

Green Building: Project Planning & Cost Estimating

Second Edition

By RSMeans & Contributing Authors

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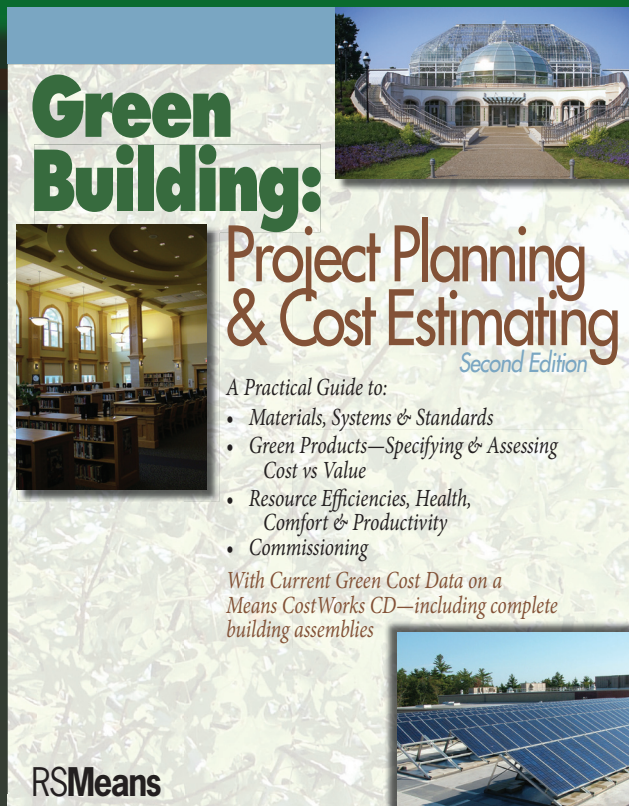
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About the Book

Market

Architects, designers, builders, engineers, building owners and managers, universities... anyone interested in sustainable design.

Description

Since the widely read first edition of this book, green building has gone from a growing trend to a major force in design and construction. Utility costs have skyrocketed; building codes and standards have adopted much stricter energy efficiencies; and businesses, institutions, and communities have discovered huge savings and advantages in sustainable building. Public and private facilities, and even whole cities and counties, are increasingly required to include green features in their new construction and remodeling projects.

This reference covers the many options for green building technologies, design concepts, standards, and costs. It includes Means' *Green Building CostWorks* CD at no additional cost. The CD contains more than 500 new assemblies (from high-efficiency HVAC and lighting, to living roofs, fuel cells, gray water systems, and much more) and over 7,000 unit price line items for green materials and products.

The chapters, case studies, resources, cost data, and more, give you the whole picture on green building, including the latest on:

- Green building approaches, materials, systems, and standards.
- Energy efficiencies—with energy modeling tools.
- Health, comfort, and productivity—goals and techniques.
- Evaluating the cost versus value of green products over their life cycle.
- Specifying green building projects—complete with a list of often-specified products/materials and a sample spec.
- Low-cost green strategies—and special economic incentives and funding.
- Assembling the green project team and commissioning the building.
- Deconstruction—a key element of sustainable building.

RSMeans

About the Authors

Written by a team of experts, consisting of over a dozen authors and reviewers representing all segments of sustainable design—engineers, economists, facilities managers, architects, cost consultants, and construction specifiers.

Among the Contributors: Mark Kalin, FAIA, FCSI, author of the original GreenSpec; Alexis Karolides, principal and team leader for the Rocky Mountain Institute (RMI), Seiglinde K. Fuller, PhD, leader of the NIST/DOE collaborative n economic analysis for energy and water conservation; Andy Walker, PhD, PE, senior engineer with NREL; and Joseph Macaluso, AACE, certified cost consultant.

- Allow open access to potential licenses from all countries.
- Establish criteria levels that encourage the production and use of products and services that are significantly less damaging to the environment than other products.
- Conduct periodic reviews, and if necessary, update both environmental criteria and categories, taking into account technological and market place developments.



Environmental Choice
Global Ecolabel Network Member
www.environmentalchoice.com

The EcoLogo (shown here) is issued on products that are certified by The Environmental Choice Program, a Canadian organization established in 1988 to "provide an incentive to manufacturers and suppliers of environmentally preferable products and services, thereby helping consumers identify products and services that are less harmful to the environment." With over 3,000 products carrying the label, it is North America's most widely recognized multi-attribute environmental label. The EcoLogo can be issued to a product or service that "improves energy efficiency, reduces hazardous products, uses recycled materials, is re-usable, or provides some other environmental benefit. Certified products or services should meet or exceed any applicable industry-specific safety and performance standards." Appendix lists EcoLogo building components and key criteria that determine eligibility. EcoLogo also maintains requirements for product longevity as well the inclusion of instructions to the user for proper use to maximize the environmental benefits of the product where applicable.



Green Seal
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Green Seal is a non-profit organization that certifies a wide variety of products, including building components such as occupancy sensors, photovoltaic modules, residential central air conditioning systems, chillers, heat pumps, windows, window films, and paints. Green Seal certified air conditioning systems also set for energy efficiency requirements. The Green Seal is developing standards for properties, promoting energy efficiency.

Chapter 7. Introduction to Green Building Materials & Systems

When moisture condenses or is trapped within a wall assembly, it can cause structural damage as well as a major cause of indoor air quality problems. Moisture can enter a building envelope in three ways: from outside, diffusion of water vapor through the wall and transport of water vapor in air that leaks through the envelope. Rain transport must be controlled with gaskets and planes in the wall assemblies. A properly located vapor retarder will help retard diffusion through a building assembly. Much more significant than vapor diffusion is the amount of moisture that can be carried through cracks and voids; thus the importance of sealing. As warmer air rises, it causes high pressure at the top and low pressure at the bottom, resulting in what is called a stack effect. (See Figure 2.2.) At these points of greater pressure, the attic and basement, it is especially crucial to seal airflows.

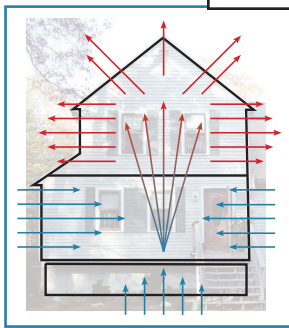


Figure 2.2 Stack Effect
As warmer air rises when surrounded by cooler temperatures outside, it causes high pressure at the top of the building and low pressure at the bottom. Cold air is drawn in through leaks and openings, such as doors and windows. At points of greater pressure differential, such as the attic and basement, it is especially crucial to seal air leaks and use airflow retarders.

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lifetime are false—empirical studies have shown that PVs recoup their production energy in two to four years;¹⁰ financial paybacks for PV systems range dramatically, depending on electric utility prices, up-front cost of the system, availability of rebates, daily solar radiation, the installation angle of the solar array, etc., but in a location with an average of five sun-hours per day and \$.10/kWh electricity costs, the payback for a PV system, without rebates (assuming a 0% discount rate), can be as long as 43 years.¹¹ Currently more than 20 states have incentives to make PV cost-effective from the perspective of the building owner.

The original and most common semi-conducting material used in PV cells is single crystal silicon. These cells have proven their durability and longevity in space applications and are also generally the most efficient type of PV cells, converting as much as 17% of incoming solar energy into electricity. The main disadvantage of single crystal silicon cells is their production costs; growing large crystals of silicon and then cutting them into thin (0.1–0.3 mm) wafers is slow and expensive.

Figure 2.4
This 51kW photovoltaic system supplies approximately 6% of the electricity needs for Whitman-Hanson Regional High School, a 234,500 SF award-winning pilot project for the Massachusetts Green Schools Initiative.



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These rammed earth homes in New Mexico feature walls 18" thick built by tamping a mixture of soil, 3% portland cement, and 6%–10% moisture content. Photo 1 shows a 18" wall section formed up with 4" forms on the bottom and middle, and 2" forms on top. Photos 2 and 3 show the walls after the forms have been removed. Photo 4 shows a finished home. (Photos courtesy of Pat Bellestri, Soledad Canyon Earth Builders, <http://www.adobe-home.com>)

Figure 2.7
Rammed earth homes

Chapter 2. Introduction to Green Building Materials & Systems

About RSMMeans

RSMMeans, a product line of Reed Construction Data, has been the nation's leading publisher of construction cost information and reference data for more than 65 years. The company provides publications, data, seminars, and consulting services for building design, construction, and facilities professionals, as well as the insurance industry and municipal and government agencies throughout the United States and Canada.