Concrete Systems for Homes and Low-Rise Construction

A Portland Cement Association Guide

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Wisconsin Thermo-Form, Inc., www.tfsystem.com
Woodland Construction Company, www.woodlandconstruction.com

Introduction

When we released the book *Concrete Homebuilding Systems* ten years ago, it was clear we hit a nerve. Although no one realized it at the time, contractors for low-rise buildings were beginning a rush to concrete- and cement-based products. Yet there was no central source to acquaint them with these. The demand for information was great, but there were few resources to supply it. Our book was one of the first, and it sold far beyond projections.

Recently the Portland Cement Association decided that it was time for an update. The use of concrete products in small buildings has grown rapidly, and contactors' need for information has grown with it.

The scope of this book is much broader than the last one. It covers all major concrete and cement-based products, not just wall systems. It adds concrete floor and roof systems, exterior finish products, landscape products, and decorative applications. It also covers the use of these products in all small, low-rise buildings, not just single-family homes. That rounds out the focus to include commercial and multifamily buildings up to a size of roughly 20,000 square feet of floor area and 40 feet in height.

This book should be useful for many building professionals, but it is directed first and foremost at the general contractor (GC) who constructs the buildings. We have tried to provide the information the GC needs to decide which of these products make sense for his or her business. The book also helps the GC to get started with the products and get rolling on them with maximum efficiency and minimum fuss.

The organization of the book is intended to be self-explanatory. Part 1 covers general information that applies to many or all the products in the book, such as principles of concrete and ways to measure product costs. Parts 2 through 6 go into specifics on the different categories of products. For example, Part 2 covers wall systems.

Each one of the Parts covering one category of products begins with a section titled "Background." These cover general principles that are important for multiple products in the category. For example, the Background of Part 2 discusses such things as moisture control, sound transmission, and other issues important to understanding walls. After this are the sections on each specific product or system within the category, such as concrete block walls, insulat-

ing concrete form walls, precast walls, walls cast with removable forms, and so on. At the end of each Part is a section titled "Developments." This describes things that promise to become important in the future, including new or specialty products, inventions, and trends.

A reasonable plan of attack is to start by reading all of Part 1 and the "Backgrounds" of Parts 2 through 6. This should help decide what specific products will be of most interest and provide the background information to read the individual product sections.

But there is no wrong way to read the book. This is a huge field with tremendous promise for the creators of small buildings. Read, wander, and enjoy.

Other sources of information

There are plenty of good periodicals and Web sites that also provide useful information on the concrete products and systems covered in this book. They are especially useful for current developments and information that changes frequently over time, such as costs and prices. Many of these information sources deal with one or two specific products. They are described in the chapter dealing with the relevant product. But others cover a wide range of concrete products and systems for small buildings. It is worth mentioning them here.

Periodicals

Concrete Construction covers a wide range of topics of interest to the concrete professional. Most of these apply to small buildings. For information go to www.concreteconstruction.net.

Concrete International is the magazine of the American Concrete Institute (ACI). It covers a broad range of topics related to concrete, many of which are relevant to small buildings. Go to www.concreteinternational.com for more information.

Concrete Homes magazine discusses all sorts of concrete products and systems and how they are used in single-family and small multifamily housing. For information, go to www.concretehomesmagazine.com.

Masonry Construction covers all types of masonry products, including concrete block, concrete brick, cast stone, concrete pavers, and segmental retaining walls. These are widely used in small buildings. Get more information about it at www.hanleywood.com.

Permanent Buildings and Foundations covers all sorts of products and systems used in homes and small commercial buildings. Information is available at www.pbf.org.

Residential Concrete is a magazine focused on all sorts of concrete products, uses, and systems in houses. Most of them apply to small nonresidential buildings as well. For information, go to www.hanleywood.com.

Web sites

The independent site www.concretenetwork.com provides information and links related to a wide variety of concrete products and systems used in small buildings.

The Portland Cement Association's site www.concretehomes.com covers every significant product or system used in houses. Most of the information is also relevant to use in other small buildings.

Associations

There are many trade associations that support and promote the use of concrete construction products. The relevant associations are covered in each of the individual product chapters in this book. However, two cover a wide range of products and bear mentioning here.

The Portland Cement Association provides information and technical assistance for virtually all products that contain significant amounts of cement. They provide extensive materials on many products and maintain a professional staff that can answer questions and provide assistance on a wide range of issues. The Association is accessible through its Web site, www.cement.org. As already discussed, it also maintains www.concretehomes.com, an information Web site on concrete products suitable for homes and other small buildings.

A very important new organization in this area is the Concrete Home Building Council (CHBC) of the National Association of Home Builders (NAHB). The NAHB represents the general contractors who construct homes in the United States. The CHBC is a newly-formed arm of the NAHB to support home builders and the leadership of the NAHB in their work with concrete products. They are quickly becoming a key clearinghouse for concrete products information and assistance to the construction community. The CHBC is accessible through the NAHB Web site (www.nahb.org) or by calling the NAHB (202-822-0200).

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Part I

General

1

Why concrete?

The use of concrete and cement based building products in low-rise construction has risen sharply in the last 20 years. Concrete walls have long dominated foundations, but above-grade they have grown from an estimated 3 percent of single-family homes in 1994 to 16 percent in 2004. They have jumped in commercial construction as well. A few years behind the growth in walls has come a similar growth in concrete floors and roofs.

Interior decorative concrete floors and countertops started with fewer than ten contractors in California in the early 1980s and have grown to thousands in 2005.

Stucco remains one of the most popular of all exterior wall finishes. Fibercement siding has grown from nothing to about 10 percent of all lapped siding in North America over the last 25 years. Concrete roof tile has grown from nearly zero to several percent of the coverings for pitched roofs in the same period.

Among landscape products, segmental retaining walls were nonexistent in 1980. Now they make up about half of the retaining walls surrounding new low-rise buildings. Concrete flatwork came seriously into use on the lots of small buildings after World War II, and now it is estimated to make up over 50 percent of the drives and walkways. Concrete pavers were under 1 percent of the paving, and now they are believed to be over 10 percent.

The growth in these materials is projected to continue.

Why has this happened? The answer is that there have been important changes in both supply and demand. On the supply side, there have been dramatic improvements in concrete, concrete products, and the systems that use them. These have made the concrete options more economical, easier to use, higher performing, and more aesthetic. On the demand side, buyers have rising incomes, and they are using some of that money to buy better buildings. They are increasingly looking for materials that are disaster resistant, conducive to comfort, energy efficient, durable, low maintenance, and distinctive looking. All of these are inherent properties of concrete. So the market is shifting to the sort of product that concrete has been all along.

Supply

Advances in concrete technology and product design are discussed throughout this book. Some developments in concrete chemistry give the material new properties. Others reduce concrete's cost without compromising its desirable properties. There are now exceptionally high-strength concretes, lightweight concretes filled with air bubbles, and concretes containing wood fibers for flexure and ease of cutting and nailing.

The possible aesthetics of concrete have grown dramatically. Pigments permit concrete to take any color of the rainbow. Concrete stains provide subtle gradations in color. Surface treatments, such as stamping, fracturing, sandblasting, retarding, tumbling, and grinding, create a wide range of finish textures that give concrete the look and feel of natural materials like stone or novel and high-tech looks not available on any other construction material (Figure 1-1).

1-1 *Applying premium finishes to concrete.* Floor Seasons, Inc.