Reduce, Reuse within the State Materials Lab building

The WSDOT State Materials Lab has taken action close to home to reduce, reuse and recycle. We now recycle nearly every type of material we encounter, testing waste (aggregates, concrete, asphalt and steel) paper, cardboard, plastics and plastic sheeting, wooden pallets and even kitchen waste (wet or soiled paper towels, food waste, coffee grounds – all are taken for compost). The local waste hauler has certified the State Materials Lab as a Certified Green Program. Additionally, WSDOT’s State Materials Lab reviewed chemicals stored in the Chemistry Lab, evaluating the real need for having them on hand. By reducing those chemicals on hand (eliminating over 600 chemicals) we reduced consumption, the risk of storing potentially hazardous chemicals and the associated costs. Now, if we need a specialty chemical for a specific test, small quantities are ordered and after completion of the expected testing the remainder is recycled, greatly reducing hazardous chemical storage onsite.

Future Activities

Limestone in Portland Cement

Since 2008, WSDOT has allowed up to 5% limestone in portland cement, reducing greenhouse gas emissions while not affecting quality. Current studies underway are reviewing the opportunity of using even greater levels of limestone in hydraulic cements.

Solar Powered Traffic Systems

Solar power holds promise for a variety of traffic systems, especially in remote locations. We are examining solar powered systems for both new installations and for retrofitting old locations. In the right location solar power can reduce greenhouse gas emissions, reduce consumption and decrease costs.

More Warm Mix Asphalt

Asphalt pavement makes up 63% of our state highways. Making asphalt pavement requires heating up the rock and asphalt binder (the “glue”) to drive off moisture and make it pliable when it is placed. New technologies can reduce the mixing temperatures by 50°F or more, in a process called “warm mix asphalt or WMA (as opposed to the current “hot mix asphalt). Less heat means less fuel and lower emissions, conserving fossil fuels while reducing greenhouse gasses. WSDOT performed trial installations in 2008 and 2009 and in 2010 WSDOT opened up the use of WMA on all projects calling for asphalt pavement.

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Sustainability means many things to many people: businesses and our economy, spending time and money wisely, preserving our natural environment, investing in people and communities. Recently these principals have taken on new relevance and urgency. Highway materials, used to build embankments, pavements, bridges and other items, offer opportunities to innovate while improving the environment. Changes to hydraulic cements allow the substitution of limestone for cement, decreasing greenhouse gas production while preserving quality. In 2009, we eliminated coal tar emulsion treatments from the parking areas in our rest stops. The new emulsions used to protect the parking areas do not contribute to polycyclic aromatic hydrocarbon (PAH) pollution, unlike the coal tars. These innovations, and other opportunities, continue to address and improve our sustainability.

At WSDOT, a sustainable transportation system is a system that preserves the environment, is durable and takes into account how we build and the materials we use. We manage and operate this system using policies and strategies that meet society’s present needs without compromising the ability of future generations to meet their own needs.

Secretary of Transportation
Paula Hammond, P.E.
Three Key Words
Reduce, Reuse, Recycle: three key words in the world of sustainability. You reduce by building to last and by not using as much material in the first place. You reuse by taking a material and returning it back to the same use. Recycling takes one material manufactured for a specific use and remanufactures that material for a different use.

Reduce
Reducing involves working to eliminate the need to replace what you have built. Building higher quality, longer lasting facilities reduces the need to regularly replace those facilities. Better roads and better bridges last longer, reduce the need for maintenance and repair, and reduce the consumption of resources.

WSDOT designs highways to be functional and durable. The basic infrastructure for any highway, the embankment and the roadway, do not need replacement once built. The basic alignment and the roadbed beneath the pavement remain in place indefinitely.

Pavement Design
Asphalt pavement designs preserve the pavement structure by driving the distress to the surface. The surface course is easily replaced, leaving the pavement’s base course and subbase course untouched. Today’s asphalt pavement structures will not need to be rehabilitated for very long periods of time, exceeding 30 years or more. Asphalt pavement wearing surfaces last an average of 16 years on the west side of the mountains and over 12 years east of the Cascades. WSDOT’s concrete pavements have proven to be extremely durable. While making up only 9% of the state highway system, concrete pavements carry 35% of the truck miles and 35% of the total vehicle miles traveled. Today over 60% of our concrete pavements are 30 years old or older. Designed for a 20 year design life, these pavements now exceed their original design life by 50%. New concrete pavement designs use dowel bars to transfer loads between panels and are built thicker to handle greater traffic loads and to allow grading of softened tensile damage. These new designs should last 50 years or more.

Making Old Pavement New Again
Dowel Bar Retrofit (DBR) extends the pavement life of old concrete pavements. Adding dowel bars and grinding old concrete pavement smooth adds years to the life of these pavements. Extending pavement life reduces consumption, improving sustainability, while also saving money.

WSDOT is a nationwide leader in the design and implementation of dowel bar retrofit techniques.

Pavement Management
WSDOT’s Pavement Management System (WSPMS) increases pavement life while providing pavements at the lowest life cycle cost. The lowest life cycle cost occurs when you replace the pavement course just before it fails and causes damage to the pavement beneath. Replace the surface course too soon and pavement life is wasted. Replace the surface course too late and costly pavement repair becomes necessary. Each year we measure all WSDOT pavements for smoothness, structural condition and rutting to find that specific point of lowest life cycle cost. Knowing when to replace the surface course preserves the pavement, decreases resource use and increases sustainability.

Alternative Hydraulic Cements
Portland cement is a wonderful material: it creates the concrete that meets many needs in construction. Production of portland cement, though, produces significant quantities of greenhouse gases, both from the fuels used in the manufacturing and the CO2 driven off the minerals used to make portland cement. Alternative hydraulic cements allow WSDOT to reduce the amount of portland cement used while still producing a high quality, durable concrete. Many of the alternative cements were once categorized as hazardous wastes and were disposed of in landfills. Today, materials like fly ash, microsilicas and ground, granulated blast furnace slag find uses in a wide variety of WSDOT concretes, reducing the need for greater quantities of portland cement.

LED Traffic Signal Heads
WSDOT aggressively updated signal heads from incandescent lamps to light emitting diode (LED) lamps, dramatically reducing energy consumption. LEDs are more durable and last much longer than incandescent lamps, saving even more money and reducing consumption, improving sustainability.

Warm Mix Asphalt: New Technology
Heating the aggregate and the asphalt binder to make asphalt mix is expensive and consumes considerable fuel (diesel of lower grades of bunker fuel), Warm Mix Asphalt (WMA) uses special modifiers that lower the mixing temperature for asphalt. Decreases of 50°F or more are possible. We placed our first test section on I-90 in 2008 and more will follow.

Recycle
The final option for increasing sustainability is recycling: taking a material in one form and converting it to a material in another form.

Cold-In-Place Recycling
Cold-In-Place recycling reconditions low volume roadways, turning worn out pavement into sound new base. The pavement is milled in place, treated with a binding agent and compacted. This new, strong base is overlaid with either new asphalt pavement or a chip seal (sprayed liquid asphalt with rock chips embedded into it). The process is inexpensive and has been very successful.

Asphalt Shingle Recycling
Asphalt shingles present a possible opportunity for recycling, using the asphalt binder in the shingle to make new asphalt pavement. WSDOT’s State Materials Lab is working closely with King County as they build a test project using recycled shingles. We will help with testing and analysis of the pavement and will help track its performance over time.

Plants and Compost
WSDOT salvages plants before the start of construction and uses them to restore other areas. Trees and logs are saved and converted to habitat features within streams, wetlands and other natural areas. We convert what once waste plant material into mulch, placing it back on site to reduce runoff and encourage plant growth. WSDOT is a national leader in using compost created from yard waste and other sources to control erosion and sediment on our projects.

Other
Other recycled materials used on WSDOT projects include benches and picnic tables manufactured from recycled pop bottles, converting brush onsite for compost use within the project and crushing old concrete into new aggregate for base or subbase courses.