

Conservation of Building Stones

Anuradha V. Kumar



SERIES EDITOR'S PREFACE

We are fully aware that consciousness for conservation of cultural heritage which includes buildings, wall paintings, paper manuscripts, canvas paintings and other forms of art has been growing at a rapid pace. On account of this growing consciousness, conservation profession is entering a new phase. While earlier there were very few who worked in the area of conservation, to-day there are more and more conservators and scientists working in different institutions like Archaeological Survey, State Departments of Archaeology, University Departments which impart training in archaeological conservation, museums and libraries. In India, there is a Department of Archaeology in practically every state. For scientific research in conservation procedures is the National Research Laboratory for Conservation of Cultural Property, Lucknow. For practice of conservation, the Indian National Trust for Art and Cultural Heritage has established a network of conservation Centres. But it was felt by many of us that books written in simple language with practical illustrations, or case-studies specially relevant to India were not available. With the greater number of conservators, archaeologists and museologists, there was a genuine need for more conservation literature. To rectify this situation to a certain extent, we thought of bringing out a series of publications on conservation of various types of artifacts and other components of cultural heritage. It was with this aim, a series of publications was conceived.

The present volume 'Conservation of Building Stones' authored by Mrs. Anuradha V. Kumar is based on extensive survey of historical buildings in India undertaken by her to understand the building stones as well as the problems they face. The book aims at enhancing the knowledge of this material, how does it deteriorate and what can be done to conserve it. We hope that it would be useful in understanding the stone in the buildings and how do they behave in nature.

PREFACE

Stone first became an important medium of Indian sculpture and architecture during the reign of the greatest Mauryan ruler Ashoka (c. 269-232 BC). Over the following centuries its popularity as a medium of artistic expression soared. Regional dynasties throughout the country used many varieties of stone to create works of great quality and technical expertise. An important part of the culture of the Indian subcontinent is, thus, chiseled in stone. We have our most authentic records of the history, customs, and ideas of this ancient culture in the facts, dates, stories, and pictorial representations carved in or painted on stone.

Stone sculptures of numerous unknown artists and the architectural edifices of various kingdoms that ruled the land through the centuries are as compellingly awe-inspiring and thrilling to us today as they were to the many generations that preceded us since their creation. This heritage we have of the past and present glories of human creativity is, however, slipping away slowly, silently, but inexorably and at an increasing rate. The voices of many artistic stone works have already fallen silent and many more are in imminent danger.

The necessity of a campaign against the destructive forces of nature to protect and preserve outdoor stone sculpture and buildings was recognized early in India. In the beginning of the twentieth century, Lord Curzon passed the Ancient Monuments Preservation Act, which provided for the protection and acquisition of ancient monuments and objects of archeological, historical or architectural merit. It also laid the main lines of approach to the problem of conservation of all national monuments and antiquities of India. He appointed Sir John Marshall as the Director General of the newly reorganized Archeological Survey of India. It was Sir John Marshall who clearly set forth the main principles underlying conservation work in a departmental manual.

The emergence of material conservation as a specialized science, however, began only in the latter half of the 20th century with concurrent developments in Europe and America. The establishment of the Conservation Laboratory of the Archaeological Survey of India in Dehradun marked the beginning of this movement. The laboratory still remains a major collaborator in the conservation activity throughout the country.

In the last few decades several other laboratories have been established in India including the National Research Laboratory for Conservation of Cultural Property (NRLC). These laboratories address the needs of stone conservation in archaeology, museums, and monuments.

With an impending need to cope with questions of stone conservation of general global relevance, current knowledge, although extensive, is by no means complete. Finding means and measures for reducing and controlling this apparent acceleration in the rate of stone decay are high priority today for conservators in India who attempt to preserve our cultural, urban and architectural environment. This book aims at providing background information on the conservation of stone used in art and architecture throughout in India.

A fairly conventional approach has been adopted in the chapterization of this book. First, this book examines the types of building stones used in India and mechanism involved in their deterioration. It then explores available conservation techniques and finally attempts to provide the reader with insight into possible approaches to dealing with stone conservation problems.

The chapters in the book are accordingly divided into three sections:

Section I Types of Building Stones

Section II Diagnosis of Stone Deterioration

Section III Treatment of Stone

The types of stone encountered in the built structures of the Indian subcontinent cover the gamut of available materials. They range from porous friable tuffs and zeolites to dense hard basalts and quartzites. Quarried rock, referred to as building stone in this book, is heterogeneous in nature. It is characterized by wide ranges of mineral composition, texture, and structure. Consequently, its physical and chemical properties and, hence, durability and resistance to the action of environmental agents of decay are extremely variable. It is, therefore, of critical importance that the chemical and geological nature of these building stones be properly understood.

Section I reviews available literature on the types of stone used as a medium for artistic expression in the Indian subcontinent, their relevant properties and the construction technology adopted in their use.

An accurate diagnosis of the causes of stone deterioration is a prerequisite for its appropriate conservation. Present day stone conservation technology demands that the antiquities, be they large monuments exposed to the environment or small exhibits displayed in museums, should be subjected to detailed examination for determining the causes of deterioration. Section II primarily focuses on natural causes of stone damage, including the whole spectrum of physical, chemical as well as biological factors, that have a prolonged action on the stone object or building.

Extrinsic causes of an accidental and unpredictable character, such as natural events that qualify as real disasters, will not be discussed except for their indirect effects in rendering the stone more susceptible to the influences of weathering agents that have a prolonged effect. These phenomena include: earthquakes, landslides and all ramifications of soil motion and disintegration, volcanic eruptions, tidal waves, cyclones, hurricanes, tornadoes and typhoons, floods, avalanches, and fires due to spontaneous combustion.

In recent years improved experimental research and application have resulted in large and growing range of materials available for stone treatment. Often treatments have only served to expedite the decay process. Rational and discriminating use of conservation products requires some understanding of the chemical and physical properties of these materials and their long-term behavior under conditions of natural weathering. Section III examines in detail many of the available conservation materials and techniques. It describes the objectives of undertaking a particular treatment. It also gives specific information on the advantages and limitations of each technique.

— Anuradha V. Kumar