

PGO20 - Alternatives to Coal Tar-based Pavement Sealcoats: Guidance for Agencies, Property Owners, Associations and Managers in Bear Creek Watershed



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Problem

Coal-tar-based sealant is a thick black liquid that is applied to many parking lots, driveways and road surfaces in the Bear Creek Watershed to protect against cracking, natural deterioration and water & snow-melt damage. A significant component of coal tar is polycyclic aromatic hydrocarbons, or PAHs. Some PAHs are highly toxic chemicals. They have known harmful impacts on humans and animals (terrestrial and aquatic) and are suspected to cause cancer in humans. Friction from vehicle tires wears down the sealant into small particles. Snow removal practices can scrap-off the sealant. These dislodged particles are washed off pavement by rain or snowmelt and carried down storm drains or directly discharged into streams like Bear Creek and Turkey Creek. If rain or snowmelt occurs before coal-tar sealant has dried, it washes into nearby water bodies, sometimes harming fish and other aquatic life (e.g., macroinvertebrates, which are the food-base for fish. Seal coat particles can adhere to vehicle tires and are transported to other surfaces, blown off site by wind, or tracked indoors on the soles of shoes. PAHs tracked indoors can become dust and inhaled by people and pets.



Minnesota researchers have traced over 60% of the PAHs in Twin Cities stormwater pond sediment to coal tar-based sealcoats. In sediment studies elsewhere in the eastern half of the U.S., the U.S. Geological Survey has found amounts traceable to coal tar sealcoats ranging from 21% to 54%. A study by the University of Colorado Cancer center shows that roofers and road construction workers who use hot asphalt are exposed to high levels of polycyclic aromatic hydrocarbons (PAHs). Biological studies, conducted by the City of Austin, Texas, in the field and in the laboratory, indicated that PAH levels in sediment contaminated with abraded sealcoat were toxic to aquatic life and were degrading aquatic communities, as indicated by loss of species and decreased numbers of organisms. The USGS in 2001-2003, through its National Water-Quality Assessment and Toxic Substances Hydrology programs and in cooperation with local agencies, found PAHs in a number of urban streams (Cache La Poudre, Boulder Creek and South Platte River) and shallow groundwater wells along the Front Range.

Cleaning out and properly managing highly PAH-contaminated stormwater sediments is expensive: up to three times the cost of low-contamination, unregulated sediments. This issue confronts local governments in Colorado.

While there are other active sources of PAH contamination such as wood fires and vehicle emissions, coal tar sealcoat is one of the more easily preventable sources. In addition, safer substitutes are now available which are comparable in performance and price.

Water Quality and Biological Concerns

Based on the pitch residue from the coking of coal for steel production, coal tar sealcoats can cause cancer and developmental impacts in aquatic organisms and people due to chemicals they contain: polycyclic aromatic hydrocarbons or PAHs. These PAHs escape from the sealcoat layer as it dries and later, as it breaks down. PAHs escape from coal tar sealcoat and other pavement materials when they are scraped, washed or blown into stormwater holding ponds and other waters receiving rain and snow runoff. The PAHs build up in the sediments that drop to the bottom of these water bodies.

Aquatic life is affected in several ways through exposure of PAHs bound to sediments. USGS studies have shown PAHs found in sealcoat and other combustion-based materials are toxic to mammals (including humans), birds, fish, amphibians, invertebrates, and plants. PAHs tend to attach to sediments; possible effects of PAHs on aquatic invertebrates include inhibited reproduction, delayed emergence, sediment avoidance, and mortality. The Probable Effect Concentration (PEC) for total PAH, a widely used sediment-quality guideline for the concentration of a contaminant in bed sediment expected to adversely affect benthic (or bottom-dwelling) biota, is 22.8 milligrams per kilogram (mg/kg). Possible adverse effects on fish include fin erosion, liver abnormalities, cataracts, and immune system impairments. The BCWA suspects that macroinvertebrate populations are affected in streams near parking lots or roads with observed sealants. Because PAHs do not readily bioaccumulate within the food chain, possible human-health risks associated with consumption of fish are low.

BCWA Recommendation

Since preventing pollution is much easier than cleaning up after the fact, the BCWA recommends the discontinued or limited use of coal-tar based sealants in the watershed. Any person, homeowner, business or agency considering a surface sealant for short-term pavement maintenance within the Bear Creek Watershed is urged you to use alternatives to coal tar-based sealcoats, which are safer for human health, stream water quality and the environment. The BCWA wants you to help protect our environment.

Sealcoat Definitions

“Sealcoats” are mixtures of liquids and solid additives that are brushed or sprayed on asphalt pavement. They may include a layer of gravel but most homeowners and agencies understand the term as liquid-only. Properly applied, they cure into a layer which seals out moisture and oxygen, which break down the underlying asphalt. They are a lower-cost treatment that last two to four years, depending on the product, and extend the life of the pavement. Some owners or agencies use them to maintain a uniform black appearance to their paved surfaces.

There are several terms used for maintenance products that are applied on top of asphalt pavement and generally fall under the heading “sealcoat”. Most on the market are emulsions, a mixture of liquids that would separate without an additive (emulsifier) that allows them to mix and stay mixed. Pavement experts in some regions of North America use the term “surface seal” instead of “sealcoat.”

The following are binder oil and water emulsions, in order of increasing upfront cost and life:

- Fog seal — the sealcoat option used most by homeowners or others with a tighter budget is typically a form of fog seal emulsion of about 30% binder and 50% or more water, which may have polymers added to enhance product performance:
- Asphalt (petroleum-based) emulsion
- Coal tar pitch emulsion
- Gilsonite© emulsion
- Acrylic emulsion

Slurry seal — an asphalt emulsion with aggregates, mineral fillers and additives which bonds to existing pavement and cures to form a new wearing surface.

Chip seal — combines a layer of asphalt emulsion (about 60% asphalt and 40% water) and a layer of fine aggregate on top of the existing pavement layer.

For sealcoat emulsions with water, the water makes them easier and safer to spread, and when it evaporates, the thorough mixing allows the remaining binder oils and solids to cure in a uniform layer which seals out moisture and oxygen which break down the underlying asphalt.

Some newer types of sealcoats contain no water, with the liquids being agricultural, plant-based oil and various types of hydrocarbon solvents, usually with some polymers. Some of these are designed to replace lost or oxidized oils and restore flexing and binding properties of the asphalt pavement. Many people use “sealant” and “sealcoat” to mean the same thing, but the industry uses “sealant” materials to fill cracks ¼ to 1 inch wide.

Most highway departments and road agencies have not used coal tar products on asphalt pavement for many years, and many experts say they reduce asphalt life in the long run.

Safer Alternatives for Parking Lots, Driveways And Roads

Do not select products if their safety data sheets, container labels, or technical bulletins show the Chemical Abstracts Service (CAS) numbers **65996-93-2**, **65996-89-6**, or **8007-45-2**, or the words “*coal tar*,” “*refined coal tar*,” “*refined tar*,” “*refined coal tar pitch*,” “*coal tar pitch volatiles*,” “*RT-12*,” “*tar*” or similar terms. You may see coal tar/asphalt blends offered with as low as 10% coal tar content, but even at that level, PAH content is around 100 times higher than asphalt-based sealcoat. These blends should be avoided.

The most common and cheapest alternative to coal tar now on the market is petroleum asphalt-based sealcoat (CAS number 8052-42-4). Asphalt sealcoats contain PAHs, but at as little as 1/1000th the PAH level of coal tar sealcoats. Good asphalt sealcoat emulsions are very affordable, will provide a black appearance for 1-2 years, and can provide less-visible protection for 2-4 years if properly applied. They are permitted in locations with bans on coal tar.

Asphalt sealcoat data sheets may give ranges such as 10-30% for asphalt content, but ask for 30%. Polymer content of 2.5% to 5% aids drying, adds flexibility, and helps retain aggregate (chip or gravel) if you are applying a chip seal.

Other alternatives such as Gilsonite®, acrylic and agricultural oil-based seals contain few or no PAHs, but they tend to be higher-priced and they have less of a performance track record than asphalt seals. Even so, you should ask about these products and their effectiveness and cost as research and market conditions evolve.

When sealing a driveway, roadway or parking lot, please take the following precautions to help protect our local streams and lakes:

- Before using a pavement sealant, make sure that it does not contain coal tar, car tar pitch, or RT-12.
- Choose a product that is asphalt - or latex-based. Many major chains such as Home Depot, Lowe’s, and Ace Hardware, no longer sell coal tar sealants and only sell alternative products.
- For those hiring a contractor to do the job, specify that you want them to use a product without coal tar, and ask to see the label before they use it.