

Dimension Stone Cladding



**Design,
Construction,
Evaluation,
and Repair**

**Kurt R. Hoigard
editor**

STP 1394



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***Dimension Stone Cladding:
Design, Construction,
Evaluation, and Repair***

Kurt R. Hoigard, editor

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Foreword

This publication, *Dimension Stone Cladding: Design, Construction, Evaluation, and Repair*, contains papers presented at the symposium of the same name held in New Orleans, Louisiana, on October 27, 1999. The symposium was sponsored by ASTM Committee C-18 on Dimension Stone. The symposium chairman was Kurt R. Hoigard of Raths, Raths & Johnson, Willowbrook, Illinois.

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Overview

This book represents the efforts of a number of authors that presented papers at the *Symposium on Dimension Stone Cladding: Design, Evaluation, Construction, and Repair* held in New Orleans on October 27, 1999. The symposium was held in conjunction with a regularly scheduled meeting of the symposium sponsor, ASTM Committee C18 on Dimension Stone. Sincere thanks are offered to those involved with the development of the materials presented and to those that endured the pressure of the podium, as well as the patient staff in the ASTM Acquisitions and Review department.

The purpose of the symposium was to promote an exchange of information on the state of the art in stone cladding applications. In the twelve years since the 1987 Exterior Stone Symposium and the subsequent publication of *ASTM STP 996, New Stone Technology, Design, and Construction for Exterior Wall Systems*, a substantial amount of work has been done in the fields of new stone cladding and the rehabilitation of existing stone cladding installations. Sixteen presentations covering case histories, original research, and new concepts were grouped into four sessions: Stone Cladding Preconstruction Evaluation; Stone Weathering and Durability; Design of Stone Cladding Systems; and Investigation and Restoration of Existing Stone Cladding Installations. Written versions of thirteen of these presentations are assembled in this book.

Stone Cladding Preconstruction Evaluation

The three papers in this section are all based upon doctoral thesis research work performed at the University of Illinois. Authors Reis and Habboub present basic research regarding the use of impulse-generated stress waves as a nondestructive means of determining stone properties such as grain size and shape, texture, bedding anisotropy, porosity, permeability, Poisson's ratio, and modulus of elasticity.

Stone Weathering and Durability

The four papers in this section cover this diverse topic from a variety of directions. Authors Miglio, Richardson, Yates, and West present information pertaining to current methods of durability assessment in the United Kingdom used for evaluating limestones, and provide recommendations for their specification in new building construction. Erlin's paper discusses the relationships between crystalline structure, thermal hysteresis, and bowing of Carrara marble panels. Authors Scheffler and Lesak offer a case history assessing the root causes of weathering-induced damage to an 80-year-old granite facade, and evaluate a variety of restorative treatment methods explored. Authors Bortz and Wonneberger provide a summary of durability test methods currently in use and under development in the United States and the European Community.

Design of Stone Cladding Systems

Both of the papers in this section address granite design issues. Authors Gerns, Wonneberger, and Scheffler stray slightly from the cladding theme of the book by providing guidance on the selection of granites and supports for exterior stone paver systems. Authors West and Heinlein provide anchor strength recommendations based upon extensive ASTM C 1354 laboratory testing of granite specimens fitted with a variety of edge anchors.

Investigation and Restoration of Existing Stone Cladding Systems

The four papers in this section offer a variety of case studies, observations, and specific recommendations regarding investigative means and repair methods used to address distressed facades. Authors Hoigard and Mulholland provide practical repair methods for addressing common types of stone distress, including chips, spalls, cracks, missing pieces, and defective or deficient anchors. Chin provides an overview discussing some of the most commonly encountered types of stone distress and their causes. Solinski presents case studies involving the investigation and repair of two distressed stone facades. Authors Scavuzzo and Acri present a case history discussing in-place load testing procedures used to evaluate the performance of a stone cladding anchorage system

Summary

The papers assembled in this book demonstrate a continuing advancement in the understanding of stone cladding. Investigations of distressed stone installations, combined with preconstruction evaluations of new stone cladding materials, continue to improve the knowledge base from which designers of new buildings can draw. Likewise, the economic needs of building owners, combined with the creative abilities of rehabilitation specialists, continue to provide advances in the methods available for maintaining and prolonging the useful life of existing facades.

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Marble quarry block is being sawed into slabs for use on a building façade

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