

FROM REFUSE

RECYCLING AND REUSE OF WASTE MATERIALS AND BY-PRODUCTS IN TRANSPORTATION INFRASTRUCTURE

Historically the transportation industry has been a major consumer of conventional construction materials, including aggregate, asphalt, portland cement, and steel. However, transportation practitioners have also maintained an open mind toward the potential for recycling and using unconventional materials such as waste and by-products. For example, reclaimed asphalt pavement, which was considered a waste material for years, now routinely appears in the asphalt paving specifications of state departments of transportation. Fly ash, a by-product of coal-burning power plants, is used extensively as a cementitious construction material, replacing some of the portland cement in concrete mix designs.

Recycling and reuse of waste and by-product materials is relevant to all transportation modes. For example, the railroads recycle nearly all of the steel and timber in their infrastructure, and the marine industry uses dredged channel materials to develop beaches, agricultural land, and wildlife habitats. The acceptance of recycling by transportation agencies has been based on short- and long-term laboratory testing, as well as on field trials. These efforts have provided information on the physical, chemical, and engineering properties of waste and by-product materials; appropriate applications and limitations; environmental effects; and cost-benefits of using these materials.

In recent years the transportation industry has been encouraged to intensify its recycling efforts,

using a variety of approaches to resolve the problem of ever-increasing quantities of solid waste and discarded by-products; to acknowledge that sources for conventional and virgin materials are dwindling and that environmental constraints often prevent the mining and processing of these materials; and to analyze the economic and environmental aspects of both conventional and waste and by-product materials.

Federal and state requirements influence the use of waste and by-product materials in transportation facilities and, in conjunction with cost and environmental constraints, have stimulated research on the use of these materials. There is extensive information on the results of recent research at local, regional, national, and international levels. Attempts have also been made to synthesize information on both the state of the art and the state of the practice.

This special issue of *TR News* provides only a glimpse into recent recycling research and transportation applications in the United States. The wide spectrum of potentially recyclable materials causes any such attempt to fall short of covering all materials and their respective applications. The primary goal of this issue of *TR News* is to create awareness among transportation professionals and the general public about the potential and current uses of waste and by-product materials in transportation. The feature articles represent a sampling of recycling and reuse efforts by state departments of transportation, the U.S. Army

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Corps of Engineers, and the railroad industry. Shorter articles highlight research being conducted across the country on specific materials such as ground rubber, tire chips, spent metal foundry sand, and recycled aggregate subbase.

This issue of *TR News* is sponsored by the committees on Design and Construction of Transportation Facilities [Group 2, one of the five volunteer groups within the Technical Activities Division (Division A)] of the Transportation Research Board. This issue is being published in conjunction with a Group 2-sponsored conference on Waste and Recycled Materials in the Transportation Infrastructure, held January 7, 1996, at TRB's 75th Annual Meeting.

Individual committees in Group 2 have proactively sponsored paper and conference sessions at recent Annual Meetings in response to the concerns of transportation agencies about recycling and the use of waste and by-product materials. Peer-reviewed papers from these meetings have been published in volumes of the *Transportation Research Records* series. The conference at the 75th Annual Meeting and this theme issue represent Group 2's collective effort to bring attention to work that addresses a topic of immediate concern to transportation agencies.

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GLOSSARY

Bottom ash. The heavier of two ashes given off by coal-fired electric generation plants. Bottom ash falls to the bottom of the furnace and mixes with slag.

Crumb rubber. Fine rubber particles manufactured through cryogenation of old tires.

Cullet. Waste glass suitable for remelting.

Fly ash. Inert material given off by coal-fired electric generation plants. Fly ash is the lighter ash that escapes with the flue gas and is trapped in and removed by a bag house.

Reclaimed asphalt pavement. Asphalt cement concrete removed by milling machines during pavement rehabilitation.

Tire chips. Scrap tires that have been cut into pieces with a maximum dimension between 75 to 300 millimeters (3 to 12 inches).

Chipped rubber from used tires is suitable for fill material in roads and backfill in retaining walls.

The work of the Group 2 Council Activities Coordinating Committee, chaired by Verne McGuffey, in developing this issue of *TR News* and acquiring and reviewing the articles that follow is gratefully acknowledged.

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