



Roofing Design and Practice

By Stephen Patterson, Medan Mehta

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For courses in Construction Methods and Materials, Commercial Construction, Residential Construction, and Roofing Design, in departments of Architecture, Architectural Engineering, and Construction Science/Management/Technology. Combining academic rigor with contemporary design practice, this is the first true text book on roofing design, and the only reference that comprehensively addresses all roof design issues. It provides necessary information on the suitability of various systems for specific projects, and offers students a greater knowledge that will enable them to prevent most roof failures and resulting disputes.

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Editorial Review

From the Back Cover

Intended for professionals and students in architecture, construction, and engineering, *Roofing Design and Practice* takes the reader through all of the processes involved in roof design. The author team of a practicing roof consultant and a university professor offers a great combination of knowledge and experience to produce this comprehensive guide to design practice, suitability of various systems to specific projects, and codes and specifications. Roofing design is one of the most neglected fields in construction, yet roofing problems represent well over half of all litigation and owner complaints. This text is a valuable resource to help avoid these potential problems.

Key Features

- Up-to-date references include the new 2000 International Building Code requirements and current industry standards.
- Comprehensive coverage of both steep and low-sloped roofing designs.
- Detailed and well-illustrated chapters on drainage design, wind design, insulation requirements, vapor control, and flashing.
- Over 500 illustrations to assist the designer and aid readers in understanding.
- Coverage of legal issues, including warranties.
- Coverage of all types of roofing: asphalt, clay concrete, slate, metal, and more.

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PREFACE

OBJECTIVES OF THIS BOOK

The aesthetic aspects of a roof may or may not be important, but in functional performance, the roof is one of the most critical components of a building. Most energy loss from a building envelope (particularly from a single-story building) occurs through the roof. Disastrous wind -caused damage to a building initiates when the roof fails to function as a structural diaphragm. Inadequate roof drainage may cause excessive water ponding on the roof, leading to its collapse.

Water leakage, the most aggravating aspect of the malperformance of a building envelope, occurs primarily through the roof. In fact, a large majority of owners' complaints with the design and construction of buildings relate to roofs that leak.

Although authoritative data is not available, it is estimated that nearly 65% of building construction lawsuits relate, in one way or the other, to roofing problems. The above statistic assumes significance considering that the roof cover of a typical building is replaced every few years — one estimate gives a 12- to 14-year period. This replacement frequency would be unacceptable for any other envelope component - walls, doors, windows, etc.!

It is the authors' belief that most roof failures and the resulting disputes can be prevented if the architects, engineers, contractors, roofing consultants, and facility managers — all personnel engaged in the design,

construction, and maintenance of buildings — have greater knowledge of roofing design and practice. This book has been written to supply that knowledge. It has taken several years to complete this book, during which the authors cotaught (and still continue to teach) a five-week component on roofing design to architecture students at the University of Texas at Arlington, as part of a building construction course.

Roofing Design and Practice is a joint undertaking of a roofing consultant, who has been in practice for over 25 years, and a university professor, who has taught building construction courses to architecture students for nearly the same period. Therefore, it combines academic rigor with the meticulousness necessary in contemporary design practice. It is expected that it will serve both as a text for students of architecture and construction, as well as a reference resource for roofing consultants, practicing architects, consulting engineers, construction specifiers, roofing contractors, and facility managers.

The need to undertake this project arose from the relative absence of a suitable publication, which could be adopted as a textbook for the course. An initial survey by the authors indicated that, although there are a few excellent manuals and compendiums dealing with the subject, none address all of the design and practice issues comprehensively in the reader-friendly format of a textbook.

Anyone involved with roofing design and installation knows that the roof in a contemporary building is an extremely complex component. Long gone are the days when a roof in architectural drawings could be represented by a squiggly line atop a wood or concrete deck, indicating a three- or four-ply, gravel-covered, built-up roof. In fact, it is highly inaccurate to refer to a contemporary roof as a mere component, since it consists of an integrated and interactive system of several components.

A typical low-slope roof in today's building consists of a roof membrane, insulation, vapor retarder (and sometimes an air retarder), and a roof deck. All of these components must be physically and chemically compatible with each other. Each component has its own individual design requirements, in addition to those of the system as a whole.

The roof must not only provide a waterproof cover over the building and be durable against all deteriorating environmental elements (such as ultraviolet radiation, exhausts from neighboring industries, kitchens, roof-top mechanical equipment, etc.), but must also be able to withstand wind and hail storms. Additionally, it must be able to protect the building from an internal or an external fire. It must also be designed to drain rainwater rapidly off its surface. It must do all of this in a reasonably economical way, because the roof will be replaced several times during a typical building's life span.

The roof's replacement frequency further complicates an otherwise complex system. Replacement frequency is the primary cause of the roofing industry's relatively large size. According to the National Roofing Contractors Association's annual survey, more than \$26 billion was spent on roofing in the United States in 1998 — a figure that is expected to rise by nearly \$2 billion in 1999.

The economic dimensions of the industry catalyzes a great deal of research in the development of new materials and application techniques. Consequently, several new roofing systems or new versions of the old systems appear in the market frequently, complicating the situation for architects, roofing consultants, and roofing contractors, who must constantly keep abreast of new products and systems.

An architect or a contractor who does not fully comprehend various roofing design issues will find it difficult to evaluate these innovations. This book promises to provide that comprehension.

A NOTE TO THE READER

The book contains 15 chapters. Chapter 1 is an introduction to roofing, which is generally divided in two

parts — lowslope (commercial) roofs, and steep (residential) roofs. Chapters 2 through 10 deal with low-slope roof components (roof membranes, insulation, and roof decks) and design issues (design for drainage, heat and vapor transmission, fire, wind, and hail). Chapters 11 through 13 deal with steep roofs, and Chapter 14 with metal roofs. Chapter 15 discusses roofing manufacturers' warranties and other legal issues in roofing.

The authors' teaching experience indicates that it is not necessary to cover all topics in detail in the classroom. Depending on the time allocated to roofing, some topics should be covered in detail, some briefly, while others could be left for students to read on their own. A large number of drawings, sketches, photographs from construction sites, and commonly used construction details make the book reader-friendly. A chapter-wise list of review questions at the end of the book should be useful to the teacher as well as the reader.

We hope that the architects, engineers, roofing consultants, and roofing contractors will find this book useful in selecting and specifying a roof system. *Roofing Design and Practice* should provide necessary information on the suitability of various systems for a specific project. The chapters on drainage, insulation, water vapor, and wind design will help to design roof drainage, the type of insulation, and the anchorage system needed.

Users Review

From reader reviews:

Steven Tran:

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