

Trade Tip Sheets

The following tip sheets address common Checklist Action Items from the various Built Green[®] Programs in our state. You should always check with your local program for specific details on program requirements, available Action Items, performance thresholds, and point levels.

Some actions listed under your particular trade may not typically be your responsibility. However, increased awareness of overarching Built Green[®] strategies will provide you with increased opportunity to contribute to overall project success, and encourages comprehensive implementation of green building strategies.

If you provide green building practices that are not referenced in these Tip Sheets or in your local Built Green[®] program, please work with your Built Green[®] Coordinator to determine whether your practice may be eligible for innovation points, or should be considered for future program updates.

Thank you, and congratulations on leading your industry by going green!

www.builtgreenwashington.org

These Tip Sheets were funded through a Public Participation Grant by the WA Department of Ecology.



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Become a Built Green[®] specialty contractor! By offering the following options with your service, you'll add value to your business and help build greener homes.

The following practices represent Green Best Management Practices (BMPs) on Built Green[®] job sites. Although the implementation of the following BMPs is not always the responsibility of all trades, Built Green[®] subcontractors should be familiar with and willing to abide by the following practices. Support your contractor and consider how your work influences these Action Items. If you don't see the following BMPs on your site – ask your contractor why he/she is not implementing them!

These actions include both program requirements and optional Checklist action items from several Washington state programs. Program requirements and BMPs vary. Please check with your local program for specific details on requirements, available points, and thresholds.

Statewide Built Green[®] Action Items

Preserve and protect critical areas during construction.

Protect wetlands from sediment using appropriate best management practices such as compost slope mulching and silt retention berms. At minimum, a 100 foot wide vegetated buffer zone should be left along water bodies, unless approved plans require larger buffers. Check with your local jurisdiction for buffer size requirements.

Limit site disturbance.

Limiting construction areas helps decrease dust and erosion concerns. Phase and sequence construction to minimize site disturbance at any one time. The recommended practice is to disturb less than 60% of the site at any time. Check with your local program for specific phasing recommendations and program requirements.

Respect the heavy equipment use zone to limit soil compaction.

Compacted soils are less able to absorb water, resist plant root penetration, and lack the porosity needed for adequate aeration. This results in increased stormwater runoff and disrupts the natural water cycle. Observe heavy equipment use areas. They should be well-marked by the contractor.

Adhere to the posted protocol for tire cleaning; if there isn't one, help create it!

- Post tire wash protocol for all trades or field labor using vehicles on site. If you need to construct a tirewash, a pressure hose wash-down area minimizes water consumption and runoff, and has better cleaning results. Drive-through troughs, while more convenient, tend to be less effective and consume more water. Designate and mark the wash area well.
- Provide hose or pressure washer without a lock-on trigger to prevent water from being left running.
- Restrict the size of the wash area to no larger than the largest vehicle.
- Use biodegradable detergents. Detergents or cleaners containing phosphate are prohibited.
- Use only the quantity of soap, detergents, or other chemicals needed for the job.

Direct stormwater away from building using grading and approved drain systems as appropriate.

Stormwater that stands or seeps around the crawlspace, slab foundation, or basement can lead to prolonged dampness, moisture damage, and mold growth. If you backfill or move soil around the footprint of a building as part of your work, make sure it is sloped down and away at least 5 feet from the building. Check with your local program for specific requirements.

Provide weather protection for stored materials.

Prevent damage to materials from weather (and accidents or vandalism) by storing them in a secure, protected place, or by covering them with tarps. Shipping pallets and other used packaging can be put to temporary re-use storing materials off the ground to protect them from the weather.

Reduce idling of vehicles and equipment on site.

Idling equipment wastes fuel and emits particulate matter and noxious gases, including carbon monoxide, into the surrounding air creating an unhealthy work environment. Encourage your crew to turn off their engines when stopped for more than 2 minutes.

Use B-20 (20%) or higher biodiesel content for all construction vehicles and equipment.

Biodiesel is a non-petroleum diesel fuel substitute that operates in conventional diesel equipment, but is made from either waste lard (from commercial deep fryers for instance) or a vegetable oil. It burns cleaner, uses a waste product or renewable resource, and is non-toxic if accidentally spilled. It can be used at 100% or in a 20% or higher blend.

Follow the jobsite IAQ management plan to manage construction dust and air pollution within the building envelope during construction and include training.

Preventative measures to avoid subsequent problems from construction dust include:

- Seal all ductwork to protect from dust and other contaminants during construction
- Mask floor registers or use temporary screens or protective boxes to prevent debris from accumulating during construction (see Resources section for product information)
- If using the HVAC system, install construction filters and change them after construction is done, then flush and change them again (mechanical contractor can do this). A MERV 8 filter at each return air grill must be used during construction if an air handler is present
- Clean/vacuum up dirt, dust, and wood shavings as you go
- Vacuum stud bays before installing sheetrock
- Vacuum the floors before final flooring installation
- Isolate areas of work to avoid contamination of clean spaces

Ask your contractor for the healthy building job-site plan for the project; if there isn't one, help create it!

- Use low-toxic materials
- Vent the building after each finish is applied
- Prevent moisture accumulation and entrapment in the structure during construction that could cause mold growth or other damage during the life of the building
- Prohibit smoking in the building enclosure (It's required on Built Green® projects!)
- Ensure that any toxic materials such as asbestos or lead are properly handled and disposed

Require workers to use VOC-safe masks.

For small projects with short exposures to VOCs, a gray carbon-impregnated dust mask manufactured by 3M or equivalent should suffice.

Avoid use of HVAC system to dry house.

It is important to ventilate and dry the finishes with a heat source other than the HVAC system. This prevents toxins from entering the system. Ventilate with portable fans or heating devices. Venting or heating should continue between two and seven days after each new application, depending on the amount of surface covered and the toxicity of the finish. Don't use portable combustion equipment! It only adds moisture to the indoor environment.

Clean duct and furnace thoroughly at job completion and before move-in.

During construction, debris often enters through the registers to collect in the ducting. To prevent contamination, install filters at both supply and return sides. Thoroughly clean and vacuum ducts and replace filters installed during construction to remove any particles that may have entered during construction.

Move leftover materials to next job, provide to the owner, or donate to the reusable building materials industry.

Many materials can be moved to the next job or left on-site for the new owner at their request to use for repairs or expansions. Also look for opportunities to donate materials to a reusable building materials facility.

Use environmentally preferable products with third-party certification such as SCS, Greenguard, FSC, Green Seal, and Floor Score (not applicable to carpet).

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.

Use only biodegradable and non-toxic cleaners.

Cleaners and solvents can be a source of harmful chemicals. Review manufacturer's Material Safety Data Sheets (MSDS) before you buy. Avoid products with health hazards ratings higher than 1. Avoid products with ingredients that the MSDS classifies as toxic (poisonous), flammable, caustic (causes burns), or chemically reactive. Leftovers from these products are considered hazardous waste.

Find out what the job site's waste reduction target is and explore recycling opportunities.

Your contractor may ask for a written agreement or contract to ensure subcontractor participation in waste reduction efforts. If there isn't a waste management plan posted on the site, ask why!

Achieve a minimum recycling rate for the following products: cardboard, metal scraps, wood/pallet scraps, packaging & pallet wrap, drywall, concrete, asphalt rubble, rock, brick, paint, asphalt roofing, land clearing debris, yard waste, and soil, glass, carpet padding, and upholstery foam.

Built Green® generally recommends minimum recycling rates of 85% for two products. More points are earned if additional materials are recycled at that rate. Check your local program for details.

Use suppliers who offer and take back reusable and recyclable packaging.

Packaging makes up a significant portion of the waste generated on site. Ask your suppliers to take back packaging, to save yourself time and money.

Eliminate materials and systems that require finishes.

Minimize finishes to reduce material cost and maintenance, and to help improve indoor air quality. Acceptable applications include unfinished floors or decking (dense-tropical hardwoods or plastic composites). The recommended practice is eliminating materials and systems that require finishes on a minimum of 100 square feet. Check your local program for details.

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Tip Sheets are available for the following trades:

- Land Clearing and Excavation Contractors
- Landscaping Contractors
- Concrete Installers
- Framing Contractors
- Insulation Contractors
- Drywall Contractors
- Window Contractors
- Roofing Contractors
- Mechanical/HVAC Contractors
- Electrical and Lighting Contractors
- Plumbing Contractors
- Flooring Contractors
- Painting Contractors

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The following practices represent Built Green[®] checklist action items from several Washington State programs. Program details vary depending on the program's location, regional climate and industry conditions. For all below action items, check with your local program for specific details on minimum requirements, available points, and performance thresholds.

Statewide Built Green[®] Action Items

Do not dispose of topsoil or any other materials into drainage channels or low-lying areas.

Preserve and protect all topsoil. Disposing of topsoil in lowlands or wetlands threatens water quality and quantity and endangers wildlife habitat

Install redundant erosion control devices and optimally maintain them to exceed code requirements. Complete full site clean-up upon construction completion.

Erosion control BMPs minimize the loss of soil during construction. Installed BMPs must be maintained on a regular basis.

- Use compost barriers or berms, or silt control fencing at appropriate
- Mulch exposed soils or use plastic sheeting.
- Install temporary straw bale erosion and sedimentation control check dams in ditches during construction.
- Immediately inspect all erosion and sedimentation control measures after rainfall of more than ½” in 24 hours.
- Compost or hydroseed exposed areas as soon as possible.

Exceed code requirements to protect stockpiled topsoil with mulch, jute, or other appropriate material.

Preserving topsoil in place without compaction, grading or excavation and replacement maintains and preserves soil health and stormwater infiltration both during construction and upon completion.

Use compost to stabilize disturbed slopes.

Research shows that compost often outperforms conventional slope stabilization methods. Apply a 3 to 4 inch layer of compost to cover the entire exposed soil surface, extending approximately 3 feet over the top of the slope or meshing into existing vegetation (check with your local code enforcers and stormwater management officials first). Select slightly coarse to coarse compost to better hold surface soil in place, even during heavy rainfall.

Limit grading outside the buildings footprint.

Minimizing grading helps retain soil health and natural water infiltration. 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. Steep slopes may benefit from terracing and retaining walls. Recommended practice is to limit grading to 20 feet outside of the building foot-print. Check with your local program for specific requirements.

Statewide Built Green® Action Items

Take extra precautions to install and maintain sediment traps.

Sediment traps help prevent nonpoint source pollution by allowing sediment to settle out of stormwater before the water leaves the site. Such traps usually consist of a small pond with overflow spilling over a washed gravel outlet. Locate traps anywhere stormwater runoff may leave the site.

Retain a healthy percentage of trees on-site.

Protecting trees on private property is an important way to protect the overall urban forest. Besides cleaning our air, trees are a valuable resource on project sites. Trees increase property values, moderate temperatures both inside and outside the building (resulting in energy savings!), act as wind buffers, reduce stormwater runoff, and protect wildlife. Before site clearing and grading, conduct a tree inventory to determine suitable trees for protection. Avoid removing mature trees wherever possible, and consider clustering structures to allow more cohesive protection of trees.

Take extra precautions to protect trees during construction.

Keep all excavations, equipment and debris away from trees at a minimum distance two times the size of the canopy from the tree trunk (dripline) whenever possible (this protects the sensitive root systems). Surround each buffer with construction fencing and prohibit any activity inside the fence-like material storage. Post signs on trees to be saved, clearly indicating the tree's monetary value (cost of replacement). Some studies have found trees add as much as 30% to the selling price of unimproved lots.

Preserve existing native vegetation as landscaping.

Retaining native vegetation in a landscape (rather than removing and replanting) provides excellent erosion, sediment, dust, and pollution control.

- Review grading and preservation plan with builder to ensure compliance.
- Respect critical area fences, such as tree root buffers, to prevent damage.
- Hand-clear under storey, if needed, to protect tree roots.
- Never park heavy equipment or store heavy materials under trees.

Specific West of Cascades Considerations

No clearing or grading during winter months.

Plan ahead to avoid clearing and grading during the wettest part of the year (November – March). This is particularly important for soils that easily erode. To find out if soils at your site “easily erode,” consult your local code official or reference the Soil Conservation Surveys at your library.

Specific East of Cascades Considerations

Incorporate appropriate defensible space zones around all built structures.

Homes built at the interface of wild lands and urban areas face an increased threat of wildfires. To reduce the chance of sparks causing a home to catch fire, create a defensible space zone in the area immediately surrounding a home; the home ignition zone. See the specific recommendations at http://www.firewise.org/usa/fw_practices.htm.

Reduce fire danger by removing underbrush and unhealthy vegetation on site.

Reducing the amount of unhealthy vegetation around a home will reduce the heat source and in turn limit the possibility of ignition. Create a fire-resistant landscape for the entire property.

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Retain native vegetation in a landscape (rather than removing and replanting) to provide excellent erosion, sediment, dust, and pollution control. To earn points:

- Review grading and preservation plan with builder to ensure compliance.
- Respect critical area fences, such as tree root buffers, to prevent damage.
- Hand-clear understorey if needed, to protect tree roots.
- Never park heavy equipment or store heavy materials under trees.

Take extra precautions to protect trees during construction.

Keep all excavations, equipment and debris away from trees at a minimum distance two times the size of the canopy from the tree trunk (dripline) whenever possible (this protects the root systems). Surround each buffer with construction fencing and prohibit any activity inside the fences – like no material storage. Post signs on trees to be saved, clearly indicating the tree's monetary value (cost of replacement). Some studies have found trees add as much as 30% to the selling price of unimproved lots

Landscape with plants (preferably native) appropriate for site topography and soil types, and emphasize the use of plants with low water requirements.

In the summer, when water supplies are at annual lows, up to 50% of water used by municipal systems is for outdoor irrigation.

- Use established vegetation
- Cluster plants with similar water needs (“water-use” zones)
- Plant native species that will easily adapt to the site
- Plant species from geographic areas with similar climates

Amend disturbed soil to restore soil environmental functions.

Amending soil helps restore its hydrological function and allows water to infiltrate more effectively. Recommended practice is amending soil to a depth of 10 to 12 inches.

Use verma-compost or slow-release organic fertilizers to establish vegetation.

Moderate fertilization with natural or natural/synthetic slow-release combination fertilizers helps build soil nutrient reserves and micro-diversity without contaminating waterways. Studies show that the majority of the phosphorus entering local lakes and areas of Puget Sound is coming from single home residential areas. The primary source for this contaminant is fertilizers and soil wash-off.

Use compost soil amendments to establish turf and other vegetation with less irrigation.

Whether you seed or use sod, all turf installations perform better when at least 2 inches of compost is tilled into the upper 6 inches of soil; 12 inches is better for deep-rooted, drought tolerant grasses.

Statewide Built Green® Action Items

Mulch landscape beds with organic mulch.

If the landscape isn't already densely planted, mulching is the next best solution to reduce the number of weeds, ease weed removal, and minimize herbicide use. Mulching also adds soil nutrients, increases the capacity of the soil to retain moisture, moderates soil temperature, and limits soil erosion. Recommended practice is to dress landscape beds with up to 4 inches of organic mulch. Check with your local program for specific requirements.

Investigate a rainwater or graywater collection system.

Rainwater collected from the roof and other hardscape can be a free source of irrigation water for the home landscape. Likewise, a graywater collection system could also supply water for non-potable (not for drinking) uses. A rooftop collection system consists of a suitable roof and guttering to storage tank(s) or cistern, with a simple filtration and a small-scale pressurized pump. Check with local authorities for help with the necessary permits.

Use low- or non-toxic outdoor lumber for outdoor landscaping.

Non- or low-toxic materials in the landscape help preserve soil, water quality, and human health. Examples include low-toxic wood preservatives, naturally rot resistant woods, and recycled-content plastic lumber

Limit use of turf grass to a percentage of landscaped area.

Landscapes that use existing vegetation along with strategically placed new plantings can offer a beautiful, low-maintenance alternative to the traditional lawn. Consider constructed landscapes that mimic ecological habitats, decrease maintenance costs, enhance wildlife survival, and blend with edges of adjoining existing vegetation.

Replant or donate removed vegetation for immediate reuse.

Plants and smaller trees can often be re-planted elsewhere on site, either immediately or at a later date with proper care and protection. Research local plant salvage programs and organizations to help find new homes for plants that must be removed.

Use plants donated from another site.

A nearby developer may have plants and trees available for donation. Work with local developers or builders to secure plants removed from their sites, or use plants from any of your other projects.

Use grass that requires minimal irrigation and maintenance.

If planting a new lawn, select a grass mix that is suitable for the sun conditions on-site, the lawn's intended use, and that is slow growing, to require less mowing. Use locally-adapted rye-fescue seed blends. Be aware that tall and other fescue grasses can be drought-tolerant if given deep soil for their long roots – they need more water if planted in shallow soil.

Specific East of Cascades Considerations

Retain or add deciduous trees.

Protecting trees is an important way to protect the overall urban forest. Deciduous trees provide shade in the summer and solar access in the winter, moderating temperatures within and around the building: like evergreens, they also reduce stormwater runoff, provide wildlife habitat, and also increase property value.

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Statewide Built Green[®] Action Items

Use pervious materials for at least one third of total area for driveways, walkways and patios.

You can pave light traffic areas and walkways with a variety of products such as porous concrete that allow water to filter down through them into the ground rather than running off and creating stormwater management issues elsewhere.

Use reusable forms, including wood if it is well maintained.

Use forms made from steel or aluminum for concrete pours. These forms are readily available and provide a better finish, metal forms help to prevent unnecessary wood waste. Dimensional lumber can be used for smaller-scale projects, and if carefully maintained, can provide adequate finish quality and can be reused many times. Typically after their last use, wood forms can be reused for non-structural applications.

Use less toxic form-releasers.

Forms are commonly coated with fuel oil to prevent the concrete from sticking to the form. Runoff, incidental drips, and spills contaminate soils and may enter storm drains, thereby contaminating surface water. Use less toxic form releasers or strategies, such as "kick-hard," vegetable oil spray, or waxing or painting the forms prior to use.

Use Insulating Concrete Forms (ICF), Structural Insulated Panels (SIPs) or straw bale construction for building envelope.

Insulating concrete forms (ICFs) are rigid plastic foam forms that hold concrete in place during curing and remain in place afterwards to serve as thermal insulation for concrete walls. ICFs make structural concrete walls, and can be used for either foundation or above grade walls. ICF walls provide R-values between R-14 and R-23 and lower air infiltration rates when compared to typical wood frame construction.

Structural Insulated Panels (SIPs) are rigid panels comprised of wood sheathing laminated on both sides of a dense insulation core. SIPs, in conjunction with careful caulking of joints, can create a continuous air barrier and provide substantial reductions in air leakage and higher R values than traditional framed wall construction.

Straw bale construction is a low-cost construction technique that uses stitched-together straw bales with an interior and exterior plaster/ stucco coating to achieve R-values between 33 and 65 with a code required two-hour fire rating. Straw bale construction allows walls to breathe, allows pollutants to escape to the outside, enhances indoor air quality, and requires less lumber thereby reducing material cost and impacts on forests.

Recycle concrete/asphalt rubble, rock, and brick.

Concrete, brick, and asphalt rubble can be collected and recycled for less money than landfilling.

Statewide Built Green® Action Items

Use fly ash as part of the cementitious content of the concrete.

Flyash, a by-product of burning coal for electricity production, can be added to concrete slabs and foundation mixes, when available, as a substitute for up to 60% of the Portland cement content. Ask your concrete vendor to include 15-30% high-lime fly ash, until you're used to working with it. Fly ash can improve concrete strength and workability, though curing time often takes longer.

Use recycled concrete, asphalt, or glass cullet for base or fill for foundation.

Make sure to 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 approval.

Use B-20 (20%) or higher biodiesel content in all construction vehicles and equipment.

Biodiesel is a non-petroleum diesel fuel substitute that operates in conventional diesel equipment, but is made from either waste lard (from commercial deep fryers for instance) or a vegetable oil. It burns cleaner and uses a waste product or renewable resource.

Wash out concrete trucks.

Over the life of a project, one to three yards of concrete slurry and lime can be generated from washing out concrete trucks. Clean concrete trucks and pumps in slab or pavement sub-base areas, such as driveways, where slurry can be contained and will be useful.

Specific East of Cascades Considerations

Install frost-protected, shallow foundation.

Implementing a frost-protected, shallow foundation with a minimum of R-10 insulation affords protection to the foundation from frost heaves, while reducing the amount of excavation and construction material needed to extend foundations below the frost line.

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Statewide Built Green[®] Action Items
<p>Use suppliers that offer and take back recycle/recyclable packaging. Framing materials generally do not come with much packaging, but make sure that vendors take back any packaging they delivered to the site.</p>
<p>Create detailed take-off and materials list for use by framers. 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 scraps because it reduces the risk of large pieces being unintentionally cut for alternative uses. A board-by-board take-off can be used as a cut list and can result in significant savings.</p>
<p>Use central cutting area or cut packs. Designating a centralized cutting area lowers the total amount of wood that is needed for a project by reducing wood waste (by up to 15%), and increasing reuse of cutoffs. It also makes the cutting process itself more efficient and easier to keep clean. Cut packs reduce on-site waste since they are pre-measured and cut offsite.</p>
<p>Use reclaimed or recycled materials. Blocking, bracing, shims, back framing, and forming stakes can be fabricated from offcuts of dimensional lumber, stored in a central cutting area. Purchase reclaimed wood from salvage stores, but make sure it has been regraded if for structural use. Choose sheathing and siding products made with a minimum of 50% pre- or post-consumer recycled content. Metal siding can contain up to 100% recycled content, and fiber cement products generally contain reclaimed wood fiber. Underlayment products are also available with recycled content, and often have the further benefit on not having urea formaldehyde (a toxic problem with standard particleboard).</p>
<p>Use dimensional lumber and sheathing certified as “sustainably produced” by a recognized third party. Order lumber that is certified by Forest Stewardship Council (FSC), CSA International, Sustainable Forestry Initiative (SFI) or the American Tree Farms system. Certified lumber is becoming more available. Cost premiums can be offset by using advanced framing techniques. 90% of dimensional lumber and 50% of sheathing certified as “sustainably produced” are recommended, but check with your local program for specific requirements.</p>
<p>Use finger-jointed framing materials (e.g. risers and studs) for longitudinal compression loads only. Finger-jointing (gluing short lengths of wood together) makes use of wood that traditionally would have been disposed of. Finger-jointed products are generally straighter and stronger than solid wood, resulting in less waste. Commonly -used finger-jointed products include studs and painted trim.</p>

Statewide Built Green® Action Items

Use 2X6 intermediate framing .

With intermediate framing, studs are placed at 16-inch on center as in conventional framing. It, however, is superior to conventional framing in that it includes insulated headers, corners, and intersections.

Or

Use advanced wall framing – 24-in OC, with double top plate.

Advanced Wall Framing is a sound, code-recognized building process that incorporates 24-inch on-center framing with increased insulation. This includes the following:

Insulated headers: Using insulated headers achieve higher R-values than standard headers without sacrificing structural integrity. They can be purchased pre-assembled, or built on-site by sandwiching rigid insulation between the lumber.

Fully insulated corners: (2-stud corners instead of 3-stud corners). Corner construction using two instead of three studs leaves space for additional insulation. Drywall clips, spaced two feet apart, provide back-up for interior finish materials, where one wall abuts another, or two walls intersect.

Fully insulated interior/exterior wall intersections: Optional framing details, such as flat-stud intersections, one-stud intersections, and ladder-blocked intersections ease insulation placement and save lumber.

Use plywood and composites of exterior grade or urea-formaldehyde-free for subfloor.

Particleboard, interior grade medium density fiberboard (MDF), and other interior wood composites are glue-containing products that often use urea-formaldehyde glue as a binder. Urea-formaldehyde in the indoor environment can cause health problems for occupants. Instead, use materials that don't contain urea-formaldehyde, or use products with exterior grade, phenol-formaldehyde glue. Phenol-formaldehyde glue off-gases quickly, and is gone often before the product reaches the jobsite.

Use insulated exterior sheathing.

The use of insulated exterior sheathing eliminates the thermal bridging created by framing. In many cases the use of insulated exterior sheathing may allow the builder to use 2X4 instead of 2X6 framing, thus reducing lumber use and cost-, and can provide a superior exterior water management system. Insulated exterior sheathing can reduce condensation in walls because walls stay warmer.

Use 50-year-warranted siding product.

Durable siding products offer a maximum consumer benefit to the homeowner, in addition to the obvious environmental impact. Many of the fiber cement composites offer a 50-year warranty. Ask your local supplier for this and other options.

Manage construction dust and air pollution within building envelope during construction.

Clean/vacuum up dirt, dust, and wood shavings as you go. Vacuum stud bays before installing insulation and drywall.

Statewide Built Green® Action Items

Keep materials dry during construction and conduct a moisture test prior to close-in of walls and conditioned space.

Keep your materials dry during transportation and storage. Do not install insulation and drywall when framing has moisture content above 15%. During construction, remove unwanted moisture with a dehumidifier, not combustion heaters, which only bring moisture into the structure.

Reuse, sell, give away, or recycle wood scraps and broken pallets.

Sell or give away logs not used as timber, or wood scraps that are less than one foot long since they are unlikely to be reused on the job. Recycle whatever is left at the end of the project that you cannot use.

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Use recycled-content (minimum 40%) insulation.

There are three commonly available types of recycled content insulation:

- Cellulose insulation is made from 100% post-consumer recycled newspapers or telephone books.
- Several brands of fiberglass insulation batts are manufactured using recycled glass, including post-consumer glass collected in curbside recycling programs.
- Mineral wool insulation is available in loose-fill or batts. It has, on average, 75% post-industrial recycled-content.

Use environmentally preferable/preferred products (EPP) for insulation (no urea formaldehyde-, CFC-s, or HCFCs).

Chlorofluorocarbons or CFCs contribute significantly to ozone depletion and global warming, two of our most serious environmental concerns. HCFCs are less damaging than CFCs, but should also be avoided if at all possible. Indoor formaldehyde is gaining recognition as a severe health hazard causing reactions from flu-like symptoms to death in individuals that become sensitized through exposure.

Options to consider include:

- Beadboard or EPS (expanded polystyrene) rigid foam insulation has an insulating value of R-3.6 to R-4.4 per inch and can be used for exterior or below grade uses
- Polyurethane insulation (e.g. polyisocyanurate) made with pentane instead of HCFCs as the blowing agent is now available.
- Blown-in cellulose (100% recycled newspaper content) or formaldehyde-free fiberglass.

Use third-party-verified insulation.

Standard fiberglass batt insulation, the most common for new houses contains up to 14% formaldehyde, which can contribute to poor indoor air quality. The recommended practice is to use a third-party-verified urea-formaldehyde-free insulation product. One verifier is GreenGuard[®]. Check with your local program for specific requirements.

Install dense-packed cellulose, wet blown cellulose, blown-in foam, soy-based foam, or fiberglass blown-in blanket (BIB)s insulation.

Blown-in insulation products, including cellulose or Icynene, provide better penetration and filling of cavities than fiberglass batts and are made from non-toxic materials. The insulation is most commonly wet-sprayed but can be dry-blown or poured loose-fill into enclosed cavities. When sprayed, the product leaves few voids, reducing air infiltration. Cellulose can also be dry-packed into wall cavities. Cellulose insulation is made from 100% post-consumer recycled newspapers or telephone books and usually contains boric acid or sodium borate as a fire retardant.

Install wall, ceiling and/or floor insulation beyond Code requirements.

The recommend practice is R-21 for walls, R-38 for ceilings and vaults, R-30 floors, R-19 for basement walls and R-10 for under slab and perimeter. Check with your local program for specific requirements.

Statewide Built Green® Action Items

Fully insulate corners.

Corner construction using two, instead of three studs leaves space for additional insulation. Ensure that you insulate right into the corner behind the stud.

Fully insulate at interior/exterior wall intersection.

Flat-stud intersections, one-stud intersections and ladder-blocked intersections provide for easy insulation placement. Ensure that you fully insulate at the intersection.

Home is certified through Northwest ENERGY STAR® Homes.

This checklist item requires commitment from many trades. If you expect to certify the house as ENERGY STAR®, there are specific insulation strategies you will need to follow. Check into the actual ENERGY STAR® requirements: <http://www.northwestenergystar.com/partner-resources/technical/index.html>.

The following are example requirements that are subject to inspection:

- Insulation is in full contact with all sides of the cavity without gaps or voids
- Insulation is installed behind showers, tubs, and fireplaces, as well as on exterior, attic, and party walls. Rigid sheathing or other supporting material is installed to hold insulation in place
- Wind baffles are installed where soffit vents are present, including vaulted/ cathedral ceilings

Keep materials dry during construction and conduct a moisture test prior to close-in of walls and conditioned space.

Keep your materials dry during transportation and storage. Do not install insulation and drywall if framing has moisture content above 15%. During construction, remove unwanted moisture with a dehumidifier, not combustion heaters, which only bring moisture into the structure.

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Statewide Built Green[®] Action Items
<p>Use suppliers who offer to take back reusable and recyclable packaging. Purchase fasteners and drywall mud in bulk containers that can be refilled or reused on-site.</p>
<p>Use drywall with recycled-content gypsum and/or use recycled or "reworked" paint and finishes. Drywall manufactured with recycled gypsum is commonly available at most building material suppliers and is cost-competitive with conventional drywall. You must specify, however, that you want recycled-content when you order, or you may not get it.</p>
<p>Use airtight drywall approach for framed structures. The airtight drywall approach (ADA) for framed structures is an advanced sealing package that goes beyond basic practice. Specifically, caulk or gasket:</p> <ul style="list-style-type: none"> • Drywall installed on exterior walls at the top and bottom plates, windows and doorframes; • Drywall installed on interior walls at intersections with exterior ceilings; caulk • Electrical, plumbing and mechanical penetrations in drywall. <p>Use good quality durable sealants and proper type of sealing material for the size of gap.</p>
<p>If garage is attached, air seal it from the house. Use the Airtight Drywall Approach (ADA) in the walls and ceiling shared by house and garage.</p>
<p>Keep materials dry during construction and conduct a moisture test prior to close-in of walls and conditioned space. Keep your materials dry prior to installation. Do not install drywall if framing has moisture content above 15%. If readings exceed 15%, dehumidify before installing drywall.</p>
<p>Use reclaimed building materials when appropriate. Save drywall scraps to use as patches around doors, windows, etc. Reuse bulk containers for storage.</p>
<p>Recycle drywall. Drywall generally makes up 11% by volume and 26% by weight of a residential home's waste stream or roughly 1-1.2 lbs. per square foot. Drywall is most often recycled as feedstock for more drywall. Many Built Green[®] builders will require you to recycle your drywall as part of your contract.</p>

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Statewide Built Green[®] Action Items
<p>Use NFRC certified windows with a U-factor of 0.32 or better, OR: If using unlimited glazing, use a U-factor of 0.30 or better. ENERGY STAR[®] qualifying windows in the northern climate region must have a U-factor rating of 0.35 or below. Skylights must have a U-factor rating of 0.45 or below.</p>
<p>Use glazing with solar heat gain coefficient (SHGC) less than 0.35 on south and west-facing windows. Windows made using specially coated or tinted glazing reduce the window's solar heat gain coefficient (SHGC). They block the heat gain without rejecting too much visible light.</p> <p>Or: Orient and design the glazing to make the best use of passive solar availability. To make the best use of passive solar potentials on-site, orient the majority of the building's glazing within 22 degrees of due south. To prevent overheating, window glass on the south side of the building should not exceed 8% of the floor area. Window area, however, can be increased significantly (and solar performance enhanced) if there is accessible thermal mass in the space to absorb excess heat. Windows on the south side should have a SHGC ≤0.6.</p>
<p>Install a maximum of 1% of the floor space with skylights, OR: install light tubes. Because skylights use sunlight in addition to daylight, they can be three to ten times smaller than a window while collecting the same amount of light. Installing no more than 1% of the floor space with skylights provides optimum daylighting while maintaining the overall energy efficiency of the envelope.</p>
<p>Install an operable skylight (manual or automated) high up in the structure to aid natural ventilation. Use U-factor of 0.45 or below and solar heat gain coefficient of 0.35 or below. An operable skylight allows controlled natural ventilation but can be a source of unwanted solar heat gain and/or thermal loss. Select the location carefully and weigh benefits against disadvantages.</p>
<p>Use wood/composite or fiberglass windows. Window frame materials made of composite recycled polyvinyl chloride (PVC) or high-density polyethylene (HPDE) plastics and waste wood fiber provide the dimensional stability and thermal performance of wood, and the uniformity and decay resistance of plastics. Fiberglass windows require less energy to produce into a final product than PVC or aluminum, reduce condensation, won't contract or expand like wood, are least likely to crack, corrode, rot, or leak, and produce the highest energy efficiency and the lowest environmental impact.</p>
<p>Use finger-jointed wood windows. Due to decline in availability of stable, clear, mature wood, the window industry has developed finger-jointed wood products. These are smaller scraps of lower value wood, edge-glued together and covered with top-quality wood veneers on the finish surface.</p>

Statewide Built Green® Action Items

Use third-party-certified, sustainably-harvested wood windows.

Third-party-certified sustainably-harvested wood is monitored and evaluated, and increases public confidence that sustainable wood-harvesting practices were used to create the window frames.

Do not use vinyl windows.

Vinyl windows are commonly-used materials and are often selected for economy and presumed durability. Vinyl is not environmentally preferred, however, due to the toxic manufacturing process required, the limited potential for recycling the material once used as window material, and the difficulties with proper disposal at the end of its service life.

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Statewide Built Green[®] Action Items
<p>Use recycled-content roofing material.</p> <p>Several new composite options provide lower maintenance along with durability. Many roofing options include recycled-content or reclaimed materials: fiber-cement composites, asphalt shingles, plastic shakes, metal shingles, and rigid sheet material made with fiber and asphalt. In general, look to achieve a minimum of 25% recycled content.</p>
<p>Use 40- or 50-year roofing material.</p> <p>Using durable materials with long lasting value prevents frequent replacement need. This is an asset to the homeowner and adds value to any home. Varieties of organic felt based shingles have up to 40-year warranties. Some brands of aluminum or steel shingles have 50-year limited warranties and include a coating that is HUD-approved for rainwater collection suitability. Fiberboard shakes also come with 40 to 50 year warranties, are durable and can be nailed and sawn similar to wood shakes.</p>
<p>Avoid zinc-galvanized ridge caps, copper flashing, copper wires, or copper/zinc impregnated shingles for moss prevention.</p> <p>Sometimes installed on roofs to discourage moss and other growth, zinc-galvanized ridge caps, copper flashing, copper wires, and shingles impregnated with copper or zinc granules 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.</p>
<p>Install a vegetated roof system (eco-roof or green roof).</p> <p>A green or vegetated roof helps reduce impervious surfaces (areas that don't absorb rainwater) and can provide some insulation as well as aesthetic benefits. Components include a strong , waterproof membrane and a structure to hold soil in place and prevent root damage to the membrane. Work with a knowledgeable landscaper to choose plants that can tolerate dry, exposed conditions.</p>
<p>Pitch and flash roofs properly.</p> <p>All roof penetrations must be properly flashed. Check your local program requirements for recommended roof pitch specific to your region.</p>
<p>Recycle asphalt roofing.</p> <p>Asphalt shingles, tar paper, flashing scraps and other building materials can be collected on site and recycled for less money than it costs to be landfilled.</p>

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Statewide Built Green[®] Action Items
<p>Design for no mechanical air conditioning (heat pumps may be acceptable).</p> <p>Design a home to make the best use of natural ventilation and passive cooling techniques. Some exhaust air heat pump systems for water heating can provide space conditioning at about 7,000 Btu/hour, adequate for supplemental conditioning of a family room, living room, or great room.</p>
<p>Ensure heating and / or cooling equipment is correctly sized to meet design heating and cooling loads of home (do not oversize).</p> <p>By limiting the size of space conditioning equipment, you avoid excessive equipment cycling, which reduces energy efficiency and service life and increases maintenance requirements. It also insures that the run cycle is long enough to condition air, by removing moisture and filtering the air. An efficient building envelope will also reduce the heating load, sometimes substantially, so factor this in when sizing the HVAC system.</p>
<p>Locate heating/ cooling equipment and the distribution system inside the conditioned or heated space.</p> <p>A heating system's efficiency can be improved by 30% or better if the entire heating system is located within the heated space. Ensure the system is sized accordingly.</p>
<p>Install ENERGY STAR[®] heating and cooling equipment.</p> <p>ENERGY STAR[®] recommends the following for:</p> <ul style="list-style-type: none"> • Heating equipment includes 90% AFUE furnaces; • Cooling equipment includes 8.0 HSPF heat pumps, and 7.6 HSPF for single package equipment (electric/gas packs, etc.). <p>Check with your local program for specific requirements.</p>
<p>Install a ductless heating system (radiant floor, hydronic, baseboard or ductless mini-splits).</p> <p>In addition to lowering operating efficiency, air leakage in forced-air heating systems frequently impacts indoor air quality. Duct leaks bring air into the home from undesirable locations, such as attics, crawl spaces, and the garage. Duct leaks can also induce combustion equipment backdrafting. Reduce impacts by thoroughly sealing the ductwork with mastic. Or eliminating these problems entirely by selecting a ductless heating system, such as a ductless electric heat pump, radiant floor, radiant panel, or baseboard system.</p>
<p>Install variable speed fan drive.</p> <p>Air handling systems can often be the largest consumers of electricity in a house. Variable Frequency Drives (VFDs) are an alternative that use roughly half as much energy as a damper-type continuous air flow system. VFDs also regulate air flow and temperature to increase overall building comfort.</p>
<p>Insulate ducts located in unconditioned space.</p> <p>Uninsulated ducts in the crawl space can increase energy use and moisture in the crawl space. Attic ductwork can also reduce energy efficiency through heat loss. Recommended practice is to insulate ducts to R-11. Check with your local program for specific requirements.</p>

Statewide Built Green® Action Items

Seal ducts using low-toxic mastic or aerosolized sealing system.

Efficiency of the heating distribution system can be improved by 15% if the ducts located in the crawlspace or attic is well-sealed. Use fittings with gaskets, or seal with mastic. Aerosol sealing will seal ducts from the inside, so select products with low- or no-toxicity and ventilate the area during application.

Performance-test ducts for air leakage and ability to meet third-party-review and verification.

Duct performance tests prove the airtight integrity of the ducting and provide third-party certification that you can show your customers.

Install return-air ducts or install passive pressure relief in bedroom(s).

Adequate fresh air supply to sleeping areas is important since sleeping accounts for a majority of the time spent in a home. Installation of return air ducts in every bedroom ensures adequate fresh air supply to sleeping areas.

Verify performance of ventilation systems by measuring supply and exhaust airflow, and by checking control activation and damper operation.

This Best Management Practice (BMP) verifies proper operation of ventilation systems by measuring the air flow of all supply and exhaust systems using a flow hood. Check controls for proper activation and mechanical damper operation, if applicable.

Install furnace and/or duct-mounted air cleaner or high efficiency air filter (non-electronic).

The higher the efficiency, the better the filtration system is at capturing and removing small particles from the air. A HEPA (High Efficiency Particle Air) Filtration System is 99.97% efficient at removing particles of 0.03 microns.

Avoid electronic, metal mesh, horse hair, or non-pleated fiberglass filters.

Electronic filters are a high maintenance item. Unless the filter elements are cleaned frequently (in practice this is rarely done), the result will be air quality that is degraded, rather than improved. Metal Mesh and horse hair filters are equally ineffective. Non-pleated fiberglass filters primarily serve to protect the fan and minimize dust in air distribution systems. Although they may capture large particles from the air, they miss tiny particles. Pleated, non-fiberglass filters are the best option for fans.

Select programmable thermostats with night-time setback and switch for the furnace fan.

EPA estimates that Energy Star® labeled programmable thermostats, when used properly and with appropriate equipment, can save consumers 20-30% on heating and cooling bills.

Provide balanced indoor pressure using controlled ventilation.

In a tight house, balanced ventilation keeps outdoor pollutants from being drawn into the house. Balanced ventilation prevents backdrafting or spillage from combustion appliances (due to under-pressurization), and prevents moisture migration into structural cavities (due to over-pressurization). Ducted fans or a heat recovery ventilator may be used to balance de-pressurization from exhaust ventilation or provide a slight positive pressure with a modest volume of fresh air. Verify that the volume of air supplied is as specified in the Washington State Ventilation and Indoor Air Quality Code.

Install 60-minute timers or humidistat for bathroom and laundry room fans.

Countdown timers allow effective use of bathroom fans without wasting energy. The room is dried out after use, and the fan automatically shuts off.

Flow-test all fans in the house.

The flow test should meet 75% of rated capacity. Research has shown that code required ventilation rates are adequate, but are not always met in the field. Test your installations using a flow hood or flow grid to verify that measured flow rates meet code requirements.

Statewide Built Green® Action Items

Install spot ventilation fans to the same standard as a whole-house fan (fan noise at 1.5 sones or less, etc.).

Washington Ventilation and Indoor Air Quality Code (VIAQ) requires the installation of whole-house ventilation in all new homes, and specifies several requirements as the standard for that installation.

VIAQ standard requirements for this category include:

- Fan Rating – Based on application, fan exhaust rates should be at 0.25 inches water gauge, which is shown on the manufacturer's fan curve. The rating marked on packaging, however, is often at the lower 0.1 inches water gauge, which does not meet the VIAQ requirement
- Fan Noise – Fans must be rated at 1.5 sones or less if the fan is located within 4 feet of the interior pick-up grille
- Ducts must be sized and installed appropriately with respect to number of elbows and length of run. Ducts must also have a back draft damper, be insulated to R-4 outside heated space, and terminate to the out-of-doors
- Outdoor Air Inlets – Must be provided into each space with an exhaust fan.

Install exhaust fans in rooms where office equipment is used.

More and more residences include home offices or dens where computers, faxes, photocopiers, and other business machines are used. This office equipment and the supplies associated with each can emit VOCs and gases like ozone, which is carcinogenic in high concentrations. A spot fan, installed in a home or commercial office, is an effective means of reducing health risks by ridding the space of such pollution. Make sure you allow for fresh air intake elsewhere in the building to balance the system and ensure adequate ventilation.

Install central vacuum, vented to outside.

Central vacuum systems efficiently remove dirt without stirring up or releasing microscopic dust particles inside the home. Locate the vacuum in the garage, and exhaust it to outside.

If garage is attached, air seal it from the house and install proper ventilation.

Studies show that carbon monoxide, sometimes produced in significant levels when automobiles are started, can enter the home from the attached garage. Other pollutant sources include off-gassing from chemicals and power tools commonly stored in garages. Install an exhaust fan in the garage, rated for continuous operation (non-ducted exhaust fan: 70 cubic feet per minute (cfm), or greater, ducted exhaust fans: 100 cfm or greater).

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Statewide Built Green[®] Action Items

Substitute ENERGY STAR[®] compact fluorescent reflector & fixtures, halogen, or LEDs for incandescent downlights.

- Compact fluorescent lights (CFL) use about a 1/3 the energy and lasts 8-10 times as long as incandescent lighting. Newer, smaller CFL screw-in bulbs can be substituted in most applications, and can save substantial energy in the kitchen, outdoor/porch, and other high-use rooms. Many new styles and higher quality light make CFLs a choice with lasting benefits. Special disposal is required because their small mercury content.
- Halogens last longer and are about 10% more efficient than standard incandescent bulbs. They have a whiter light that may allow you to install lower wattage bulbs than if using standard incandescent, saving more energy.
- Light-emitting diodes (LEDs) are 90% more efficient than incandescents, and are ultra-durable and mercury-free. Their high initial cost is rapidly repaid in energy savings and 20-year service life.

Install two or more properly supported ceiling fan pre-wires.

Provide wiring and switching needed for two or more ceiling fans in the electrical plan. When installed, a ceiling fan can be used as a low-energy option to provide cooling on hot days.

Use appropriate lighting controls & motion detectors on exterior lights, and dimmers, timers and motion detector on interior lights.

Where appropriate, controls can turn lights off automatically in areas where they may be left on unnoticed, and dimmers allow users to reduce lighting intensity. Light- and motion-sensing devices help save energy and lengthen lamp life.

Install hard-wired ENERGY STAR[®] CF bulbs or fixtures.

For maximum cost-effectiveness, place fluorescent fixtures in the locations that get the greatest use. The most used fixtures are commonly in the kitchen, followed by the porch, living room, and other outdoor lighting. Recommended practice is to install more than 50% of the sockets with CF bulbs or fixtures. Check with your local program for specific requirements.

Use solar-powered walkway or outdoor area lighting.

Solar powered outdoor lighting uses a photovoltaic (PV) panel to generate electricity during the daytime, which is then stored in a battery. At night the stored electricity is used to power the light. Models vary from being manually activated, to light- and motion-sensing activation. Most of these walkway or security lights require no wiring or installation other than pushing the stake into the ground, or screwing the fixture to the garage wall

Statewide Built Green® Action Items

Install CO detector(s) (hard-wiring required for 4- and 5- Star Certification).

Carbon monoxide (CO) is produced by incomplete combustion of natural gas, wood, coal, oil, kerosene, gasoline, and even tobacco. Home detectors warn occupants of unsafe CO levels and are relatively inexpensive and easy to install. Install detectors near all fuel burning devices and bedrooms.

Pre-wire home for photovoltaics (PVs).

Pre-wiring for a future PV solar energy system is a cost-effective way for builders to provide a future renewable-energy option for new home owners. Easy installation of future PV becomes a selling point for builders and is a great way to “future-proof” a house.

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The following practices represent Built Green[®] checklist action items from several Washington State programs. Code and permit requirements vary throughout the state, so **be sure to check with your local program, local County Health Department officials, and the Department of Ecology**. If one of the Action Items is not allowed in your jurisdiction, find out why not!

Statewide Built Green[®] Action Items
<p>Plumb for graywater reuse (check with authorities). Graywater is all wastewater generated in the house, except by toilet flushing (black water). Sometimes referred to as “recycled” water, this includes wastewater from laundries, showers, and sinks. Points are achieved by using greywater for irrigation and/or flushing toilets.</p>
<p>Investigate a rainwater or graywater collection system (check with authorities). Rainwater collected from the roof and other hardscape can be a free source of irrigation water for the home landscape, and in some areas, as a source of potable water if appropriately treated. A graywater collection system can recycle water for non-potable (not for drinking) uses. A rooftop rainwater collection system consists of a suitable roof with guttering to storage tank(s) or cistern, with simple filtration and a small-scale pressurized pump. Check with local authorities regarding water rights and cistern installation and to request assistance with the necessary permits.</p>
<p>Locate water heater within 20 pipe feet of highest use. Locating the hot water heater near the point of highest use will minimize pipeline energy loss. Typically, the point of highest domestic hot water demand is the shower.</p>
<p>Install on-demand or small, local hot water delivery system, or “home run” hot plumbing at farthest location from water heater. The goal is to eliminate the waste of energy from water heated but left standing in long pipe runs from a water heater to the point of use.</p> <ul style="list-style-type: none"> • On-demand systems are centralized or located at the point of use. These heat the water as it passes through and are best for intermittent demands. • A small, well-insulated tank heater can be installed at a remote point of use. • “Home Run” hot plumbing uses a smaller diameter pipe to deliver hot water direct from water heater to a remote location.
<p>Install a recirculating pump for domestic hot water. Recirculating pumps can be used with standard plumbing. The pump rapidly moves water from the water heater to fixtures, and sends the cooled water back to the water heater for reheating. This system saves both water and energy conventionally wasted while occupants wait for the water to heat.</p>
<p>Install sealed combustion heating and hot water equipment, if home is fueled by natural gas, oil or wood, and locate it within conditioned space. Sealed combustion equipment draws combustion air from outside the conditioned or living space and exhausts combustion by-products directly to the outside, allowing no spillage or backdrafting into the living space. Maximize the distance between exhaust vents and fresh air intakes. Install all water heaters within conditioned space and insulate their exterior to reduce heat loss to the outside.</p>
<p>Select electric water heaters with efficiency factor (EF) of .93 or higher. Upgrading electric water heater efficiency from an Energy Factor (EF) of .88 (code) to .93 will save 225 kWh per year. Household operational savings will support an additional cost of about \$50.</p>

Statewide Built Green® Action Items

Consider an exhaust air heat pump water heater or desuperheater: EF 1.9.

The exhaust air heat pump is a good option for families who require lots of hot water. A unit with an EF of 1.9 will yield 50% savings in energy use compared to a conventional system. A desuperheater, a small auxiliary heat-exchanger' can capture additional energy to heat water.

Install gas or propane water heater to efficiency factor (EF) of .61, .83, or .90.

Upgrading gas water heater efficiency from an EF of .55 (code) to .60 will save 18 therms per year. Household operational savings will support an additional cost of about \$38. Upgrading a propane water heater from an EF of .55 (code) to .60 will save 16 gallons of propane per year. Household operational savings will support an additional cost of about \$50.

Install instant (tankless) hot water systems in a central location.

Standby energy losses represent 10% to 20% of a household's annual water heating costs. With instant, on-demand, or tankless water heaters, you only heat the water you use. Instead of storing hot water in an insulated tank, the water is heated on demand, at point of use or nearby. These systems can save as much as 3 to 4 gallons per use, (the amount of cooled water drained before hot water arrives at the faucet in traditional systems), plus the heating energy used but wasted when this water cooled.

Install drainwater heat recovery system (DHR).

A significant amount of energy is lost when draining warm wastewater. Drainwater heat recovery (DHR) devices fit into existing drain lines to capture exiting energy and redirect it to preheat cold water going to a shower or to a water heater. DHR systems reduce the 'new' energy needed to heat water and can increase the efficiency of water heaters.

Consider a solar hot water system to supply all or part of household hot water needs.

Solar energy can meet part or all of a home's domestic hot water needs. Geographic location, solar access, system design, collector orientation, and collector size will determine how much energy can be provided for domestic hot water heating. A solar water heating system may result in immediate positive cash flow if the monthly cost of financing the system is less than the net savings. Check local program for point threshold details.

If using a water filter at the sink, select one with biodegradable carbon filter.

As a result of growing concern about the quality of drinking water, the popularity of water filters has increased dramatically. In fact, one third of consumers surveyed in a 1997 Water Quality Association study reported they use a home water treatment device other than bottled water.

Install showerhead filter.

Recent studies indicate that exposure to chlorine, absorbed through the skin during showering, can contribute to increased risk of health problems. Showerhead filters on the market today effectively remove 90% or more of chlorine from shower water.

Install a whole house water filtration system.

Generally, no one single whole house water filter can filter chemicals, microorganisms, and sediments. Find a dual purpose "effective" product or design a multi-filter system to capture all contaminants. Whole house systems are inline systems at the point of entry.

For bathroom and kitchen faucets, select fixtures with GPM less than code.

Federal law requires that faucets have flow rates no greater than 2.5 gallons per minute (gpm). Faucets typically use 11.4 gallons per person per day. Selecting low-flow faucets (less than 2.5gpm) can help reduce overall water use. Faucets with flow rates of 2.0 or 1.5gpm are effective and now readily available.

Statewide Built Green® Action Items

For showers, install showerheads with a flow rate (GPM) less than code.

Consumer performance complaints with reduced flow rates are most often associated with the “feel” of the water coming from the faucet, and with clogging associated with fixtures that reduces flow rate with small hole screening. Showerheads with flow rates less than 2.5gpm that have the ‘feel’ of higher flow and that are guaranteed against clogging, are now available.

Provide the most efficient aerators available on market.

Install aerators that do not exceed 2.2gpm for kitchen faucets and 0.5gpm for bathroom faucets. Adding air to the water flow from faucets helps maintain water temperature and coverage while reducing overall water consumption.

Install high-performance low-flush or dual-flush toilets and/ or waterless urinals.

Toilet flushing is the largest single use of water (up to 40% of residential water use) inside the home. Water savings from new low-flush and dual-flush models is significant compared to older models that used 3 to 5 gallons per flush (gpf).

Consider composting toilets.

Composting toilets convert human waste into nutrient-rich fertilizer for non-food plants, rather than mixing the waste with potable water and flushing it down the drain. The advantages of these toilets include dramatic reductions in water use, reduced groundwater pollution and/or sewage treatment impacts, and a recycling of nutrients and costs associated with sewage infrastructure.

Install ENERGY STAR® Appliances.

ENERGY STAR® certified clothes washers offer significant water and energy efficiencies (up to 30% less) compared to non-certified machines. Horizontal-axis (H-axis) washers use less water and detergent per wash, and are gentler on clothes so they last longer. Energy- and water-efficiency are closely related in dishwashers except for booster heating and drying cycles. The most water-efficient dishwashers use as little as 3.9 gallons per cycle at the economy setting.

Provide food waste chutes and compost worm bins instead of food garbage disposal.

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 and tilth. 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.

Specific East of Cascades Considerations

Install a chemical- and salt-free water softener system.

Hard water can cause residue build-up on fixtures and faucets. Over time, scale can restrict flow in plumbing and appliances, which decrease their longevity. Chemicals or salts released from conventional water softener systems can lead to long term health effects. Alternative water softener systems can reduce all these problems, as well as save money long-term. Some alternative systems work by forcing water to pass through a tube with a rough alloy surface inside of it. The roughness encourages molecules to form into crystals in the tube, instead of clogging pipes, drains, or toilets. Chemical- and salt-free softened water retains its healthful drinking qualities, and does not interfere with soap lathering the way hard water does.

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www.builtgreenwashington.org

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The following practices represent Built Green[®] checklist action items from several Washington State programs. Program details vary depending on the program's location, regional climate and industry conditions. For all below action items, check with your local program for specific details on minimum requirements, available points, and performance thresholds.

Statewide Built Green[®] Action Items
<p>No carpet in home.</p> <p>Synthetic carpet off gases when new. All carpet acts as a highly- efficient 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.</p>
<p>If using carpet, specify low-VOC carpets.</p> <p>New carpet can emit volatile organic compounds (VOCs) when first installed. The Carpet and Rug Institute developed testing and labeling programs to aid in the selection of low-emitting carpet, adhesives, and cushion materials. Recommended practice is to specify carpet with Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) Label. Check with your local program for detailed requirements to earn points for this action.</p>
<p>If using carpet, install low pile or less allergen-attracting carpet and pad, and choose carpet without brominated flame retardants and/or made with natural fibers (jute, sisal, wool, and bamboo).</p> <p>Choose a low pile carpet to protect air quality. Preferably, select a natural fiber or all-nylon carpet and pad, which is less attractive to dust mites and mold. Also look for recycled-content carpets containing less toxic material. Carpet tiles allow for the replacement of individual tiles that have been stained or worn without having to replace the entire carpeted surface.</p>
<p>If using carpet, limit carpet to one-third of home's conditioned area.</p> <p>The healthiest floor choices are smooth surfaces, such as tile, linoleum, wood and finished concrete, which do not harbor dust and other allergy-causing particles. Solid surfaces are easier to clean than carpet .</p>
<p>If installing carpet, use recycled-content carpet pad.</p> <p>Carpet padding may be made from several recycled content materials including nylon and polypropylene waste from carpet manufacturing and recycled tire rubber and rebound urethane, reprocessed from virgin prime urethane products.</p>
<p>If installing carpet, use rapidly-renewable or recycled-content, renewed carpet, or replaceable carpet tile.</p> <p>Recycled-content carpets may include plastic yarns produced from recycled pop bottles or recovered fibers from recycled textiles. Wool carpet is another resource-efficient option that is renewable, biodegradable, naturally fire- and stain-resistant, and colorfast. Renewed carpet is used carpet that has been thoroughly cleaned and re-stamped. A variety of attractive renewed styles are available.</p>
<p>If using carpet, install using dry method (no glue).</p> <p>Adhesives used to install the carpet to the floor are a significant source of odor and air pollution. Tack strips eliminate this problem. As a last resort, choose a low-odor, water-based adhesive. Never use solvent-based carpet adhesive.</p>

Statewide Built Green® Action Items

Use plywood and composites of exterior grade or that have no urea-formaldehyde for subfloor.

Particleboard, interior grade medium density fiberboard (MDF), and other interior use products use urea-formaldehyde glue as a binder. Urea-formaldehyde in the indoor environment can cause health problems for the occupants. Instead, use materials containing no urea-formaldehyde, or use products with exterior-grade glue, often phenol-formaldehyde glue. Phenol-formaldehyde glue off-gases quickly, and is often gone before the product reaches the jobsite.

Use recycled-content underlayment for sub-floor.

Using underlayment products below wood, tile, resilient flooring, or carpet and carpet cushion provides a level surface, covers cracks, and helps insulate floors from sound transmission and some heat loss. Standard particleboards are traditionally used for the purpose of underlayment, even though they are known to be the primary source of toxic formaldehyde gas in new homes. Exterior-grade plywood or formaldehyde-free wood fiberboards with recycled-content are both superior choices for underlayment. Other environmentally preferable materials for flooring underlayment include natural cork and products made with recycled rubber, paper, jute, hemp, and/or agricultural fiber.

Use reclaimed wood flooring.

Hardwood flooring is a valuable and desired material and low in embodied energy in wood-rich areas. Reclaimed wood can be reused successfully as flooring when properly removed and refinished.

Use recycled-content glass, ceramic, or porcelain tile.

Several manufacturers make glass, ceramic, and porcelain tiles with recycled content. These tend to be pricey, but are very durable and offer an attractive opportunity to highlight (and market) the use of an environmentally-friendly material to your client or market. Recommended practice is to use minimum 40% recycled-content glass. Check with your local program for specific requirements.

Use linoleum, cork, salvaged wood, or bamboo flooring.

Linoleum is durable, low-maintenance, and made of natural linseed oil, pine resin, sawdust, cork dust, limestone, natural pigments, and a jute backing. Linoleum does not contain significant petroleum-based products or chlorinated chemicals (vinyl sheet flooring does have this and is often mistakenly referred to as 'linoleum'). Cork and bamboo are renewable resources and natural materials. Cork flooring is durable, sound absorbing, and naturally moisture-, mold-, and rot resistant. Bamboo flooring is very durable and a dimensionally stable material. Despite long distance transport of these products to the United States, the renewability and performance of these products can justify specifying them instead of wood.

No vinyl flooring.

Vinyl flooring is a commonly-used material and often selected for economy and durability. It is not environmentally-preferred due to the manufacturing process that creates air pollution problems and off-gassing concerns during manufacturing, installation, occupancy, and disposal.

Use a durable, spot-repairable floor finish.

Spot-repairable floor finishes, also known as penetrating oil or wax finishes, soak into wood fibers unlike products such as polyurethane, which coat the floor with a plastic film. As polyurethane wears down over time, everything must be removed from the floor so screening and recoating can be done. This inconvenient process prevents many floors from being properly maintained, sacrificing the life span of the wood floor. A spot repairable finish can be touched-up in only areas that need it.

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Statewide Built Green[®] Action Items

Use light-colored interior finishes.

Since they naturally reflect both natural and artificial light, light colored interior finishes reduce the demand for additional artificial lighting.

Use low- or non-VOC interior paints and finishes for large surface areas, doors, window casements and trim.

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 volatile organic compounds (VOCs) during, and for months following application, which can cause upper respiratory irritation to painting crew and occupants. "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.

Use water-based, non- or low-VOC, non- or low-toxic, sealers, grouts, mortars, caulks, and adhesives inside the building.

Low-toxic, clear sealers are also available to use as finishes for woodwork. Water-based varnishes, polyurethane, and other finishes for hardwood floors are very durable and much safer to handle than traditional products. Low- or non-toxic solvents, water-based strippers, and all natural thinners are also readily available.

Properly ventilate with fans after each new finish is applied.

Each new finish (for example, paints, stains, and floor finishes) will off gas for a time after it is applied. It is important to ventilate the house with fans (several box fans in windows work best) so that gases will be exhausted outside. Venting out should continue for at least two and up to seven days after each application, depending on the amount of surface covered and the toxicity of the finish. If the house is not properly ventilated during this phase, the emitted gases will adhere to surfaces in the house and later re-release gradually into the indoor environment. Use construction filters on the HVAC system and change them out before occupancy.

Specify and use recycled or "reworked" paint and finishes.

Companies are marketing recycled paint on a regional basis. Recycled paint was formerly offered only in limited colors and styles, but the selection is expanding, and recycled paint is usually cheaper than its virgin counterpart.

Statewide Built Green® Action Items

Use natural wall finishes, such as lime paint and clay.

Natural finishes refer to lime paints, milk paints and clays free of plastics and acrylics and low in 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 in toxicity.

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