systems that convey water away from footings. Garage floor and driveway are sloped to drain out.

Points: 1 point

When Verified: Visually verified during intermediate construction.

4-28: Envelope inspection at pre-insulation and pre-dry wall by a qualified professional

Responsible Party: Developer, General Contractor, Building Enclosure Commissioner

Intent: To ensure that envelope design features are properly installed and will properly control rainwater absorption, airflow, and vapor diffusion, decreasing the chance of moisture-related problems and improving air quality and building durability.

Performance Requirement: A qualified envelope consultant inspects construction elements that can impact the building envelope's ability to control and manage moisture intrusion. Qualifications include Building Enclosure Commissioning Process Provider (BECxP) or equivalent, approved by Built Green program—must be a third-party (not be an

employee or subcontractor of the General Contractor). Site inspection schedule must be determined in advance, based on envelope assembly details and sequencing, and must be coordinated appropriately during construction; reports must be submitted for each visit. Credit will not be earned if Developer or General Contractor chooses not to correct any substantive issues reported during these inspections.

The inspection should address the following elements:

- Air sealing: building envelope penetrations should be sealed (such as air-tight recessed cans) and chases are capped and sealed.
- Insulation and windows: insulation should be installed properly and to specification from roof to foundation, roof should be properly vented and window penetrations are sealed.
- Heating, cooling, and ventilation systems: ducts should be supported, run properly and located out of insulated cavities, and systems should maintain moisture levels in a safe range.
- Indoor Air Quality (IAQ): fireplaces with flues and inlets should be sealed to prevent indoor air pollution.

Points: 3 points

When Verified: Review of site visit reports and visual verification of recommended corrections and changes.

4-29: Slab on grade, upgrade under-slab moisture barrier beyond code to 10 mil minimum; minimum of 10 mil poly in crawl spaces with sealed seams and sealed perimeter

Responsible Party: General Contractor

Intent: Avoid moisture-related problems by keeping water vapor and water in the ground and out of the slab; and provide sufficient drying of the water already in the slab.

Performance Requirement: Use 10 mil polyethylene vapor barrier or equivalent performance, directly under slab. Depending on weather conditions during curing, it may be necessary to slow the drying rate of the exposed surface of the slab (by wetting out, using burlap covering, etc.) to accommodate the slower curing of the lower surface. This will prevent cracking of the slab.

If a slab is installed, use gravel fill beneath the foundation slab with a poly membrane (min. thickness of 10 mm) or vapor retarder, sealed over the gravel prior to pouring the basement floor. Seal the poly at the edges and seams to prevent moisture from migrating

into the home. Taped and sealed foam under the entire slab also applies for this credit. (Note: The poly barrier also protects against radon and other soil gases. However, soil gases are generally not a problem in Western Washington.)

If no slab is used, bottom of floor structure should be at least 12 inches (1 foot) above backfilled dirt.

Points: 3 points

When Verified: Visually verified during early construction inspection or photo documented.

4-30: Install high quality ice and water shield membrane for roofs sloped under 4:12

Responsible Party: Developer/General Contractor, Architect

Intent: Ice dams are formed by the continuous melting and freezing of snow due to heat escaping from the house, or from a backup of frozen slush from rain gutters. The melted water flows under the snow and freezes as it reaches the unheated soffit area at the eaves, thus creating an ice dam. When this occurs, water can be forced under the shingles and into the attic, resulting in damage to the home's interior. Ice and water protector membranes are a time-tested and effective solution. They not only stop leaks caused by ice dams but also stop leaks created by wind-driven rain.

Ice and water protectors, also referred to as ice and water shields, are waterproof roof underlayment membranes developed to protect vulnerable areas on a roof from ice and water damage. They are made with asphalt cement, a special stretchable membrane, and a co-polymer called styrene butadene styrene (SBS). Ice and water protectors are recommended for low-slope areas and valleys because these roof areas are particularly vulnerable.

Low-slope roofs, between the minimum of 2:12 and 4:12, are also high-risk and should be protected with an ice and water protector. Large snow drifts may collect on lower sloped roofs as they often take on the burden of snow from higher pitched roofs above. The lower slope also allows ice dams to develop higher up the roof.

The ice and water shield protects vulnerable areas on your roof where the shingles cannot. It's a great product, but like most materials, there are quality shields and ones that should be avoided. A common safety feature of high-quality membranes is a slip-resistant top surface that offers better traction during installation.

Performance Requirement: Ice and Water shield products are considered high-quality if they meet all of the following material properties: include recycled content, are reroofable, provide a slip resistant walking surface, seal around nails, inhibit oil bleed-through, and do not void the other roofing material's warranty.

Points: 1 Point

When Verified: Visually verified during intermediate construction and final inspections.

4-31 Roof overhangs are at least 24" inches

Responsible Party: Architect

Intent: Appropriately sized roof overhangs provide passive energy savings, see Credit 3-9. They also provide a moisture control benefit as they help protect the home from moisture damage caused by precipitation. When designing the structure take both the energy and moisture control benefits into account to obtain the best results. For Washington's climates, minimum roof overhangs are recommended to be 18 inch; however, this recommendation does not account for wind-driven rain, a condition that varies with local climate or site exposure. Specifying 24inch overhangs provide more protection for the wall system.

Performance Requirement: Building's roof overhangs are at least 24 inches.

Points: 1 point

When Verified: Visually verified at final inspections.

Cross Reference: 3-9

4-32: Protect windows and doors on tall walls with additional overhang protection

Responsible Party: Architect

Intent: Consider using larger overhangs, over 24 inches, for overhangs protecting more than two stories of walls with exposed windows and doors. Beyond contributing to reducing moisture penetration on exterior and foundation walls, this strategy also protects the door's finish from moisture around jambs, trim, and thresholds. Success of a larger overhang is dependent on having properly constructed walls with a weather barrier, roofs that are adequately guttered, and a maintenance plan for the exterior. Appropriately sized window and door overhangs also provide passive energy savings, see Credit 3-9. For front entry overhangs large enough to create a covered front porch they can also provide additional site and IAQ benefits, see credit 2-75.

Performance Requirement: Windows and doors on tall walls include overhangs at least 24 inches.

Points: 2 points

When Verified: Visually verified at final inspections.

Cross Reference: 2-75, 3-9

4-33: Use a nontoxic foundation, damp proofing treatment, and perimeter drain to protect walls against moisture

Responsible Party: General Contractor, Architect, Civil Engineer

Intent: Protect the building envelope from exterior moisture intrusion and uncontrolled air infiltration and exfiltration. Damp proofing is intended to keep out soil moisture while waterproofing keeps out both moisture and liquid water.

Performance Requirement: Use a non-petroleum/coal-based damp proofing product that is non-toxic, low- or zero-VOC, and solvent free. Install a perimeter drainage wall to move water away from walls and foundation.

Points: 2 points

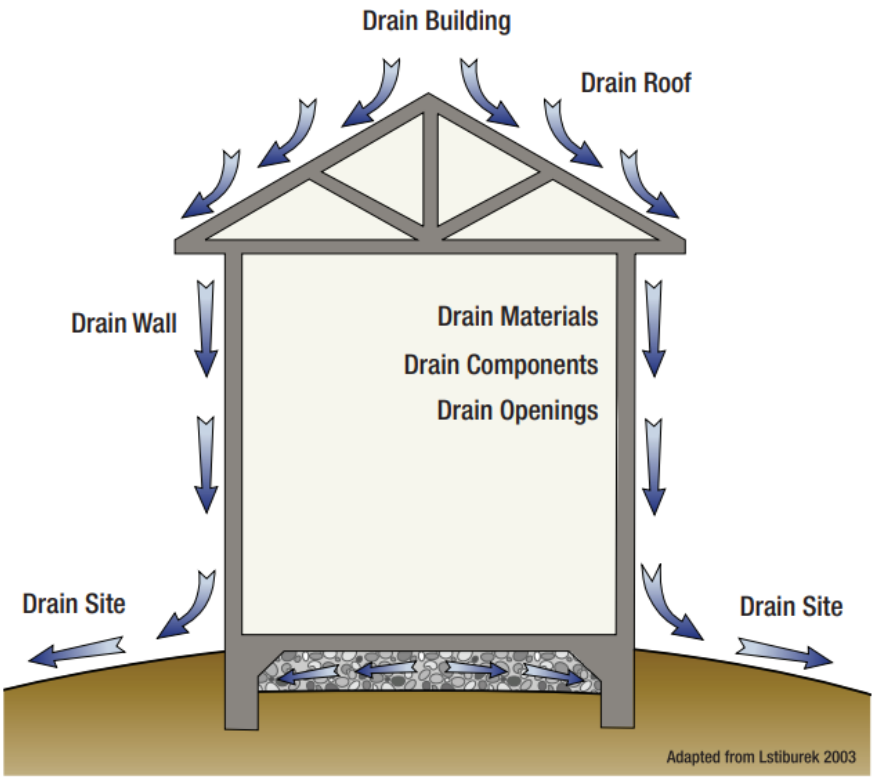
When Verified: Visually verified during intermediate construction.

Cross Reference: 4-27

4-34: Full exterior drainage plane integrated shingle-style with pan-flashed and face-flashed door and window openings, as designated in EEBA's "Water Management Guide", or equivalent

Responsible Party: General Contractor, Architect

Intent: Protect the building envelope from exterior moisture intrusion, and uncontrolled air infiltration and exfiltration.



Performance Requirement: Comply to builder requirements described in the EnergyStar Water Management System checklist section 2 water-managed wall assembly, see resources below.

Points: 5 points

When Verified: Visually verified during intermediate construction.

Resources:

Energy Star® Water Management System Builder Checklist Guide, https://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Energy_Star_V3_Water_Management_Guidebook_02.21.2011.pdf

EnergyStar® Water Management System Builder Requirements Checklist, https://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/water_mgmt_sys_bldr_req.pdf

4-35: Install a sloped sill pan with end dams and back dams for all windows, and back dams for all exterior doors exposed to weather

Responsible Party: General Contractor, Envelope Consultant, Architect

Intent: Reduce risk of moisture-related negative impacts on indoor air quality and durability problems. Window perimeters should have flashings (sill, jambs, and head) that are integrated with the water proofing at adjacent walls. Self-adhered membrane flashing as well as metal flashing are acceptable strategies for preventing water ingress. Slope head and sill flashings to the exterior for prompt drainage. Many windows leak at sill-to-jamb corners. To collect this leakage and drain it to the exterior, sill flashings with a panned up interior leg and end dams are required. Do not penetrate the horizontal portion of the sill flashing with window fasteners. Instead, where attachment of the sill frame is required, provide an attachment angle inboard of the windowsill, and fasten through the upturned leg of the sill flashing into back of the sill frame.

Products are also available that offer greater performance than traditional entry door and window flashing. Sloped sill pans feature durable synthetic construction, sloped surface, integral drainage features, lock-in end caps, and are cut table to desired lengths. Other products include a one-piece sill drain mat that installs under windows on the rough opening.

Performance Requirement: Design and implement window and door installation details that include pre-fabricated, wet-applied or self-adhered flashing that forms a back dam and end dams at the window and door sill, with a slope to drain water from the opening to the outside. Window is air sealed to the dam on the inside.

Points: 5 points

When Verified: Visually verified during intermediate construction.

4-36: Hose-test installed windows, before siding, to verify resistance to wind driven rain

Responsible Party: General Contractor, Architect

Intent: Quality-assure the effectiveness of both the window installation details as installed and the window frames themselves. The window is factory-tested, but jobsite installation can lead to potential water and air leakage into the building assembly. For instance, joints between windows and walls may not have been properly sealed, nor may there have been proper sealing to the adjoining cladding.

Performance Requirement: Perform test on the first installed window of each type in the project. If intrusion occurs during test, perform root cause analysis, modify installation, and retest. After successful completion of the test, modify installation details for all future installations accordingly.

Points: 3 points

When Verified: Review test report at time of final inspections.

4-37: Show and build moisture management details for below grade walls beyond code, such as dimple drainage mat at exterior face and capillary breaks

Responsible Party: Architect, Envelope Consultant, General Contractor

Intent: Minimize the risk of moisture issues by improving drainage of water away from foundation assemblies. Best practices indicate that there are six elements of waterproofing below grade walls:

- Slope surface soil away from the structure.
- Install roof water management system that keeps water away from basement walls.
- Install a waterproof barrier, either roll membrane or liquid-applied membrane from 6” above final grade down to and onto the die of the footing or slab.
- Install a perforated footing drain around the perimeter of foundation, and cover with geotextile filter fabric.
- Install dimple drainage mat on exterior face of waterproofing membrane to provide protection for the membrane and over top of the footing drain and drain rock. The dimple drainage mat provides an air channel for water to be carried by gravity to the footing drain.
- Finally, backfill with native soil if a dimple board air barrier with a filter fabric has been installed.

Another practice to protect the home from water moving up into the foundation is the use of capillary breaks. A capillary break is created using either an elastomeric asphalt coating or a polyethylene sheet. On the vertical face of the foundation (exterior walls) be sure to clean the surface and fill any cracks or gaps larger than 1/8" wide. Spray on a coat of elastomeric asphalt starting 4" from the ground, completely covering the surface to the top. Place a capillary break between the footing and the foundation wall. This can be done by spraying the footing with an elastomeric asphalt coating or by covering the footings with a polyethylene sheet.

Performance Requirement: Fully waterproof the exterior of foundation and below grade walls and install a dimpled drain mat from 6 inch above grade down to the footing to protect the waterproofing and facilitate free drainage of water down to the footing drain. Install at 100% of foundation and below grade walls for credit.

Points: 3 points

When Verified: Visually verified at early construction inspection or photo documented.

Cross Reference: 4-26, 4-33, 4-38

4-38: Perform calcium chloride moisture test on all slabs on grade prior to installing any finish flooring in conformance with product warranties

Responsible Party: General Contractor

Intent: Decrease potential for mold growth and installed floor failure from buckling or lifting. The calcium chloride test method is used to determine the moisture vapor emission rate (MVER) from a concrete slab. If the concrete slab has not been properly dried and cured before the flooring is installed, moisture problems are virtually guaranteed. Moisture-related problems in flooring can also become health issues as mildew, mold, gaps, bumps, and unsecured flooring pose additional risks to anyone walking over them.

Performance Requirement: Follow the protocols in ASTM F1869-04 for the use of the calcium chloride test.

Points: 2 points

When Verified: Review results of calcium chloride test.

Cross Reference: 4-6, 4-29, 4-37

4-39: Have crawl space, attic, and garage building performance tested for disconnection to the living space of house

Responsible Party: Architect, General Contractor, Energy Consultant

Intent: In the temperate marine climate of King and Snohomish counties, uncontrolled envelope infiltration can lead to excessive energy consumption for space conditioning and ventilation. It can also result in moisture ingress into building cavities, which may lead to durability issues. Clearly defining the air barrier at all points in the building envelope and ensuring its continuity at all transitions and penetrations, paired with quality assurance and quality control, allows for control of air movement in and out of the building.

Blower door tests are used to both identify air leakage paths in a home and to quantify air leakage ranges. Blower doors are also used to locate duct leaks. A blower door consists of a variable speed fan sealed into an exterior doorway and used to blow air into or out of a house. When air is blown out of the house, the structure develops a slight negative pressure (or vacuum) relative to the outside. The pressure differential drives outside air

into the house (infiltration) through any available openings in the exterior shell. These leaks can be located by touch or with smoke, then sealed.

In addition, the pressure induced by the blower door can be used to yield a quantitative estimate of the "leakiness" of the home (in square inches). Additional calculations yield the approximate natural air change rate (ACH). It's best to do a blower door test once just before sheet rock and once after sheet rock, but before attic insulation is blown in.

Performance Requirement: Architect must design and communicate to the General Contractor (GC) a continuous air barrier at, or in close alignment with the weather-resistive barrier (WRB). This is generally achieved with a membrane or wet-applied WRB, or with rigid sheet goods (sheathing, glazing, curtain-wall assemblies) and framing members. The GC must ensure that the subcontractors responsible for unit air tightness (those providing plumbing, electrical, fire-stopping, and acoustic as well as thermal sealing details) understand the importance of making clean penetrations and air-tight seals wherever possible.

Performance is confirmed with a blower door test, typically using the WSEC envelope testing protocol, to verify performance is 3.0 or less Air Changes per Hour at 50 pascals pressure difference.

Points: 3 points

When Verified: Typically, the envelope infiltration test is performed at the time of building completion. Test certificate is required as documentation.

4-40: Use an unvented, conditioned crawl space (not appropriate where flood venting is required)

Responsible Party: Architect, General Contractor

Intent: Unvented, conditioned crawl spaces perform better than vented crawl spaces in terms of safety, health, comfort, durability, and energy consumption. Conditioned crawl spaces also do not cost more to construct than vented crawl spaces. Unvented crawl spaces are not appropriate for flood zones, where flood venting is required.

Unvented, conditioned crawl spaces with insulation on the perimeter perform better in terms of safety and health (pest control), comfort (warm floors, uniform temperatures), durability (moisture) and energy consumption than passively vented crawl spaces with subfloor insulation.

Perimeter insulation, versus floor insulation, performs better in all climates from an energy conservation perspective. The crawl space temperatures, dew points, and relative humidity track with the house. Crawl spaces insulated on the perimeter are warmer and drier than crawl spaces insulated between the crawl space and the house.

Performance Requirement: Crawl spaces should be designed and constructed as mini-basements, part of the house and within the conditioned space. They should be insulated on their perimeters and should have a continuous sealed ground cover such as taped polyethylene. They should have perimeter drainage just like a basement when the crawl space is below the ground level of the surrounding grade.

Points: 3 points

When Verified: Visually verified during intermediate construction.

Resources:

Conditioned Crawlspace Construction, Performance and Codes (2004):

http://www.buildingscience.com/resources/foundations/conditioned_crawl.pdf

4-41: No plumbing distribution lines in exterior walls

Responsible Party: Architect, Plumbing Engineer

Intent: Insulating water pipes can save energy by minimizing heat loss through the piping. Insulating pipes will reduce the risk of condensation forming on the pipes, which can lead to mold and moisture damage. Pipe insulation can protect the pipes from freezing and cracking in the winter, which can cause considerable damage in the walls of the home and result in significant home repair bills for the homeowner.

Performance Requirement: Plumbing distribution lines are not located in exterior walls.

Points: 4 points

When Verified: Visually verified during intermediate construction.

Air Distribution and Filtration

4-42 Install return-air ducts or passive pressure relief strategy in all bedrooms

Responsible Party: Mechanical Engineer, HVAC Subcontractor

Intent: The most important areas of the house for optimizing indoor air quality are the bedrooms because that's where we spend most of our time. This can be achieved by eliminating toxic finishes, dust, and/or moisture-prone surfaces in these rooms. The installation of return air ducts in every bedroom ensures an adequate supply of fresh air to sleeping areas.

Optimizing air quality in sleeping areas is one example of "air quality zoning," a strategy that recognizes that different rooms have different functions and air quality control requirements. Another example is isolating air distribution systems serving hobby rooms and office areas, which produce odors, from the rest of the home.

A passive ventilation system is extremely dependent on the outdoor temperature; it functions best during colder periods of the year, when the difference between inside and outside temperatures is greatest. If used alone it can't extract humidity from bathrooms and laundry rooms. Also, passive ventilation systems should be used in conjunction with a heat-recovery ventilator, see Credit 3-16.

Performance Requirement: Design and install a ventilation system for 100% of bedrooms that provides balanced outside air supply and return, rather than an exhaust only system. System may serve individual units or be centralized. In either case, supply and return flows should be tested and balanced to be neutral or provide slight depressurization of the unit and should be commissioned prior to occupancy.

Points breakdown:

3 Points: for installing return-air ducts in all bedrooms

5 Points: for passive-pressure relief strategy in all bedrooms

When Verified: Visually verify at final inspection and review Test & Balance report.

Cross Reference: 3-16

4-43 Use medium-efficiency pleated filter, MERV 10

Responsible Party: Mechanical Engineer, Mechanical Subcontractor

Intent: When purchasing filters, look for the highest efficiency filter that works with your furnace. Filter efficiency is based on the Minimum Efficiency Reporting Value, or MERV. MERV ratings are usually listed on the product packaging. Look for the highest MERV ratings possible since this industry standard rating system measures the ability of the filter to trap particulates.

Medium-efficiency pleated filters filter air through an extended surface area (pleating) to remove between 40% and 50% of all particulate matter. They are relatively inexpensive and sufficient for most home applications. Look for products with a minimum of 10 MERV rating.

Performance Requirement: Specify medium-efficiency pleated media filters (MERV 10) and design HVAC system to function optimally with the specified filter installed. Filter housings should be designed to deter the use of inappropriate filters, and access hatches should be marked with the correct filter type and size.

Make sure you include information about the air filter system you choose (including filter size, type, quality, and the ideal replacement schedule) in the Homeowner's Kit so the homeowner can properly maintain it, see Credit 7-1.

Points: 1 point

When Verified: Visually verified at final inspection.

Cross Reference: 7-1

4-44: Use high-efficiency pleated filter, MERV 12 or better, or HEPA

Responsible Party: Mechanical Engineer, Mechanical Subcontractor

Intent: High-efficiency pleated filters with a MERV of 12 or better are available on the market. Since the MERV rating is higher, so is the filter efficiency.

More efficient filters, such as HEPA (high-efficiency particulate air) filters, remove 99% or more of all particulate matter in the air. They are expensive, have high flow resistance, and may require custom design for home applications. However, because of its high efficiency at filtering out tiny particulates, HEPA filtration is recommended for those individuals who suffer from allergies, asthma, or other respiratory problems. The filtration system connects in-line with the furnace ductwork and offers three stage filtration. An anti-microbial polyester pre-filter with a five-pound, activated carbon filter is attached to the filtration system. For these reasons, they are not commonly used in residential filtration at this time.

Performance Requirement: Specify high-efficiency pleated media filters (MERV 12+ or HEPA) and design HVAC system to function optimally with the specified filter installed. Filter housings should be designed to deter the use of inappropriate filters, and access hatches should be marked with the correct filter type and size.

Make sure you include information about the air filter system you choose (including filter size, type, quality, and the ideal replacement schedule) in the Homeowner's Kit so the homeowner can properly maintain it, see Credit 7-1.

Points: 5 points

When Verified: Visually verified at final inspection.

Cross Reference: 7-1

4-45: Balance airflow system based on filter being used

Responsible Party: Mechanical Engineer, HVAC Subcontractor

Intent: Optimize HVAC performance while removing harmful particulates from supplied air.

Performance Requirement: All filters add resistance to airflow. Make sure the filter is installed in the system prior to final ventilation system balancing, and ensure the system is installed according to Air Conditioning Contractors of America (ACCA) manual J specifications.

Points: 2 points

When Verified: Visually verified during intermediate construction and review Test & Balance report at final inspections.

Cross Reference: 3-13

4-46: Install central vacuum, exhausted to outside

Responsible Party: Architect, Mechanical Engineer

Intent: Central vacuum systems provide cleaner indoor air by efficiently removing particles without stirring up microscopic dust particles and reemitting them into the home's interior. The vacuum receptacle is usually vented outside of the living space so dust isn't blown about the house. They do not have particularly efficient filters, however, so make sure the outdoor exhaust isn't directed into a basement or located near a fresh air inlet.

Performance Requirement: Locate the central vacuum in the garage, or utility room when there is no garage, and exhaust it to outside (but not near a fresh air inlet). Make sure the garage is air sealed from the living spaces or other unconditioned space, see Credit 4-20.

Points: 3 points

When Verified: Visually verified at final inspections.

Cross Reference: 4-20

4-47: Provide for cross ventilation using operable windows

Responsible Party: Architect

Intent: Strategically placed operable windows promote indoor air quality by providing a means to bring fresh air into the home and exhaust stale air. Open floor plans with a minimum of interior partitions improve air circulation throughout the home. See Credit 3-11 for further details on using operable windows as a passive cooling strategy.

Performance Requirement: Generally, natural cross ventilation is obtained by locating window openings in opposing walls and in line with each other. By having windows on both sides of a room, positive pressure on the inlet side and/or a vacuum on the outlet side of the building cause air movement when windows on both sides of the room are open. Use smaller window openings for the inlets and larger openings for the outlet. This increases the air speed and improves the cooling effect.

Points: 2 points

When Verified: Visually verified at final inspections.

Cross Reference: 3-11

4-48: Install an operable skylight, clerestory, or roof monitor (manual or automated) high up in the structure to aid natural ventilation. Use U-factor of 0.45 or below and solar gain co-efficient of 0.35 or below for skylight

Responsible Party: Architect

Intent: An operable skylight can be used to create controlled natural ventilation, allowing warm air that has risen to the top of the house to escape, and drawing up cool air from below. However, skylights can be a source of unwanted solar heat gain and/or thermal loss, so location should be carefully selected, and the benefits weighed against the costs. Operable clerestory windows in an upper wall or a roof monitor could also qualify. See Credit 3-11 for further details on using operable glazing as a passive cooling strategy.

Performance Requirement: Install operable skylight, clerestory, or roof monitor high up in the home to provide natural ventilation. Use U-factor of 0.45 or below and solar gain co-efficient of 0.35 or below for skylight.

Points: 2 points

When Verified: Visually verified at final inspections.

Cross Reference: 3-11

HVAC Equipment

4-49: Install timers, humidistat controls, or occupancy sensors for bath and laundry exhaust fans

Responsible Party: Mechanical Engineer, General Contractor

Intent: Reduce moisture buildup and possible mildew problems by using automatic controls for exhaust fans. Homeowners are more likely to use an exhaust fan with a crank or electronic timer switch, avoiding moisture buildup and eventual mildew problems in bathrooms. Ideally, a fan should run for up to one hour after a hot bath or shower to ensure complete moisture removal.

Performance Requirement: Bathroom exhaust fans must be activated by a timer switch that includes a 60-minute to 5-minute run time; be activated automatically with each use (fan tied to light switch or occupancy motion sensor) and include a 20-minute delay timer (runtime after occupancy); or a humidistat that will maintain Relative Humidity below 60%. All fans are required to be low-sone fans (<0.5 sone or less) to enhance comfort and encourage use, see credit 4-50.

Points breakdown: 2 Points per control device, 4 points maximum.

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 4-50

4-50: Install quiet (<0.5 sone) ENERGY STAR bath fan with smooth ducting, minimum 4 inch

Responsible Party: Mechanical Engineer, General Contractor, HVAC Subcontractor

Intent: Spot ventilation removes moisture, odors, and pollutants directly at the source. Quiet fans enhance occupant comfort and encourage use of bath exhaust fans. ASHRAE requires a ventilation rate of at least 50 cubic feet per minute for the bath fan.

Performance Requirement: All bath exhaust fans must have a sone rating of 0.5 or less, when operating at the design flow rate. Ducts must be smooth, sheet metal or plastic, at least 4-inch diameter and no elbow bends for at least 12-inch from the fan box.

Points breakdown: 1 point per fan, 3 points maximum.

When Verified: Duct type, size, and layout visually verified at intermediate construction inspections. Review of fan product and documentation at final inspection

Cross Reference: 1-10, 4-49

4-51: Do not install naturally aspirated heating and hot water equipment (includes fireplaces)

Responsible Party: Mechanical and Plumbing Engineer, General Contractor

Intent: Like natural gas stoves (see Credit 3-22), naturally aspirating heating and water equipment (including fireplaces) contribute to poor indoor air quality and introduce harmful gases like carbon monoxide into the home.

Additionally, the efficiency of naturally aspirated water heaters ranges from 54% to 62%. They cannot be placed inside the conditioned area of the home unless they are in a cold room and outdoor combustion air is ducted to the room. That means that at least 38% of the residual heat from the water heater, that the occupant paid for, is wasted, and only contributing to global warming and air pollution.

Performance Requirement: If using combustion equipment, specify and install only closed-combustion, direct vent, space and hot water heating equipment inside the building envelope with exhaust vented outside with no possibility of mixing with indoor air. Better yet, eliminate combustion all together and install electric or heat-pump systems, see Credits 3-14, 3-17 or 3-26. All types of combustion-based fireplaces are within the scope of this credit, only direct vent natural gas fireplaces are excluded.

Points: 3 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 1-39, 3-14, 3-17, 3-26

Resources:

4-25: Provide balanced or slightly positive indoor pressure using controlled ventilation

Responsible Party: Mechanical Engineer, General Contractor, HVAC Subcontractor

Intent: Greater air tightness creates a need for mechanical ventilation to avoid potential indoor air quality problems. Balanced ventilation keeps outdoor pollutants from being drawn into the house, prevents back drafting or spillage from combustion appliances (due

to under-pressurization), and prevents moisture migration into structural cavities (due to over-pressurization).

It is a good idea to operate the home at a natural pressure (+1 pascal pressure difference with outdoors). If you accomplish this using supply ventilation only, you may be ignoring other critical factors involved in making the home energy-efficient and healthy. These items need to accompany any attempts to balance a system.

The primary causes of negative pressure in the home are:

- Wind, natural convection, or the stack effect
- Supply duct leaks
- Supply ducts isolated from return ducts by a closed door
- Excessive exhaust ventilation: Usually a large range hood or the clothes dryer

The best way to bring a home into natural pressure under normal operating conditions is:

- Caulk and seal the home.
- Seal the heating system ducts with mastic.
- Provide return air to isolated rooms with ductwork or bypass grille.

Performance Requirement: Once these items are addressed, the supply ventilation system may be used to balance exhaust ventilation depressurization or provide a slight positive pressure with a modest volume of fresh air. Ventilation can be provided by quiet fans with automatic controls (see Credit 4-42) or by heat recovery ventilators (see Credit 3-16). The volume of air supplied should follow Washington State Building Code specifications.

Points: 5 points

When Verified: Visually verify at final inspection and review Test & Balance report.

Cross Reference: 3-16, 4-42, 4-45

4-53: Install whole house radiant or ductless heating system

Responsible Party: Architect, Mechanical Engineer

Intent: Ductless mini split systems do not need ducts to distribute air, which helps eliminate the problem of contaminated air indoors. Ductless systems are not likely to collect pollutants and circulate them indoors, ensuring indoor air quality remains safe. See Credit 3-14 for full system benefits.

Performance Requirement: Install ductless distribution system(s) as the unit's primary heating/cooling system.

Points: 8 points

When Verified: Reviewed at completion of design. Visually verified during intermediate construction and final inspections.

Cross Reference: 3-14

4-54: If providing central heating and cooling, install whole-house humidification and/or dehumidification

Responsible Party: Mechanical engineer, General Contractor

Intent: With a whole-house dehumidifier installed, reduced humidity levels allow occupants to keep their thermostat at a higher setting while still feeling comfortable. Not only does this reduce their energy usage and help the environment, but it also allows them to save money on electricity bills every month.

Installing a whole-home humidifier with the heating and cooling system to maintain an indoor relative humidity of 40-60% can help provide greater comfort, improved air quality, and increase the life of wood finishes and furniture. The evaporator pads of flow-through and drum humidifiers are dried out by the hot air passing through them (as long as they are set up correctly so that water only flows to the pad when the heat is running). This means that mold cannot grow in any part of the system.

Performance Requirement: Install a whole home humidification/dehumidification system with a humidistat automatic sensor as a part of the central heating and cooling system. Alternatively, a whole-home Energy Recovery Ventilation system can provide both ventilation and humidity conditioning, see Credit 3-16. Relative humidity levels in the home should be maintained between 40-60%. Include required system cleaning and replacement information as part of the Homeowner's Kit, see Credit 7-1.

Points: 3 points

When Verified: Visually verified during intermediate construction and final inspections.

Cross Reference: 3-16, 7-1

Resources:

Is a Whole House Humidifier the Right Choice for You?: https://molekule.science/is-a-whole-house-humidifier-the-right-choice-for-you/

INDOOR POLLUTANT CONTROL

4-55: Build a lockable storage closet for hazardous cleaning and maintenance products, separate from occupied space

Responsible Party: Architect, General Contractor

Intent: A lockable storage closet in the garage (vented to the outside away from fresh air intakes such as windows) is one way to prevent fumes from getting into the living area, as well as toxic or otherwise dangerous chemicals from getting into the hands of curious children. Alternatively, consider constructing a noncombustible storage unit.

Performance Requirement: Keep the storage closet small to discourage homeowners from accumulating too many hazardous products, and locate it away from any source of ignition, such as a water heater. Provide a note in the Homeowner's Kit advising that all hazardous materials should be stored in original containers.

Points: 1 point

When Verified: Visually verified at final inspections.

Cross Reference: 7-1

4-56: Provide durable metal, felt, rubber, or natural fiber exterior grill or mats at main entrances; minimum size 24" x 36" x 0.38"

Responsible Party: Architect, General Contractor

Intent: One of the single most important indoor air quality (IAQ) measures you can take is to minimize pollutants entering the house in the first place. Walk-off mats and grills decrease the number and volume of particles and pollutants brought into the living space by shoes. They also reduce wear and tear on flooring by removing damaging particles from shoes prior to entrance. Combine with indoor walk-off mats (see Credit 4-57), a covered front porch (see Credit 2-75) and a designated shoe removal area (see Credit 4-58) for additional IAQ benefits and points.

Performance Requirement: For all main entrances, install permanent metal grill(s) or provide durable felt, rubber, or natural fiber walk-off mats designed for exterior use. The

width of the grill or mat should equal that of the door it is used at. Minimum size for any grills or mats used is 24-inch length, 36-inch width, 0.38-inch thick. If a permanent grill is installed, provide cleaning instructions in the Homeowner's Kit, see Credit 7-1.

Points: 3 points

When Verified: Visually verified at final inspections.

Cross Reference: 2-75, 4-57, 4-58, 7-1

4-57: Provide durable felt, rubber, or natural fiber interior mat at main entrances; minimum size 36" x 48" x 0.38"

Responsible Party: Architect, General Contractor

Intent: One of the single most important indoor air quality (IAQ) measures you can take is to minimize pollutants entering the house in the first place. Walk-off mats and grills decrease the number and volume of particles and pollutants brought into the living space by shoes. They also reduce wear and tear on flooring by removing damaging particles from shoes prior to entrance.

Combine with exterior walk-off mats (see Credit 4-56), a covered front porch (see Credit 2-75), and a designated shoe removal area (see Credit 4-58) for additional IAQ benefits and points.

Performance Requirement: For all main entrances provide durable felt, rubber, or natural fiber walk-off mats. The width of the mat should equal that of the door it is used at. Minimum size for any mats used is 24-inch length, 36-inch width, 0.38-inch thick.

Points: 5 points

When Verified: Visually verified at final inspections.

Cross Reference: 2-75, 4-56, 4-58

4-58: Design a designated shoe-removal area and storage at primary entrance

Responsible Party: Architect

Intent: Some studies indicate that up to 80% of indoor pollutants are tracked into the home on shoes. Providing track-off mats, see Credits 4-56 and 4-57, and shoe racks encourages shoe removal, which can go a long way to reducing this source of indoor pollution. One important indoor air quality measures you can take is to minimize bringing

pollutants into the house in the first place. The first line of defense is to remove shoes from the living space that can bring in pesticides, hydrocarbons, and pollen from outside.

There are a variety of ways to achieve this intent through design of the main entrances; examples include an exterior or interior vestibule, built-in seating and/or shelves, space-defining flooring materials or grade changes, or a closet next to the entrance.

Using design and material selection to define an entrance is a simple way to delineate the main home from the entrance and encourage the behavior of shoe removal. An example of this is installing stone, polished concrete or tile flooring at the main entryways and then install more resilient flooring materials for the rest of the home. Doing this also has an added benefit of reducing the wear and tear on interior flooring materials that are less resilient to tracked-in debris or moisture and more expensive to maintain.

Building a shoe removal vestibule at major entrances of the house will help improve indoor air quality and provide additional Energy Efficiency benefits. You can build an exterior vestibule or build one indoors in an underused, often over-designed, foyer. An enclosed front porch can double as an exterior vestibule, see Credit 2-75.

Make sure the building envelope of the vestibule is tightly air-sealed. Specifically, make sure the door is airtight. Good weatherstripping is essential. For an exterior vestibule, consider installing a window for natural lighting; you can reuse salvaged single-pane window because the primary purpose of the vestibule is to create an airlock.

Performance Requirement: Provide a built-in feature at main entrances, where occupants and visitors can sit to remove their shoes, with storage space for two pairs of shoes per bedroom in the unit. Staging furniture or removable shoe-removal furniture is not appliable.

Points: 6 points

When Verified: Visually verify at substantial completion.

Cross Reference: 1-33, 2-75, 4-56, 4-57

4-59: Install floor drain or catch basin with drain under washing machine and/or water heater

Responsible Party: General Contractor

Intent: This measure helps to avoid additional moisture problems within the dwelling if the washing machine and/or water heater floods.

Performance Requirement: Install a floor drain or catch basin with drain under all washing machines and/or water heater.

Points breakdown: 1 point for each appliance, 3 points maximum

When Verified: Visually verified at final inspection.

4-60: Install moisture alarms under sinks, dishwasher, and water heater

Responsible Party: General Contractor, Plumbing Subcontractor

Intent: Moisture alarms are small devices that you can place under sinks, dishwashers and water heaters with moisture sensors that activate with an audible alarm when excess moisture is present. They can be placed on the floor or wall-mounted. They help avoid extensive moisture problems from malfunctioning equipment; however, most of the inexpensive devices only work if someone is in the house to hear the alarm. There are now moisture alarm devices that may connect to wi-fi for remote notifications on a cell phone. Moisture alarms that also include automatic shut-off valves can greatly dimmish the damage and repair costs associated with leaks from water heaters.

Performance Requirement: Install moisture alarms under sinks, dishwasher, and water heater. Water heaters sensors shall be placed in the catch basin, and alarms shall provide remote notifications and/or include an automatic shut-off valve to stop leaks in progress.

Points: 1 point

When Verified: Visually verified at final inspection.

4-61: Locate air intake away from roadways or driveways

Responsible Party: Architect, Mechanical Engineer

Intent: Avoid introducing pollutants to indoor air environment.

Performance Requirement: All outside air intakes are located with spacing at least 20% greater than required by applicable code for any given contaminant source. Take prevailing winds and other relevant environmental factors into account when determining spacing requirements. No air intakes located within 40 feet of a parking area.

Points: 2 points

When Verified: Visually verified at final inspections.

EXTRA CREDIT FOR HEALTH AND INDOOR AIR QUALITY

4-62: Extra credit for innovation in health and indoor air quality

You may submit a health and indoor air quality strategy or system, not specifically called out in this Section, for consideration for an Extra Credit for Innovation. All extra credits are subject to approval by the Built Green Program Manager. If approved, add up to 10 points to your Section total.

SECTION FIVE: MATERIALS EFFICIENCY

OVERALL DESIGN

5-1: Design for disassembly

Responsible Party: Architect, General Contractor

Intent: Deconstruction is the preferred alternative to traditional building demolition for removing existing structures. Deconstruction is a coordinated process of disassembling a building and salvaging materials. It increases material life, reduces environmental impact of landfills and harvesting new materials, and saves money in dumping fees. Designing for deconstruction draws on design, construction, and demolition to maximize reusability and durability of building components throughout their functional lifetime and end of life.

Design for disassembly goes beyond the concept of designing for deconstruction, which is primarily focused on harvesting and reusing individual materials. Instead, disassembly expands that focus to the reuse of the building and its system components. When designed for disassembly, an existing structure can be taken apart in sections, modules, or panels that can facilitate future changes, be relocated and rebuilt into the original structure again, or used to create a new structure altogether.

This strategy must be fully integrated during the design phase and communicated to all subcontractors and installers of system components. Using an Integrated Design Process (see credit 6-33) that involves all major subcontractors and introducing design for disassembly expectations in specifications or job contracts would facilitate the intent of this credit.

Spray foams considerations for designing for disassembly:

Large surface area applications of spray foam are highly detrimental to future deconstruction and material salvaging, reuse, and recycling. Spray foam application impedes the ability to deconstruct, separate, and salvage building components at the building's end of life and further contaminates the materials preventing them from being recycled. Limit use of spray foams to spot applications for minor air-sealing or use a non-spray foam alternative, see Credit 5-53.

Performance Requirement: Design and construct the building using components and fastening systems that facilitate disassembly and deconstruction, including modular components or framing, prefabricated structural elements, pre-cast panels, glue- and nail-

free assemblies, mechanical connectors instead of glued or soldered joints, and centralized, accessible wiring and utilities, see Credit 5-8. Projects that include surface area applications of spray foam (excluding minor spot applications for air-sealing) are not eligible for this credit.

Project team must describe the systems that facilitate disassembly for reuse and demonstrate what percentage of total building they constitute, by cost, surface area, or other metric approved by the Built Green Program Manager. Information on these systems must be included in the As-Built documents, and Homeowner's Kit, see Credits 7-1. It is highly encouraged to document the areas and modular sections that can be disassembled as part of the project's photo record in the Homeowner's Kit, see Credit 7-5.

If there are existing dwellings on the building site that need to be removed, see Credits 5-9 through 5-11 for credits related to relocating existing structures for reuse and deconstruction and material salvaging.

Points Breakdown:

5 points: 50% of building components and materials chosen for future disassembly

7 points: 75% of building components and materials chosen for future disassembly

9 points: 90% of building components and materials chosen for future disassembly

When Verified: Since this strategy must be fully integrated into the design and construction process, the plan and approach should be reviewed by the verifier in the design phase. As-built and Homeowner's Kit content should be visually verified at the time of final inspections.

Cross Reference: 5-8, 5-9, 5-10, 5-11, 5-53, 6-33, 7-1, 7-5

Resources:

Design for Disassembly in the Built Environment: a guide to closed-loop design and building: https://www.lifecyclebuilding.org/docs/DfDseattle.pdf

A Guide to Design for Disassembly: https://www.archdaily.com/943366/a-guide-to-design-for-disassembly

What Is Design for Disassembly?: https://www.c2ccertified.org/news/article/what-is-design-for-disassembly

Design for Disassembly and Deconstruction - Challenges and Opportunities: https://doi.org/10.1016/j.proeng.2015.08.485

"Design for Deconstruction", by Michael Pulaski, Christopher Hewitt, Michael Horman Ph.D. and Bradley Guy, 2003: https://www.aisc.org/globalassets/modern-steel/archives/2004/06/2004v06_deconstruction.pdf

Design for Deconstruction (EPA): https://www.epa.gov/sites/production/files/2015-11/documents/designfordeconstrmanual.pdf

5-2: Minimize floor space and design multifunctional and flexible spaces

Responsible Party: Architect

Intent: Multifunctional and flexible spaces is a concept that emphasizes designs that can evolve for many uses throughout a day or through different lifecycle stages. Resilient, flexible design enables homes to act not just as dwelling units, but also as work, teaching, entertainment gathering, and exercise spaces. Flexible homes can be adjusted with slight modifications to expand within their own footprint or provide more function within the same amount of space.

Flexible housing can be defined as housing that is designed for choice at the design stage, both in terms of social use and construction, or designed for change over its lifetime. Flexibility can be categorized into 3 levels: re-adjustability by rearranging furniture; resize ability by shifting partitions and walls; and re-interpretability by dynamic area configuration.

For below-market value housing, optimizing every square foot to provide purpose and function minimizes material use and cost, while providing more value and long-term functionality for occupants. Keeping visual connection between the spaces, by reducing walls and open space plans (see Credit 5-4), provides visual connections between occupants and a more spacious feeling to smaller spaces.

Performance Requirement: Project team must describe the systems that facilitate multifunctional or flexible spaces. Systems could consist of moving walls or partitions, built-in transforming furniture, walls that can be added or removed without having to make significant alterations to the structure or services, pre-wired/ pre-plumbed building upgrades, or Live/Work units. Provide information about the building's flexible features in the Homeowner's Kit, see Credit 7-2.

Points: 3 points

When Verified: Reviewed at completion of design. Visually verified during intermediate construction and final inspections.

Cross Reference: 5-3, 5-4, 7-2

Resources:

What is Flexible Housing?: https://www.re-thinkingthefuture.com/fresh-perspectives/a1024-what-is-flexible-housing/

Flexible Housing: Opportunities and Limits: https://www.researchgate.net/publication/228348236_Flexible_housing_Opportunities_and_limits

Building houses that grow with us: https://archive.curbed.com/2018/11/14/18093134/home-movie-theaters-game-rooms-mcmansion-hell-wagner

Multifunctional Home That Combines Several Activities in One Area: https://www.interiorzine.com/2019/02/11/multifunctional-home-that-combines-several-activities-in-one-area/

REDUCE

5-3: Use stacked floor plan or rectangular building shape

Responsible Party: Architect

Intent: Reduce the building size by stacking floor plans. Wet spaces can be located over mechanical areas, minimizing piping, vents, and chases. By building up versus out, efficiency of land use preserves open space, and tight floor plans reduce material consumption. Stacked plans also reduce construction costs for site and foundation work.

Additionally, rectangular building shapes optimize both energy performance and materials efficiency, while simplifying design and providing more opportunities for designing for disassembly. Rectangular building shapes reduce time and costs required by traditional bump-outs

Performance Requirement: Building is constructed using a stacked floorplan and/or rectangular building shape.

Points: 2 points

When Verified: Visually verified at final inspection.

5-4: Reduce interior walls through open plan for kitchen, dining, and living areas

Responsible Party: Architect

Intent: This strategy reduces material use and cost for walls and creates an adaptable space that allows for maximum daylighting, occupant interaction, and natural ventilation.

Performance Requirement: Building is constructed using an open floorplan that limits interior walls between the kitchen, dining, and living areas of the home. Half-walls or glass walls that still allow for visual connection between spaces and interior daylighting are acceptable in an open plan.

Points: 2 points

When Verified: Visually verified at final inspection.

Cross Reference: 5-2, 6-23

5-5: Create detailed take-off and provide as cut list to framer

Responsible Party: Architect, General Contractor

Intent: Having a list identifying the intended location of each piece of lumber reduces the overall volume of lumber needed to construct the house as well as the volume of leftover cut unintentionally. The cut list increases accountability of framers and suppliers and can result in significant savings.

Performance Requirement: Create a board-by-board lumber take-off from the plans as part of the lumber ordering process. Provide to framer as a cut list, to ensure long studs and joists are not cut short by mistake.

Points: 2 points

When Verified: Review documents at preconstruction, or at time of final inspection.

5-6: Use central cutting area or cut packs

Responsible Party: General Contractor

Intent:
A cut pack is a set of lumber that is pre-measured and precut at the lumberyard to increase efficiency of lumber use and minimize onsite waste.

Designating a centralized cutting area reduces wood waste, reduces the total amount of wood that must be supplied to the site, and saves time by making it convenient for carpenters to reuse cutoffs and scrap. It also makes the cutting process itself more efficient. Studies of construction sites with a centralized cutting area showed total waste reduction up to 15%.

A central cutting area also creates an ideal location for the wood scraps bin or pile, convenient for subcontractors to reuse the wood.

Performance Requirement: Restrict all dimensional lumber cutting to a central area and retain off-cuts nearby for reuse. Alternatively, order dimensional lumber in precut packages as much as possible.

Points: 2 points

When Verified: Visually verify cutting areas or precut framing packages during intermediate construction inspections.

5-7: Use suppliers who offer reusable or recyclable packaging with recyclable/ biodegradable fillers or plastic and Styrofoam free packaging

Responsible Party: Architect, General Contractor

Intent: Reduce or eliminate material wasted onsite that is not intended for installation with policies and practices. Material and product packaging makes up a substantial percentage of construction material waste. Keeping material out of the waste stream helps preserve landfill space and lower disposal fees. Construction product suppliers can realize these benefits by working with their supply chain and using various types of reusable, recyclable packaging. When possible, consider no packaging.

Not all packaging is created equal when it comes to their lifecycle impact and recyclability. Plastic and Styrofoam manufacturing are energy intensive and emit greenhouse gases and toxic air pollutants. Most recycling facilities cannot process common forms of plastic (e.g., shrink wrap, strapping ties, plastic foams) and Styrofoam packaging materials so most of it is sent to landfills. When materials are not incinerated, contributing to toxic air pollutants, they often end up in the natural environment. An estimated 8 million tons of plastic is dumped into the ocean every year. Minimizing, or better yet, eliminating use of these types of packaging would greatly reduce the damage they cause to our planet.

Performance Requirement: Identify areas to eliminate or reduce non-reusable, non-recyclable, plastic, and Styrofoam packaging in project's supply chains. Require

subcontractors to adhere to reusable or recyclable packaging purchasing practices. Specify in the contract that the subcontractor will purchase and deliver products/materials in recycled or reusable packaging, entirely free of plastic and Styrofoam whenever feasible. Consider requiring the subcontractor to collect and recycle packaging materials after use. Use a phase-appropriate bin to collect plastic films, wraps and foams, and Styrofoam packaging materials for source-separated recycling, see Credits 5-14 and 5-16.

Use suppliers who:

- Use minimal packaging, providing materials in bulk packaging, on pallets, in blankets, etc.
- Offer takeback of packaging for their product for reuse or recycling
- Provide their product in easy-to-recycle packaging, such as cardboard, wood, or metal
- Offer "just in time" delivery to minimize the need for protective plastic wrapping and damage to materials during onsite storage
- Purchase materials and products that are not packaged in plastic or Styrofoam
- Certified as Plastic-Free or Single Use Plastic Elimination or Reduction (SUPER)

Points Breakdown: May be combined for a maximum of 3 points.

1 point: Reusable or recyclable packaging with recyclable or biodegradable fillers

2 points: Packaging is 100% plastic and Styrofoam free

When Verified: Verify packaging requirements in Construction Waste Management Plan at pre-construction, visually verify during intermediate construction inspections.

Cross Reference: 5-14, 5-16

Resources:

Packaging waste 101: the problem: https://supplychain.edf.org/resources/sustainability-101-packaging-waste-the-problem/

Single Use Plastic Elimination or Reduction (SUPER) Certification: https://www.super.ngo/

Plastic-free packaging materials library: https://aplasticplanet.com/resource-library/

5-8: Use prefabricated or modular construction elements

Responsible Party: Architect, General Contractor

Intent: Modular construction can cut net waste in half compared to conventional construction. Under optimized conditions, the fabrication facility can reduce errors and accidental damage. Factory-based modular construction processes are also better suited for implementing lean production principles and other strategies to better control inventory.

Although the total amount of materials used for a modular project will be greater than an equivalent, conventionally constructed project (each module requires substantial, independent structure frame), from a lifecycle perspective, the reduction of material waste in the modular construction process more than offsets the increased use of structural materials. The robust structures of modular buildings support a longer lifecycle, so the energy and carbon cost of its construction can be amortized over a longer period of time.

Prefabrication allows for entire buildings or building elements to be constructed in a factory, where materials are close at hand, weather-protected, and optimized in a way that cannot be mimicked by site-built construction. Production is further accelerated by the lack of weather-related delays and greatly reduced onsite time. This process saves time and money, which can contribute to making homes more affordable.

Incorporating prefabricated and modular elements into a structure may also contribute to easier disassembly and reuse (see Credit 5-1) and more flexible structures that can adapt and change over time (see Credit 5-2).

Performance Requirement: Design and construct the building using prefabricated or modular components. Project team must describe the components and information on these systems must be included in the As-Built documents and Homeowner's Kit, see Credit 7-2. If ICF, SIPs, CLT, or other factory-framed wall panels are used this credit may be combined with Credits 5-28 and 5-29.

Points: 5 points

When Verified: Since this strategy must be fully integrated into the design and construction process, the plan and approach should be reviewed by the verifier in the design phase. As-built and Homeowner's Kit content should be visually verified at the time of final inspections.

Cross Reference: 5-1, 5-2, 5-28, 5-29, 7-2

Resources:

The Potential of Prefab: How Modular Construction Can Be Green: https://www.buildinggreen.com/feature/potential-prefab-how-modular-construction-can-be-green

Shipping Container Home Designs and their Costs in 2021: https://www.24hplans.com/top-20-shipping-container-home-designs-and-their-costs/

The Difference Between Prefab And Manufactured Homes: https://modularhomeowners.com/do-you-know-the-difference-between-prefab-and-manufactured-homes/

Prefab Zero Energy Homes: https://zeroenergyproject.org/2016/09/20/prefab-zero-energy-homes-lower-cost-efficient-wider-availability/

DECONSTRUCTION AND REUSE

5-9: Reuse existing buildings onsite or relocate buildings for reuse

Responsible Party: Architect, General Contractor

Intent: Leaving buildings and materials intact and in place is the highest form of materials efficiency and low embodied carbon construction. Renovation and reuse projects typically save between 50 and 75 percent of the embodied carbon emissions compared to constructing a new building. This is especially true if the foundation and structure are preserved since most of the embodied carbon resides there.

Older homes and structures in our region can offer high-quality construction and materials that cannot be sourced in modern supply chains, especially when it comes to timber products. Nickel Bros estimated that a 1,600-sq. ft. home represents over 80 tons of materials and about 70 trees worth of lumber (equivalent to the amount of what one person could recycle in 125 years). Homes that are reused, rather than demolished, help preserve landfill space and significantly reduce disposal fees. Older homes may also contain toxic elements that are safer for workers and the environment if they are undisturbed and left in place. When relocated onto a new foundation and retrofitted with some energy efficiency upgrades, a reused home can increase its lifespan another 100 years.

Existing homes and buildings can also be sold or donated and then relocated to offer more affordable housing options with a much lower carbon footprint.

Reuse or Remodel: Existing buildings that are reused and/or relocated onsite to create a new secondary dwelling unit to the newly constructed primary home (e.g., a smaller existing home is reused as a DADU), are applicable as reuse and must conform to this credit's performance requirement. Constructing a new home that is attached to the existing primary home (e.g., an addition or as an ADU) would be considered a remodel and would be required to certify under the Built Green Remodel checklist, and is not applicable under the New Construction checklist.

Performance Requirement: Reuse existing building on or offsite (may be reused by the general contractor, owner, or outside party). Majority of original building (homes, carriage houses, or detached garages) must be reused in its original form to earn this credit. Existing building may be disassembled into modular sections to be reconstructed later, but full deconstruction and salvage for material reuse is not appliable (see Credits 5-10 and 5-11 for deconstruction). Reused home or building must be a part of the new construction project scope and project address, subdivisions where an existing house remains unchanged and independent of new housing units that are built on the subdivided lot(s) are not applicable.

If building is reused or repurposed onsite as part of the new development (e.g., as a DADU), renovations of the reused building to improve energy performance to at least current code requirements must be included in the project's scope. The DADU is not required to have its own energy performance model. The reused building may contribute to the project earning any other Section 5 Material Efficiency credits. Any construction and demolition waste generated by reuse of the building are required to be included in Construction and Demolition Materials Management calculations and planning. Section 2 Site and Water credits such as landscaping and occupant water reduction requirements must be applied to the reused building as well as the new building(s). Any DADU that has a separate address from the main house or can be sold independently, must certify under its own Built Green checklist, see credit 6-8.

Points: 15 points

When Verified: Reviewed at completion of design. Visually verified during intermediate construction and final inspections.

Cross Reference: 5-11, 6-8, Section 2, Section 5 Design and Material Selection and Embodied Carbon credits

5-10: Engage a salvage professional to conduct a salvage assessment of buildings planned for removal

Responsible Party: General Contractor

Intent: Increase the reuse of high-value salvaged materials from the site. Reduce costs associated with wasted materials; mitigate the pollution and costs of trucking waste; and keep construction materials out of landfills.

Performance Requirement: Contract a licensed deconstruction and salvage professional to conduct a salvage assessment of buildings planned for removal. Their assessment report should include the amount of salvageable material described by type and total weight. Self-assessments are not applicable.

The deconstruction and salvage professional must meet at least one (1) of the following criteria:

1. An established salvage and reuse retail company
2. A licensed contractor specializing in deconstruction
3. A demolition company with knowledge and experience with local and current salvage retail markets

Points: 3 points

When Verified: Review salvage assessment prior to demolition or deconstruction.

Cross Reference: 5-11

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-11: Use deconstruction to dismantle existing building and salvage materials for reuse

Responsible Party: Architect, General Contractor

Intent: This credit is designed to salvage valuable, reusable building materials from existing onsite buildings through deconstruction for reuse in other projects. Reuse includes selling, donating, or reusing the materials onsite or for other projects.

Salvageable materials include but are not limited to:

- Lighting and hardware
- Mantels
- Timbers and framing
- Tongue and groove paneling
- Flooring
- Trim and molding
- Shelving
- Sinks
- Bathtubs
- Built-in hutches
- Wrought iron railings
- Bricks
- Pavers
- Cabinets
- Tile
- Glass blocks
- Doors
- Countertops
- Mirrors and vanity cabinets
- Antique architectural elements

Also included (but consider energy and water efficiency trade-offs):

- Faucets and toilets
- Windows
- Appliances (less than 5 years old)

Note: prior to beginning any renovation or demolition work, an asbestos survey must be performed by an accredited AHERA Building Inspector. In addition, a completed Notice of Intent must be submitted before any asbestos removal, and all asbestos-containing materials must be removed by asbestos workers prior to demolition. See your local jurisdictions to learn more about asbestos rules.

Performance Requirement: Requires salvage assessment conducted by a salvage professional with final amount of salvageable materials described by type and total weight (credit 5-10). Use deconstruction to dismantle existing buildings prior to any demolition work and salvage reusable materials for reuse. Determine amount salvaged by comparing the total weight in the assessment with the amount actually salvaged by weight.

Points Breakdown:

5 points: Deconstruct existing buildings or structures

8 points: Deconstruct and salvage at least 20% of all salvageable materials by weight

10 points: Deconstruct and salvage 50% or more of all salvageable materials by weight

When Verified: Review salvage assessment and visually verified at intermediate inspections.

Cross Reference: 5-10, 5-20

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-12: Move leftover materials to next job, provide to owner, or donate to charity

Responsible Party: General Contractor

Intent: Many materials can be moved to the next job or left onsite for the new owner at their request to use for repairs or expansions. Paint, for example, can be left with owners for touchups and repainting, or can be used as a primer on your next job. Decking material can be reused by the owner as part of a future expansion or for other landscaping applications. Also look for opportunities to donate materials to a reusable building materials retailer or charity.

Performance Requirement: Include steps for this in the Construction Waste Management Plan, provide infrastructure and require all onsite personnel to participate.

Points: 1 point

When Verified: Review Construction waste management plan and visually verified at intermediate or final inspections.

5-13: Salvage trees harvested or removed during site clearing for reuse (excludes reuse as mulch or chips)

Responsible Party: General Contractor

Intent: Optimize the utilization of natural building material resources. Reduce carbon emissions by maintaining tree as intact lumber or wood that has spent its life sequestering carbon in its cellulose. Save money in disposal and hauling costs.

Removing trees from a site to achieve points for this credit is not the intention of the credit. Only salvaged trees that were originally planned for removal are applicable, see Section 2 Protect Site's Natural Features Credits.

Performance Requirement: Salvage mature trees that are tagged for removal during site clearing for reuse as building materials, lumber products, or landscaping features, on or

offsite, see Credits 5-21, 5-81, and 5-88. Trees that are chipped for mulch are not applicable.

Points: 2 points

When Verified: Review natural resources inventory or arborist assessment for identified trees. Visually verify reuse of tree onsite or documentation of tree being sold or donated for reuse by others.

Cross Reference: 2-6, 2-7, 5-21, 5-81, 5-88

Resources:

Wood salvage and reuse on site:
http://treesolutions.net/community/Lumber%20Reuse%202016.pdf

Northwest Building Salvage Network: https://www.nbsnseattle.org/

CONSTRUCTION AND DEMOLITION MATERIALS MANAGEMENT

5-14: Use a three-bin waste separation system: one for landfill, one for commingled recycling, one for phase-appropriate source-separated recycling

Responsible Party: General Contractor

Intent: Recycle the greatest amount of construction and demolition "waste" materials as possible while retaining value and quality of the materials for recycling. By utilizing three bins for comingled recycling, waste, and source-separated recycling will result in cleaner, higher quality, and presorted materials for recycling facilities and ensure more materials are truly diverted from landfills.

Performance Requirement: Must demonstrate that an appropriately sized commingled C&D recycling container and a waste C&D container (for landfill) have been onsite for the duration of the construction project. A third, phase-appropriate, container should be utilized to facilitate source-separated recycling of specific materials, e.g., wood during framing, gypsum board during drywalling, and cardboard during finish installation. Verify by assessing C&D hauling receipts and construction progress photos.

Points Breakdown: 5 points

When Verified: Review of waste management documentation and visually verified during intermediate construction.

Cross Reference: 5-15, 5-16, 5-17, 5-18

Resources:

Construction and Demolition Debris Section of King County's "What Do I Do With....?" Database: https://info.kingcounty.gov/services/recycling-garbage/solid-waste/what-do-i-do-with/Materials?cat=17

Washington State regulations (WAC 173-345-040) require a separate collection container be provided for waste at jobsites that conduct recycling, https://apps.leg.wa.gov/WAC/default.aspx?cite=173-345-040

5-15: Send at least 90% of jobsite waste (by weight, excluding concrete, brick, and asphalt) to a commingled recycling facility with a minimum of 50% diversion rate

Responsible Party: General Contractor

Intent: Reduce pressure on virgin resources and decrease the volume of material disposed of in landfills.

Performance Requirement: Include all necessary steps in Construction Waste Management plan to recycle at least 90% of waste generated, provide suitable facilities for staging and removal of materials, and document throughout construction, see Credit 5-14. Arrange for your construction waste to be hauled to a qualified recycling facility with an approved facility diversion rate as listed in the Built Green Recycling Guidelines. These guidelines are updated twice a year (summer and winter). Please stay aware of latest facility diversion rates. Any use of a recycling facility not listed in the guidelines must be approved by the Built Green Program Manager prior to use.

Comingled recycling is encouraged to be combined with source-separated recycling waste management strategies.

Points Breakdown:

8 Points: Use comingled waste facility with a 50% diversion rate

12 Points: Use comingled waste facility with a 75% diversion rate

15 Points: Use comingled waste facility with a 90% diversion rate

When Verified: Verify by assessing C&D hauling receipts. Built Green Recycling Guidelines are updated twice a year (summer and winter) based on the SPU Facility Certification Program quarterly diversion reports. Always check the current guidelines and their effective dates.

Cross Reference: 1-23, 1-34, 5-14, 5-16, 5-17, 5-18

Resources: Built Green Recycling Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

5-16: Bonus: Source separated recycling, 90% minimum rate for materials generated during construction

Responsible Party: General Contractor

Intent: Effective source separation supports the highest and best use of materials and cleaner feedstock for producing recycled materials because there is less contamination.

On average, about 25% of discarded construction materials is dimensional lumber and another 10% is waste from manufactured wood products. Wood scrap you can't reuse should be targeted for recycling. Clean wood scraps refer to unpainted and untreated materials. Depending on the final use of the material, the following may be considered unacceptable contaminants: paint, stain, pressure treatment, lamination, adhesives, and nails or other fasteners. Many of the region's wood recyclers also accept pallets as part of their wood waste stream. Check with wood recycler to identify any restrictions on the wood they accept.

Drywall generally comprises 11% by volume and 26% by weight of a residential home's waste stream or roughly one pound per square foot. Drywall is most often recycled as feedstock for recycled-content drywall, see Credit 5-51. If your drywall subcontractor handles his or her own waste, work with the subcontractor to develop a recycling program and obtain recycling receipts for project verification.

Paints may be taken to the household hazardous waste areas. Check with your solid waste collector to see if full cans of paint are acceptable.

Performance Requirement: Verify by assessing C&D hauling receipts to ensure that 90% of a specific material was recycled via source-separation. Utilize photo documentation and a spreadsheet to track and calculate source-separated recycled materials and their quantities. See resource section for list of source separation recycling service providers. Please contact the facility directly to confirm what they accept and any restrictions they may have on materials accepted. If a subcontractor handles their own waste, work with them to develop a recycling program and designated recycling facility for drop-off and obtain their facility receipts for project verification. May be combined with three-bin separation system and commingled recycling credits, see Credits 5-14 and 5-15.

Point Breakdown:

2 points: Recycle clean scrap wood and broken pallets

3 points: Recycle drywall

3 points: Recycle asphalt roofing

2 points: Recycle carpet padding and upholstery foam

3–5 points: Recycle carpeting (3pts) or send back to manufacturer's recycling program (5pts)

2 points: Recycle clean plastic films, package wrap and pallet wrap

1 point: Recycle paint

2 points: Recycle fluorescent lights and ballasts, Halogens, LEDs

2 points: Recycle Styrofoam

When Verified: Review of waste management documentation and visually verified during intermediate construction.

Cross Reference: Section 1, 5-7, 5-14, 5-15, 5-17, 5-18

Resources:

Built Green Recycling Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

King County Salvage and Source-Separated Recyclers List:
https://www.seattle.gov/utilities/construction-resources/collection-and-disposal/construction-and-demolition/certified-facilities

5-17: Compost land clearing and yard waste, sod, and food waste, 90% minimum composting rate

Responsible Party: General Contractor

Intent: Compostable materials are heavy, high-volume materials that take up valuable space in landfills and produce methane gas as they decompose.

Performance Requirement: Include all necessary steps in Construction Waste Management plan to compost at least 90% of organic waste generated, including food waste from jobsite operations, provide suitable facilities for collection and removal of

materials (see Credit 5-14), and document throughout construction. Verify by assessing C&D hauling and/or municipal composting receipts.

Points: 3 points

When Verified: Visually verify during intermediate construction inspections, and review documentation at time of final inspection.

5-18: Recycle all mercury thermostats and smoke detectors through a hazardous waste disposal facility

Responsible Party: General Contractor, Demolition/Deconstruction Subcontractor

Intent: Mercury is a persistent, bio-accumulative, toxic pollutant. When released into the environment, it accumulates in water laid sediments where it converts into toxic methylmercury and enters the food chain. Methylmercury biomagnifies through the food chain as predators eat other organisms and absorb the contaminants in their prey. Over time, an individual who consumes plants or animals contaminated with methylmercury will accumulate levels of mercury higher than their habitat or food. As a result, top predators (such as humans) acquire greater body burdens of mercury than the fish they consume.

Performance Requirement: Recycle all mercury thermostats and smoke detectors through a hazardous waste disposal facility.

Points: 2 points

When Verified: Review of waste management documentation and visually verified during demolition/deconstruction and intermediate construction.

Resources: Mercury-containing products: https://kingcounty.gov/depts/dnrp/solid-waste/garbage-recycling/whats-in-our-garbage/mercury.aspx

DESIGN AND MATERIAL SELECTION

OVERALL

5-19: Install locally-produced materials

Responsible Party: Architect, General Contractor

Intent: Supporting the use of local materials and resources reduces environmental impacts resulting from transportation.

Performance Requirement: "Locally produced" materials are produced—both extracted and manufactured—within a 500-mile radius of the project site. May be combined with other Materials Efficiency credits.

Points Breakdown: 1 point per material or product, 12 points maximum.

When Verified: Review of product documentation and visually verified during intermediate construction and final inspections.

5-20: Use building-salvaged lumber, minimum 200 board feet

Responsible Party: Architect

Intent: Reduce pressure on virgin timber resources. According to EPA statistics, a 2000-square-foot residential project generates 127 tons of demolition debris. Ten percent of this is recoverable framing lumber, which averages 6,000 board feet or 33 mature trees.

The most common commercially salvaged and reused building component is wood salvaged from beams in turn-of-the-century buildings or abandoned railroad trestles. Consequently, reclaimed wood is often available in species, coloration, and wood quality not found in today's new material markets. Some companies offer original hand-hewn beams for reuse in their present form. Most companies grade the wood depending on its grain, the number and type of knots, and the number of nail holes left over from its prior use. Others provide salvaged wood re-milled into flooring, millwork, or paneling, see cross-referenced credits below.

Engaging a salvage professional to identify salvageable materials in existing structures that are targeted for removal (see Credit 5-10) can provide valuable high-quality lumber that can reduce time, costs, and embodied carbon impacts associated with disposal, supply, and transportation.

Performance Requirement: Points are awarded for the quantity of building-salvaged lumber from an existing building onsite, deconstructed building, or commercially salvaged and reused building material sources. This does not apply to new wood from trees cut onsite or off-cuts produced onsite during framing. Finished wood products that incorporate or are re-milled from salvaged lumber that are not already covered by other Material Efficiency credits may be counted here.

Points Breakdown: 1 point for every 200 board feet, 8 points maximum.

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross Reference: 5-9, 5-10, 5-11, 5-19, 5-25, 5-39, 5-56, 5-57, 5-68, 5-88, 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

Sustainable Northwest Wood: https://www.snwwood.com/

Pioneer Millworks: https://pioneermillworks.com/

5-21: Use urban or forest-salvaged lumber, minimum 250 board feet

Responsible Party: Architect, General Contractor

Intent: This credit applies to new wood recovered from urban or forest salvage operators. Many wood suppliers offer new wood products that are made from wood salvaged from urban or forest resources. This credit does not apply to burning, chipping, or mulching salvaged materials.

Urban salvage refers to trees removed from urban parks, campgrounds, and recreation areas, possibly disease damaged or considered a hazard. Other sources include trees removed from construction sites for clearing and grading, see Credit 5-13.

Forest salvage refers to trees recovered from forest restoration projects or removed from forestland to make way for roads, campgrounds, or utility lines. It may also refer to hazardous trees removed from campgrounds. Instead of being chipped or used as firewood, these trees are sent to a mill and processed into flooring, trim, and other finish materials.

Identify trees from the natural resources inventory that can be harvested from site clearing and can be reused in landscaping or milled into wood products for use in the new building, see Credits 2-6 and 2-7. Removing trees from a site to achieve the points for this credit is not intended. Only salvaged trees that were originally planned for removal are applicable, see Section 2 Protect Site's Natural Features Credits.

Performance Requirement: Points are awarded for a minimum of 250 board feet of urban or forest-salvaged lumber sourced from the site or another urban or forest site. Finished wood products that incorporate or are re-milled from forest-salvaged lumber that are not already covered by other Material Efficiency credits may be counted here. Also applicable are trees species that are removed to restore habitat (e.g., invasive Juniper).

Points: 3 points

When Verified: Review of natural resources inventory, product documentation or receipt of sale and visually verified at final inspection.

Cross Reference: 2-6, 2-7, 5-13, 5-19

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

Sustainable Northwest Wood: https://www.snwwood.com/

Wood salvage and reuse on site:
http://treesolutions.net/community/Lumber%20Reuse%202016.pdf

5-22: Use rapidly renewable building materials and products made from plants harvested within a ten-year cycle or shorter in at least 2 substantial applications

Responsible Party: Architect, General Contractor

Intent: To reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.

There are many wall paneling options available, such as cork and bamboo, that are both renewable resources and natural materials. Cork is sustainable because the bark is harvested, and the tree is left to regenerate more bark. The bark is harvested on an eight-year cycle. Cork is durable, sound absorbing, and naturally moisture-, mold-, and rot-resistant. Bamboo is sustainable because it can be harvested on a six- to eight-year cycle. Bamboo is a very durable and dimensionally stable. Despite the long-distance transport of these products to the United States, the durability, hardness, short regeneration time and

continued carbon-sequestering provide justification for specifying bamboo and cork products over more local alternatives. There are also indoor air quality advantages to using natural materials—they off-gas less due to using fewer or no chemicals during manufacture.

Paneling made from reclaimed agricultural fibers is plant-based and sustainable because it is harvested on an annual or semi-annual cycle. The straw that makes up strawboard for example can be harvested every 2–3 years. Strawboard can be a substitute for wood particleboard and medium-density fiberboard. Seek out products that have no added formaldehyde in the bonding agents and finishes.
Plant-based finishes refer to products made from rapidly renewable vegetable oils, citrus oils, waxes, and mineral oils. They often create a more natural-looking final product.

Performance Requirement: Install materials that are made from plants harvested within a ten-year cycle or shorter in at least two substantial applications. Acceptable applications for this credit could include wall or ceiling finishes, countertops, paneling, insulation, panel boards, and plant-based finish on any substantial wood surface. This credit does not apply to finish flooring, trim, cabinetry or OSB products, see cross referenced credits below for where those are applicable. Materials made with recycled content are not applicable.

Points: 3 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 5-40, 5-41, 5-47, 5-71, 5-74, 5-100

5-23: Use products with third-party certification, such as SCS, GreenGuard, and Floor Score (not applicable to carpet); 85% minimum

Responsible Party: Architect, General Contractor

Intent: Third-party certification is based on standards developed by an unaffiliated organization. Third-party certification standards establish criteria and verify manufacturer claims regarding the environmental, social, and economic benefits of their products.

Science Certification Systems (SCS) is a third-party certifier that promotes sustainable development in the forms of environmental protection and social responsibility. They administer multiple product certification programs covering a variety environmental and indoor health impacts, including FloorScore for flooring products.

Greenguard Environmental Institute, which governs the Certification Program, is another third-party certification organization that provides information related to Indoor Air Quality on insulation, air filters, doors, floor finish, flooring, and wall finish.

Green Seal is a third-party certification organization that evaluates, tests and visits manufacturing facilities to identify a product as environmentally preferable.

Performance Requirement: For a minimum of 85% of materials selected use products that are third-party certified from any the above organizations, or other certifications mentioned in other Materials Efficiency credits, other than carpet (carpets are not applicable under this credit). May be combined with other third-party certified material and product credits to reach the 85% minimum.

Points: 2 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 4-3, 4-19, 5-24, 5-26, 5-49, 5-60, 5-67, 5-69, 5-70, 5-75, 5-80, 5-90

Resources:

Green Seal: www.greenseal.org/

Scientific Certification Systems: https://www.scsglobalservices.com/certified-green-products-guide

Greenguard Environmental Institute: www.greenguard.org/

5-24: Use DECLARE, Living Product Challenge, or Cradle-to-Cradle labelled products

Responsible Party: Architect, General Contractor

Intent: Third-party certification standards establish criteria and verify manufacturer claims regarding the environmental, social, and economic benefits of their products. The following certifications represent industry-transforming standards of sourcing, manufacturing, and disposal transparency focused on a product's impacts over its entire life cycle.

Declare is a product ingredient transparency platform. Declare requires ingredient reporting to 100ppm for a minimum of 99%, by weight, of a product's ingredients. Look for products with Declare labels that are third-party verified and not listed on the Living Building Challenge Red List.

Living Products are healthy and free of toxins, socially responsible, respect the rights of workers, are net positive, and benefit both people and the environment. Based on the Living Building Challenge, products must demonstrate compliance in seven performance areas (petals); place, water, energy, health and happiness, materials, equity, and beauty.

Cradle-to-Cradle Certified products are sustainable products made for the circular economy. To receive certification, products are assessed for environmental and social performance across five critical sustainability categories: material health, material reuse, renewable energy and carbon management, water stewardship, and social fairness.

Performance Requirement: Use any product in any application that carries one of these labels or certifications to achieve this credit's intent.

Points: 3 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 5-23

Resources:

Declare Label and Product Database: https://living-future.org/declare/declare-about/#declare-2-0

Living Products: https://living-future.org/lpc/basics/

Cradle-to-Cradle Product Registry: https://www.c2ccertified.org/products/registry

FRAMING

5-25: Use salvaged framing lumber in structural applications, 30% minimum

Responsible Party: General Contractor, Structural Engineer

Intent: Reduce pressure on virgin timber resources.

Performance Requirement: Use framing lumber from salvage and reuse operations, reused from other jobsites, or reclaimed in deconstruction/demolition. When reusing or repurposing lumber for structural purposes, check with your local building authority

regarding grading requirements, strength restrictions or limits. Code may require some downgrading of structural capacity. In some cases, such as old heavy timbers, structural capacity may be increased.

Points Breakdown: 30% minimum with 1 point per 10% of structural framing, maximum of 10 points.

7 Points: at least 30% of structural framing is salvaged lumber

10 Points: 60% or more of structural framing is salvaged lumber

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale. Visually verified during intermediate construction and final inspections.

Cross Reference: 5-19, 5-20

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

Pioneer Millworks: https://pioneermillworks.com/

5-26: Use third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines; 50% minimum per application

Responsible Party: Architect, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: Add third-party certified wood products in material specifications and supplier order requirements. Use wood that is third-party certified and sustainably harvested in accordance with the Tier 1 or Tier 2 requirements outlined in the Built Green Wood Certification Guidelines for at least 50% on the following framing applications:

- Dimensional lumber
- Sheathing
- Beams

See the Built Green Wood Certification Guidelines for the specific third-party certification labels accepted and their tier levels.

Points Breakdown: Points are applied to each framing application individually. Points from all three applications may be combined for a maximum of 15 points.

2 points: Tier 2 certification

5 points: Tier 1 certification

When Verified: Review of product documentation and visually verified during intermediate construction and at final inspection.

Cross Reference: 5-23

Resources:

Built Green Wood Certification Guidelines: https://builtgreen.net/certification/#checklistandhandbook

Forest Stewardship Council: https://fsc.org/en

Sustainable Forest Initiative: https://www.forests.org/

Sustainable Northwest Wood: https://www.snwwood.com/

Pioneer Millworks: https://pioneermillworks.com/

5-27: Use Cross-laminated Timber (CLT) or Mass-timber beams

Responsible Party: Architect, General Contractor

Intent: Reduce the embodied carbon of buildings by avoiding the use of materials with high energy inputs during production.

Cross-laminated timber (CLT) is a wood panel product made from gluing together layers of solid-sawn lumber, i.e., lumber cut from a single log. Each layer of boards is usually oriented perpendicular to adjacent layers and glued on the wide faces of each board, usually in a symmetric way so that the outer layers have the same orientation. CLT offers high strength and structural simplicity needed for cost-effective buildings, as well as a lighter environmental footprint than concrete or steel. It also provides numerous other

benefits, including quicker installation, reduced waste, improved thermal performance, and design versatility.

Mass timber, composite wood, man-made wood, or manufactured board, includes a range of derivative wood products which are manufactured by binding or fixing the strands, particles, fibers, or veneers or boards of wood together with adhesives or other methods of fixation[1] to form composite material. Structurally, mass timber offers the kind of proven performance—including fire protection and seismic resistance—that allows its use in larger buildings. It also expands options for exposed wood structure in smaller projects.

Mass Timber/CLT has a high strength-to-weight ratio, which makes it good for protecting against seismic events and for use in load-bearing applications. Since mass timber panels are prefabricated and then assembled on site, buildings made from mass timber have much shorter project timelines and safer construction sites. Like traditional wood products, CLT products can offer very pleasing interior design aesthetics that require no additional surface finishes, see Credit 5-56.

Performance Requirement: Use Cross-laminated Timber (CLT) or mass timber beams for at least 20% of the project's structural beams and posts.

Points: 3 points

When Verified: Visually verified during intermediate construction.

Cross Reference: 5-8, 5-56

Resources:

Mass Timber Design Manual: https://www.thinkwood.com/mass-timber

Wood Products Council: https://www.woodworks.org/

5-28: Use factory-framed wall panels (panelized wall construction), e.g. SIPs, ICFs, CLT

Responsible Party: Architect, General Contractor

Intent: Prefabricated wall panels are built in a factory based on individual building plans. Since the panels are manufactured in a quality-controlled environment, they are stronger, more dimensionally accurate, more durable structures, and do not suffer from weather-related delays. They are built, labeled for assembly, and shipped to the job site. Builders follow assembly procedures defined by factory specifications.

Factory-framed wall panel systems offer significant savings in labor by combining framing, insulating, and sheathing. Less waste is produced because of the system's flexibility (the forms can be cut to any shape). Additionally, many systems have "studs" built in so there's something to nail or screw to, and sheetrock may be attached directly to the foam's interior surface. Exterior siding material, such as wood, vinyl, brick, or stucco, can be easily attached.

Using structural insulated panel (SIP) systems for wall, roof, and flooring applications instead of traditional stick framing can be an effective way to reduce the amount of wood used in a building. Panel systems have been in use for over 30 years and a variety of systems are available. The most common system includes a foam core sandwiched between oriented strand board (OSB) skins. Avoid structural insulated panels produced with ozone-depleting HCFCs. EPS (expanded polystyrene) does not contain HCFCs or other ozone-depleting chemicals. Non-ozone-depleting polyurethane is now available.

For homes located in wild land-urban interface zones and other areas increasingly prone to wildfires, ICF and SIP panel systems also provide exceptional fire protection over traditional stick-frame construction. The Concrete in ICF panels is one of the most resistant materials to heat and fire and can withstand intense heat for four or more hours. SIPs panels are less resistant to the heat, but the panels' solid core of EPS eliminates the chimney effect in the walls that occurs in stick-built structure; it will melt and self-extinguish rather than maintain a flame.

ICFs also represents an opportunity to use waste products like fly ash and wood waste in standard building material, which coincidentally offer superior performance. Fly ash waste from coal burning has been shown to improve the strength of concrete, see Credit 5-29.

In order to get optimum performance and waste reduction out of a panel system, first carefully evaluate your building plans to see if panels are appropriate. A complex shell design with lots of window or door openings can make it more difficult to use panels resourcefully. If you decide to use panels, make sure your framer understands how to work with them. Improper installation can negate the benefits. (The manufacturer should be able to provide some assistance when you start using these products.)

Performance Requirement: Use a factory-framed wall panel system for at least 90% of the exterior walls and roof.

Points: 4 points

When Verified: Visually verified during intermediate construction and final inspections.

Cross Reference: 5-8, 5-29

Resources:

Sustainable Building with SIPS: https://www.sips.org/green-building/green-building-with-sips

About SIPS: https://www.greenbuildingadvisor.com/green-basics/structural-insulated-panels

Mass Timber Design Manual: https://www.thinkwood.com/mass-timber

ICF Walls are Durable and Energy Efficient: https://www.greenbuildingadvisor.com/green-basics/insulated-concrete-forms

ICF Construction: Everything You Need To Know: https://www.buildwithrise.com/stories/mythbusting-icf-sustainable

Fireproof ICFs: https://www.icfmag.com/2008/08/fireproof-icfs/

5-29 Use ICFs with concrete using at least 20% supplementary cementitious materials (by weight)

Responsible Party: Architect, General Contractor

Intent: Reduce waste of dimensional lumber by using prefabricated wall systems. Reduce the embodied carbon footprint of the project by using non-portland cement and industry byproducts as supplementary cementitious materials (SCM).

Performance Requirement: For at least 75% of the exterior above grade walls, use insulated concrete forms made from concrete mixes composed of at least 20% non-portland cement SCM.

Points: 3 points

When Verified: Review of product documentation and verified at final inspection.

Cross Reference: 5-8, 5-28

Resources: Supplementary Cementitious Materials: https://www.nahb.org/-/media/NAHB/nahb-community/docs/councils/bsc/supplementary-cementitious-materials.pdf

5-30: Use engineered structural products and use no dimensional 2xs larger than 2x8, and no 4xs larger than 4x8

Responsible Party: Architect, General Contractor

Intent: Reduce demand for dimensional lumber from large, mature trees by using engineered products that can be made from smaller trees with shorter harvesting cycles.

There are many engineered structural products, including laminated veneer lumber (LVL), wood I-beams and I-joists, and wood roof and floor trusses. These products combine efficient raw material use with improved strength and performance capabilities to produce a superior option to traditional materials. Engineered lumber manufacturers use fast-growing, small-diameter trees efficiently.

Be aware of indoor air quality issues associated with formaldehyde binders. Look for products that do not contain this type of binder or, at a minimum, use phenol formaldehyde in place of urea formaldehyde binders. Ask your supplier for more information. Also ask them about manufacturers who use certified wood in their engineered wood products.

Performance Requirement: Design for and specify engineered products, such as open web trusses, I-joists, glue-laminates and Laminated Veneer Lumber (LVL) for all structural joists and beams greater than 8 inch wide. Clearly communicate to lumber yard and framer that no dimensional lumber greater than 2x8 and 4x8 is to be used in the project.

Points: 3 points

When Verified: Visually verified during intermediate construction inspections.

5-31: Use finger-jointed framing material (e.g., risers and studs) longitudinal compression loads only

Responsible Party: Architect, General Contractor

Intent: Finger-jointing or engineered studs (gluing short lengths of wood together) makes use of wood that traditionally would have been disposed of as waste. Finger-jointed products are generally straighter and stronger than solid wood; you won't have to reject and ultimately waste warped or split boards. For structural use, they are acceptable for longitudinal compression loads only.

Performance Requirement: Use finger-jointed studs for at least 50% of wood-framed walls, based on linear feet of one-story wall.

Points: 3 points

When Verified: Visually verified during intermediate construction inspections.

5-32: Use truss roof system

Responsible Party: Architect, General Contractor

Intent: Improve the efficient use of framing lumber. Manufacturing of trusses in the controlled environment of a factory using computer-controlled material optimization can significantly reduce wood waste.

Performance Requirement: Design and install the roof using a truss roof system.

Points: 3 points

When Verified: Visually verified during intermediate construction inspections.

Foundation

5-33: Use supplementary cementitious materials for 25-50% by weight of cementitious materials for all concrete

Responsible Party: General Contractor, Structural or Civil Engineer

Intent: Reduce the embodied carbon footprint of the project by using non-portland cement and industry byproducts as supplementary cementitious materials (SCM).

Performance Requirement: For at least 90% of the poured-in-place concrete in the project, use concrete mixes with at least 25% of cementitious content composed of non-portland cement SCM. Concrete pavements are excluded from this credit, see Credit 5-94.

Points Breakdown:

3 points: at least 25%, by weight, of concrete mix is supplementary cementitious materials

6 points: 50%, by weight, of concrete mix is supplementary cementitious materials

When Verified: Review concrete mix documentation at time of final inspections.

Resources: Supplementary Cementitious Materials: https://www.nahb.org/-/media/NAHB/nahb-community/docs/councils/bsc/supplementary-cementitious-materials.pdf

5-34: Use recycled concrete, asphalt, or glass cullet for base or fill

Responsible Party: General Contractor

Intent: Optimize the use of material resources by repurposing waste/salvaged materials.

When using this technique, grind concrete, asphalt, or glass cullet properly to meet base or fill specification. When ground to specs, the materials compact nicely to form a stable base. Get a sample from the supplier for your excavator crew to approve. See your pavement supplier for recycled concrete and asphalt options. Reduce waste hauling and disposal fees by contracting a mobile concrete crusher that can crush concrete onsite to spec.

Performance Requirement: Use recycled concrete, asphalt, or glass cullet for at least 30% of base or fill aggregate in foundations or paved areas. Not to be used as fill in landscaped or stormwater infiltration areas.

Points: 2 points

When Verified: Visually verified during intermediate construction inspections, review documentation at final inspections.

Cross Reference: 5-19

5-35: Use an alternative foundation system that minimizes volume of concrete foundation material

Responsible Party: General Contractor, Architect or Structural Engineer

Intent: Reduce the embodied carbon footprint of the project by reducing volume of cementitious materials. Traditional concrete foundations and slabs are one of the largest contributors to embodied carbon in buildings. Alternative foundation systems significantly reduce the volume of concrete used and greatly reduce the embodied carbon of a building.

Examples of alternative foundation systems:

- Pin systems
- Post and Pier systems
- Slim Slab or no-slab designs

Performance Requirement: Alternative foundation system must be used for minimum of 50% of building's foundation. Document with photo of the system.

Points: 5 points

When Verified: Review of product documentation and visually verified during intermediate construction.

Cross Reference: 2-20

Resources:

Minimizing Concrete in a Slab-on-Grade Home: https://www.finehomebuilding.com/2019/02/27/minimizing-concrete-in-a-slab-on-grade-home

Types and advantages of pier foundations: https://civiltoday.com/geotechnical-engineering/foundation-engineering/deep-foundation/119-what-is-a-pier-foundation-details-types-advantages-location

How pin foundations work: https://www.diamondpiers.com/how-it-works

Doors

5-36: Use salvaged doors

Responsible Party: Architect, General Contractor

Intent: Reusing building materials provides wide-ranging environmental benefits including reducing waste, avoiding disposal costs, preserving embodied energy, reducing pollution, and preserving natural resources and habitats.

Performance Requirement: Use salvaged doors that are purchased from salvage and reuse operations, reused from other jobsites, or reclaimed in demolition/deconstruction.

Points Breakdown: 1 point per door. 4 points maximum.

When Verified: Visually verify at final inspection. Review receipt of purchase or material sourcing documentation.

Cross reference: 5-19, 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-37: Use doors that include recycled-content or are certified as sustainably-produced by any tier on the Built Green Wood Certification Guidelines

Responsible Party: Architect, General Contractor

Intent: Optimize the use of material resources by repurposing waste and reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: Use doors that contain minimum 69% recycled content; or certified as sustainably harvested/produced by FSC, SFI, or American Tree Farms System.

Points: 2 points

When Verified: Visually verify at final inspection. Review receipt of purchase, EPD, or product documentation.

Resources:

Built Green Wood Certification Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

5-38: Use domestically grown and manufactured wood interior doors

Responsible Party: Architect, General Contractor

Intent: Domestically grown wood interior doors offer the same performance without compromising limited and endangered hardwood species stock. They also represent an opportunity to reduce embodied energy through minimizing the transportation impact.

Performance Requirement: Install wooden doors that are both harvested/extracted and processed/manufactured within 500 miles of the project site.

Points: 1 point

When Verified: Review at final verification, include product submittal with documentation of extraction, production, and manufacture.

Cross Reference: 5-19

Finish Floor

5-39: Use salvaged flooring, or flooring with a wear layer made from salvaged lumber, minimum 3mm wear layer; on more than 250SF

Responsible Party: Architect/ Interior Designer, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on forest resources and habitats. Reuse flooring purchased from salvage and reuse operations, reused from other jobsites, or reclaimed in deconstruction. Salvaged wood flooring can add an attractive feature to a home a rich historical appeal. Many salvaged woods come from original old-growth timbers, have fewer knots, longer lengths or widths, and come from species no longer available. Quality and availability can vary widely but reusing wood flooring causes no new trees to be harvested.

Performance Requirement: For 250 sq. ft. or more per unit, install salvaged flooring and/or flooring with a wear layer made from salvaged lumber (minimum 3mm wear layer). Points may be combined if both types of salvaged wood flooring are utilized in a project.

Points Breakdown:

5 points: salvaged flooring

2 points: flooring made with salvaged lumber wear layer

When Verified: Visually verify at final inspection. Review receipt of purchase, EPD, or product documentation.

Cross reference: 4-13, 4-14, 4-19, 5-19, 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

Greenhome Solutions: https://www.ghsproducts.com/

Sustainable Northwest Wood: https://www.snwwood.com/

Pioneer Millworks: https://pioneermillworks.com/

Craft flooring: https://craftfloor.com/

5-40: Use rapidly-renewable wood flooring products with a ten-year or less harvest cycle on more than 250SF, minimum 3mm wear layer for engineered products

Responsible Party: Architect/ Interior Designer, General Contractor

Intent: Reduce embodied carbon emissions and pressure on forest resources and habitats by increasing demand for rapidly-renewable flooring products.

Cork bark is harvested, and its tree left to regenerate more bark. The bark is harvested on an eight-year cycle. Cork flooring is durable, temperature neutral, sound absorbing, and naturally moisture-, mold-, and rot-resistant.

Bamboo can be harvested on a six- to eight-year cycle. Bamboo flooring is a very durable and dimensionally stable material. The short regeneration time of bamboo provides justification for specifying bamboo flooring instead of more locally-sourced tree hardwoods.

There can also be indoor air quality advantages to using natural materials, such as less off-gassing due to fewer or no chemicals used during manufacture. Check product's Environmental Product Declaration (EPD) or Material Safety Data Sheet (MSDS) to make sure adhesives and other flooring components do not contain hazardous materials, such as added urea formaldehyde.

Performance Requirement: For 250 sq. ft. or more per unit, install flooring made from rapidly renewable materials with a ten-year or shorter harvest cycle. Engineered products must have a minimum of 3mm wear layer of the rapidly-renewable material.

Points: 5 points

When Verified: Visually verify at final inspection. Review receipt of purchase, EPD, or product documentation.

Cross reference: 4-13, 4-14, 4-19, 5-100

Resources:

Greenhome Solutions: https://www.ghsproducts.com/

5-41 Use recycled-content or rapidly renewable flooring underlayment products

Responsible Party: Architect, General Contractor

Intent: Reduce pressure on virgin materials and forest habitats, by increasing demand for products with high recycled content or rapidly renewable flooring products.

Performance Requirement: Use an engineered sub-floor or underlayment product, that is certified to have at least 20% total recycled content or is made from rapidly renewable materials (e.g., cork), for at least 50% of the framed floor in the project.

Points: 2 points

When Verified: Visually verify during intermediate construction. Review receipt of purchase, EPD, or product documentation.

Cross reference: 4-23, 4-24, 5-100

Resources:

Greenhome Solutions: https://www.ghsproducts.com/

5-42 Install untreated natural fiber carpet (e.g., wool, jute, sisal)

Responsible Party: Architect/ Interior Designer, General Contractor

Intent: Today, 97% of all manufactured carpets consist of synthetic fibers, backing material, binders, and protective coatings. These synthetic components off-gas and some are known to be detrimental to health. Several companies make carpets with natural fibers, such as wool, cotton, sisal, and jute. Look for natural fiber carpets that use a jute and natural rubber backing to avoid noxious off-gassing from synthetic chemical treatments, glues, and synthetic backing materials.

Wool carpeting provides many benefits: it is soil and stain resistant, has long-term appearance retention, color retention and texture recovery, is flame-resistant, mildew

resistant, and water repellant. Wool is hypoallergenic. Unlike synthetic carpets that attract and lock-in lint, pollen, and dirt particles, wool repels them for easy removal with a vacuum. It has been proven hygienically safe in medically sensitive areas. Wool does not promote the growth of dust mites or bacteria and significantly improves indoor air quality by rapidly absorbing the common pollutants formaldehyde, sulfur dioxide, and nitrogen oxides. Not only does wool neutralize these contaminants more quickly and completely than synthetic carpet fibers, but wool will also not re-emit them, even when heated. Wool carpet may continue purifying the air for up to 30 years. All these features lead to improved comfort, ease of maintenance, and less waste from replacement.

At the end of the carpet's life untreated natural fiber carpeting with natural backing materials and binders are biodegradable.

Performance Requirement: Install natural fiber floor coverings with no synthetic chemical treatments (including synthetic moth-proofing treatments) for at least 50% of non-hard surface floors in the project.

Points: 3 points

When Verified: Review product documentation and visually verify at final inspection.

Cross reference: 4-15 through 4-18, 5-100

5-43 Install recycled-content or renewed carpet

Responsible Party: Architect/ Interior Designer, General Contractor

Intent: Reduce pressure on virgin materials by increasing demand for products with high recycled content.

Performance Requirement: Use renewed carpet or carpet that is certified to have at least 40% total recycled content in the pile or the backing (or both), for at least 50% of the carpet in the project. Preference should be given to suppliers with "takeback" programs, which help close the loop of manufacturer responsibility.

Points: 2 points

When Verified: Visually verified during final inspections, with review of product documentation

Cross Reference: 4-15 through 4-18

5-44: Use replaceable carpet tile

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Carpet tiles are a sustainable material choice because they are often made of recycled fiber content. In addition, one or more tiles can be replaced if damaged without having to replace an entire wall-to-wall carpet. Carpet tiles allow easy access to wiring or plumbing located under the floor. They can be used in high- and low-traffic areas and require less time and fewer tools than traditional carpet. They can be installed using either special adhesive or double-faced tape or can be ordered with self-stick backing. Carpet tiles come in many thicknesses, patterns, and colors.

Performance Requirement: Install replaceable carpet tile in the project. Preference should be given to suppliers with "take-back" programs, which help to close the loop of manufacturer responsibility.

Points: 1 point

When Verified: Visually verified during final inspections, with review of product documentation.

Cross Reference: 4-15 through 4-18

5-45: Use recycled-content or natural fiber carpet pad

Responsible Party: General Contractor

Intent: Reduce pressure on virgin materials and reduce embodied carbon emissions by increasing demand for products with high recycled content and rapidly renewable natural fiber (e.g., wool) content.

Performance Requirement: Use a carpet pad that is certified to have at least 40% total recycled or 100% natural fiber content, for at least 90% of the carpeting in the project (excluding carpet tile areas). Product also must not contain brominated flame retardants to earn this point.

Points: 1 point

When Verified: Visually verify during intermediate construction, with review of product documentation.

Cross Reference: 4-15, 4-16, 5-100

5-46: Use 40% recycled-content hard surface tile, 100 square feet minimum

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on virgin materials by increasing demand for products with high recycled content. Several manufacturers make glass, ceramic, and porcelain tiles with recycled content. These tiles are durable and offer an attractive opportunity to highlight (and market) the use of an environmentally friendly material to your client or market.

Performance Requirement: Use hard-surface tile that is certified to have at least 40% total recycled content. Preference should be given to high levels of post-consumer recycled content. Acceptable applications to qualify for this credit include flooring, countertops, floors, and shower surrounds.

Points: 3 points

When Verified: Visually verified during final inspections, with review of product documentation.

Cross reference: 4-13, 4-14, 4-23

5-47: Use natural linoleum

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Linoleum is durable, low-maintenance flooring made from all-natural materials including linseed oil, pine resin, sawdust, cork dust, limestone, natural pigments, and jute backing. Unlike vinyl flooring, linoleum does not contain significant petroleum-based products, phthalates, or chlorinated chemicals. From a raw materials standpoint, linoleum is an outstanding product. It also contributes to healthy indoor air quality by inhibiting the growth of bacteria and dust mites and providing sound absorption. All of its ingredients are minimally processed, commonly available, rapidly renewable, and it is biodegradable at the end of life.

Linoleum comes in a wide range of colors, patterns, textures in sheet, tiles, or engineered click tiles that allow it to compliment any aesthetic style.

Performance Requirement: Use natural linoleum in place of synthetic resilient flooring products. Use a low-VOC adhesive if using sheet or tile linoleum to maximize indoor air quality.

Points: 3 points

When Verified: Visually verified during final inspections, with review of product documentation.

Cross reference: 4-12, 4-13, 4-19, 4-23, 4-24, 5-100

Resources:

Forbo: https://www.forbo.com/flooring/en-us/marmoleum/p41k10

5-48: No vinyl flooring

Responsible Party: Architect/Interior Designer, General Contractor

Intent: The use of Polyvinyl chloride (PVC) plastics and flooring, which contain high levels of phthalate plasticizers, in the home is related to increased rates of asthma and allergies in children. In the event of a fire, burning PVC creates toxic smoke. The manufacture of PVC plastics releases toxic amounts of chlorine and dioxin gases into the atmosphere, contributing to poor air quality and global warming. Byproducts of PVC production are extremely hazardous and long-lived pollutants, shown to cause a range of serious health hazards even from low-level exposures. Dioxin is a potent carcinogen and there is no known safe dosage level. Furthermore, its recycling potential is limited once it has been used as flooring.

Alternatives to vinyl can provide the same look, durability, and water-resistant properties while offering superior comfort, indoor air quality, and environmental conservation. These include waterproof cork flooring, linoleum, and non-vinyl composites.

For full benefits of linoleum see Credit 5-47. In 2019, Amorim launched their waterproof Cork Wise product line that fuses all the benefits of cork flooring (see Credit 5-40) with the desired characteristics of vinyl flooring. Cork Wise is also more dimensionally stable than vinyl plank flooring, it can be installed up to 3,200 sq. ft. or 60 linear feet without the need for transition strips or expansion joints between rooms. Amorim Wise products are made from cork, a byproduct of the wine cork industry, and recycled BPA-free PET plastic, which makes the product PVC-free, carbon-negative, and a healthier option for both people and the planet.

Non-vinyl resilient flooring products, also known as vinyl composition tiles (VCT), are composite flooring materials made without PVC, chlorines, phthalates, and other plasticizers. They are typically made with only a small amount of recycled content vinyl, polypropylene, and mineral powders so they contain and produce fewer VOCs and other harmful chemicals than traditional vinyl products. While VCT tends to have a lower price point than other options, it is more porous and requires more time and money to maintain it, leading to more waste from replacement. Use only products that include recycled vinyl

content and provide Environmental and Health Product Declarations or Declare Red List Free so you can confirm that the products are free of harmful PVC and plasticizer chemicals.

Performance Requirement: Install no vinyl flooring in the project.

Points: 4 points

When Verified: Visually verified during final inspections.

Cross Reference: 5-39 through 5-47, 5-100

Resources: See credits 5-39 through 5-47 for non-vinyl flooring options or ask your local flooring supplier for PVC-free and phthalate-free vinyl alternatives. Some manufacturers to consider are:

- Marmoleum (Natural linoleum) by Forbo: https://www.forbo.com/flooring/en-us/marmoleum/p41k10
- Wise (Cork) by Amorim: https://www.amorimwise.us/
- Cirro (Non-vinyl resilient flooring) by Mannington Commercial: https://www.manningtoncommercial.com/products/hard-surface/non-vinyl-resilient/

5-49 Use flooring that is third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines; 50% minimum

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: Use flooring made from wood that is third-party certified sustainably harvested in accordance with Tier 1 or Tier 2 certification requirements (outlined in Built Green Wood Certification Guidelines) for at least 50% of the hard surface flooring in the project.

Points Breakdown:

5 points: Tier 1 certification

4 points: Tier 2 certification

When Verified: Review of product documentation and visually verified at final inspection.

Resources:

Built Green Wood Certification Guidelines: https://builtgreen.net/certification/#checklistandhandbook

Greenhome Solutions: https://www.ghsproducts.com/

Sustainable Northwest Wood: https://www.snwwood.com/

Pioneer Millworks: https://pioneermillworks.com/

Craft flooring: https://craftfloor.com/

5-50: Use concrete slab or sub-floor as a finished floor in living space

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on virgin materials and reduce embodied carbon emissions. If you have already poured a concrete slab or sub-floor, the embodied energy of this material has already been incorporated into the project. Consider using this as a finished floor for a very durable and stylish look while greatly minimizing additional material use. Concrete slab floors also provide passive cooling and temperature regulation to increase indoor comfort and energy efficiency.

Performance Requirement: Use home's concrete slab foundation or sub-floor as a finished floor in at least all common/shared living spaces.

Points: 2 points

When Verified: Visually verified at final inspection.

Cross Reference: 4-13, 4-14, 4-23, 5-33, 5-99

Interior Walls

5-51: Use drywall with a minimum of 95% recycled content synthetic gypsum or 10% if non-synthetic gypsum

Responsible Party: General Contractor

Intent: Reduce pressure on virgin materials, by increasing demand for products with high recycled content. Gypsum board manufacturers employ various levels of recycled content

(pre- and post-consumer) in the production of gypsum board through either the use of flue-gas desulfurization (FGD) (also known as synthetic) gypsum or post-consumer gypsum collected from construction and demolition projects used in new product board core and recycled paper for board facing. These higher recycled content boards are commonly available at most building material suppliers and are cost-competitive with conventional drywall. Non-synthetic recycled gypsum content industry standard is around 5%, therefore specifying a higher content product with your vendor is necessary. Some products are locally sourced/manufactured.

Performance Requirement: Use at least 30% of drywall with a minimum of 95% recycled content synthetic gypsum or 10% if non-synthetic gypsum.

Points: 1 point

When Verified: Review of product documentation and visually verified during intermediate construction.

Cross Reference: 5-16

5-52: All insulation to have a minimum of 40% recycled-content

Responsible Party: General Contractor

Intent: Reduce pressure on virgin materials, by increasing demand for products with high recycled content.

There are several commonly available types of recycled content insulation:

- *Cellulose insulation* is made from 100% post-consumer recycled newspapers or telephone books. The insulation can be dry-blown or poured loose-fill into enclosed cavities but is most commonly wet-sprayed.
- Several brands of *fiberglass insulation* batts are manufactured using recycled glass, including post-consumer glass collected in curbside recycling programs.
- *Mineral wool* insulation is another option and is available in loose-fill or batts. It has, on average, 75% post-industrial recycled-content.
- *Cork insulation* is a rigid panel insulation made from 100% post-industrial recycled cork bark and is biodegradable, see Credit 5-54.

Performance Requirement: All cavity-installed insulation must be certified to contain at least 40% post-consumer recycled content.

Points: 2 points

When Verified: Review of product documentation and visually verified during intermediate construction

Cross Reference: 4-24, 5-54

5-53: Use environmentally-friendly foam building products (formaldehyde-free, CFC-free, HCFC-free, HFC-free)

Responsible Party: General Contractor

Intent: Reduce the use of products containing chemicals with high global warming potential, greenhouse gas emissions, and other atmospheric impacts associated with foam product manufacture by using products made with more benign blowing agents. Building an environmentally friendly home means eliminating the use of foam building materials that are manufactured using chlorofluorocarbons (CFCs)hydrochlorofluorocarbons (HCFCs), or hydrofluorocarbons (HFCs).

CFCs and HFCs are known to contribute significantly to ozone depletion and have a global warming potential (GWP) ranging thousands to tens of thousands of times higher than carbon dioxide (CO_2). HCFCs are less damaging than CFCs but are still considered high GWP gases and should also be avoided. Use of these high-GWP foams will further exasperate climate change by increasing a project's embodied carbon emissions during construction and end-of-life stage.

Also avoid products that include formaldehyde because indoor formaldehyde is recognized as a severe health hazard, causing reactions ranging from flu-like symptoms to death in individuals sensitized through exposure.

Alternative foams for insulation:

- *Beadboard* or *EPS* (expanded polystyrene) rigid foam insulation can be used for interior or below grade uses. However, it doesn't insulate as well (R-3.6 to R-4.4 per inch), but it is less damaging to the environment because pentane is used in its production rather than HCFC.
- *Polyurethane* insulation (e.g., polyisocyanurate) made with pentane instead of HCFCs as the blowing agent is now available. Unlike EPS, however, there are few outlets for polyurethane foam as a recycled product.
- *Blown-in cellulose* (100% recycled newspaper content) or *formaldehyde-free fiberglass*.
- *Soy-based foams*

Alternatives to spray foams for air sealing:

- *Interior-applied waterborne acrylic* sealants that are aerosolized and injected into a pressurized home (e.g., Aerobarrier)
- *Exterior-applied, liquid-applied* weatherproofing membranes (e.g., Enviro-Dri by Tremco)

Spray foams considerations for deconstruction and salvage at end of life:

Large surface area applications of spray foam are highly detrimental to future deconstruction, material salvaging, and recycling due to the spray foam impeding deconstruction and salvaging building components and contaminating materials for reuse or recycling.

Performance Requirement: All rigid foam insulation and spray foam used in the building must be documented to use no CFC-, HFC-, or HCFC-blowing agents during manufacture or installation.

Points: 3 points

When Verified: Review of product documentation and visually verified during intermediate construction.

Cross-Reference: 4-23, 4-24, 5-1

Resources:

Chlorofluorocarbons (CFCs) and hydrofluorocarbons (HFCs): https://www.pca.state.mn.us/air/chlorofluorocarbons-cfcs-and-hydrofluorocarbons-hfcs

Choosing Insulation for Carbon Value: https://www.swinter.com/party-walls/choosing-insulation-for-carbon-value-why-more-is-not-always-better-part-1/

AeroBarrier: https://aeroseal.com/aerobarrier/

Enviro-Dri by Tremco: https://www.tremcosealants.com/markets/residential/weather-resistive-barrier-systems/enviro-dri/enviro-dri/

5-54: At least 50% use of wool, hemp, or cork insulation

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Natural insulation products reduce embodied carbon emissions by increasing demand for products with high recycled content and rapidly renewable content.

Benefits of wool and plant-based insulation materials include:

- Non-toxic and non-abrasive
- Easy and safer installation
- Hygroscopic and regulates humidity without compromising performance
- Naturally anti-microbial, anti-fungal, hypoallergenic, and air purifying
- Sound absorbing
- Made from rapidly renewable resources (only 9 months to 8 years)
- Recyclable or biodegradable at end of life
- Low to negative embodied carbon emissions

Hemp insulation batts consist of about 92% hemp and about 8% recycled polyester fibers. *Wool* insulation is installed into cavities as batts or blown-in. *Cork* insulation is comprised of rigid panels made of 100% post-industrial cork bark from the cork stopper industry with no additional adhesives or binder chemicals.

These materials tend to be more expensive than traditional insulation options but are a superior choice for people with chemical sensitivities or looking for ways to reduce their embodied carbon emissions.

Performance Requirement: Use wool, hemp, or cork insulation for at least 50% of all cavity-installed insulation.

Points: 5 points

When Verified: Review of product documentation and visually verified during intermediate construction.

Cross reference: 5-52, 5-99, 5-100

Resources:

Hemp Insulation: What every Homeowner needs to know:
https://innovativebuildingmaterials.com/hemp-insulation/

HempWool insulation: https://www.hempitecture.com/hempwool

Cork Insulation Guide: https://www.buildwithrise.com/stories/cork-insulation

Wool Insulation: https://havelockwool.com/fiberglass-insulation-vs-wool-insulation/

5-55: Use recycled or "reworked" paint and finishes

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on virgin materials by increasing demand for products with high recycled content. Companies are marketing recycled paint on a regional basis. Formerly offered only in limited colors and styles, the selection of recycled paint is expanding—and it's usually cheaper than its virgin counterpart. Do not use these paints in frequently occupied living spaces such as bedrooms, children's playrooms, or in homes of individuals with chemical sensitivities.

Performance Requirement: Use recycled or reworked paints and coatings on large interior surfaces (not trim, doors, etc.) of the project.

Points: 2 points

When Verified: Visually verified at final inspection, with product documentation review.

Cross Reference: 4-26

5-56: Use natural wall finishes, e.g., lime paint, clay, wood

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on virgin materials and reduce embodied carbon emissions. Natural finishes include lime paints, milk paints, and clays with no plastics or acrylics and low levels of solvents and VOCs.

Lime paint is an interior or exterior finish that contains slaked lime, clay, marble dust, earth pigments, natural glue, and water. Lime paint can be applied to a variety of surfaces including wood, drywall, and masonry.

Milk paint is a durable, economical, matte finish made of milk protein, lime, and clay. Milk paint dries quickly without the solvents and VOCs of traditional paint.

Natural clay plaster is an interior, trowel-on finish that comes in a wide variety of colors and can be highly polished or heavily textured. It contains clay, marble dust, borax, and earth pigments. Clay plaster is mold resistant, hypoallergenic, and low-toxic.

When left exposed, cross-laminated timber (CLT) panels and beams provides a finished wood surface that can enhance an interior space with a warm natural aesthetic without the use of sealers or solvents, see Credits 5-27 and 5-28.

Performance Requirement: Use natural wall finishes on large interior surfaces (not trim, doors, etc.) of the project.

Points: 2 points

When Verified: Visually verified at final inspection, with product documentation review.

Cross Reference: 4-24, 4-26, 5-27, 5-28

Exterior Walls

5-57: Use salvaged siding

Responsible Party: Architect, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on forest resources and habitats. Reuse siding purchased from salvage and reuse operations, reused from other jobsites, or reclaimed in deconstruction. Salvaged wood siding and siding made from salvaged lumber can add an attractive feature or historical appeal to a home. Many salvaged woods come from original old-growth timbers, have fewer knots, longer lengths or widths, and represent species no longer available. Quality and availability can vary widely but reusing wood flooring causes no new trees to be harvested.

Only reuse siding in good condition. Be aware of building envelope considerations when selecting any siding product/material. Be sure to install a drainable house wrap under exterior siding to promote wall drainage.

Performance Requirement: Use salvaged siding or siding made from salvaged lumber for at least 33% of the exterior surfacing.

Points: 2 points

When Verified: Visually verify at final inspection and review receipt of purchase, product documentation, etc.

Cross reference: 5-19, 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

Greenhome Solutions: https://www.ghsproducts.com/

Sustainable Northwest Wood: https://www.snwwood.com/

Pioneer Millworks: https://pioneermillworks.com/

5-58: Use recycled-content or salvaged sheathing

Responsible Party: Architect, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on forest resources and habitats.

Performance Requirement: Use sheathing with a minimum of 50% recycled content (excludes OSB) or reuse siding purchased from salvage and reuse operations, reused from other jobsites, or reclaimed in deconstruction.

Points: 1 point

When Verified: Review of product documentation and visually verified during intermediate construction.

Cross reference: 5-19, 5-100

5-59: Use siding with at least 15% recycled content on at least 75% of solid wall surface

Responsible Party: Architect, General Contractor

Intent: Reduce pressure on virgin materials by increasing demand for products with high recycled content. There are currently three types of siding that include recycled-content: metal, paper fiber composites, and cement fiber composites. These products also offer durable and low-maintenance alternatives to wood siding and significantly lower environmental and health concerns than vinyl siding.

Metal offers the greatest opportunity to use post-consumer recycled-content in your project. Aluminum or steel siding products contain high percentages of recycled metal—up to 100%. The scrap is also recyclable, creating a circular lifecycle.

Paper fiber composites uses FSC certified recycled paper fiber and non-off-gassing phenolic resins to create rigid panels in a variety of colors, eliminating the need for paint or sealers. The panels are very durable and low-maintenance. There are multiple manufacturers located in Washington state; look for those that use petroleum-free resins.

Cement fiber composites are also resource-efficient and offer a very good fire rating when compared to wood or metal siding. In addition to benefits like durability and low-maintenance, the wood fiber in these products is reclaimed from wood processing waste. It can also be harvested from fast-growing, small-diameter tree species.

Performance Requirement: Select and install siding which has at least 15% recycled content on at least 75% of exterior solid wall surfaces.

Points: 1 point

When Verified: Review of product documentation and visually verified during intermediate construction.

5-60: Wood siding that is third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines; at least 20% of solid wall surface

Responsible Party: Architect, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvest wood products.

Performance Requirement: Use siding made from wood that is third-party certified sustainably harvested in accordance with Tier 1 or Tier 2 certification requirements (outlined in Built Green Wood Certification Guidelines) for at least 20% of the solid wall surface.

Points Breakdown:

5 points: Tier 1 certification

2 points: Tier 2 certification

When Verified: Review of product documentation and visually verified at final inspection.

Resources: Built Green Wood Certification Guidelines: https://builtgreen.net/certification/#checklistandhandbook

Greenhome Solutions: https://www.ghsproducts.com/

Sustainable Northwest Wood: https://www.snwwood.com/

Pioneer Millworks: https://pioneermillworks.com/

5-61: Use 50-year warranted siding product

Responsible Party: Architect, General Contractor

Intent: Reduce future consumption of raw materials for replacement of short-service-life building components. Minimizing the need to replace any siding product offers a maximum consumer benefit to the homeowner, in addition to the obvious environmental impact. Many of the Shou Sugi Ban wood siding (see Credit 5-64) and fiber-cement composite (see Credit 5-59) products offer a 50-year warranty. Ask your local supplier for these and other options.

Performance Requirement: Use a siding/cladding product with a 50-year service life (based on warranty/manufacturers documentation) on at least 20% of the solid wall surface.

Points: 2 points

When Verified: Review of product warranty documentation and visually verified at final inspection.

Cross Reference: 5-59, 5-64

5-62: Use salvaged masonry brick or block, 50% minimum

Responsible Party: Architect, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources.

Performance Requirement: Use salvaged masonry brick or block for at least 50% of the stone or brick used onsite. Applicable to all exterior applications.

Points: 2 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross reference: 5-19, 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-63: Use regionally-produced stone or brick

Responsible Party: Architect, General Contractor

Intent: Generally, “regionally produced” materials are extracted and produced in the Pacific Northwest region, ideally in Washington, Oregon, Idaho, or British Columbia, Canada. Ask your local supplier about the origin of the material.

Use of regional materials helps keep material transport costs and fuel emissions down, reinforces a regional aesthetic, and supports the local economy.

Performance Requirement: Use locally quarried, indigenous stone that is cut and polished locally. Applicable to all exterior applications.

Points: 2 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross reference: 5-19

5-64 Use thermally-modified wood siding that does not require wood sealer

Responsible Party: Architect, General Contractor

Intent: Thermally-modified wood products, increasingly common in the marketplace, are a natural, non-toxic alternative to chemically treated or sensitive rainforest wood products. Unlike pressure-treated lumber, thermally modified wood is essentially "cooked" in oxygen-free ovens which changes its cellular and molecular makeup by removing all organic compounds from its cells. The wood no longer absorbs water, reducing its ability to expand or contract, a leading cause of rot in outdoor uses. The lack of moisture content in the wood also means that the wood's cellulose will no longer act as a "food source" for fungi or insects. The processes also eliminate the need for sealers or paints for preservation. Thermally modified wood products can be guaranteed for up to 25 years.

There are three types of thermally-modified wood products accepted for this credit: thermally-modified with no additives, bio-based liquid impregnated thermally-modified wood, and Shou Sugi Ban (i.e., wood charring).

Kebony wood products use a thermal-modification process that impregnates traditional FSC-certified pine lumber with a bio-based (furfuryl alcohol) liquid that further increases its dimensional stability. The impregnated lumber is then heat-cured and dried, creating a polymer that fuses with the wood on a cellular level and increases the cell's thickness by 50%. The result is lumber products that are similar in dimensional stability, hardness, and rot and pest resistance to rarer and environmentally-sensitive tropical woods (e.g., ipe, cumaru, garapa). The modification process utilizes rapidly renewing pine trees from sustainably-managed forests and increases the lifespan of the wood in exterior applications to over 30 years without the need for sealers or paints. This product can be used for siding and decking applications.

Shou Sugi Ban is an antient Japanese exterior siding technique that preserves wood by charring it with fire. The process involves charring the wood, cooling it, cleaning it, and finishing it with a natural oil. The charred wood becomes more moisture, rot, pest, and fire resistant, with an expected lifespan of 80 years. Traditionally red cedar was used, but the technique can be applied to many other wood species.

Performance Requirement: Use a thermally-modified wood product on at least 20% of the solid wall surface without applying a wood sealer (natural oil prefinishes are ok). Preference should be given to products that are certified under a Tier 1 certification as described in the Built Green Wood Certification Guidelines.

Points: 4 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 5-60, 5-61

Resources:

Built Green Wood Certification Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

Thermally treated wood: https://www.buildwithrise.com/stories/thermally-treated-wood

Shou Sugi Ban: https://shousugiban.com/

Kebony wood modification process: https://us.kebony.com/technology/the-process/

Greenhome Solutions: https://www.ghsproducts.com/

Pioneer Millworks: https://pioneermillworks.com/

5-65: No vinyl siding or exterior trim

Responsible Party: Architect, General Contractor

Intent: Reduce the negative environmental and human health impacts of manufacturing, using, and disposing of materials with toxic components by using environmental-friendly alternatives.

The use of Polyvinyl chloride (PVC) plastics and flooring, which contain high levels of phthalate plasticizers, in the home is related to increased rates of asthma and allergies in children. In fires, burning PVC creates toxic smoke. The manufacture of PVC plastics releases toxic amounts of chlorine and dioxin gases into the atmosphere contributing to poor air quality and global warming. Byproducts of PVC production are extremely hazardous and long-lived pollutants, shown to cause a range of serious health problems from even low-level exposures. Dioxin is a potent carcinogen and there is no known safe dosage level. Furthermore, options for recycling the material are limited after its use as siding.

Durable, low maintenance, or lower carbon alternatives to vinyl siding:

- Salvaged siding, see credits 5-57 and 5-62
- Recycled content siding (e.g., cement fiber board, metal, paper fiber), see Credit 5-59
- Thermally-modified wood siding, see Credit 5-64

Performance Requirement: Install no vinyl siding in the project.

Points: 2 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 5-57, 5-59, 5-62, 5-64

Windows

5-66 Use wood / fiberglass / finger jointed / composite wood windows

Responsible Party: Architect, General Contractor

Intent: Reduce the environmental impact of vinyl during manufacture, use, and disposal by sourcing alternate materials with lower impact.

Wood fiber increases the dimensional stability of the composite material. Dimensional stability is commonly a problem with PVC plastic frame materials. The composite coefficient of expansion more closely matches glass than vinyl and helps keep the seal

between the frame and glass intact for long-term performance. Further, the composite does not absorb moisture and will not swell like wood.

Windows made of fiberglass produce the highest energy efficiency and minimal environmental impact. Fiberglass requires less energy to produce into a final product than PVC or aluminum. It reduces condensation, won't contract or expand like wood, and is least likely to crack, corrode, rot, or leak.

Traditionally, the finest clear-grained wood has been used for doors and window frames. However, the availability of stable, clear, mature wood has declined. As a result, the industry has responded by developing finger-jointed wood products—taking smaller scraps of lower value wood and edge gluing them together, covered by top-quality wood veneers on the finish surface.

Look for window manufacturers that offer windows that qualify for the ENERGY STAR program or have a U-Factor less than 0.28.

Performance Requirement: Install all-wood, plastic composite (no vinyl), or fiberglass windows in at least 90% of window locations.

Points: 5 points

When Verified: Visually verified at final inspections.

Cross Reference: 5-67

5-67 Use wood windows that are third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines

Responsible Party: Architect, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: Use windows made from wood that is third-party certified sustainably harvested in accordance with Tier 1 or Tier 2 certification requirements (outlined in Built Green Wood Certification Guidelines) for at least 50% of the windows in the project.

Points Breakdown:

5 points: Tier 1 certification

2 points: Tier 2 certification

When Verified: Review of product documentation and visually verified at final inspection.

Resources:

Built Green Wood Certification Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

Cabinetry and Trim

Trim:

5-68 Use salvaged trim

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources.

Performance Requirement: Use salvaged trim is purchased from salvage and reuse operations, reused from other job sites, or reclaimed in demolition.

Points: 2 points

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross reference: 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-69: Use trim that is third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines, 50% minimum

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: At least 50% of interior trim (by cost or linear footage) must be from certified sustainably harvested wood that meets the Tier 1 or Tier 2 requirements (outlined in Built Green Wood Certification Guidelines).

Points Breakdown:

4 points: Tier 1 certification

2 points: Tier 2 certification

When Verified: Review of product documentation and visually verified at final inspection.

Resources:

Built Green Wood Certification Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

5-70 Use wood veneers that are third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines, 50% minimum

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: At least 50% of wood veneers (by cost or linear feet) must be from certified sustainably harvested wood that meets the Tier 1 or Tier 2 requirements (outlined in Built Green Wood Certification Guidelines).

Points Breakdown:

4 points: Tier 1 certification

2 points: Tier 2 certification

When Verified: Review of product documentation and visually verified at final inspection.

Resources:

Built Green Wood Certification Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

5-71 Use wood veneers made of rapidly renewable product

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by using materials with short harvesting cycles (10 years or less).

Performance Requirement: At least 90% of interior trim (by cost or linear footage) must be made from a rapidly renewable products with no added urea formaldehyde, certified NAUF, NAF, ULEF, or CARB II compliant. Prioritize products that are certified sustainably harvested.

Points: 2 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross reference: 5-100

Cabinets:

5-72: Use salvaged hardware

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources.

Many salvaged hardware items provide a period-authentic look that could be incorporated into new homes. Consider handles, drawer pulls, cabinet hardware, drapery hardware, registers, hooks, and brackets.

Performance Requirement: Use salvaged hardware that was purchased from salvage and reuse operations, reused from other jobsites, or reclaimed in demolition.

Points Breakdown: 1 point per set of hardware. 2 points maximum.

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross reference: 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-73 Use salvaged cabinets

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources.

Salvaged kitchen cabinets can be restored and reused in the home or for storage cabinetry in garage or workshop. Period-specific cabinetry can also be restored to add a distinctive look for bathrooms. These materials/components are available from building salvage and architectural salvage operations.

Performance Requirement: Use salvaged cabinets that were purchased from salvage and reuse operations, reused from other jobsites, or reclaimed in demolition.

Points: 2 points

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross reference: 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-74 Cabinet facing and exposed sides or shelving made from a rapidly renewable product (e.g., bamboo)

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by using materials with short harvesting cycles (10 years or less).

Performance Requirement: At least 50% of cabinet facing and exposed sides in the project (based on cost or linear feet of cabinet) must be made from a rapidly renewable products with no added urea formaldehyde, certified NAUF, NAF, ULEF or CARB II compliant. Prioritize products that are certified sustainably harvested. May be combined with Credit 5-77 if agricultural fiber is used for cabinet boxes in place of MDF.

Points Breakdown:

1 point: Bamboo veneers used on cabinet facing and exposed sides

2 points: Solid laminated or strand bamboo cabinet facing and exposed sides

When Verified: Review of product documentation and visually verified at final inspection.

Cross reference: 4-24, 5-77, 5-100

5-75: Use wood that is third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines, 50% minimum

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: At least 50% of cabinetry must be from certified sustainably harvested wood that meets the Tier 1 or Tier 2 requirements (outlined in Built Green Wood Certification Guidelines). This credit may be combined with Credit 5-77 if agricultural fiber is used for cabinet boxes in place of MDF.

Points Breakdown:

4 points: Tier 1 certification

2 points: Tier 2 certification

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 4-24, 5-77

Resources:

Built Green Wood Certification Guidelines:
https://builtgreen.net/certification/#checklistandhandbook

5-76: Alternative materials used for cabinetry with low or no VOCs (e.g., recycled content stainless steel, solid wood, glass, etc.) or construction methods (e.g., pantry use, open shelves, etc.)

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by using non-wood alternatives and alternative construction methods that reduce resource consumption of raw materials. Increase inclusiveness and accessibility using alternative construction methods and alternative storage types that allow more people of different abilities to use the storage. Using alternative materials can also add unique character to a space.

Performance Requirement: At least 25% of all casework uses alternative materials (e.g., upcycled materials, recycled-content stainless steel, solid wood, glass, etc.) and/or construction methods (e.g., pantry use, open shelves, hanging rack, peg wall, etc.)

Points Breakdown:

3 points: using alternative design and construction methods

4 points: using alternative materials

When Verified: Visually verified at final inspection.

Cross Reference: 4-24, 6-19

5-77: Use cabinet casework and shelving constructed of agricultural fiber with no added urea formaldehyde

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by using non-wood alternatives with short harvesting cycles.

Strawboard and wheatboard are suitable material choices for this credit. These materials are readily available and provide a good alternative without off-gassing concerns or the use of toxic chemicals in its manufacture.

Performance Requirement: At least 50% of cabinet case work in the project (based on cost or linear feet of cabinet) must be made from agricultural fiber with no added urea formaldehyde, certified NAUF, NAF or ULEF.

Points: 2 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 5-75, 5-78, 5-100

5-78: Cabinet facing and exposed sides or shelving constructed of recycled paper product with no added urea formaldehyde

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources and virgin materials, by increasing demand for products with high recycled content. Prioritize products that are FSC certified.

Performance Requirement: At least 50% of cabinet case work in the project (based on cost or linear feet of cabinet) must be certified to contain recycled paper content with no added urea formaldehyde, certified NAUF, NAF or ULEF.

Points: 3 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 4-24

Countertops:

5-79 Use salvaged countertop

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources.

Performance Requirement: Use salvaged countertops or salvaged materials that were purchased from salvage and reuse operations, reused from other jobsites, or reclaimed in demolition. Also applicable are countertops made from trees species that are removed to restore habitat (e.g., invasive Juniper).

Points: 5 points

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross reference: 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-80: Use countertops that are third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: Install a countertop made from certified sustainably harvested wood that meets the Tier 1 or Tier 2 requirements (outlined in Built Green Wood Certification Guidelines).

Points Breakdown:

4 points: Tier 1 certification

2 points: Tier 2 certification

When Verified: Review of product documentation and visually verified at final inspection.

Resources:

Greenhome Solutions: https://www.ghsproducts.com/

Sustainable Northwest Wood: https://www.snwwood.com/

5-81: Use salvaged or urban-harvested, locally-milled wood

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources.

Performance Requirement: Install a countertop made from salvaged or urban-forest-harvested wood that was milled locally.

Points: 3 points

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross Reference: 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

Greenhome Solutions: https://www.ghsproducts.com/

Sustainable Northwest Wood: https://www.snwwood.com/

5-82: Use domestic stone, 90%+ quartz content, slab or tile with recycled content, or recycled paper products; requires countertop underlayment of wheatboard, or no-added urea formaldehyde plywood or particle board

Responsible Party: Architect/Interior Designer, General Contractor

Intent: Products with recycled content or made from industrial byproducts reduce pressure on virgin materials and ecosystems. Locally quarried stone reduces the impact of carbon dioxide emitted during the production and transportation of materials and construction to project site.

Performance Requirement: Install countertops made from either domestic stone, quartz (with at least 90% quartz content), slab or tile with recycled content, or recycled paper products. The countertop underlayment installed with countertop must be either wheatboard, or no-added urea formaldehyde plywood or particle board (CARB II Compliance not accepted as substitute).

Points: 4 points

When Verified: Review of product documentation and visually verified at final inspection.

Roof

5-83 Use recycled-content or salvaged roofing material

Responsible Party: Architect, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources.

Performance Requirement: Use recycled-content or salvaged roofing material that is purchased from salvage and reuse operations, reused from other job sites, or reclaimed in demolition.

Points: 4 points

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross Reference: 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-84 Use solar shingles

Responsible Party: Architect, General Contractor, Electrical Engineer

Intent: Solar photovoltaic (PV) cells are now being incorporated into rooftop shingles. They are available in the same patterns of traditional asphalt shingles, are exceptionally durable, and are wind-resistant and watertight. Using solar shingles can lower electricity bills and increase home value. Installation involves nailing PV shingles in place on roof decking over 30 lb. felt sheeting. Be aware that unlike conventional PV systems, solar shingles may need to be replaced if the roof needs repair or replacing.

Performance Requirement: Install solar shingles as roofing

Points: 5 points

When Verified: Review of product documentation and visually verified at final inspection.

5-85: Install a metal, ICF/SIP panel, slate, tile, or clay roof

Responsible Party: Architect, General Contractor

Intent: Reduce the future consumption of raw materials for the replacement of short-service-life building components.

Metal roofs are made of recycled material and are 100% recyclable at the end of their lifecycle. They come with warranties ranging from 30 to 50 years compared to 15-to-20-year life expectancies of asphalt shingles. Metal roofs will not decompose under sun exposure, are noncombustible, can fit over existing roofing materials, are less than 1/3 the weight of asphalt, and can withstand winds up to 140 mph.

Metal is naturally heat- and light-reflective and can reduce energy costs by as much as 25%. Metal roofs are a better choice for rainwater collection systems, see Credit 2-56.

Slate roofs can withstand fire and many of the tougher elements and are extremely durable, with a lifespan of 100–150 years, eliminating the need for reroofing every 10–30 years. Prioritize slate products that are locally sourced or have a lower upfront carbon emission cost from its transportation during production to the project site. Tile or clay roofs also offer similar thermal mass benefits and longer lifespans of 50–100 years and can be easily recycled. Clay roofs are particularly resistant to the corrosion of salt air, making it a great choice for homes situated in coastal regions near an ocean.

ICF and SIP roofs can greatly simplify construction while also increasing the building envelope performance. Prefabricated panels reduce waste and ease installation. ICF and SIP roof systems also eliminate the need for trusses and can increase usable indoor living space. ICF roofs offer additional fire protection to homes in wildland-urban interface zones more susceptible to wildfires. See full benefits of these factory-framed panel systems in Credit 5-28.

Performance Requirement: Install a metal, ICF/SIP panel, slate, tile, or clay roof

Points: 8 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 2-56, 5-8, 5-28

Resources:

Four Person Crew Installed 2,200 Sq. Ft of SIP Roof Panels: https://www.premiersips.com/4-person-crew-installed-2200-sq-ft-of-sip-roof-panels/

Fireproof ICFs: https://www.icfmag.com/2008/08/fireproof-icfs/

5-86: Install self-adhering underlayment on eves, valleys and penetrations or entire roof

Responsible Party: General Contractor

Intent: Increase weatherproofing to protect roof from damage, increasing life of roof system and interior structures and reducing waste caused by more frequent replacement.

Performance Requirement: Install self-adhering underlayment on eves, valleys, and penetrations or the entire roof.

Points Breakdown:

1 point: Install self-adhering underlayment on eves, valleys, and penetrations

3 points: Install self-adhering underlayment on entire roof

When Verified: Visually verified during intermediate construction and final inspections.

5-87: Install a carbon sequestering vegetated roof system (e.g. green roof) for minimum 10% of roof area

Responsible Party: Architect, General Contractor, Green Roof Professional

Intent: Reduce upfront carbon emissions and increase carbon and stormwater capturing surfacing on the development site.

Green roofs can be very low-maintenance and self-sustaining without need of irrigation, fertilizers, or pesticides. The initial cost may be higher than a good quality conventional roof, but they last about twice as long resulting in a relatively low lifecycle cost. They also help reduce building heat gain and urban heat islands. Additionally, the plantings sequester carbon dioxide and other air pollutants. Studies have shown that vegetated roofs sequester more carbon over their lifecycle than they emit through their production and maintenance practices, making green roofing one of the only carbon-negative roofing systems.

Plant selection is crucial to maximizing carbon sequestration, air purification, and habitat benefits as well as making sure the plants will thrive in the extreme environment of a roof with no supplemental potable water irrigation. Studies have also shown that as systems with deeper soil substrates increase so do the benefits from plant diversity and water retention, thereby reducing the carbon payback period by years. To further reduce the upfront carbon emissions of the system vegetated roof systems should use recycled content materials.

Consult a certified Green Roof Professional (GRP) on plant and material selection, system design, and installation and maintenance needs. See Credit 2-28 for more information on water- and site-related benefits of vegetated roofs.

Performance Requirement: Install a vegetated roof system (e.g., green roof) for minimum 10% of roof area. Must be an incorporated structure of the roof system; planters do not meet the intent of this credit.

Points Breakdown: 1 point per 10% of roof area that is covered by the green roof, maximum of 10 points.

When Verified: Review of sizing calculations. Visually verify installation at final inspection.

Cross Reference: 2-28, 5-100

Resources:

About Green Roofs: https://greenroofs.org/about-green-roofs

Green Roof Policy Resources: https://greenroofs.org/policy-resources

How Much CO2 is Captured by a Green Roof?: https://www.purple-roof.com/post/green-roof-co2-capture-explained

Kuronuma, Takanori & Watanabe, Hitoshi & Ishihara, Tatsuaki & Kou, Daitoku & Toushima, Kazunari & Ando, Masaya & Shindo, Satoshi. (2018). CO2 Payoff of Extensive Green Roofs with Different Vegetation Species: https://doi.org/10.3390/su10072256

M.G. Rasul, L.K.R. Arutla, Environmental Impact Assessment of Green Roofs Using Life Cycle Assessment: https://doi.org/10.1016/j.egyr.2019.09.015

Green Poof Professionals: https://greenroofs.org/green-roof-professional

Other Exterior

5-88: Use reclaimed or salvaged materials for landscaping walls or fencing (excludes railroad ties)

Responsible Party: Landscape Architect/Designer, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources. Railroad ties, treated with coal tar creosote, which leaches and containments the surrounding environment and poses a

health hazard, and salvaged wood pressure-treated with chromated copper arsenate (CCA) are excluded from this credit.

Performance Requirement: Use salvaged material that is purchased from salvage and reuse operations, reused from other job sites, or reclaimed in demolition for landscaping walls, fencing or raised beds. Also applicable is lumber products made from trees species that are removed to restore habitat (e.g., invasive Juniper).

Points: 2 points

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross reference: 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-89: Use salvaged decking

Responsible Party: Architect, General Contractor

Intent: Optimize the use of material resources by repurposing waste, preserving embodied energy, and reducing pressure on natural resources.

Performance Requirement: Use salvaged decking that is purchased from salvage and reuse operations, reused from other job sites, or reclaimed in demolition. Also applicable is decking made from trees species that are removed to restore habitat (e.g., invasive Juniper).

Points: 2 points

When Verified: Review of salvage assessment and deconstruction supplied materials, product documentation or receipt of sale, and visually verified at final inspection.

Cross reference: 5-100

Resources:

Northwest Building Salvage Network: https://www.nbsnseattle.org/

Habitat for humanity Restores: https://www.habitat.org/restores

Washington Materials Marketplace: https://washington.materialsmarketplace.org/

RE-USE Consulting: https://reuseconsulting.com/home-page

5-90: Use lumber that is third-party certified, sustainably harvested wood that meets Tier 1 or Tier 2 of the Built Green Wood Certification Guidelines (excluding siding)

Responsible Party: Architect, Landscape Architect, General Contractor

Intent: Reduce pressure on forest resources by increasing demand for sustainably managed and harvested wood products.

Performance Requirement: Use lumber made from certified sustainably harvested wood that meets the Tier 1 or Tier 2 requirements (outlined in Built Green Wood Certification Guidelines) on landscaping or exterior applications. Siding is excluded from this credit, please see Credit 5-60.

Points Breakdown:

4 points: Tier 1 certification

3 points: Tier 2 certification

When Verified: Review of product documentation and visually verified at final inspection.

5-91: Use 95% recycled-content plastic and certified sustainably harvested wood/bamboo composite lumber for decks and porches

Responsible Party: Architect, Landscape Architect, General Contractor

Intent: Reduce pressure on forest resources and virgin materials by increasing demand for products with high recycled content. Prioritize composite products that are FSC or SFI certified.

Performance Requirement: Use composite lumber made from 95% recycled content plastic and certified sustainably harvested wood/bamboo for decks and porches. Composite decking containing PVC are not applicable.

Points: 1 point

When Verified: Review of product documentation and visually verified at final inspection.

5-92: Use no pressure-treated lumber

Responsible Party: Architect, Landscape Architect, General Contractor

Intent: Minimize the use of toxic chemicals that may impact soil and surface water ecosystems. The pesticides contained in the sawdust from pressure-treated wood is also a health hazard if inhaled and can cause eye and skin irritation.

Performance Requirement: When including wood on the exterior of the building or in the landscape, do not specify or install pressure-treated lumber. Instead, use naturally rot-resistant materials.

Points: 2 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 5-26, 5-69, 5-88 through 5-91, 5-93

5-93: Use thermally-modified lumber that does not require wood sealer for decking and exterior millwork (excludes siding)

Responsible Party: Architect, General Contractor

Intent: Thermally-modified wood products, increasingly common in the marketplace, are a natural, non-toxic alternative to chemically treated or sensitive rainforest wood products. Unlike pressure-treated lumber, thermally modified wood is essentially "cooked" in oxygen-free ovens which changes its cellular and molecular makeup by removing all organic compounds from its cells. The wood no longer absorbs water, reducing its ability to expand or contract, a leading cause of rot in outdoor uses. The lack of moisture content in the wood also means that the wood's cellulose will no longer act as a "food source" for fungi or insects. The processes also eliminate the need for sealers or paints for preservation. Thermally modified wood products can be guaranteed for up to 25 years.

There are three types of thermally-modified wood products accepted for this credit: thermally-modified with no additives, bio-based liquid impregnated thermally-modified wood, and Shou Sugi Ban (i.e., wood charring).

Kebony wood products use a thermal-modification process that impregnates traditional FSC-certified pine lumber with a bio-based (furfuryl alcohol) liquid that further increases its

dimensional stability. The impregnated lumber is then heat-cured and dried, creating a polymer that fuses with the wood on a cellular level and increases the cell's thickness by 50%. The result is lumber products that are similar in dimensional stability, hardness, and rot and pest resistance to rarer and environmentally-sensitive tropical woods (e.g., ipe, cumaru, garapa). The modification process utilizes rapidly renewing pine trees from sustainably-managed forests and increases the lifespan of the wood in exterior applications to over 30 years without the need for sealers or paints. This product can be used for siding and decking applications.

Performance Requirement: Use a thermally-modified lumber for decking and/or exterior millwork without applying a wood sealer. Preference should be given to products that are certified under a Tier 1 certification as described in the Built Green Wood Certification Guidelines. Siding is excluded from this credit, see Credit 5-64.

Points: 4 points

When Verified: Review of product documentation and visually verified at final inspection.

Cross Reference: 5-90

Resources: Built Green Wood Certification Guidelines: https://builtgreen.net/certification/#checklistandhandbook

Thermally treated wood: https://www.buildwithrise.com/stories/thermally-treated-wood

Kebony wood modification process: https://us.kebony.com/technology/the-process/

Greenhome Solutions: https://www.ghsproducts.com/

5-94: For all concrete pavements, use supplementary cementitious materials for 25-50% by weight of cementitious materials for all concrete; 25% and 50%

Responsible Party: General Contractor, Structural or Civil Engineer

Intent: Reduce the embodied carbon footprint of the project by using non-portland cement and industry byproducts as supplementary cementitious materials.

Performance Requirement: For at least 90% of the poured-in-place concrete pavements in the project use concrete mixes with at least 25% of cementitious content from non-portland cement supplementary cementitious materials. Concrete foundations and retaining walls are excluded from this credit, please see Credit 5-33.

Points Breakdown:

3 points: at least 25%, by weight, of concrete mix is supplementary cementitious materials

6 points: 50%, by weight, of concrete mix is supplementary cementitious materials

When Verified: Review concrete mix documentation at time of final inspections.

Resources: Supplementary Cementitious Materials: https://www.nahb.org/-/media/NAHB/nahb-community/docs/councils/bsc/supplementary-cementitious-materials.pdf

HOMEOWNER RECYCLING

5-95 Provide built-in kitchen or utility room recycling center

Responsible Party: Architect, General Contractor

Intent: One way to encourage more recycling and responsible waste management practices is to build a space for recycling containers in or near the kitchen, where 80% of a home's waste is generated. Most millwork manufacturers now design cabinetry lines with storage areas geared to hold recycling bins.

Garages or utility rooms that include built-in sorting and collection centers for recycling household items create a more convenient place to handle items that may not fit in smaller kitchen bins or are not collected by curbside pick-up programs but instead collected and recycled at drop-off locations. Built-in pegboard systems allow for attractive and flexible storage options. Additionally, provide a space where hazardous materials can be safely stored until they are ready to be disposed of at the appropriate drop-off centers.

Performance Requirement: In the kitchen, provide built-in millwork that holds bins for household recycling, or in a utility room provide a built-in recycling center. Include information on local recycling programs and drop-off locations in the Homeowners manual, see Credit 7-1.

Points: 3 points

When Verified: Visually verified at final inspection.

Cross Reference: 7-1

5-96: Provide sorting bins for recyclable materials and designated space for bin storage (include a compost bin where municipal compost is available)

Responsible Party: Architect, General Contractor

Intent: Check with your municipality to see whether the bins offered by the program are suitable to meet the daily collection needs of the family in the home. As an added service to your clients who presort, you can offer additional bins for the garage to make the daily collection of recyclable materials more convenient, keeping municipal containers outside for weekly or biweekly collection.

Performance Requirement: Provide sorting bins for recyclable materials, including a compost bin where municipal compost is available, and designated space for bin storage.

Points: 1 point

When Verified: Visually verified at final inspection.

Cross Reference: 7-1

Embodied Carbon

5-97: Use materials with Environmental Product Declaration (EPD)

Responsible Party: Architect, General Contractor

Intent: The intent of Environmental Product Declarations (EPD) is to increase transparency around the environmental performance or impact of any product or material over its entire lifecycle. To create an EPD, a manufacturer must conduct a lifecycle assessment of their product following ISO standards and have the assessment third-party verified. EPDs allow architects, engineers, and designers to compare materials and products to select the option that supports the most sustainable result and lowers embodied carbon. An EPD is not a claim of environmental superiority for a specific product or material. Some local jurisdictions, like Seattle, are now requiring the use of EPDs on all projects receiving green building incentives.

Performance Requirement: Specify and select materials and products that have EPDs. EPD must be third-party verified and valid at the time of specification and purchase.

Points: 1 point per EPD. Maximum of 10 points.

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 1-22

Resources:

Simple guide to Environmental Product Declarations: https://www.oneclicklca.com/simple-epd-guide/

Model LCA Specifications: https://www.buildingtransparency.org/en/ec3-resources/ec3-downloads/

5-98: Request product-specific EPDs from vendors or manufacturers for materials that do not have one. (Builder is limited to claiming one letter per product across multiple units and checklists)

Responsible Party: Architect, General Contractor

Intent: Creating EPDs is a voluntary act by the manufacturer, and while many manufacturers have chosen to disclose the environmental impacts of their products, many still have not taken the step. One reason is that they don't see a business case for incurring the cost of creating an EPD. The lack of EPDs in the construction industry creates gaps in our understanding of the environmental impact of the products and materials used for Built Green projects, increases the difficulty of comparing similar products, and hinders the accurate calculation of embodied carbon emissions of a project. Our Built Green architects and builders can leverage their purchasing power to communicate the benefits of and need for transparency concerning a product's lifecycle to manufacturers and distributors so they can quantify the economic benefit of providing the EPD.

Performance Requirement: Prior to sending a letter, contact the sales representative or manufacturer to confirm they do not have an EPD available for the specific material or product. If using the Building Transparency letter template, please include a mention of Built Green where it says "LEED." Builder is limited to claiming one letter per product. Non-transferable or repeatable across multiple projects for the same product.

Points: 1 point per letter. Maximum 5 points.

When Verified: Design

Resources: EPD Request Letter templates: https://www.buildingtransparency.org/en/ec3-resources/ec3-downloads/

5-99: Calculate the embodied carbon of the new building OR calculate an embodied carbon baseline and show at least a 10% reduction

Responsible Party: Architect, General Contractor, and Verifier

Intent: Embodied carbon is the sum of all the greenhouse gas emissions (mostly carbon dioxide) resulting from the mining, harvesting, processing, manufacturing, transporting, and installation of building materials. Current building codes and Built Green energy efficiency credits reduce operational carbon emissions, but do not typically address the impacts of embodied carbon from the materials and products used in new homes. Looking at total greenhouse gas emissions from new buildings to be built over the next ten years—the critical period for action on the climate emergency—Architecture 2030 estimates that

74% will come from embodied emissions. So, lowering embodied carbon emissions is even more urgent than lowering operating emissions.

As building operations become more efficient, these embodied impacts related to producing building materials become increasingly significant.

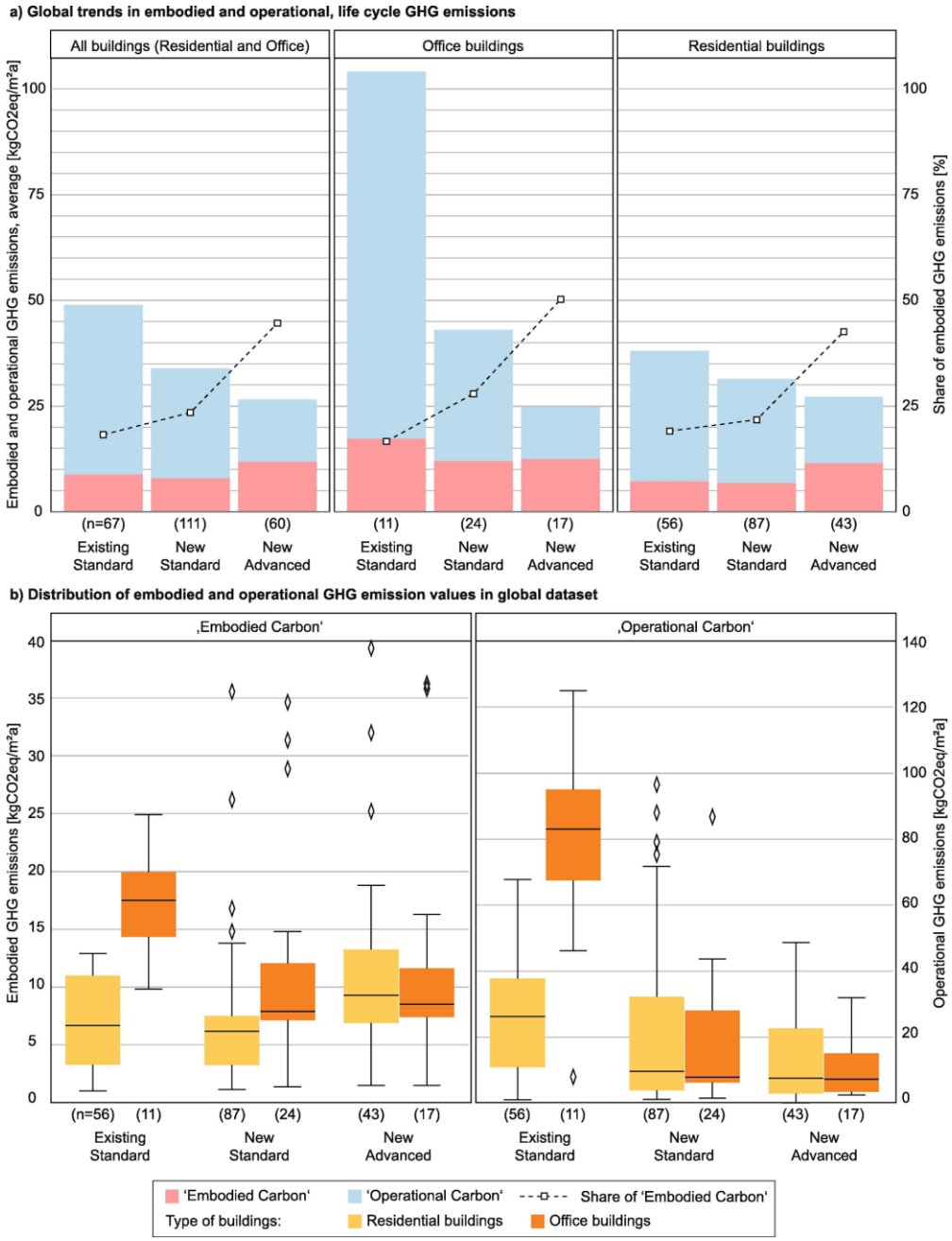


Fig. Global trends in buildings' life cycle GHG emissions (a), and distribution of GHG emission values (b) for residential and office buildings by energy performance class. Source: https://doi.org/10.1016/j.apenergy.2019.114107

Rock et al. (2020) found that, "there has been a global escalation of the contribution of embodied greenhouse gas (GHG) emissions in both residential and office buildings – from

~20% to ~50% in new advanced buildings, surpassing 90% in extreme cases. This relative increase in embodied GHG emissions is mainly because operational GHG emissions have dropped in the transition from existing buildings to buildings with new and advanced standards… buildings with newly advanced standards show a substantially higher share of embodied GHG emissions, which means that most of the GHG emissions saved through energy efficiency measures have been lost or even outweighed through extra emissions from building materials and technical systems."

Just having net-zero homes and buildings will not save us from the worst of the climate change forecasts, as studies have shown that over the next 20 years embodied carbon emissions will outweigh the operating emissions from buildings. As the saying goes, if you do not measure it, how do you hope to improve it?

Performance Requirement: The embodied carbon emissions of the project shall be calculated using one of the approved LCA modeling tools below. Calculations should list the estimated carbon impact of each of the final construction materials and processes associated with the foundation, structure, enclosure, and interior of the project. All projects should use a standard 50-year lifespan when calculating embodied carbon for consistency and to ensure buildings with longer lifespans are not penalized for the carbon impacts of replacing materials over time. If an existing building is being reused on site, you will also use the Carbon Avoided Retrofit Estimator (CARE) to report how much carbon was avoided by retrofitting that structure for reuse onsite, see Resources below.

For materials where there are no EPDs or product data in the LCA tool's database you have the following two options:

1. Find a similar product (ingredients and manufacturing location) to use in the model as a stand-in and call out each material that was substituted in the overall assessment. Must meet ISO 21930:2017 standards for comparability. Please see EPD comparability video by the Carbon leadership Forum in Resources.
2. List excluded materials in the comments of the overall assessment with an explanation of why they are not included.

Preliminary embodied carbon should be calculated based upon the design and utilized to make design decisions resulting in the selection of lower embodied carbon materials, products, and mechanical systems. When construction has been completed, all materials and products and their quantities should be verified and updated as needed to calculate the final embodied carbon emissions.

Approved LCA modeling tools:

- Embodied Carbon Construction Calculator (EC3)
- BEAM Calculator

- Tally
- Athena Impact Estimator
- One-Click LCA

Points Breakdown:

20 points: calculate the embodied carbon of the building

30 points: create an embodied carbon baseline and show an embodied carbon reduction of at least 10%.

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: 1-35, 5-97, 5-98, and 5-100

Resources:

Embodied GHG emissions of buildings – The hidden challenge for effective climate change mitigation: https://doi.org/10.1016/j.apenergy.2019.114107

The Urgency of Embodied Carbon and What You Can Do about It: https://www.buildinggreen.com/feature/urgency-embodied-carbon-and-what-you-can-do-about-it

Carbon Leadership Forum: https://carbonleadershipforum.org/

Architecture 2030: https://architecture2030.org/new-buildings-embodied/

Embodied Carbon Tools: Assessing the Options: https://www.buildinggreen.com/news-analysis/embodied-carbon-tools-assessing-options

BEAM Calculator: https://www.buildersforclimateaction.org/beam-calculator.html

CARE Calculator: https://carbonleadershipforum.org/care-estimator/

Embodied Carbon in Construction Calculator (EC3): https://www.buildingtransparency.org/en/

Carbon Leadership Forum resources and EC3 tool videos: https://carbonleadershipforum.org/resource-library/

Carbon Leadership Forum- EPD Comparability for EC3 tool: https://youtu.be/GgrifjsOE1Q

ULI Embodied Carbon in Building Materials for Real Estate: https://americas.uli.org/research/centers-initiatives/greenprint-center/greenprint-resources-2/best-practices-in-sustainable-real-estate/embodied-carbon-in-building-materials-for-real-estate/

Builders for Climate Action: https://www.buildersforclimateaction.org/

5-100: Use a minimum of 250 square feet of carbon-neutral, carbon-negative, or climate-positive materials

Responsible Party: Architect, General Contractor

Intent: Carbon-neutral materials release net-zero carbon emissions into the atmosphere over their life cycle. Carbon-negative or climate-positive materials go beyond net-zero carbon and create an environmental benefit by sequestering or removing additional carbon dioxide from the atmosphere.

Examples of applicable products

- Salvaged and reused building materials
- Natural linoleum
- Sheep wool carpet and insulation
- Cork flooring, wall paneling, insulation
- Sustainably grown and harvested bamboo
- Locally harvested, third-party certified sustainably harvested wood products
- Vegetated roof systems
- Hemp insulation or hempcrete
- Earthen materials
- Algae or mycelium-based building materials
- Strawbale walls

Materials from this category that are not already represented in the Material section credits may be eligible for Material Efficiency Innovation credits, see Credit 5-102.

Performance Requirement: Specify and install a minimum of 250 sq.ft. of carbon-neutral, carbon-negative, or climate-positive materials. For vegetated roof systems you must comply with performance requirements for minimum size in Credit 5-87. For natural insulation materials see performance requirement for minimum amount in Credit 5-54. If sq.ft. is not applicable to the material to determine minimum usage, it must represent at least 10% of that building component or application (by volume or weight).

Points: 2 point per product. 14 points maximum. May be combined with other Material Efficiency credits.

When Verified: Reviewed at completion of design. Visually verified at final inspection.

Cross Reference: Material Efficiency credits, 5-40, 5-42, 5-47, 5-54, 5-74, 5-87, 5-102

Resources:

Carbon smart materials palette: https://materialspalette.org/

2030 Palette: http://www.2030palette.org/

The New Carbon Architecture-Building to Cool the Climate, Bruce King (2017): https://www.ecobuildnetwork.org/

Carbon Storing Materials (2021): https://carbonleadershipforum.org/carbon-storing-materials/

Transformative Carbon-Storing Materials (2021): https://carbonleadershipforum.org/transformative-materials/

Greenhome Solutions: https://www.ghsproducts.com/

Habitat for Humanity ReStores: https://www.habitat.org/restores

Northwest Building Salvage Network: https://www.nbsnseattle.org/

5-101: Alternative fuel powered equipment

Responsible Party: Developer, Architect, General Contractor, Subcontractors

Intent: Protect human health by reducing local and regional pollution due to diesel exhaust; reduce dependency on fossil fuels. Priority should be given to non-fossil-fuel-burning vehicles and equipment (e.g., electric and hydrogen). More and more electric vehicles and construction equipment are available on the market, and more are in development. The EPA offers funding through the Diesel Emissions Reduction Act (DERA) for projects that reduce emissions from existing diesel engines.

Companies like JCP have developed a wide range of zero-emissions construction equipment with rapid charging capability, such as Loadall telescopic handlers, site dumpers, and electric mini excavators. These machines run for many hours and have rapid charging capability and reduce noise and air pollution on construction sites. Electric construction equipment offers cost savings from higher, fluctuating diesel and gas prices, and lower maintenance costs.

Performance Requirement: Architect must include expectation and submittal requirements in specifications or contract documents. Contractor must distribute a letter to all subcontractors to use of non-petroleum alternatives when available; contractor to provide a table/spreadsheet to the verifier that lists all construction equipment used onsite and its fuel type. Hybrid passenger vehicles do not meet the intent of this credit. Gasless generators, dryers, heaters, and landscaping equipment frequently used during construction are applicable.

Points Breakdown: 8 points maximum.

5 points: 100% excavation equipment on alternative fuel

1 point: any additional alternative fuel vehicle or per gasless equipment frequently used onsite

When Verified: Visual verification during intermediate construction inspections. Review of completed table at final inspection.

Resources:

Reducing Diesel Emissions from Construction and Agriculture: https://www.epa.gov/dera/reducing-diesel-emissions-construction-and-agriculture

Impacts of Diesel Exhaust and the Diesel Emissions Reduction Act (DERA): https://www.epa.gov/dera

Washington Laws and Incentives for Alternative Fuel: https://afdc.energy.gov/laws/state_summary?state=WA

Upcoming Electric Trucks: https://insideevs.com/car-lists/electric-trucks/

Fully Charged Digs Deeper Into Electrification: Electric Excavator: https://insideevs.com/news/368573/fully-charged-electric-excavator/

JCB Expands Electric Machine Offering for Zero-Emissions Operations: https://www.oemoffhighway.com/trends/electrification/article/21244426/jcb-expands-electric-machine-offering-for-zeroemissions-operations

Extra Credit for Materials Efficiency

5-102: Extra credit for innovation in Materials Efficiency, subject to approval by Built Green Program Manager

You may submit a materials efficiency strategy or system, not specifically called out in this Section, for consideration for an Extra Credit for Innovation. All extra credits are subject to approval by the Program Director. If approved, add up to 10 points to your Section total.

SECTION SIX: EQUITY AND SOCIAL JUSTICE

CREATING SPACES OF BELONGING

When people feel like they belong to a community, they feel like they're at home. Building a home has always been more than a construction project on a plot of land. It's the creation of a place of physical and psychological safety where hopes and dreams can flourish, a place to make connections with others, raise families and grow old, a place to call home. It's the foundation for building community.

All of us must work together to create spaces of belonging. It begins with imagining what could be and encompasses all phases of development, from site selection, to design, to construction, to homeownership. For some, this may be a new business approach offering new concepts, additional revenue streams, reduction in employee turnover costs, and opportunities for growth. Getting it right requires understanding the surrounding community and prospective homeowners, and a willingness to learn about and confront the obstacles that keep homeownership or skilled trades careers out of reach for many community members.

Despite the myriad benefits of owning a home, many community members don't have access to homeownership. Many also lack living-wage jobs that would make homeownership more attainable. In order to overcome these disparities, an equitable, just, and inclusive approach is required, one that opens the door to homeownership as well as living-wage jobs in the building trades.

That's where equity comes in. The organization Americans for the Arts states, "equity embodies the values, policies, and practices that ensure that all people—including but not limited to those who have been historically underrepresented based on race/ethnicity, age, disability, sexual orientation, gender, gender identity, socioeconomic status, geography, citizenship status, or religion—are represented…"

As we commit to working for equity and inclusion in housing and the building trades, we must value the voices, experiences, cultures, knowledge, and multi-dimensionality of all people, including community members impacted by discrimination, bias, and systemic barriers. Understanding their perspectives is essential to removing these barriers. Creating these spaces of belonging and centering equity in turn provides economic and growth opportunities, reduction in turnover costs and increased applicant labor pool for builders to capitalize on.

The following section is intended to support architects, builders, and developers in their efforts to promote equity and inclusion, one home at a time. This work will require a common language. Adopting the following terms and definitions is the first step.

Equity: A system of fairness. Equity is the full and equal access to opportunities, power, and resources so that all people achieve their full potential and thrive. Equity is an ardent journey toward wellbeing as defined by those most negatively affected. [2]

Social Justice: This includes all aspects of justice—legal, political, economic, and environmental—and requires the fair distribution of and access to public goods, institutional resources, and life opportunities for all people. [1]

Underserved Communities: Community groups, such as Black, Indigenous, people of color, LGBTQ+ members, people with disabilities, immigrants and refugees, and others who have consistently and historically been impacted by inadequate services and limited access to opportunity (limited access to quality schools, safe neighborhoods, reliable transportation, or higher-paying jobs) in comparison to dominant culture community members.

Marginalized Populations or Communities: Groups and communities that experience discrimination and exclusion (social, political, and economic), because of unequal power relationships across social, political, economic, and cultural dimensions.

BIPOC – Black, Indigenous, and People of Color: Black commonly refers to people of African or Afro-Caribbean ancestry, often the descendants of people who were enslaved.

Indigenous refers to groups native to the Americas who were here before European colonization. This includes Native Americans, as well as Indigenous peoples from the Americas who later immigrated to the U.S.

People of color (POC) is an umbrella term to refer to non-white individuals who often face discrimination. Non-white people include those who have Asian, Middle Eastern, Indian, and Pacific Island heritage, among others.

CBS News has also reported on the BIPOC acronym recently, saying, “People are using the term to acknowledge that not all people of color face equal levels of injustice. They say BIPOC is significant in recognizing that Black and Indigenous people are severely impacted by systemic racial injustices.”

Structural Inequality: Structural inequality occurs when the fabric of organizations, institutions, governments, or social networks contains an embedded bias which provides

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[2] *King County Equity and Social Justice Strategic Plan: https://www.kingcounty.gov/~/media/elected/executive/equity-social-justice/documents/201609-ESJ-SP-FULL.ashx?la=en*

advantages for some members and marginalizes or produces disadvantages for other members. This can involve property rights, status, or unequal access to health care, housing, education, and other physical or financial resources or opportunities. Structural inequality is believed to be an embedded part of the culture of the United States due to the history of slavery and the subsequent suppression of equal civil rights of BIPOC individuals.

Environmental Racism: Environmental racism refers to the institutional rules, regulations, policies, or government and/or corporate decisions that deliberately target certain communities for locally undesirable land uses and lax enforcement of zoning and environmental laws, resulting in communities being disproportionately exposed to toxic and hazardous waste based upon race.

Environmental Justice: A movement centered on creating legislation and policies to directly address environmentally racist policies and institutional decision-making processes to improve and maintain clean and heathy communities, typically in BIPOC and lower income communities who live and work closest to pollution sources.

Creating Brave Spaces: Brave spaces are intentional environments and settings that facilitate the courageous, uncomfortable, and honest exploration of social categorizations such as physical ability, race, ethnicity, class, and gender identity and the privilege or marginalization that is extended to individuals based on these categorizations. Brave spaces are created and maintained by a transparent commitment to practices that allow difference and celebrate new forms of action and strategy. [3]

Culturally Enriched Communities: Culturally Enriched Communities recognize the potential that lies within each individual and therefore include spaces that support diverse ways of living and being in the world. Culturally Enriched Communities allow for the creation of municipalities that can contribute to the prosperity and wellbeing of all people. Their creation relies on planners, policy leaders, housing developers, and others who feel an obligation to understand those they are working with and are interested in the lives of others.

The Beloved Community: Martin Luther King's Beloved Community is a global vision in which all people can share in the wealth of the earth. In the Beloved Community, poverty, hunger, and homelessness will not be tolerated because international standards of human decency will not allow it. Racism and all forms of discrimination, bigotry, and prejudice will be replaced by an all-inclusive spirit of sisterhood and brotherhood.

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[3] *Salzburg Statement on Confronting Power and Privilege for Inclusive, Equitable and Healthy Communities: https://www.salzburgglobal.org/news/statements/article/confronting-power-and-privilege-for-inclusive-equitable-and-healthy-communities*

Resources:

Yes, There's a Difference Between 'BIPOC' and 'POC' — Here's Why It Matters: https://www.healthline.com/health/bipoc-meaning#learn-more

ULI-Towards Culturally Enriched Communities: https://metrocouncil.org/Handbook/PlanIt/Files/Workshop-Housing-ULI-MN.aspx

Culturally Enriched Communities Design: https://www.cec-design.com/

Martin Luther King's Beloved Community: https://thekingcenter.org/#the-beloved-community

Economic Justice Project: http://economicjusticeproject.org/

Centering Health Equity Framework: https://www.centeringequity.org/

Salzburg Statement on Confronting Power and Privilege for Inclusive, Equitable and Healthy Communities: https://www.salzburgglobal.org/news/statements/article/confronting-power-and-privilege-for-inclusive-equitable-and-healthy-communities

Project Team

6-1: Emphasize use of Built Green® member subcontractors, vendors, service providers, and real estate agents that are committed to equity and inclusion.

Responsible Party: Builder/Developer

Intent: Cultivate relationships among the green building community to ensure alignment of Built Green principles, expertise, and experience of green practices to support the Built Green movement. Emphasize members that have an Equity and Social Justice vision, mission, and values statement publicly shared on their website.

Performance Requirement: Document all Built Green members hired or retained during design, construction, and marketing phases. If feasible, include their public commitment to Equity and Social Justice. The professional or company must be a current Built Green member at the time of contracting with them. Project Builder and Built Green Verifier are not applicable.

Points Breakdown: 1 point for each Built Green member. Maximum of 5 points.

Cross Reference: 6-4

Resources: Built Green Member Search: https://builtgreen.net/find-a-member

6-2: Expand stakeholder involvement to create diverse teams to guide equitable development and culturally enriched spaces while expanding interest and capacity-building among priority populations, consultants, and in-house staff.

Responsible Party: Architect, Builder/Developer

Intent: In addition to creating teams to advance Built Green efforts, builders/developers should cultivate a diverse, multicultural team to offer new and different perspectives on a project. Having a more diverse team is a win-win proposition, adding new dimensions to the team while also creating employment opportunities for people historically excluded from the building trades. A team can include diverse staff, consultants, and other construction trade members as well as potential homeowners, community-based equitable development organizations, and community members with a vested interest in their neighborhood—all who offer different perspectives and types of expertise.

Imagine building in a historically Black neighborhood. What site and building elements can honor those roots or address systemic disadvantages such as food insecurity or health disparities? How is belonging best conveyed in the built environment? By connecting with local community-based organizations, Black community members and artists, the builder may learn of and incorporate important design elements otherwise missed.

Performance Requirement: Build a diverse team representing multiple viewpoints and perspectives. Find opportunities to work together on current projects and, more importantly, new projects where design and construction decisions can be made in advance. If augmenting your team with community members or prospective homeowners, use the project to build a lasting relationship that will continue beyond the immediate work.

Document what steps were taken to build a diverse team, what perspectives were added to the team, and how a more inclusive team approach benefitted the design and/or construction of the project.

Points Breakdown:

5 points: A diverse and inclusive design team (architect, designers, engineers etc.) or construction team.

10 points: Entire design and construction teams are inclusive of diverse team members.

15 points: A diverse team representing both design and construction teams, plus community members or homeowners.

When Verified: Design and construction phase

Cross Reference: 6-33 and 6-34

Resources:

Why You Need Diversity on Your Team and 8 Ways to Build It: https://www.entrepreneur.com/article/338663

How to Build Diverse Teams at Work: https://www.achievers.com/blog/diverse-teams-at-work/

The Business Case for Diversity and Inclusion in the Construction Industry: https://www.agc.org/sites/default/files/Files/Advocacy/AGC%20Report%20on%20Biz%20Case%20for%20D%26I%20FINAL.pdf

6-3: Offer equity-focused trainings and workshops to staff, subcontractors, and other building partners.

Responsible Party: Builder/ Developer

Intent: "No matter where you live in the United States, no matter who you are, race has been relevant to your life." — Winona Guo, cofounder of CHOOSE and author of "Tell Me Who You Are"

Take time to broaden and deepen your understanding of race and racism, the importance of belonging, and our individual and collective role in building communities of belonging. In order to address racial, ethnic, and other disparities, we must understand the challenges and possible solutions.

We are all better off when we grow together. Offering trainings and workshops to staff and other team members sends the message that equity is a valued principle in your business and that each team member is responsible for advancing equity. Staff-wide trainings provide a foundation and common language for subsequent discussions and action steps.

Performance Requirement: There are many types of trainings, workshops, and seminars that advance race and social justice awareness. Investigate the type of training most appropriate to your business and consider inviting team members, subcontractors, and other building partners to participate—learning together fosters collective action.

Submit the sign-in sheet from the training that documents the date, duration, type of training, third-party training provider, number of attendees, and their employer. Requires at least 100% of project builder's direct reports to attend at least one training over one

calendar year. Trainings may be applied to multiple checklists/projects submitted over the course of a calendar year.

Points: 5 points

When Verified: Design and/or construction phase

Resources:

Equity Matters offers trainings, assessments, skill-building, and other services: https://www.equitymattersnw.com/services-1

ANEW's RISE Up (Respect, Inclusion, Safety and Equity in the Construction Trades) offers trainings geared to the construction trades: https://img1.wsimg.com/blobby/go/d66c1945-9e3c-45ab-a825-4f236211ff16/ANEW_RISEUp_Technical%20Assistance%20Form.pdf

Race Forward's Racial Justice Trainings: https://www.raceforward.org/trainings?utm_term=Building%20Racial%20Equity%20trainings&utm_campaign=Doubling%20Down%3A%20Upcoming%20Virtual%20Building%20Racial%20Equity%20Trainings&utm_content=email&utm_source=Act-On+Software&utm_medium=email

Trainings offered by: Education for Racial Equity: https://www.educationforracialequity.com/

6-4: Develop a racial equity vision, mission, and values statement and prominently display and share with staff, building partners, clients, and general public.

Responsible Party: Architect, Builder

Intent: Just like in other areas of business and building, if we don't write it down it can't be that important. Imagine building a home without a contract, architectural plans, specifications, or basic construction principles to guide the process. If it's not written down and stated publicly how would you be able to hold vendors, subcontractors, and your direct reports accountable for their actions and deliverables on a project? Having an Equity and Social Justice (ESJ) vision, mission, and values statement—in addition to existing vision, mission, and values statement—makes clear to all (including team members) that the business is committed to dismantling the barriers to employment and homeownership and achieving equity for all. Publicly displaying these values holds everyone in an organization accountable to the values codified in these statements. The following definitions and examples may be useful:

A **vision statement** succinctly states what the business would like to achieve, in this case, designing and building spaces where all people belong. A good vision statement should be short, simple, specific to your business, and leave nothing open to interpretation.

A **mission statement** sets forth what the business will do to achieve its vision. It is a statement describing the organization's specific role in creating spaces of belonging, removing racial and other barriers, and promoting equity in housing.

Values are principles the business is committed to observing and following. The values are embedded in all aspects of the business, both its internal operations and its community-facing endeavors. A set of values are unique to a business—you get to choose which values resonate with your business and represent your best practices. Race Forward, a national organization working to advance racial justice offers the following core values:

- **People of Color:** We value the voices, experiences, cultures, knowledge, and multi-dimensionality of people of color.
- **Justice:** We value fairness, the best foundation for unity among all people.
- **Transformation:** We value the ability of individuals and systems to change in ways that make racial justice possible. We recognize the importance of struggle in fueling transformation.
- **Bridging:** We value the insights, relationships, and holistic understandings that are deepened when divergent paths come together.
- **Expression:** We value voicing and sharing our viewpoints with integrity even when difficult, unpopular, or risky.
- **Adaptability:** We value relevance and resourcefulness in the face of changing social, economic, political, and ideological environments.
- **Delight:** We value making space for laughter, beauty, and joy in the work of social change.

Performance Requirement: Provide a screenshot of your company website or marketing materials that prominently display your ESJ vision, mission statement, and core values. Information must be publicly available on the organization's website. Prominently displayed refers to the intent of transparency and that information is easily located for the public to find, it is not required to be on the homepage. Burying the information in subpages on a website or on a page that is not intuitive to locate does not meet the intent of this credit.

Points: 5 points

Resources:

Partnership for a Healthy Durham, examples of racial equity mission statements: https://healthydurham.org/cms/wp-content/uploads/2018/10/Racial-Equity-mission-statement-1.pdf

Race Forward, Vision, Mission and Core Values: https://www.raceforward.org/about

Racial Equity Tools: https://www.racialequitytools.org/

6-5: Develop an annual ESJ workplan to focus internal and external equity efforts taken by your organization.

Responsible Party: Architect, Builder/Developer

Intent: No organization can achieve all of its goals and objectives in a single year. If you don't develop and implement a realistic workplan, accounting for all the daily pressures and tasks, it's unlikely you'll find time for equity work unless you plan accordingly.

The purpose of the annual ESJ workplan is to identify equity action steps that will impact your entire business. With your team, set aside time to develop a workplan that will prioritize the year's equity activities. For example, your team may identify action steps such as:

- Creating a more diverse staff, team, subcontractor, and vendor pool, etc.
- Examining your pay structure to ensure that all members are paid fairly and equitably (staff conducting similar work are paid consistent to skill and tenure).
- Working with a design team that intentionally focuses on building elements demonstrating cultural awareness, community/neighborhood stories, other community concepts.
- Providing information to prospective buyers about pathways to homeownership.
- Engaging local community organization (design phase, housing opportunities, etc.).
- Using your social media platforms to inform others of your equity efforts, share your ESJ mission, etc.
- Partnering with job training organizations to provide meaningful apprenticeship opportunities to youth of color and other underserved populations.
- Taking advantage of low-income, affordable, and attainable home construction opportunities.
- Looking for and contracting with Just-labelled vendors, subcontractors, and others.

The workplan, akin to a project management tool, should identify and document the specific equity tasks you intend to accomplish, the timeframe for action steps, responsible parties, any necessary resources, and anticipated date of completion. Be realistic and allow sufficient time to complete each identified action step—it's better to successfully complete fewer tasks than to take on too many and fail. Many of the actions of this workplan will also earn you additional project-specific ESJ Section 6 credits.

Performance Requirement: Document and manage the workplan by including its calendar year, action items, timeframe, and any other critical information (e.g., Gantt chart). Must be reviewed and updated annually for the duration of the project. If using this plan over multiple projects/checklists it should document progress or completion of items with each resubmission.

Points: 5 points

Cross Reference: 6-2, 6-3, 6-4, 6-9, 6-12, 6-34 through 6-45

Resources:

How to Write an Action Plan: https://creately.com/blog/diagrams/how-to-write-an-action-plan/

Racial Equity Tools: https://www.racialequitytools.org/

How to Make a Gantt Chart in Excel: https://youtu.be/un8j6QqpYa0

Guide to Developing a Strategic Diversity, Equity and Inclusion Plan: https://www.shrm.org/resourcesandtools/tools-and-samples/hr-forms/pages/guide-to-developing-a-strategic-diversity-equity-and-inclusion-plan.aspx

Centering Health Equity Framework worksheets: https://www.centeringequity.org/v0-beta-frameworks

Salzburg Statement on Confronting Power and Privilege for Inclusive, Equitable and Healthy Communities: https://www.salzburgglobal.org/news/statements/article/confronting-power-and-privilege-for-inclusive-equitable-and-healthy-communities

6-6: Use Just-labelled firms.

Responsible Party: Architect, Builder, Other Team Members

Intent: The Just program was created by the International Living Futures Institute to help organizations optimize policies that improve social equity and enhance employee engagement. It is a voluntary disclosure tool for organizations, providing a transparency platform to disclose an organization's operations, including how they treat their employees and where they make financial and community investments.

Just labeling allows building teams to identify and choose other businesses with a similar social equity commitment with which to work, partner, and engage.

Performance Requirement: Use the Just program to identify and hire/retain contractors, vendors, and others associated with the building trades. Just labels must be active and unexpired at time of hire/contracting to qualify. Certified B Corporations are also accepted for this credit.

Points Breakdown: 1 point per firm. Maximum of 3 points.

Resources:

International Living Future Institute, Just Program: https://living-future.org/just/

Certified B Corporations: https://bcorporation.net/

Overall Design

6-7: Project is affordable housing or workforce housing or attainable housing

Responsible Party: Builder/Developer

Intent: More community members can become homeowners if affordable housing and additional ownership pathways are offered. As the Aspen Institute has noted, "An ugly and central aspect of the history of public policy in housing is its purposeful, race-based exclusion and marginalization of many people, particularly Native American and black populations." Policies impacting BIPOC communities included redlining, certain zoning practices, placement of public housing, and the disparate allocation of infrastructure dollars, all leading to impoverished, underserved neighborhoods.

> *Affordable Housing:* Building affordable housing opens the door to community members whose social-economic status blocks traditional avenues toward homeownership. Housing is considered affordable to a household if rent or mortgage costs no more than 30% of the household's income. Household income is shown as a percentage of the Area Median Income (AMI) and is typically limited to 60% AMI. Builders and developers may find that local cities and counties provide incentives for affordable housing construction.
>
> *Workforce Housing:* Workforce housing is defined as housing affordable to households earning between 60% and 120% of AMI. Workforce housing targets middle-income workers and includes professions such as police officers, firefighters, teachers, health care workers, retail clerks, etc.
>
> *Attainable Housing:* Endeavors to create market-rate housing that is accessible to a wider range of prospective homeowners. The industry definition of attainable, for-

sale housing is unsubsidized, profitable housing developments that meet the needs of those with incomes between 80% and 120% AMI. The price points for attainable housing vary by metro area depending on the AMI, with FHA Loan Limits typically hovering around 115% AMI.

Performance Requirement: Work with financial institutions, nonprofit organizations, and local governmental agencies to identify subsidized and unsubsidized housing development opportunities and participate by developing or constructing one of these housing projects.

Document the local AMI and unit sale price for each unit that is achieving this credit. In the verifier's cover letter identify the below-market-priced unit addresses. If there are multiple units being represented by one checklist, with a mixture of market and below-market units, then the minimum number of below-market units required is 10% of all units or one unit, whichever is greater. Should the local jurisdiction or incentive program require a project to provide more below-market units than Built Green requires for this credit, the builder needs to comply with those requirements.

Points Breakdown:

25 points: Building and selling/leasing of affordable housing units.

15 points: Building and selling/leasing of workforce or attainable housing units.

When Verified: Completion

Resources:

RCLCO, Attainable Housing: Challenges, Perceptions and Solutions: https://www.rclco.com/publication/attainable-housing-challenges-perceptions-and-solutions/

Strong Towns, Want to Make Housing More Affordable? Start by designing neighborhoods, not just buildings: https://www.strongtowns.org/journal/2020/6/11/affordable-housing

The Aspen Institute: Strong Foundations: Financial Security Starts With Affordable, Stable Housing: https://mbaks.app.box.com/s/q84ry2cx1mbyhusncyga4bjpmkumee00

Poor Households Spend Nearly Four Times as Much on Utilities as Well-Off Ones: https://earther.gizmodo.com/poor-households-spend-nearly-four-times-as-much-on-util-1845010294

6-8: Provide accessory dwelling unit or accessory living quarters intended to serve as permanent residences and not short-term rentals.

Responsible party: Architect, Developer/Builder

Intent: An accessory dwelling unit (ADU), also known as a "mother-in-law" apartment or "granny flat," is a small, secondary unit on a single-family lot. ADUs can be attached to the main living quarters via shared walls or be a separate structure on the same lot. Attached accessory dwelling units (AADU) are ADUs that share one or more walls with the main house or its garage. Detached accessory dwelling units (DADU) are ADUs that do not share any walls with the primary single-family residence (SFR).

ADUs contribute to the versatility of the home/site, diversity of the neighborhood, and increased affordable housing options. For example, they can be used to support multigenerational living arrangements such as older parents moving in with their children or grown children moving back into the house after college. Units can also be rented to those with lower incomes. For homeowners on a fixed income, long-term rentals can provide stable income to help with a mortgage. Mixing this type of less expensive housing into established neighborhoods reduces the demand for large apartment projects, provides greater variety of housing choices, and promotes density in urban areas.

Check with the local jurisdiction for ADU requirements, including minimum or maximum size or setbacks. Be sure to include ADUs in your permit process.

Performance requirement:

AADUs must include living, sleeping, kitchen, and bathroom facilities and have a lockable entrance door, and are located within the same structure as the principal or primary dwelling unit.

DADUs must include living, sleeping, kitchen and bathroom facilities and have a lockable entrance door, and are not located within the same structure as the principal or primary dwelling unit.

Document with pictures the ADU or DADU that was built. Materials and waste management credits need to account for the materials and amounts used in the construction of the unit. Points are allocated for any number of ADUs on a single-family lot, not per ADU. If there are multiple units being represented by one checklist, please identify which unit addresses include an ADU in the verifier's cover letter. If the DADU has its own address separate from the main house or can be sold as an individual unit, it needs to be enrolled and certified under a separate single-family checklist. This credit is applicable to DADU-only new construction projects.

SFR + AADU + DADU project performance scenarios:

All units are sold together:

The AADU is included on the energy modelling of the primary SFR. The DADU must demonstrate the required energy efficiency for the project's star level, but does not need to complete its own checklist. All site and water credits and materials credits are applied and shared across the entire site/all units. This credit is applicable to the primary SFR's checklist.

The DADU is being sold separately from SFR and AADU:

The AADU is included on the energy modelling of the primary SFR. The DADU must enroll and meet the requirements on its own checklist. Only site, outdoor water conservation, and waste management, and ESJ credits are applied and shared across the SFR/AADU and DADU checklists. This credit is applicable to the primary SFR's and DADU's checklists.

All units are sold separately:

All units must enroll and meet the requirements as individual units; using separate checklists for any units that differ by more than 20% in size, feature set (i.e. solar panels, NZE, etc), or more than 10% in points. Only site, outdoor water conservation, and waste management, and ESJ credits are applied and shared across all units' checklists. This credit is applicable on all units' checklists.

Points: 10 points

Resources:

ADUs in Seattle: https://www.seattle.gov/sdci/permits/common-projects/accessory-dwelling-units

Accessory Dwelling Units explained: https://www.buildinganadu.com/what-is-an-adu

'Grannie Units' Are All the Rage as Multigenerational Households Grow: https://www.forbes.com/advisor/mortgages/grannie-units/

6-9: Develop a project-specific ESJ plan clearly indicating equity objectives and actions; identifying priority actions.

Responsible Party: Architect, Builder, Other Team Members

Intent: Every project is an opportunity to further the goals of building green and creating spaces of belonging for all people, particularly historically underserved communities. A project-specific ESJ plan is one tool to document the different equity objectives and action steps appropriate to a specific project, particularly the priority elements (those with the highest impact and most important to the project to achieve). In addition to listing, tracking,

and managing equity activities, a plan helps a team stay focused, and provides a guidepost so project decisions align with goals and objectives, meet project deadlines, and hold everyone accountable.

Project timelines and available resources can be ever-changing, and even standard project objectives can be difficult to achieve by required completion deadlines. If you don't develop and implement a realistic workplan, accounting for all the daily pressures and tasks, it's unlikely you'll find time for equity work unless you plan accordingly. Be pragmatic and allow sufficient time to complete each identified action step—it's better to successfully complete fewer tasks than to take on too many and fail.

Examples of possible equity objectives and their associated action steps/ESJ credits:

- Diversifying the design team
    - Action step: Credit 6-2: Expand stakeholder involvement to create diverse teams to guide equitable development and culturally enriched spaces while expanding interest and capacity-building among priority populations, consultants, and in-house staff
- Provide women and minority-owned business development and growth opportunities
    - Action step: Credit 6-35: Use suppliers, vendors, or subcontractors that are certified WMBE or MBE firms
- Engaging the community
    - Action step: Credit 6-34: Engage with local community groups to assess community needs to inform the project-specific ESJ plan
- Provide affordable and/or attainable housing
    - Action step: Credit 6-7: Project is attainable housing
- Adopting universal design elements or including cultural design elements
    - Action step: Credit 6-14: Stepless front entry
    - Action step: Credit 6-23: Bedroom, bathroom, kitchen, and laundry appliances on main floor, requires a stepless entry

Many of these ESJ objectives connect with Section 6 ESJ credits that can be used to guide implementable actions to achieve the objectives and earn points towards meeting star level requirements.

Performance Requirement: Project-specific ESJ plans should be documented on the builder's letterhead and signed by the project builder/developer and project manager. Of the many possible equity-building efforts, choose elements most appropriate for the specific project, community, building team, and available resources. The content of the plan should address the following statements:

1. What equity objectives could be addressed by this project?
2. Highlight (bold) priority equity objectives that could be implemented
    a. Priority elements: those with the highest possible impact and most important for the project to achieve.
3. What objectives are the project committed to implement on this project?
    a. For each equity objective provide the specific action steps that will achieve its intent (including as much specific details as possible), ESJ credits related to these actions, responsible party accountable for implementation, and anticipated completion timeline/project phase.
4. If there are priority elements identified, but not selected for implementation, describe reasons why it was not selected.

Performance requirement is not determined by ability to implement or achieve all equity objectives committed to in the plan (project still must meet star level requirements).

Points: 5 points

When Verified: Design

Cross Reference: 6-10 and 6-11

Resources:

Section 6 Equity and Social Justice credits 6-1 through 6-45

How to Develop a Diversity, Equity, and Inclusion Initiative: https://www.shrm.org/resourcesandtools/tools-and-samples/how-to-guides/pages/how-to-develop-a-diversity-and-inclusion-initiative.aspx

Centering Health Equity Framework worksheets: https://www.centeringequity.org/v0-beta-frameworks

Salzburg Statement on Confronting Power and Privilege for Inclusive, Equitable and Healthy Communities: https://www.salzburgglobal.org/news/statements/article/confronting-power-and-privilege-for-inclusive-equitable-and-healthy-communities

6-10: Implement priority elements of project's ESJ plan; implement all elements or calculate local economic and equity impact of implemented actions

Responsible Party: Architect, Builder, Other Team Members

Intent: A project-specific ESJ plan is only as valuable as the elements and actions that are implemented. While our goal may be to accomplish all elements in an ESJ Plan, there may

be situations where an element, for one reason or another, cannot be realized. The best way of ensuring completion of an ESJ plan is to continuously monitor implementation efforts.

Performance Requirement: Use a Gantt chart or other project management software to track project-specific ESJ plan elements and action items and document whether each element listed was implemented and completed. For any element not implemented, include a short explanation as to why the team was unable to complete it.

Points Breakdown:

7 points: implementing all priority elements.

12 points: implementing all elements; OR implementing any number of elements and calculating the local economic and equity impact (LM3) of those actions.

When Verified: Completion

Cross Reference: 6-9 and 6-11

Resources:

Calculate your local economic and equity impact- Local Multiplier (LM3): https://www.nefconsulting.com/our-services/evaluation-impact-assessment/local-multiplier-3/

How to Make a Gantt chart in Excel: https://youtu.be/un8j6QqpYa0

6-11: Conduct internal review of ESJ plan implementation.

Responsible Party: Architect, Builder, Other Team Members

Intent: Conducting an internal review of your project-specific or organizational ESJ plan efforts will provide valuable insights and information for future projects. Were you able to implement all identified action steps? Did the equity action steps meet your expectations? Did they benefit the project? If not, why? What action step did you not include that might have been a valuable addition?

A Practice Example: Action Step – In year 20XX, we will seek to diversify by 20% (remember: goals should be measurable) our sub-contractor pool to include women, BIPOC, and members of LGBTQ communities. A team member is identified who will be responsible for the implementation of the action steps. We will identify potential subcontractor vendors and take time to meet and discuss possible business opportunities. We will track our use of

subcontractors and on a quarterly basis, we will evaluate progress towards our goal of diversifying our subcontractor pool. On a quarterly basis, we will make adjustments (such as increasing recruitment efforts, reviewing the composition of building teams, obtaining feedback from diverse subcontractors, and reporting findings to our internal team) to ensure we meet our annual goal. If best efforts were not successful, we will reevaluate, seek external advice, and implement alternative or additional strategies if necessary.

Performance Requirement: Document the findings of the internal review with the ultimate goal of creating a menu of effective equity elements; use the findings to evaluate the efficacy of implementation and strategies associated with the equity elements chosen for the particular project.

Points: 2 points

When Verified: Completion

Cross Reference: 6-5, 6-9, and 6-10

Resources: 6 Steps to Measure Your Diversity, Equity & Inclusion Initiatives: https://everfi.com/blog/workplace-training/measuring-your-dei-initiatives/

6-12: Site, design, and construct to counter known disparities identified through engagement with community stakeholders.

Responsible Party: Builder, Verifier

Intent: The Center for American Progress reports, "While Native Americans have long been the primary target of government-sponsored land redistribution, other communities of color—especially Black communities—have experienced and continue to experience displacement as well. For Black communities in urban areas, public policies have often been enacted under the guise of creating new public spaces, combating urban blight, or bolstering economic development. But over time, these policies have stripped Black communities of the wealth and financial stability found in property ownership and affordable rental housing."

To make matters worse, Forbes magazine reports that, "according to listing site Zillow, Covid-19-spurred job losses are disproportionately impacting Latino, Asian and Black workers, who make up the majority of the workforce in the hospitality, tourism and service industries, which have borne the largest economic brunt of the pandemic so far." Moreover, compounding the impact of job losses is the fact that people of color shoulder higher housing costs as a portion of their incomes, while earning less than whites.

In general, during times of economic downturns, Black, Indigenous, Latin, and Hispanic communities suffer disproportionately. According to the Urban Institute, history has shown that once the economy rebounds, the racial gaps in income, home equity, and wealth do not shrink.

Examples of known disparities in communities of color and underserved populations:

- Food deserts and food insecurity
- Displacement
- Lack of affordable housing
- Housing segregation
- Lack of affordable, accessible transportation
- Poorly maintained infrastructure, lack of resilient systems
- Higher proportion of income spent on utilities
- Poor indoor and outdoor air quality
- Higher exposure to environmental pollutants or hazards
- Higher instances of asthma, obesity, diabetes, and other health issues
- Lack of tree canopy or access to green space/nature
- Higher than average commute times for necessities (food, health services, and employment)

So how do we confront or address these and other disparities that continue to burden BIPOC individuals and families? A first step is to engage community stakeholders to learn more about the challenges they face and possible remedies or solutions.

Community engagement serves multiple purposes, including gaining vital information about site, design, and construction elements as well as other concerns, such as the impact of gentrification, the construction of non-affordable homes, and the loss of small businesses that have played a key role in the community.

By learning from a community's feedback and concerns, the builder/developer has the opportunity to eliminate or mitigate inequities or other harms associated with development. For example, imagine a 30-home development in a historically Black neighborhood. By engaging community stakeholders, the developer/builder may learn about concerns over gentrification exacerbated by the cost of market-priced homes. One way to counter gentrification would be offering some of the properties as affordable or attainable homes, thereby creating opportunity for lower-income community members to qualify for homeownership.

Performance Requirement: Document the actions taken to counter at least three known disparities and the outcomes of each action item.

Points: 15 points

Cross Reference: 6-7 through 6-11, 6-28 through 6-32, 6-34, and 6-43

Resources:

Racial Disparities in Home Appreciation: https://www.americanprogress.org/issues/economy/reports/2019/07/15/469838/racial-disparities-home-appreciation/

Racial Inequities in Housing Fact Sheet: https://www.opportunityhome.org/resources/racial-equity-housing/

Centering Equity in the Sustainable Building Sector: https://naacp.org/climate-justice-resources/centering-equity-sustainable-building-sector/

This Project Is Trying To Reverse Gentrification by Bringing People Back to Seattle's Central District: https://www.seattletimes.com/seattle-news/politics/this-project-is-trying-to-bring-reverse-gentrification-by-bringing-people-back-to-seattles-central-district/

Environmental Health Disparities in Housing: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3222490/

Rethink Resilience for the Era of COVID-19 and Climate Change: https://nextcity.org/daily/entry/rethink-resilience-for-the-era-of-covid-19-and-climate-change

About Climate Safe Neighborhoods: https://groundworkusa.org/focus-areas/climate-safe-neighborhoods/about/

Missing Middle Housing: https://missingmiddlehousing.com/

Tacoma's Missing Middle Housing: Planning for Access, Affordability, and Mobility: https://www.theurbanist.org/2021/01/22/tacomas-missing-middle-housing-planning-for-access-affordability-and-mobility

6-13: Submit a Code Innovation case study on this project and be selected by the Building Innovations Database.

Responsible Party: Builder, Verifier

Intent: Share your innovative practices and outcomes with others in the building trades to help those who are embarking on a similar path and increase positive impacts of Built Green homes. Case studies can cover any topic represented in the Built Green checklist.

Performance Requirement: Submit a case study to www.buildinginnovations.org and have it selected for publishing by the Building Innovations Database.

Points: 1 point

When Verified: When submission and selection has occurred

Resources: Submit a case study here: http://www.buildinginnovations.org/for-builders/

Universal Design

NC State University's Center for Universal Design defines universal design as, "an approach to design that incorporates products as well as building features and elements which, to the greatest extent possible, can be used by everyone. While accessible or adaptable design requirements are specified by codes or standards for only some buildings and are aimed at benefiting only some people (those with mobility limitations), the universal design concept targets all people of all ages, sizes, and abilities and is applied to all buildings."

To truly create spaces of belonging we must design and build spaces that are universally accessible to and inclusive of a broad range of human abilities and life stages. Universal and inclusive design can be leveraged to address barriers faced by people with disabilities, older people, children, and other populations that are typically overlooked in the design process to reduce stigma and provide benefits for all users.

Eight Goals of Universal Design (© Steinfeld and Maisel, 2012)

- Body Fit: Accommodating a wide range of body sizes and abilities.
- Comfort: Keeping demands within desirable limits of body function and perception.
- Awareness: Ensuring that critical information for use is easily perceived.
- Understanding: Making methods of operation and use intuitive, clear, and unambiguous.
- Wellness: Contributing to health promotion, avoidance of disease, and protection from hazards.
- Social Integration: Treating all groups with dignity and respect.
- Personalization: Incorporating opportunities for choice and the expression of individual preferences.
- Cultural Appropriateness: Respecting and reinforcing cultural values, and the social and environmental contexts of any design project.

Resources:

What is Universal Design: http://idea.ap.buffalo.edu/about/universal-design/

8 Goals of Universal Design: http://idea.ap.buffalo.edu/wp-content/uploads/sites/110/2019/10/UDGoals_DigitalDistribution.pdf

Universal Design Training and Resources: http://universaldesign.com/

Americans Need Home Design That Welcomes Everyone: https://www.architecturaldigest.com/story/universal-design-living-laboratory

Universal Design in Housing: https://projects.ncsu.edu/ncsu/design/cud/pubs_p/docs/UDinHousing.pdf

Designed for Inclusivity

6-14: Stepless front entry, stepless other entry; max threshold height of one-half inch.

Responsible Party: Architect

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer and encouraging visits from a broader range of friends and family who might otherwise not be able to visit their home. The design will never need to be changed to accommodate lifecycle changes by current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a larger population that is growing by the day (e.g., boomers).

Performance Requirement: Photo documentation of entrances with maximum threshold heights of one-half inch.

Points Breakdown: 2 points - Stepless front entry. 1 point - Stepless other entries. Maximum 3 points.

When Verified: Design and completion

6-15: Hard-surface stepless grade changes at exterior to allow access to essential maintenance locations, like garbage cans, etc.

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by encouraging visits from a broader range of friends and family participating in hosted outdoor events (e.g., BBQ) who might

otherwise not be able to navigate outdoor living spaces. Promotes healthier lifestyles by extending the years that residents remain active and busy nurturing their yards, gardens, and socializing with family and friends in lifespan-designed outdoor spaces. Promotes smarter and more functional outdoor spaces that better accommodate wheeled items that are found in most of our homes, such as:

- Shop Vac
- BBQ
- Lawnmower
- Generator
- Wheelbarrow
- Furniture dolly
- Garbage bin
- Recycle bin
- Yard waste bin
- Yard cart
- Pressure washer
- Strollers
- Bikes, trikes, wagons, scooters
- Luggage
- Wheelchair
- Other

Performance Requirement: Photo documentation of site finished grading and pavement.

Points: 1 point

When Verified: Design and completion

6-16: Install exterior accessible hard-surface gathering area.

Responsible Party: Architect, Builder

Intent: Landscape hard-surface gathering areas (e.g., paved at-grade patio areas) should be considered an upgrade and complement to stepless grade changes throughout and considered for additional earned checklist point value.

Performance Requirement: Photo documentation of site finished grading and pavement. Must be combined with credit 6-15, Hard-surface stepless grade changes at exterior to allow access to essential maintenance locations, like garbage cans, etc.

Points: 1 point

Cross Reference: 6-15

When Verified: Design and completion

6-17: Provide accessible guest bathroom on main floor of home (requires stepless front entry).

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Performance Requirement: Must be combined with credit 6-14 of stepless front entry.

Points: 2 points

Cross Reference: 6-14

When Verified: Design and completion

6-18: Accessible bathroom with curbless shower (grab-bar blocking required in all bathrooms).

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Points: 2 points

When Verified: Design and completion

6-19: Install cabinets with removable or slide-away lower doors for roll-up access to kitchen sink and upper cabinets that lower to countertop height for access, etc.

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Performance Requirement: Customized cabinetry with special features such as upper cabinets that lower to counter level accessible to a wheelchair user or person of short stature or sink-base doors that slide away with no cabinet bottom shelf, allowing rollup access to the kitchen sink.

Points Breakdown: 1 point per fixture. 3 points maximum.

When Verified: Design and completion

6-20: Install fire and CO alarms that include visual alarm features.

Responsible Party: Builder

Intent: Research shows that people who are deaf or have hearing loss will not be awakened from a deep sleep by an audible smoke alarm. It is critical that deaf and hard of hearing individuals have a visual smoke alarm in their homes. Using alarms with strobe lights increases the likelihood that a hearing-impaired person will be able to quickly respond and escape unharmed.

Performance Requirement: Strobe lights should be LEDs and alarms should be hardwired with battery back-up. Minimum required locations for visual alarms include the kitchen and outside of each separate sleeping area in the immediate vicinity of the bedrooms.

Points: 1 point

When Verified: Design and completion

6-21: Minimum door width 2'10" for all rooms requiring entry (small closets excepted).

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Performance Requirement: Rooms not requiring entry by homeowners are exempted from this requirement. Rooms requiring entry means any room that a person would need to enter in order to use the room. Only small, shallow closets where reach-in access is the normal use of the room and special equipment rooms for furnaces or similar equipment normally accessible to only qualified technicians would be exempted from this requirement.

Points: 3 points

When Verified: Design and completion

6-22: Install touchless or motion sensor plumbing fixtures.

Responsible Party: Architect, Builder

Intent: For most this would be seen as a luxury or convenience when dealing with dirty hands; for many people with different abilities or physical constraints, however, these fixtures mean greater comfort and lower physical effort to function in their home.

Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Points: 1 point

When Verified: Design and completion

6-23: Bedroom, bathroom, kitchen, and laundry appliances on main floor (requires stepless access to house).

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Performance Requirement: Provide first floorplan detailing required elements. Must be combined with credit 6-14 of a stepless entry.

Points: 8 points

Cross Reference: 6-14

When Verified: Design and completion

6-24: Locate closets or other spaces directly above each other on all floors that can be used for future elevator installation.

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Performance Requirement: Requires that the rooms have been sized according to manufacturer's data to ensure that a residential elevator will fit in the designated space. Requires a concrete slab with a drain at the bottom. Requires 38" rough-opening door framing width and door openings lined up from floor to floor.

Points Breakdown:

3 points: Stacking closets engineered to receive a future elevator

5 points: Adequate electrical circuits are provided in attic

When Verified: Design and during framing and electrical phases

6-25: Use of lever-style handles for all interior and exterior doors.

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Points: 1 point

When Verified: Design and completion

6-26: Design low-maintenance outdoor spaces.

Responsible Party: Landscape Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home. Low-maintenance outdoor spaces have the added benefit of using less resources (water, fertilizers, herbicides, and pesticides) to maintain beauty and functionality.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population. While many enjoy gardening, not all homeowners have the time, ability, or financial resources to maintain it.

Performance requirements: Select plants and foliage that are slower growing, require minimal trimming and grooming over multiyear cycles, grow deep drought-resistant root systems, emphasizing hardy native perennials. Install easy to maintain, long-lasting hardscaping materials that do not require annual application of sealant or stain. Designs that greatly reduce permeable surface area by covering all exterior surfaces in rock gardens lined by impermeable liners, artificial grass, compacted decomposed granite, or pavement are not aligned with the intent of this credit.

Points: 1 point

When Verified: Design and completion

Cross Reference: 2-35 through 2-40

Resources:

Plants and techniques for a low-maintenance garden: https://www.oregonlive.com/homesandgardens/2010/06/plants_and_techniques_for_a_lo.html

Landscape Design for the Elderly: A Golden Plan for Aging in Place: https://www.earthturfwood.com/landscaping-blog/landscape-design-for-the-elderly-a-golden-plan-for-aging-in-place

6-27: Install smart technology (e.g., electronic blinds, programmed environmental controls, etc.)

Responsible Party: Architect, Builder

Intent: Promotes equity and social sustainability by allowing homeowners to live in their home and communities longer; the design will never need to be changed to accommodate lifecycle changes of current, temporary, or future occupants of the home.

Improves resale value and marketability (i.e., economic sustainability) as your home will be considered for purchase by a broader population that is growing by the day (e.g., boomers).

Points Breakdown: 1 point per fixture. 3 points maximum.

When Verified: Design and completion

Community Connectivity

We all benefit from living in walkable, pedestrian-oriented, mixed-use communities centered around high-quality transportation systems. We benefit from a cleaner environment, more active lives, and less dependence on cars for transportation.

6-28: Build within one-quarter mile of a transit stop.

Responsible Party: Developer/Builder

Intent: When selecting sites for development, consider access to public transportation. Selecting sites that are within one-quarter mile of a transit stop promotes the use of public transportation, which in turn provides environmental and community benefits.

Points: 3 points

When Verified: Design

6-29: Build on a lot that is within one-half mile of at least six essential services, (e.g., grocery store, post office, place of worship, community center, daycare center, bank, school, restaurant, medical/dental office, laundromat/dry cleaner, etc.).

Responsible Party: Developer/Builder

Intent: Walkable neighborhoods increase accessibility of necessary services to those who have limited access to transportation. Higher walkability in neighborhoods is associated with decreased rates of obesity and diabetes, improved air quality, and decreased noise pollution. Increased foot traffic can support local businesses and neighborhood economies and increase property values. Walk Score, a service that measures the walkability of addresses, has shown that for each point of a home's walkability, its value typically increases by $500 to $3,000.

Examples:

- Grocery store (excluding convenience or quickie-mart style stores)
- Post office
- Place of worship
- Community center
- Daycare center
- Bank
- School
- Restaurant
- Medical/dental office
- Laundromat/dry cleaner
- Transit Station (Facility with several routes or modes of transit)

Points: 3 points

When Verified: Design

Resources: Walk Score: https://www.walkscore.com/

6-30: Install EV charging stations available to public at street parking strip.

Responsible Party: Builder

Intent: Increase EV charging infrastructure for the general public in residential areas and to homeowners who lack off-street parking and EV charging for their personal vehicle.

Performance Requirement: EV charging station must be located in a publicly accessible street parking area.

Points: 8 points

When Verified: Design and completion

6-31: Provide raised garden beds in publicly accessible area for community garden space and community interactions.

Responsible Party: Landscape Architect, Builder

Intent: Public garden spaces provide numerous benefits, including decreasing food insecurity by increasing access for fresh produce that maybe unavailable in some underserved communities, providing space for community members to interact and nurture something together, and overall beautification of a neighborhood and added curb appeal.

Ideally locate the raised beds along city sidewalks and in public easements as a welcoming and productive landscape design, utilizing space that cannot otherwise be developed. When designing the boxes consider a design that will allow the most people with the widest range of abilities to use them (ask yourself, can people of different heights use the boxes comfortably if standing? Could someone sitting in a chair use them?). The beds should not impede access to the home for those with limited mobility (do not block street-to-sidewalk access). Construct the beds using salvaged materials from deconstruction of the original structure for additional materials credits.

Please check with local jurisdictions for guidelines for gardening in planting strips, such as required setbacks and size and material restrictions for raised beds.

Points: 1 point

When Verified: Completion

Cross-reference: 5-11, 5-20, 5-88, and 6-32

Resources:

Seattle's Gardening in the Planting Strip: https://www.seattle.gov/transportation/permits-and-services/permits/planting-in-the-right-of-way

How to Farm Your Parking Strip: https://www.seattlemag.com/home-and-garden/how-farm-your-parking-strip

6-32: Design to promote and encourage pedestrian-friendly and safe neighborhoods.

Responsible Party: Builder, Architect or Landscape Architect

Intent: There are many ways to create more pedestrian friendly and safe neighborhoods. The following are examples of design innovations eligible for points toward this credit:

- Good visibility in front yard (no fences 5' or higher) and front door visibility from street
- Accessibility for bicycles (at least 1 access point with no steps or curbs)
- Special bike storage designed into garage OR separate storage outside
- Edible landscaping in front yard/in planting strip/or vegetable garden planter boxes
- Street trees planted in courtesy strip
- North area of the lot built first; south area retained for outdoor activities

Points Breakdown: 1 point per measure. 5 points maximum.

Cross Reference: 2-35, 2-41, and 6-31

When Verified: Design and completion

STAKEHOLDER ENGAGEMENT

6-33: Use integrated design process.

Responsible Party: Project Team – Architect, Builder, Engineers, Landscaper, Deconstructer, Subcontractors, Homeowner

Intent: Conduct an eco-charrette with the homeowner before the project begins, using the checklist to determine Built Green features to be included in the home. Goal setting and commitment to a green approach to the project can help ensure successful implementation of green strategies and actions. Review this checklist with all parties (e.g., owner, designer, engineer, general contractor, landscape professional) at an early stage in the design process. An integrated approach can help identify innovative solutions and ensure that team members are not working at cross purposes.

A knowledgeable team is established, and team member roles are identified with respect to lot design, preparation, and development. A written mission statement that includes the project's goals and objectives is developed.

One of the earliest challenges for a builder in developing a green lot is assembling an effective team to help them implement best green practices throughout the process. Examples of possible team members include staff, site superintendents, utilities, excavators, landscape architects, wildlife biologists, ecologists, and arborists.

Those involved in the development phase must understand what the mission of the site is, what it means to be a green lot, and why green practices should be followed. Once the green intent of the builder is communicated to the lot development team, the builder should work with the team throughout the development process to identify and delegate responsibilities of team members, as well as facilitate coordination between the members to achieve best green practices.

Performance Requirement: Incorporate Built Green early in the design by conducting an eco-charrette with the homeowner and team to determine Built Green features to be included in the home. Identify team member roles and how they relate to various phases of green lot design, prep, and development. Create a mission statement that includes the project's goals and objectives.

Points: 5 points

Cross Reference: 6-2 and 6-34

When Verified: Design

Resources: Integrated Design for Green Homes: https://www.greenbuildingadvisor.com/green-basics/integrated-design

6-34: Engage with local community groups to assess community needs to inform the project-specific ESJ plan, Built Green checklist and project goals, or developer's overall equity workplan.

Responsible Party: Architect, Builder, Developer

Intent: Community engagement pays dividends in multiple ways. While it may seem like a task outside the scope of work, it is well worth the effort. It is first and foremost about relationship building. The developer is actively seeking to establish a relationship with a new community organization, a new neighborhood, or community members. Often, community engagement is tied to a specific project, but the process can blossom into workforce development opportunities, neighborhood support, new friendships, and often, a greater awareness of the diverse world in which we live.

According to PolicyLink, “Transformative engagement can be the difference between a successful initiative and one that falls well short of its potential.” One benefit of engagement is “legitimacy and increased support for plans and projects.”

Engaging with the community can take many forms. Here, the credit is related to conducting a project-specific community needs assessment, or seeking feedback on a ESJ plan or, on a larger scale, a developer's portfolio of projects. A note of caution: Asking community organizations and/or community members to donate their time and energy without some recognition of their investment will not help future relationship building or engagement. Remember, you are seeking out their involvement. Ask the community-based organization what you can do in exchange for their effort. Similarly, think of ways to recognize and compensate community members for their time. A hosting organization may be able to assist you in that regard.

Practice Example: The organization Forterra has a long and successful history of using its expertise in real estate, development, and coalition building to support communities to grow equitably within their existing footprint. Forterra recently partnered with a community for the Tacoma Hilltop attainable housing development. In Forterra's own words: "We are working with Fab-5, a hyper-local Hilltop-based nonprofit, to guide community engagement for this project. Fab-5 has actively been engaged with the Hilltop community on housing for several years. Together, Tacoma Housing Authority and Fab-5 worked with the Hilltop residents on the Hilltop Community Framework Plan, which expanded to #DesignTheHill, a grassroots development initiative that empowered the community to shape the future of Hilltop. Building on this work, Fab-5 is partnering with us on our community engagement strategy, community design lab meetings, a Community Investment Council, and more."

Performance Requirement: Document the type of community engagement, the group(s) engaged, and the outcome of the engagement activities. Documentation should be a memo on company letterhead describing the engagement activity, date of event, community group(s) involved, summary of the event activities, and the outcomes and actionable items that came from the event.

Points: 8 points

When Verified: Design phase

Cross References: 6-5, 6-9, and 6-10

Resources:

The Sustainable Communities Initiative:
https://www.policylink.org/sites/default/files/COMMUNITYENGAGEMENTGUIDE_LY_FINAL%20%281%29.pdf

Big Idea: Let Community Engagement Surprise You:
https://www.enterprisecommunity.org/blog/big-idea-let-community-engagement-surprise-you

Communities of Opportunity: https://www.coopartnerships.org/work

A Guide to Engaging the Community in Your Project: https://www.artscapediy.org/guide/a-guide-to-engaging-the-community-in-your-project/

Pro-Equity Sourcing

6-35: Use suppliers, vendors, or subcontractors that are WMBE or MBE firms

Responsible Party: Builder/Developer

Intent: Women and People of Color face an uphill battle in traditionally white-male-dominated industries, and WMBE and MBE businesses face a wide range of difficulties and challenges. These include facing biases and prejudices regarding their ability to complete a job and overcoming false views regarding their sophistication and capabilities. Such companies often have limited access to vital business, information networks, and capital. The misperception that small, BIPOC- and women-owned subcontractors are too risky to work with due to their size, limited resources, and portfolio is one of the main barriers to their growth and success. Although many of these companies have exactly what it takes to be successful, they aren't given the chance to compete for contracts. Shifting away from the practice of using "go-to" companies and into intentional efforts to build capacity, diversity, and inclusion in the building industry could lead to new ideas, new approaches, and accomplishments that benefit everyone.

> *WMBE:* Women and Minority-Owned Businesses: small business state-certified or self-identified firms at least 51% owned by women and/or minorities.
>
> *MBE:* Minority-Owned Business: small business state-certified or self-identified firms at least 51% owned by minorities.

Performance Requirement: Firm must have valid state or federal WMBE or MBE certification at time of contracting or purchase to qualify for this credit.

Points Breakdown: 1 point per firm. Maximum of 10 points.

When Verified: Construction phase

Resources:

One Woman on What It's Like to Run a Construction Company: https://repeller.com/olay-female-construction-company-interview/

A Key Challenge for Minority-Owned Subcontractors? Misperceptions: https://www.messer.com/news-and-insight/a-key-challenge-for-minority-owned-subcontractors-misperceptions/

Washington State Office of Minority & Women's Business Enterprises Directory: https://omwbe.wa.gov/directory-certified-firms

Supplier Diversity Best Practices: https://omwbe.wa.gov/state-supplier-diversity-reporting/supplier-diversity-best-practices

MBAKS Professional Women in Building (PWB) Council: https://www.mbaks.com/membership/councils-and-committees/professional-women-in-building-council

6-36: Hire temporary employees or apprentices through Weld Works or ANEW (or equivalent mission-driven employment program); minimum 25% of temporary work hours

Responsible Party: Builder/Developer

Intent: *Weld Works* is a division of Weld Seattle, whose mission is to equip system-impacted individuals with housing, employment, and resources conducive to recovery and successful reintegration. *System-impacted* refers to a person who is legally, economically, or familially-affected in a negative way by his or her incarceration or the incarceration of a close relative. System-impacted also includes people who have been arrested and/or convicted without incarceration. Weld Works is an innovative staffing organization effectively serving the construction, manufacturing, and retail industries.

Apprenticeship & Nontraditional Employment for Women (ANEW) is dedicated to improving access and advancement of women in non-traditional career pathways such as construction and manufacturing. ANEW focuses on equity and inclusion in the construction industry for both women and people of color by offering pre-apprentice training and apprenticeship opportunities placement programs.

For projects outside of Weld Works' or ANEW's operational territories, similar non-profit, mission-driven organizations exist that focus on employment and training of marginalized populations. Look for an organization that can provide the appropriate labor type for your project and a program that provides participants with case management, mentoring, and/or retention services.

Performance Requirement: Hire temporary workers or apprentices from a program such as Weld Works or ANEW (or equivalent mission-driven employment program). Provide proof of the agreement with the organization and the number of hours the employee(s) were employed. This can apply for any category of temporary labor on a project (e.g., site cleanup, deconstruction, demolition, administrative, skilled or unskilled labor, etc.). May extend to first tier subcontractors and their direct hires. This credit is project-site-specific and non-transferable to other projects/checklists.

Points Breakdown:

5 points: At least 25% of temporary labor hours

8 points: At least 50% of temporary labor hours

12 points: 75% or more of temporary labor hours

15 points: 100% of temporary labor hours

Resources:

Weld Works: https://weldworks.org/hire-us/

Apprenticeship & Nontraditional Employment for Women (ANEW) programs: https://anewaop.org/programs/

United Way of King County Organizations focused on employment and job training: https://volunteer.uwkc.org/agency/index/?q=&cat_id=22106&distance=&zip=&name=&partners=&county=&s=1

Washington State Department of Social and Health Services- Community Based Organizations: https://www.dshs.wa.gov/esa/community-partnership-program/community-based-organizations-cbos-alphabet

6-37: Permanently hire employees from Weld Works or ANEW (or equivalent mission-driven employment program) used during demolition or construction

Responsible Party: Builder/Developer

Intent: Offer a space of belonging within your business by permanently hiring Weld Works temporary or ANEW apprentices that were utilized during demolition and construction. Your business will gain a new staff person who will bring new ideas and skills to your team and you will benefit from retaining trained employees. The employee will benefit from a stable living wage, and the community organization will benefit from positive outcomes for their participants and a stronger relationship with the industry.

Performance Requirement: Permanently hire workers from programs such as Weld Works or ANEW (or equivalent mission-driven employment program). Provide proof of a hiring agreement with Weld Works, ANEW (or similar organization), removing any confidential personal identification numbers, residential address and wage information. This credit is project site-specific and non-transferable to other projects/checklists.

Points: 2 points

Cross Reference: 6-36

6-38: Hire workers and apprentices who reside in one of the 43 Priority Hire ZIP codes (or equivalent economically distressed Washington ZIP codes); minimum 25% of work hours

Responsible Party: Builder/Developer

Intent: Due to institutionalized racism and sexism, women and minorities have continued to be excluded from the construction trades. Economically distressed ZIP codes represent communities that are home to the most disenfranchised peoples, and people of color are disproportionately represented in those areas. Intentionally hiring from these low-income and underserved communities is a good step to ensure that economically distressed residents can begin to benefit from Washington's booming construction industry. By prioritizing these communities, we offer their residents an opportunity to grab that first rung on the economic ladder with living-wage careers.

King County has 43 Priority Hire ZIP codes that are considered *economically distressed* due to having high concentration of the following three criteria:

- People living under 200% below the Federal Poverty Level (FPL)
- High unemployment
- People without a college degree

For projects located at least 20 miles outside of King County, please search for your local city or county jurisdiction's list of economically distressed ZIP codes, or locate local ZIP codes listed as Mid-tier, At-Risk, or Distressed on the Economic Innovation Group's Distressed Communities Index.

Performance Requirement: Provide a report that documents permanent employee's name, residential ZIP code, labor classification, job title, and number of hours worked on the project. Do not disclose employee's address, wages, or other confidential personal identification information. This can apply for any category of labor on a project (e.g., site cleanup, deconstruction, demolition, administrative, skilled or unskilled labor, etc.). May extend to first tier subcontractors and their direct hires. This credit is project-site-specific and nontransferable to other projects/checklists. May be combined with credit 6-36 and 6-37.

Points Breakdown:

5 points: At least 25% of labor hours

8 points: At least 50% of labor hours

10 points: 75% or more of labor hours

Cross Reference: 6-36 and 6-37

Resources:

Priority Hire in the City of Seattle and King County:
https://www.seattle.gov/Documents/Departments/FAS/PurchasingAndContracting/Labor/Zip_Codes.pdf

City of Tacoma Economically Distressed ZIP codes:
https://cms.cityoftacoma.org/CBCFiles/CommunityWorkforceAgreementTaskForce/Meeting%201/Economically%20Distressed%20ZIP%20Codes%20Chart.pdf

Economic Innovation Group's Distressed Communities Index:
https://eig.org/dci/interactive-map?path=state/WA

Advance Economic Justice

6-39: Offer vacant properties to Weld Seattle (or similar organization) for use as temporary housing prior to demolition

Responsible Party: Builder

Intent: Weld Seattle, a nonprofit organization, serves formerly incarcerated and system-impacted individuals by offering housing and job placement in construction trades. *System-impacted* refers to a person who is legally, economically, or familially-affected in a negative way by his or her incarceration or the incarceration of a close relative. System-impacted also includes people who have been arrested and/or convicted without incarceration.

According to Weld Seattle, 77% of former prisoners are rearrested within 5 years. However, Weld Seattle's program, which includes employment pathways, clean and sober housing, and community re-engagement, has resulted in a less than 4% rearrest rate for Weld Seattle members. By partnering with builders and developers, Weld Seattle receives vacant properties which serve as temporary housing for its members. The developer/builder benefits because the Weld program maintains the property and prevents these otherwise unoccupied spaces from becoming magnets for squatters and crime.

Performance Requirement: Offer and provide the vacant property scheduled for demolition to Weld Seattle (or similar mission-driven organization) to serve in the organization's temporary housing program. Provide proof of the agreement with WELD or similar organization. This credit is project-site-specific and non-transferable to other projects/checklists.

Points: 8 points

When Verified: Pre-demolition

Resources: Weld Seattle: https://www.weldseattle.org/housing

6-40: Offer mentorship program to employees, interns, and apprentices

Responsible Party: Builder/Developer

Intent: Mentoring employees, interns, and apprentices can mean the difference between continued employment or a higher-than-average turnover rate. Moreover, according to the Association for Talent Development, "Unlike other tactics companies have used to improve diversity, mentoring is proven to make a difference. One 2016 study in the American Sociological Review found that mentoring, in comparison to other corporate tactics (such as mandatory diversity training, grievance systems or job tests), increased BIPOC representation among managers in the workplace anywhere from 9 to 24%." When we mentor staff, particularly underrepresented staff members, their likelihood of advancing to higher levels increases as does the value of their contribution to the company.

Performance Requirement: Create and implement a mentorship program and include underrepresented staff members, interns, and apprentices; must be maintained for the duration of the project. Provide a memo that describes the program, benchmarks used to determine success, and outcomes. This program does not need to be project-specific, but if it is reused across multiple projects/checklists it should be updated each time to reflect progress and outcomes.

Points: 3 points

Cross Reference: 6-5, 6-38, and 6-42

Resources:

Building Mentorship Programs for People of Color:
https://rvcseattle.org/2018/03/21/building-mentorship-programs-people-color/

4 Ways Mentoring Can Empower Your Diversity and Inclusion Initiatives:
https://www.td.org/insights/4-ways-mentoring-can-empower-your-diversity-and-inclusion-initiatives

The 7 Benefits of a Structured Workplace Mentorship Program: https://www.gqrgm.com/7-benefits-structured-workplace-mentoring-program/
https://wabuildingtrades.org/community/apprenticeship-programs/

Construction and Trades Apprenticeship information:
http://www.futuresnw.org/apprenticeships

6-41: Participate in recruitment or career development events in underserved communities

Responsible Party: Builder

Intent: The goal is to broaden recruitment and hiring functions to more fully include people of color and other underrepresented communities impacted by bias and discrimination. By participating in organized recruitment efforts or career development events, individuals seeking employment in the construction trades will have an opportunity to meet potential employers while builders are able to meet their workforce needs and diversify their teams.

Career development events may include:

- Youth mentorship programs
- Participation in a WorkSource or community organization's career fair
- A recruitment or career development workshop targeting underserved community residents organized by your business.
- Job site tours and educational activities with local architecture, engineering, or construction students

Performance Requirement: Participate in at least one recruitment or career development event designed to reach an underserved community per calendar year throughout the duration of the project. Also accepted: voluntary participation and mentorship activities through partnerships with youth-focused organizations that focus on enrolling youth, POC, and women into pre-apprenticeship programs or helping them pursue careers in architecture, construction, or engineering. This may be reused across multiple projects/checklists per calendar year.

Points: 1 point

Cross reference: 6-5 and 6-38

Resources:

ACE Mentorship Program: https://www.acementor.org/

WorkSource career fairs:
https://secure.esd.wa.gov/home/WorkSourceWA/Employer/Account

MBAKS workforce development: https://www.mbaks.com/workforce-development

6-42: Offer job training, job assistance, or job retention programs to underserved community members

Responsible Party: Builder

Intent: Creating a diverse, equitable, and inclusive organization often starts with offering job opportunities to individuals who have faced racial and other forms of discrimination. Low-barrier job entry, job training, and retention programs are effective and economical ways to provide pathways to living-wage jobs. At the same time, the builder may benefit by expanding his/her team and achieving a more diverse workforce.

Performance Requirement: Develop or partner with a local organization or academic program to offer a job training, job assistance, and/or job retention program for underserved community members. Program must be maintained for the duration of the project. Document the type of program and the individual(s) served, including length of time and relevant outcome (such as, the trainee found employment in the construction field, individual hired by builder, program led to retention of employee or employee promotion). This may be reused across multiple projects/checklists.

Points: 1 point

When Verified: Construction phase

Cross Reference: 6-36 and 6-40

Resources:

ANEW Apprenticeship Programs**:** https://anewaop.org/programs/

Youth Build: https://youthcare.org/homeless-youth-services/employment/youthbuild/

MBAKS workforce development: https://www.mbaks.com/workforce-development

Sawhorse Revolution: https://sawhorserevolution.org/

6-43: Partner with organizations and/or financial institutions to create pathways to investment and homeownership, especially for individuals and families facing the most pressing disparities

Responsible Party: Developer/Builder

Intent: In 2020, Citibank acknowledged persistent housing disparities impacting people of color. “Homeownership is a key way to build wealth and equity, and safe, affordable

housing is an important platform for financial stability. However, Black homeownership is at its lowest level since the 1960s. In addition, rental housing in many urban areas across the country is scarce and too expensive. Compounding this crisis is the near-absence of minority-owned real estate developers in the affordable housing industry." As a result, Citi and other institutions are working to identify new funding streams dedicated to confronting racial disparities. Specifically, Citi promises to "expand access to its mortgage products and services among minority borrowers in low- and moderate-income neighborhoods and provide $200 million of equity and preferential financing through Citi Community Capital to affordable and workforce housing projects by minority developers who either are the sole equity owners or are in a joint venture with meaningful equity participation. Some of this funding will also be invested in minority developers to increase their capacity and allow them to compete for larger affordable housing projects."

Citi is not alone in their commitment to closing the racial wealth gap and housing disparities. Builders and developers can benefit by obtaining funding to build affordable/attainable housing and by helping individuals and families find pathways to investment and homeownership opportunities like the one described below.

Practice Example: A community-based organization based in South Seattle, El Centro de la Raza, offers a Home Purchase program including workshops and one-on-one consulting to community members. Their website states: "As a HUD-approved housing counseling agency, ECDLR's Home Purchase Program is designed for potential homebuyers. We evaluate your current financial and credit capacity to determine your mortgage readiness. Workshops are also available to inform participants of the homebuying process (finding lenders and real estate agents, budgeting, and different loan products)." This program has been effective in assisting community members in fulfilling their dream of homeownership. Partnering with an organization like El Centro de la Raza could offer valuable information to prospective homeowners and possible new business to the builder/developer.

Performance Requirement: Document the partnership effort leading to creating or expanding pathways to investment or homeownership. Specifically, document the builder or developer's role in the process.

Points: 8 points

Resources:

Announcing the Release of the Housing Pathways Proposal - Coming Home: Providing a Pathway to Housing for All: https://prosperitynow.org/blog/announcing-release-housing-pathways-proposal-coming-home-providing-pathway-housing-all

A Financial Institution's Action Plan for Racial Equity: https://www.citigroup.com/citi/racial-equity/

Building for Tomorrow: Innovative Infrastructure Solutions: https://www.nahb.org/-/media/NAHB/advocacy/docs/industry-issues/land-use-101/infrastructure/building-for-tomorrow-innovative-infrastructure-solutions.pdf

Habitat for Humanity Seattle-King County: https://www.habitatskc.org/

Green Choice and Affordable Loan programs from Olympia Federal Savings: https://www.olyfed.com/personal/home-loans/

Study: How Diverse is the Real Estate Investing Community?: https://www.millionacres.com/research/real-estate-investor-diversity/

6-44: Annually provide pro bono or substantially reduced rate services, resources, or trainings to nonprofit or historically marginalized community organizations

Responsible Party: Builder/Developer

Intent: Providing free or substantially reduced services or materials and/or supporting local organizations, particularly those that serve people of color and other marginalized groups, is a great way of demonstrating your commitment to community and for serving others in need. Set aside time to provide construction services to a local community organization. MBAKS organizes 2–3 community stewardship events each year, such as our annual Rampathon and Painting a Better Tomorrow. Organizations like United Way King County's Day of Caring or Rebuilding Together organize events where volunteers are dispatched to community organizations in need of remodeling or construction services (such as new paint, new playground, etc.). Similarly, Habitat for Humanity seeks volunteers and material suppliers to help build houses for individuals and families who are unable to purchase a home without assistance. Alternatively, you could also offer a training or DIY clinic at a community-based organization related to homeowner education, water and energy conservation, or indoor air quality.

Performance Requirement: Document services provided with date, description of services, and the organization that you worked with. May be resubmitted for multiple project checklists in a given calendar year.

Points: 5 points

When Verified: Upon completion of service.

Resources:

Habitat for Humanity: https://www.habitatskc.org/

United Way Day of Caring: https://www.uwkc.org/events/day-of-caring/

MBAKS Community Stewardship: https://www.mbaks.com/community

Rebuilding Together Seattle: http://www.rtseattle.org/

Sawhorse Revolution: https://sawhorserevolution.org/

6-45: Use alternative development and ownership models (e.g., land trust, co-ownership) to create additional pathways to homeownership

Responsible Party: Builder/Developer

Intent: Traditional paths to homeownership are not sufficient and prevent too many community members from owning their own home. Alternatives to development, alternative ownership models, and alternative financing create additional pathways to address this problem.

Performance Requirement: Work with organizations and financial institutions promoting innovative alternative development opportunities and/or different ownership models.

Points: Earn 8 points for use of alternative development or ownership model leading to homeownership.

When Verified: Upon completion of project.

Cross Reference: 6-7

Resources:

Community Land Trusts and Stable Affordable Housing: https://www.huduser.gov/portal/pdredge/pdr-edge-featd-article-110419.html

Shared Equity Models of Ownership: https://nhc.org/policy-guide/shared-equity-homeownership-the-basics/shared-equity-models-of-ownership/

SECTION SEVEN: OPERATION, MAINTENANCE & HOMEOWNER EDUCATION

The purpose of this section is to promote responsible operation and maintenance of the home throughout its life by equipping the homeowners to continue the good work you have begun. Whether your clients requested green features or green features are a part of your standard business practices, it is important to educate them on how to use and maintain products, equipment, and other features installed during the project. Taking steps to provide useful information and practical products to help your clients maintain their new green home ensures that it will achieve and maintain maximum performance for generations to come.

Your Homeowner's Kit can simply include required information, but it may also include environmentally friendly "gifts." Gifts might include non- or low-toxic, zero waste, or compostable cleaning supplies, or environmentally friendly furnace filter or gardening supplies. We encourage you to be creative with these credit items. In addition to the kit's educational value, you'll benefit from showing your client that you care. It will reinforce your reputation as a "Green Builder" serving the community.

Personalize the Homeowner's Kit by labeling it with the owner's name and address and be sure to include any specific information requested by the owner. Obtain owner's signature on a sign-off sheet indicating information in the kit has been received. Let the owner know the information should be read carefully to optimize the environmentally friendly features you have taken extra effort to incorporate.

The credits below relate to the scope and varieties of educational and informational materials you provide to homeowners in the Homeowner's Kit.

7-1: A building owner's manual is provided

Responsible Party: General Contractor

Intent: Occupant behavior and proper maintenance determines the long-term sustainability impacts of strategies implemented in the Built Green process. Educating occupants and owners can help ensure that Built Green homes operate and perform as designed for generations to come.

Performance Requirement: Include at least 4 of the items below in the Homeowner's Kit.

1. Information on local recycling programs (include composting information where municipal composting is available)

2. Information about green power programs available through their local utility that allow for a percentage of their electricity to be generated from renewable energy sources or purchase of natural gas carbon offsets or carbon capture
3. A compelling explanation of the benefits, beyond utility bill savings, of using energy-efficient and water-saving systems, proper ventilation, and maintaining good indoor air quality
4. A list of practices to conserve water and energy
5. Local public transportation and bike route options
6. List of common hazardous materials often used around the home and instructions for proper handling and disposal of these materials
7. Information about environmentally friendly pest control, fertilizers, de-icers, and cleaning products
8. Information about native and pollinator landscape materials and/or those that have low-water requirements
9. Provide home energy performance summary and water conservation modelling summary (if applicable) (e.g., HERS score, REMRate summary performance report page, WERS/ WRI scores, or Built Green Water Use Reduction summary)

When possible, provide information sheets and flyers in languages that the homeowners speak. Check with your municipality, or utility (electricity, gas, water, or waste hauler) for existing resources, or ask one of your residents to translate the materials for individual cultural and language groups.

Points breakdown:

3 points: 4–5 items included

4 points: 6–8 items included

5 points: All 9 items included

When Verified: Visually verified during construction or at the time of final inspection.

Cross Reference: 2-55, 2-56, 2-57, 2-60, 2-74, 3-1 through 3-5, 3-21, 4-23, 4-24, 4-26, 4-55 through 4-58, 4-60, 6-27, and 6-28

Resources:

Local utility tip sheets, flyers, or brochures

Municipal or waste management hauler tip sheets or brochures

Local Public transportation brochures or tip sheets

Built Green Consumer Resources: https://builtgreen.net/resources/#consumers

Northwest Natural Yard and Garden: https://kingcounty.gov/services/environment/stewardship/nw-yard-and-garden.aspx

7-2: Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided on the equipment operation and control systems

Responsible Party: General Contractor

Intent: Increase market awareness, interest, and the value of green building by educating the public about green building strategies, benefits, and the specific approaches in your project.

Performance Requirement: Homeowner's Kit must be provided, see Section 6 Credits, and a minimum of one hour training to building owners/occupants on the following aspects of the building:

- Built Green strategies implemented; provide copy of signed final Built Green checklist
- Impacts of occupant behaviors on operating costs and maintenance of systems
- Equipment operation and control systems
- Required maintenance of building and landscaping systems to maintain optimum performance

Points: 4 Points

When Verified: After final inspection, obtain owner's signature on a sign-off sheet indicating training was received.

Cross Reference: 2-28, 2-29, 2-40, 2-51, 2-53, 2-54, 2-56, 2-69, 2-70, 2-71, 2-72, 3-1, 3-2, 3-5, 3-9, 3-11, 3-16, 3-22, 3-23, 3-24, 3-25, 4-23, 4-43, 4-44, 4-49, 4-58, 5-1, 5-2, 5-8, salvaged material credits, 5-99, 5-100, Section 7 credits

7-3: A diagram showing the location of safety valves and controls for major building systems

Responsible Party: General Contractor, Architect

Intent: Empowering homeowners with the ability to curtail property damage during utility emergencies, such as gas or water leaks, and for safety shutoffs during maintenance or repair work.

Performance Requirement: Easy-to-read diagram showing where safety shutoff valves are located in the home or on the property, and how to shut them off.

Points: 1 Point

When Verified: Visually verified during construction or at the time of final inspection.

7-4: A list of local service providers that offer regularly scheduled service and maintenance contracts to assure proper performance of equipment and structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, shower/tub surrounds, irrigation system)

Responsible Party: General Contractor

Intent: Promote proper maintenance and performance of building's equipment and adherence to building material warranties.

Performance Requirement: Provide list that includes referrals to Built Green members at builtgreen.net and other private contractors that offer services on the specific equipment installed in the building in the following areas:

- HVAC systems
- Water heating equipment
- Water softening system
- Kitchen and laundry appliances
- Showers/tubs
- Gutter, downspout, and drainage systems
- Landscaping
- Rainwater harvesting or greywater systems (if applicable)
- Irrigation systems (if applicable)

Points: 1 Point

When Verified: Visually verified during construction or at the time of final inspection.

Cross Reference: 2-54, 2-56, 2-57, 2-70, 2-72, 3-14, 3-16, 3-17, 3-24, 3-25, 7-7

Resources:

Built Green Member Directory: https://builtgreen.net/find-a-member

7-5: A photo record of framing with utilities installed. Photos taken prior to installing insulation, clearly labeled, and included as part of the Homeowner's Kit

Responsible Party: General Contractor

Intent: Provide easily understandable information and transparency for homeowners regarding the home's as-built conditions. Photographic documentation demonstrates and proves code adherence. Second, carefully executed construction imagery reveals where things are in the event of future maintenance, repair, or replacement projects.

Stud finders make it much easier to locate many of these structures behind wallboard. Many walls however have additional studs to tie into other walls or have extra "sistered" boards and blocking which would be confusing to someone relying on a stud finder's LED indicators.

Performance Requirement: Clear, well-lit, photos taken of framing with utilities installed, prior to installing insulation, clearly labeled, and included as part of the homeowner's kit. Due to the high number of photos and organization required, a digital flash drive is recommended for sharing this information. If printed, maximum two photos per single 8.5" x 11" page. Use a consistent photographic map route through the house to help orient the view and the photo. Please see article in Resources below for an example of a well-organized photo record of framing.

Points: 3 Points

When Verified: Visually verified during construction or at the time of final inspection. Photos taken during verification may be used, but those photos alone are not detailed enough to meet the intent of this credit; additional photos and details will be required from General Contractor.

Resources:

What's behind that wall? How to photograph wiring & plumbing before drywall goes up: https://photofocus.com/photography/whats-behind-that-wall-how-to-photograph-wiring-plumbing-before-sheetrock-goes-up/

7-6 Maintenance checklist

Responsible Party: General Contractor

Intent: A home maintenance schedule is important for every house's upkeep. Continuing to check on exterior, appliances, heating and cooling, plumbing, security, and electrical systems will help prevent breakdowns, save money, and keep the home looking and performing its best.

Performance Requirement: Provide property-specific maintenance checklist on all important interior and exterior features and systems of the home. Checklist items should be categorized by frequency and recommended season for carrying out. Identify any checklist items where it is recommended or required by manufacturer warranty for maintenance by a professional. Also include typical lifespans and replacement timeframes for operational systems and large appliances.

For homes located in wildland-urban interface areas, or areas more susceptible to wildfires, list preventive actions that should be taken to minimize ignition points and maintain defensible space around the home.

Points: 1 Point

When Verified: Visually verified during construction or at the time of final inspection.

Cross Reference: 2-9, 2-10

Resource: The Ultimate Home Maintenance Checklist for Every Season: https://www.bhg.com/home-improvement/advice/home-maintenance-checklist/

7-7: Instructions for maintaining gutters, downspouts, rain gardens and other infiltration devices, and importance of diverting water at least five feet away from foundation

Responsible Party: General Contractor

Intent: Promote proper maintenance and performance of building's equipment and landscape design and adherence to building material warranties. Prevent moisture related issues and damage due to improper or inadequate drainage.

Performance Requirement: Provide routine maintenance list and instructions that are informed by product or material warranties, maintenance schedules, and typical lifecycle or replacement timelines. For homes located in wildland-urban interface areas, or areas more susceptible to wildfires, list preventive actions that should be taken to minimize ignition points from gutters and landscaping.

Points: 1 Point

When Verified: Visually verified during construction or at the time of final inspection.

Cross Reference: 2-9, 2-10, 2-27, 2-28, 2-29, 2-48, 2-54, 2-56, 2-70, 4-27, 7-9

7-8: A narrative detailing the importance of maintenance and operation in retaining the attributes of a Built Green® home

Responsible Party: General Contractor

Intent: Increase market awareness, interest, and the value of green building by educating the public about Built Green building strategies, benefits, and the specific approaches in your project. Occupant behavior and proper maintenance determines the long-term sustainability impacts of strategies implemented in the Built Green process. Educating occupants and owners can help ensure that Built Green homes operate and perform as designed for generations to come.

Performance Requirement: Provide a written narrative as part of the Homeowner's Kit that details the benefits of Built Green Certification and maintaining all systems and attributes built into the home, how to address future remodels, and information about Built Green's consumer resources and remodel certifications.

Points: 1 Point

When Verified: Visually verified during construction or at the time of final inspection.

Cross Reference: Section 7

Resources:

Eco-Cool Remodel Tool: https://builtgreen.net/eco-cool/eco-remodel.asp

Built Green Consumer Resources: https://builtgreen.net/resources/#consumers

7-9: Educate owners/tenants about fish-friendly landscaping and gardening practices

Responsible Party: General Contractor or Landscape Professional

Intent: Keep your residents, your landscaping, and your building healthy and resource-efficient through ongoing landscape operations and maintenance best practices.

Performance Requirement: Provide information about environmentally friendly landscaping and gardening practices as part of the Homeowners Kits, see Credit 7-1. At a minimum, your landscape maintenance information needs to include the following:

- Integrated Pest Management (IPM) strategies that list regular tasks to minimize the use of chemicals and mitigate pest risk
- List of chemicals or types of products that should not be used or purchased by building owners or contracted service providers
- Monthly and annual checklists that include all of the following, as applicable to your property:
    - Landscaping maintenance
    - Gutters and drainage system
    - Erosion Control
    - Hardscapes
    - Stormwater management system
    - Irrigation system
- Tip sheets that indicate:
    - Storage and disposal requirements for any potentially hazardous materials or chemicals
    - Considerations when contracting landscaping service providers

Points: 1 Point

When Verified: Visually verified during construction or at the time of final inspection.

Cross Reference: Section 2 credits, 7-1, 7-7

Resources:

Living with Lakes: https://kingcounty.gov/services/environment/water-and-land/lakes/facts/garden.aspx

Salmon-Friendly Gardner: https://snohomishcountywa.gov/DocumentCenter/View/3769/Salmon-Friendly-Gardener?bidId=

7-10: Extra credit for innovation in Homeowner Education, subject to approval by Built Green Program Manager

You may submit a strategy that includes homeowner education, not specifically called out in this Section, for consideration for an Extra Credit for Innovation. All extra credits are subject to approval by the Program Manager. If approved, add up to 5 points to your Section 7 total.

SECTION EIGHT: BUILT GREEN BRAND PROMOTION

8-1: Verifier provides case study write-up highlighting project's green features and performance with professional project photos for use on Built Green's blog (requires minimum of 450 points to be earned, project provides affordable housing, or is innovative). Requires preapproval and subject to discretion of the Built Green Program Manager.

Responsible Party: Verifier

Intent: Recognize Built Green builders and projects that demonstrate environmental and social equity leadership in the residential building industry. Share project examples and best practices throughout the Built Green community.

Performance Requirement: Requires prior approval from Built Green Program Manager. To propose a project to be featured by Built Green, send an email to Built Green detailing the preliminary point count, location, project type, and interesting features or story. See below for selection criteria* (must meet at least one criterion to be considered):

1. Scores at least 450 points on the checklist and performs beyond minimum requirements
2. A Net Zero Energy, all electric home
3. A multifamily or remodel project
4. Located outside of Seattle, or in an area where Built Green is less represented
5. Has innovative or underutilized features that should be promoted
6. Has a unique story to tell
7. Design aesthetic is unique, eye-catching, and captivating
8. Project provides a teaching/educational opportunity

**Selection criteria subject to Built Green's discretion*

Points: 2 points

When Verified: After final inspection. Submit case study proposal to Built Green Program Manager prior to submittal of verification packet.

Resources:

Built Green Case Studies: https://builtgreen.net/blog-home

8-2: Post a Built Green yard sign during construction or selling, display Built Green marketing materials during home tours, or include targeted Built Green certification star level in MLS listing description or photos

Responsible Party: Developer, General Contractor or Realtor

Intent: Increase consumer awareness of Built Green by increasing visibility of program benefits and projects being built in their communities, thereby building brand recognition value for Built Green members and homeowners.

Performance Requirement:

- Photo of sign that includes Built Green logo onsite either during construction or during sales process.
- Educational signage posted inside the home during home tours that highlight Built Green certification and Built Green features to potential buyers.
- Include the *targeted* Built Green certification star-level in the description or photos of the MLS listing. A project may not claim any star level certification unless the certificate has been issued by Built Green.

Points: 1 Point per action. Maximum of 3 points.

When Verified: Visually verified during intermediate construction and final inspections.

Resources:

Built Green Logo files available by logging into your Built Green Builder portal: builtgreen.net/

Built Green Marketing Materials: https://builtgreen.net/resources/#builders

8-3: Builder's Website: Built Green logo and program description displayed and/or a Built Green hyperlink included in project description

Responsible Party: Developer, General Contractor

Intent: Increase consumer awareness of Built Green by increasing visibility of program benefits and Built Green builders in their communities, thereby building brand recognition value for Built Green members and homeowners.

Performance Requirement: Built Green logo or Built Green Member logo and program description (including benefits to homebuyers) displayed in an easily found location on the builder's website.

Points: 1 Point

When Verified: Visually verified during intermediate construction and final inspections.

Resources:

Built Green Logo files available by logging into your Built Green Builder portal: builtgreen.net

Built Green Marketing Materials: https://builtgreen.net/resources/#builders

8-4: Extra credit for innovation in marketing for Built Green brand

You may submit a marketing strategy that includes promoting the Built Green logo or brand, not specifically called out in this section, for consideration for an extra credit for Innovation. All extra credits are subject to approval by the Program Manager. If approved, add up to 5 points to your Section 8 total.