

Roofing Materials

Overview

The roof is the first line of defense against the elements, protecting the people and things you value on the inside of your home or structure. Beyond this critical role, roofs can improve your home's performance and comfort. For instance, the slope of the roof, color and material type can help reflect rather than absorb solar heat and reduce stormwater runoff.

Additionally, roof materials play a major part in affecting local water quality. Some roofing materials contain harmful ingredients such as arsenic, cadmium, copper, lead, and zinc and the stormwater runoff from roofs often filters directly into the local water table. You can help protect your local ecosystems while potentially reducing cooling needs and utility bills through informed and strategic roofing material choices. Below you will find different options, best practices, and important things to consider when upgrading, repairing or building your new roof.



Composite Roofing with solar photovoltaic panels. Source: O'Brien & Company.

Definitions

Solar Heat Gain - The increase in temperature in a space, object or structure that results from solar radiation.

Stormwater Runoff - Precipitation that flows over impervious surfaces, accumulating debris, chemicals, sediment and other pollutants as it goes, and does not percolate immediately into the ground.

Vegetated Roof - A roof that is partially or completely covered with vegetation and a growing medium, planted over a waterproof membrane.

Solar Reflectance Index (SRI) - The measure of a material's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black is measured at 0 and a standard white is 100.

When is This Applicable?

Whether you are repairing or replacing your roof or planning to build a new structure, there are opportunities to consider roofing material choices and how your roof water runoff will be handled. When doing roof work, you might also consider pre-wiring for solar, even if you have no immediate plans to install a solar array; integrating the pre-wiring into the roof is a better approach than drilling holes in a good roof later.

Roofing is covered in the following code areas: stormwater/infiltration, structure, and innovations (solar installation).



What Makes it Green?

Consumers have many choices when it comes to roofing materials. While initial cost is often a driving force, there are numerous other considerations that factor into the total lifetime costs and benefits of your roof including many that deliver green benefits.

Roofing Materials

Durable roofing materials offer long lasting and require less frequent replacement, saving natural resources and money while adding value to your property.

Roof Runoff

You can make roofing choices that minimize pollution transported to our water bodies through roof runoff. For example:

- Choose roofs that are not pollution-generating in order to avoid the need for additional treatment of roof runoff for water quality mitigation. Metal roofs are considered pollution-generating impervious surface unless they are treated to prevent leaching of zinc and other water pollutants.
- Consider using a vegetated roof to help you meet the requirements for full infiltration of roof runoff for your project (See Appendix C of the Surface Water Design Manual). Vegetated roofs reduce stormwater runoff by facilitating some infiltration, slowing peak flows, and increasing evapotranspiration when conditions allow. This in turn decreases the demand on our stormwater systems. Vegetated roofs can also help promote clean air and increase wildlife habitat.



Metal Roofing. Source: Studio Hamlet Architects.

Installation

Air sealing and proper insulation will improve home comfort and thermal performance of the roofing assembly, reducing energy consumption and saving money on your energy bills.

Rooftop Solar Options

Adding solar photovoltaic panels or solar thermal collectors to your roof increase your energy independence and reduce your carbon footprint. The cost of solar energy systems is falling rapidly - some forecast photovoltaic systems will be cheaper than grid electricity in King County in the near future.

- Even if this is not an option for you now, prewiring for solar is a great way to make the possibility easier in the future.
- You can save money and later hassle by properly detailing the structural and conduit while someone is working on your roof, making the addition of solar panels a plug-and-play opportunity for you or a future owner.



Best Practices

Solid-Surface Roofing

- Pay careful attention to the design of your roof – think like water when looking at the design. Is there a free path for the water from the point of impact to the bottom of the downspout? Even the best flashing and materials will fail if water flows are concentrated and constrained by roof lines.
- Use durable materials to reduce the frequency of replacement. Some varieties of shingles have 40-year to lifetime warranties, while some aluminum or steel shingles have 50-year warranties and include a coating that is HUD-approved for rainwater collection suitability.
- Consider one of numerous composite roofing material options that can provide lower maintenance along with durability. Because some composite materials may contain zinc, it is important to identify the ingredients of your options before making a decision.
- Give preference to shingles with recycled content, preferably at least 25 percent post-consumer content.
- Asphalt shingles typically contain recycled “mixed” waste paper or reclaimed mineral slag, some resulting in 20 to 25 percent recycled content.
- Roof panels made from recycled plastic resins provide a lightweight roofing alternative.
- Recycled aluminum shingles may contain up to 100 percent recycled content.
- Based on a recent Department of Ecology collaborative study with King County and Roof Manufacturers, it’s best to avoid the following materials to prevent the release of additional pollutants in runoff:
 - Treated wood panels - copper and arsenic
 - PVC panels - arsenic
 - Copper panels – high copper concentrations
 - Zinalume® and EPDM roof - zinc



Salvaged Tile Roof. Source: O'Brien & Company.

If you consider a vegetated roof (and want it to count as an impervious surface):

- The roof must be designed to carry the added load of a vegetated roof system; therefore design by a structural engineer may be needed.
- A 60- to 80-millimeter reinforced PVC membrane must be placed on the roof surface to provide waterproofing and protect against root penetration, or if the roof is asphalt-based, the membrane must be high-density polyethylene (HDPE).
- If the roof surface is flat or has a pitch flatter than 1 in 12, an underdrain system or layer must be provided to drain excess water away from the root zone of the soil layer.
- The growing medium must have the capacity to store a minimum depth of 3 inches of water for full Best Management



Practices (BMP) credit, partial credit will be given for reduced storage.

- The soil layer must be adequately contained on the roof with sidewalls or other appropriate means.
- The composition of the soil layer must be confirmed by a civil engineer as meeting the desired soil storage and the maximum allowable loading specified by the structural engineer.
- Plant grass or other vegetative cover suitable for shallow soils and harsh roof conditions (e.g., various species of sedum, sempervivum, creeping thyme, allium, phloxes, antenaria, armeria, and aubrieta).
- Vegetated roofs must not be subject to any use that would significantly compact the soil.
- Provision must be made for supplemental irrigation during the first dry season to ensure plant survival, along with replacing dead plants, removing weeds and leaves, and clearing drain inlets.

- Make sure your gutters are clear, continuous and well attached to your home.
- Remove overhanging tree limbs to avoid pest infestation and potential damage from falling branches.
- If you have one, inspect your attic ceiling to identify any issues that may not be visible from the exterior. Look out for streaks or staining from water leakage as well as holes and insulation damage from pests.

Roof Removal / Disposal

You may be able to recycle your old roof. Check King County's interactive website [What do I do with...](#), which allows you to select the materials you are looking to recycle/dispose of and see locations and contact information for many sites, as well as King County's [2012 Construction Recycling Directory](#).

Maintenance

After installation, continued roof maintenance is the most important factor in prolonging the life and performance of your roof.

- Visually inspect your roof for damage or debris (algae, fungus, moss, leaves, etc.) on a regular basis to identify trouble as soon as possible and avoid cumulative effects of disrepair. Do this by walking around your home and, if accessible, by climbing a ladder. Also schedule routine professional inspections every few years.
- Check the flashing around all exterior penetrations, such as vents and chimneys, for signs of deterioration.



*Vegetated (green) roof.
Source: O'Brien & Company.*



Applicable References/ Standards

2009 King County Surface Water Design Manual: In particular, Appendix C:

- Section C.1.3.1 Small Lot BMP Requirements
- Section C.2.8 Vegetated Roof C-71

Bulletin 9 – Obtaining a Residential Building Permit: Submittal Requirements.

Resources

For the complete King County Green Building Handbook and individual Green Sheet PDF files, please visit our website at: <http://kingcounty.gov/property/permits/publications/greenbuild.aspx>. For additional information, please email dperwebinquiries@kingcounty.gov or call 206-296-6600.

See these related DPER Green Sheets (GS):

- Green Products, GS Number 7
- Solar Energy, GS Number 20
- Permeable Surfaces and Driveways, GS Number 3
- Routine Maintenance, GS Number 5

ASTM International www.astm.org/Standards/roofing-standards.html

National Roofing Contractors Association (NRCA) www.nrca.net/

WA Department of Ecology, Investigation of Toxic Chemicals in Roof Runoff <https://www.casqa.org/asca/investigation-toxic-chemicals-roof-runoff>

Permit Tips

If you are increasing your existing roof load by more than five percent, you will need a permit. DPER will inspect the roof typically during the framing inspection.

Be sure to clearly show the roofing on your plan sections and include elevation views within the building plans.

