Asphalt:

The Environmental Choice

Prepared for the Asphalt Pavement Alliance

Asphalt is the material of choice for highway engineers and design engineers who want to complement and enhance the environment. From crafted highways in scenic mountain settings to environmental liners and recreational facilities, these engineers have found that asphalt provides a creative solution to many environmental problems.

One such solution was found for the Franconia Notch Parkway, a north-south corridor through the beautiful and environmentally sensitive White Mountains of New Hampshire. For more than 25 years, a controversy raged over the design of the Parkway.

Environmental Demands

Planners first proposed a conventional Interstate highway through the White Mountain corridor. But environmentalists demanded that the color of the highway match the surrounding mountains. They said that a conventional concrete Interstate would look like two white scars through the Notch. Nor would environmental groups accept a conventional asphalt mix for the pavement because they feared it would age to a light color and disfigure the mountains.

Years of meetings between environmental groups, the White Mountain Environmental Committee, the Federal Highway Administration (FHWA), the New Hampshire Department of Natural Resources and Economic Development and the New Hampshire Department of Transportation (NHDOT), finally produced an agreement.

The Right Rock, the Right Color

To assure that the pavement would retain a dark or deep gray color, the NHDOT Materials and Research Division specified the use of "dark vein" granite aggregate mined from the White Mountains.

NHDOT called for specific percentages of large-size dark aggregate to ensure the lasting color in the pavement surface. NHDOT also assured environmentalists that they would use dark aggregates for future overlays and rehabilitation. Construction of the Parkway was completed in 1988. NHDOT soon found that the dark gray color served to enhance traffic lane and safety island delineations on the Parkway. The contrast of the dark pavement also facilitated snow and ice removal.

After more than ten years of living with the Franconia Notch Parkway, environmental groups, planners, highway designers and tourists alike agree that the dark gray asphalt pavement blends respectfully into the natural beauty of Franconia Notch and the surrounding White Mountains.

Blue Route Protest

The Blue Route, a planned 21-mile connector between the Pennsylvania Turnpike, the Schuylkill Expressway and Interstate 95 through west Philadelphia's crowded suburbs, almost didn't get built. For years it was the site of a classic environmental battleground.

Suburban Philadelphia commuters, frustrated by years of traffic snarls and gridlock, wanted to see the Blue Route built. The Pennsylvania DOT's (PennDOT) original specification for the connector was concrete but environmental groups in the nearby Nether Providence and Swarthmore College area opposed it because its construction would disturb historical sites, wetlands and natural woodlands. They said the highway would be a source of excessive noise.

Using the Environmental Policy Act, the citizens groups successfully protested the Blue Route and forced additional environmental studies. The legal battle continued for eleven years until a U.S. District Court denied an appeal to prevent construction. Meanwhile, the Council of Environmental Quality asked PennDOT to chair a Task Force to work out environmental solutions that the community, PennDOT and the federal government could support.

Noise Mitigation

The Task Force formed two subcommittees, a Noise Subcommittee and a Design Subcommittee. The committees called in acoustics expert Lou Cohn, Professor of Engineering at the University of Louisville, to help with sound mitigation and Don Smith of Andrews & Clark to assist with environmental design.

Cohn and Smith helped persuade PennDOT to reduce the grade design of the Blue Route section next to Swarthmore University from 3.8 percent to 2.8 percent. The lower percentage meant that heavy trucks would make substantially less noise when ascending

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the grade. The Task Force also insisted on a "seamless asphalt pavement" because it would make less noise than jointed pavement. Up to this point, PennDOT had not offered any options beside concrete.

"The Task Force simply concluded that seamless bituminous pavement would cause less noise than jointed concrete pavement," said then Swarthmore University Vice President Kendall Landis. The Task Force also recognized that the cost of initial construction for asphalt would be less than concrete. PennDOT then decided to pave all sections of the Blue Route with asphalt, even though two short sections of concrete had been placed on the original route before construction was halted.

The Blue Route, which opened in 1991, now serves as the connector to I-95 to get to Philadelphia International Airport and directly intersects the Northeastern Extension of the Pennsylvania Turnpike. It also intersects with the east/west leg of the Pennsylvania Turnpike. Traffic on the Blue Route is approximately 100,000 vehicles per day with as much as 12 percent truck traffic.

Environmental Showcase

In 1997, the Philadelphia Inquirer proclaimed the Blue Route "an environmental showcase." The Inquirer stated that it is "an especially beautiful and environmentally pleasing road. From the earth tone paint used on its guardrails and bridge abutments, to the thousands of day lilies and roses, to the walls of cascading evergreens adapted from European parkways, the Blue Route was meant to be an environmental showcase."

A later Inquirer editorial summed up the sentiments of the people in Philadelphia about the Blue Route. "It's hard to believe we ever thought we could live without you. Hard to believe we almost didn't get you. So, please, hang around and grow, but not too fast. Keep working hard. And plan on taking care of us when we grow old."

Truly, the asphalt-paved Blue Route has become a model for the co-existence of man, nature and vehicle.

Diverse Environmental Uses

From waterproof liners for fish rearing ponds to wearing surfaces at industrial sites, asphalt has become the choice of both designers and owners for a wide range of environmental projects.

The Oregon and Washington Departments of Fish and Wildlife and several Indian tribes in Washington State operate more than 35 fish rearing ponds lined with asphalt. These asphalt-lined ponds, used to raise fish from the fingerling stage until they are ready for release into nearby rivers, have consistently produced quality fish. The asphalt-lined ponds are especially compatible to the sensitivity of the small fish. MiCiver State Park Hatchery releases more than 1.5 million Chinook salmon each spring.

A typical Washington State Hatchery pond is 5-to-7 feet deep covering a one-half acre surface area. The liner is constructed of 2 or 3 inches of hydraulic asphalt mixture on 8 inches of granular base. Pond designers specify an asphalt emulsion to seal the liner surfaces so surface voids will not form a habitat for bacteria detrimental to the small fish. The liners have low permeability, but have the structural capability to sustain the heavy equipment needed to clean the ponds when they are drained.

Domestic Water Reservoirs

Another use of asphalt is liners for drinking water reservoirs. The Metropolitan Water District of Southern California (MWDSC) has been using asphalt-lined water reservoirs for 50 years. One of its most recent facilities is the Devil's Canyon Reservoir to store MWDSC drinking water. The 19-inch thick asphalt liner for the huge facility will hold 800-acre-feet of water. The East Bay Municipal Utility District (EBMUD) in Oakland, California, has also been using asphalt to line domestic water supply reservoirs since the 1950s.

The liners for large water reservoirs are designed using both dense-graded and open-graded asphalt mixtures. Most important, the asphalt liner provides a liner that is environmentally safe for the storage of domestic drinking water. The design of the liner must address permeability, durability, flexibility, resistance to weather, and the ability to absorb stresses during rapid filling and drawdown cycles. The liner must also withstand long-term stresses caused by settlement in the supporting subgrade.

Open-graded asphalt interlayers are used in the liner structure to monitor and intercept any leakage that may occur. Asphalt liners meet all the required environmental and economical design criteria.

Landfill Caps

Asphalt not only provides a safe environment for small fish and drinking water, but it also protects our environment by providing impermeable caps for abandoned landfills and deposits of hazardous materials. A typical example is a three-acre dense-graded asphalt cap on a portion of an abandoned landfill owned by the City of Tacoma, Washington.

This cap had to meet stringent permeability standards, sustain heavy axle loads and be environmentally acceptable. The maximum coefficient of permeability allowed by federal and state regulations was easily attained. In addition to minimizing the intrusion of surface water into the fill material, the cap serves as the paved surface for a high volume solid waste transfer station.

Waterproof Waste Site

Waterproofing hazardous waste sites is yet another environmental use for asphalt. The Port of Tacoma saved money and met environmental requirements with a waterproof asphalt cap. After the Port Authority isolated the contaminated soil and installed a drainage system, an impermeable cap was constructed over the entire area. The composite cap included hydraulic hot mix asphalt, paving fabric, a permeable asphalt layer and crushed aggregate. Currently, local police are using the capped waste site as a training area for high-risk driving techniques.

Bicycle Trails

Asphalt's diversity doesn't end with highways, liners and caps, but includes the recreational arena too. Raleigh, North Carolina, and its surrounding area are one of the nation's leaders in the development and growth of recreational and bicycle trails. "We have bicycle paths, rail-trails and streets with marked bicycle lanes," says the Director of the Office of Bicycle and Pedestrian Transportation (OBPT) for the North Carolina DOT.

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The Director says that an asphalt ribbon runs through the whole North Carolina Bicycle path program. "I know of no place where asphalt is not being used," he says. "We go for Full-Depth® trails, from 2-to-3 inches deep and 10 feet wide."

Whether it's special highway pavements, reservoir liners, landfill caps or bicycle paths, asphalt provides a solution to our environmental challenges.

Deep-Strength® is a registered trademark of the Asphalt Institute.

An asphalt ribbon runs through the whole North Carolina Bicycle Path Program.

Asphalt pavements contribute to a beautiful and environmentally pleasing road.