

Recycling Construction & Demolition Waste

A LEED-Based Toolkit

Greg Winkler

拆建废料的回收利用

基于 LEED 的工具包



A GreenSource BOOK 影印版

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GREG WINKLER



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*To my son Alexander
Keep building castles in the air
A few will find their way to earth*

About the Author

Greg Winkler, AIA, LEED AP, has over 27 years of experience as a practicing architect and owner's representative on commercial, industrial, and institutional projects. A graduate of the Georgia Institute of Technology, Mr. Winkler has participated in construction projects as a design professional, design-builder, and owner's agent. This perspective gives him a pragmatic view of the possibilities—and pitfalls—of construction waste management.

Mr. Winkler currently works as the director of a regional construction trade organization. He is the co-author of McGraw-Hill's *Construction Administration for Architects*, a desktop guide for design professionals during construction.

FOREWORD

Resource conservation and recycling have long been devoted passions for a segment of the population. As a vocation, recycling has been a cost-effective standard practice for centuries in the production of metals and it also has deep roots in the papermaking industry.

Both of these influences—the passion of environmental advocates and the cost-effectiveness sought in the business world—came together in the late twentieth century in the construction and demolition sectors.

With the exception of scrap metals, most other materials generated at a construction or demolition site had previously been regarded as waste—as garbage or rubble. The procedure that developed (and it developed as an efficient one) was to divert materials by the truckload to inert landfills designed to accept this rubble or waste.

Construction scrap and demolition debris was largely out of sight and out of mind for conservationists who focused instead on the pop bottles, newspapers, and other unrecycled litter that was clearly visible.

But this sensibility began to change when waste characterization studies (essentially landfill audits) began to be conducted. Statistics revealed quite clearly that the scrap and debris being generated at construction sites added up to a considerable volume—and environmental advocates noticed.

On the cost-effectiveness side, contractors also began to see changes in the factors that affect material hauling and disposal costs. Sprawling metropolitan areas often meant landfills were a longer journey away—just as diesel fuel costs were rising. Similarly, stone being brought in from quarries was traveling longer distances and triggering higher transportation costs.

The concept and practice of crushing and recycling concrete and asphalt began to grow rapidly, and in many cases spurred entrepreneurs to try similar approaches with other construction and demolition (C&D) materials, such as wood scrap and gypsum drywall scrap.

The two universes—contractors finding cost-effective ways to recycle and advocates identifying C&D materials as a major landfill contributor—were soon joined by a third group of interested parties: architects, builders, and property owners who wanted to demonstrate environmental responsibility.

These construction industry professionals spurred the rapid rise of the green building movement, including the U.S. Green Building Council and its LEED (Leadership in Energy and Environmental Design) standards. Turning C&D materials into recyclable commodities has been adopted as part of the LEED standards, providing a boost to an emerging economic sector that had already gained considerable momentum.

Labeling change as revolutionary can run the risk of overstating a case. In many ways, however, the manner in which C&D scrap materials are now handled at a job site—whether diverted into a recycling container or processed for recycling on site—has changed in ways that would be difficult to recognize by someone who had not set foot on a construction site since the 1980s.

BRIAN TAYLOR

Editor-in-Chief

Construction & Demolition Recycling magazine

www.CDRecycler.com

www.RecyclingToday.com

PREFACE

In the late 1980s the National Trust for Historic Preservation (U.S.) embraced a concept called *embodied energy*. Spawned from the oil embargo of the late 70s, this concept was based on the assertion that the accumulated labor, transport, materials manufacturing, and erection of our buildings represented captured energy, and that preserving and reusing existing buildings was among the most effective forms of energy conservation. The concept never gained ground within or outside of preservation circles, principally because the best reasons for preserving buildings—their architectural or historic merit—are far more compelling than that of not wasting energy by demolishing them.

In some ways, the original arguments for recycling construction and demolition waste ran along the same fault lines. Proponents argued, with good cause, that recycling C&D waste was the right thing to do for society and the environment. The moral argument was undeniable, but in the early days of C&D recycling few markets existed outside of scrap metal for the materials generated in the demolition of a building. Absent the economic impetus, the social arguments for recycling were simply not enough to compel change in our long-standing “throw-away” culture. Contracting is a competitive business, and until the landfills and incinerators of America became too expensive and politically unpalatable for communities to tolerate, they were the preferred and least costly way of disposing of our nation’s large stream of C&D waste. In this sense, the demolition and contracting industries were a reflection of society at large. Thankfully, society and the contracting profession have changed. Recycling is now the preferred, and often required, means of handling waste from construction sites.

This happened because the public became more accepting of purchasing manufactured goods with recycled content. Manufacturers recognized this acceptance, as well as the public goodwill that using recycling content in their products generated, and developed more innovative ways to use waste material. It also happened because of a gradual shift in the economics of waste management. Contractors learned how to better manage, sort, and process material on their jobsites to make it more marketable. Recyclers became more sophisticated in separating single-stream materials and in processing waste to manufacturer’s specifications. Manufacturers learned that recycled content yielded economic and marketing benefits, and consumers realized they could buy recycled-content products with confidence. Recycling markets for C&D waste have grown dramatically in the past decade, and continue to expand even in economic hard times.

For that reason the market sections of this book, or any book on recycling waste, are a snapshot in time of a continuously changing landscape. Similarly, the code and

certification requirements associated with recycling are in a constant state of evolution. The management techniques and tools—the means of managing waste on a construction site—are longer lasting. Even they will evolve, however, as the opportunities and markets for recycling C&D waste expand.

All of this argues for the demolition and contracting professions to fully commit to learning and maintaining awareness of the best current practices in recycling their job-site waste. There is no longer any excuse for a contractor to not recycle at least half the waste generated from his or her construction site. In urban areas with better developed markets, contractors should be able to easily recycle 75 percent of their waste. Those who recycle more, and do it better, will be more profitable and competitive.

In the realm of managing construction and demolition waste, social accountability and financial accountability have finally merged on the side of recycling. It is a good thing.

GREG WINKLER

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Respect and admiration for the construction and demolition professionals who skillfully manage recycling programs on construction sites across the country.

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RECYCLING WASTE:

THE FUNDAMENTALS

The amount of waste generated by building construction and demolition activities in the United States is enormous—more than 164 million tons (149 million metric tonnes) per year. This represents 25 to 40 percent of all the discarded solid waste in the country. What happens to all of this material? More than 75 percent is trucked to landfills or incinerators.¹ Increasingly, municipalities and building owners are responding to the cost of maintaining landfills and the burgeoning environmental movement in the country by requiring that contractors recycle construction and demolition waste. The U.S. Green Building Council (USGBC) estimates that as much as 95 percent of the waste on a typical construction site can be recycled. In response, green waste management ordinances are appearing in municipalities across the nation.

Savvy developers and owners are also realizing the cost savings of recycling versus disposal, and are requiring their design professionals to incorporate recycling waste requirements into their construction documents.

The life cycle of a building used to be a one-way street. Building materials were extracted and used to manufacture building products, and once the building reached the end of its useful life and was demolished, the materials were buried in a landfill or incinerated. Societal and economic factors require that today's building life cycle be circular (see Fig. 1.1), with the loop completed to the largest extent possible by reusing demolition materials to manufacture new products.

The Reasons to Recycle

The original reasons for the existence of landfills were simplicity and economy. It was easier and less expensive to send demolished building materials and construction waste to landfills than to attempt to recycle them. Indeed, the recycling markets barely existed for many demolition materials even 10 years ago. Contractors seeking