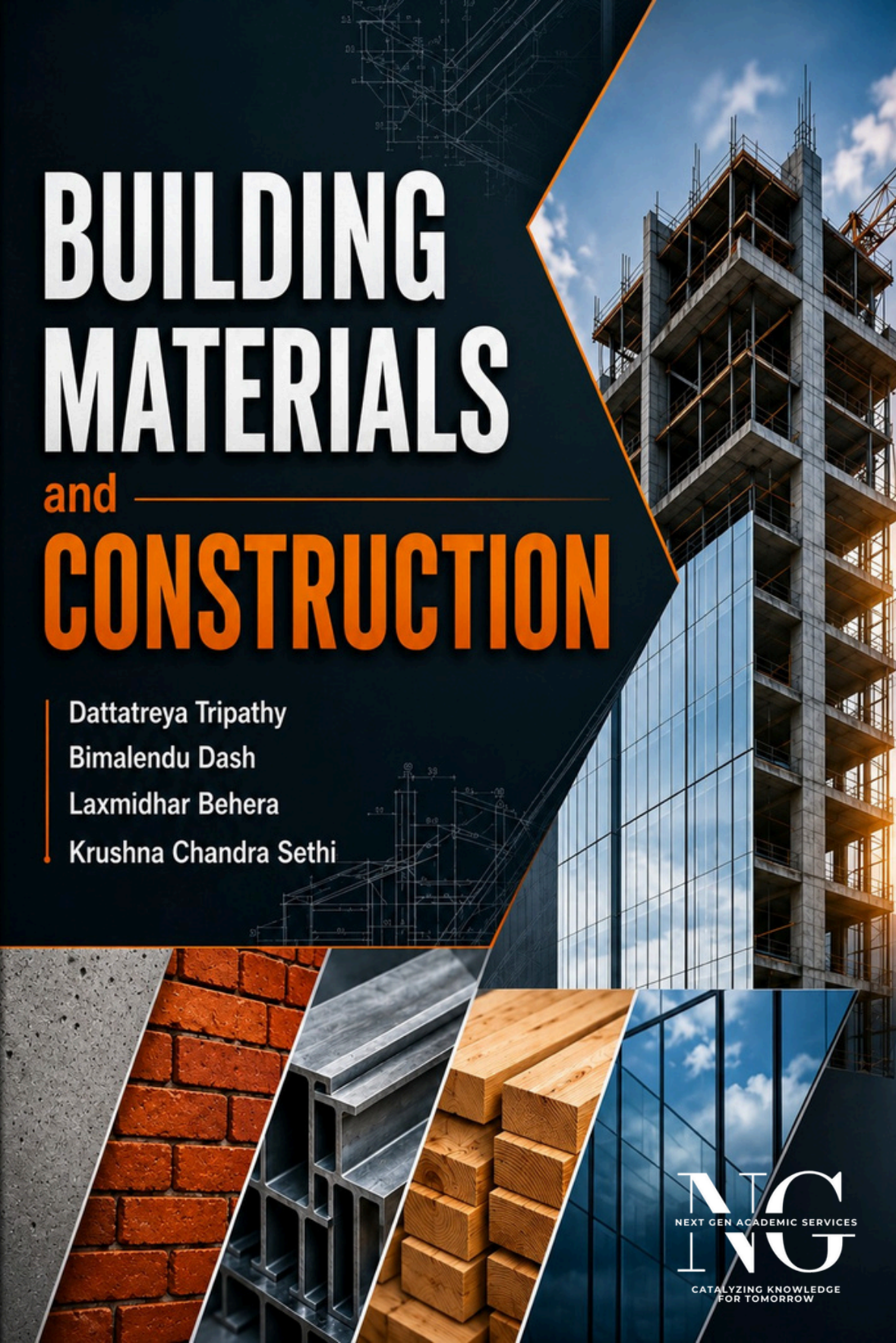
BUILDING MATERIALS and CONSTRUCTION

Dattatreya Tripathy
Bimalendu Dash
Laxmidhar Behera
Krushna Chandra Sethi



NEXT GEN ACADEMIC SERVICES
CATALYZING KNOWLEDGE FOR TOMORROW

BUILDING MATERIALS AND CONSTRUCTION

BUILDING MATERIALS AND CONSTRUCTION

Authors:

Dr. Dattatreya Tripathy
Assistant Professor, Department of Civil Engineering, Dr. Vishwanath Karad MIT World Peace University, Pune, Maharashtra, India

Dr. Bimalendu Dash
Assistant Professor (Senior grade), Department of civil engineering GMR Institute of Technology (GMRIT)-Deemed to be University, Rajam

Mr. Laxmidhar Behera
Assistant Professor, Department of Civil Engineering at Centurion University of Technology and Management Paralakhemundi, Odisha

Dr. Krushna Chandra Sethi
Assistant Professor, Department of Civil Engineering, Centurion University of Technology, & Management, Paralakhemundi, Odisha, India

NEXT GEN ACADEMIC SERVICES
CATALYZING KNOWLEDGE FOR TOMORROW

Next Gen Academic Services Private Limited
1942/2956, Lane R4, Jagamohan Nagar, Khordha, Odisha, 751030, India
e-mail: books@ngenpub.com, Website: https://ngenbook.com/

Published by:

Next Gen Academic Services Private Limited

1942/2956, Lane R4, Jagamohan Nagar, Khordha, Odisha, 751030, India
e-mail: books@ngenpub.com; Website: https://ngenbook.com/

ISBN (eBook): 978-81-686718-5-0
ISBN (Paperback/softback): 978-81-686718-4-3

First Edition: 2026
First Published: 26 June 2026

Composed, Designed & Printed in India

Authors

Dr. Dattatreya Tripathy is an Assistant Professor in the Department of Civil Engineering at Dr. Vishwanath Karad MIT World Peace University, Pune, Maharashtra, India. He holds a Ph.D. in Structural Engineering from the Indian Institute of Technology Patna (IITP). His research primarily focuses on structural rehabilitation, masonry strengthening, sustainable construction materials and impact of water quality on it. With 3+ years of teaching and research experience, along with academic leadership roles such as Dean (R&D), he has contributed significantly to engineering education and research. Dr. Tripathy has published 20+ research articles in reputed international journals, conferences, book chapters and technical seminars. His work reflects a strong commitment to sustainable and resilient infrastructure, aligning with modern challenges in sanitation engineering, environmental protection, and resource efficient construction.

Dr. Bimalendu Dash is a Civil Engineer and Ph.D. holder in Structural Engineering with over nine years of teaching and academic experience. His expertise lies in sustainable construction materials, particularly fiber-reinforced concrete incorporating recycled aggregates. He has taught key civil engineering subjects with a strong focus on conceptual clarity, practical application, and student engagement. Alongside teaching, he has contributed to curriculum development, academic coordination, and quality assurance aligned with modern educational standards. A recipient of the Best Faculty Award, he is committed to bridging the gap between theory and practice. Through his work, he aims to develop accessible and practical learning resources that prepare students to address real-world engineering and sustainability challenges.

Mr. Laxmidhar Behera is an Assistant Professor in the Department of Civil Engineering at Centurion University of Technology and Management (CUTM), Odisha. He has over five years of professional experience in teaching, project execution, construction planning, and renovation works. His academic and professional interests focus on construction planning and management, structural engineering practices, and infrastructure development. Mr. Behera is committed to providing industry-oriented education through experiential and project-based learning. He has actively guided students in various live construction and infrastructure projects, including concrete gate construction, landscaping works, architectural planning, and drafting activities, helping them develop practical engineering skills. He has participated in several professional development programmes and certification courses to enhance his technical knowledge and stay updated with advancements in civil engineering.

Dr.Krushna Chandra Sethi is an Assistant Professor in the Department of Civil Engineering at Centurion University of Technology and Management (CUTM), Odisha, India, with over eight years of teaching and research experience in Civil and Transportation Engineering. His academic and research expertise encompasses flexible pavement design, asphalt mixture evaluation, pavement materials, transportation planning, and sustainable transportation infrastructure. As a certified practitioner of problem-based learning (PBL) from Aalborg University, Denmark, he actively promotes innovative, learner-centric, and outcome-based engineering education. Dr Sethi has made notable contributions to research and innovation, holding three patents and authoring more than 35 publications in reputed international journals, conference proceedings, and edited volumes. He also served as the principal investigator of a TEQIP-III-funded research project focused on developing innovative solutions for pothole repair and pavement maintenance. In recognition of his scholarly contributions and academic excellence, he has received several prestigious honours, including the CSIR–UGC NET Junior Research Fellowship (JRF) Award, Best Paper Presentation Award, Best Performer Faculty Award, and the Eminent Achiever Award. Through his teaching, research, and innovation activities, Dr Sethi continues to contribute to the advancement of sustainable transportation systems, modern construction technologies, and industry-oriented engineering education.

Preface

Building materials are the foundation of every construction activity. The strength, durability, safety, economy, appearance and service life of a structure depend greatly on the proper selection and use of materials. At the same time, good construction practice is essential to ensure that these materials perform as intended in actual site conditions. For this reason, the study of building materials must be closely connected with the study of construction methods, workmanship, quality control and field applications.

This book, ***Building Materials and Construction,*** has been prepared to provide a clear, systematic and practically useful understanding of the materials and construction practices commonly used in civil engineering works. It is intended primarily for students of civil engineering, construction technology and related disciplines. The book will also be useful for teachers, site engineers, supervisors, contractors, technicians and professionals who require a dependable reference on material properties, construction suitability and practical execution.

The book covers a wide range of traditional and modern materials, including stones, bricks, blocks, clay products, lime, cement, cementitious materials, aggregates, sand, mortar, plastering materials, concrete, timber, engineered wood, metals, steel, glass, plastics, polymer-based materials, paints, varnishes, distempers, surface finishes, flooring, roofing and ceiling materials. It also discusses important construction practices related to masonry, foundations, damp-proofing, waterproofing and the use of modern, sustainable and smart building materials.

While preparing this book, we have attempted to maintain a balance between theoretical explanation and practical relevance. The discussion focuses not only on the properties and classification of materials but also on their field performance, advantages, limitations, defects, precautions and suitability for different construction purposes. Special attention has been given to the relationship between material selection, workmanship, durability and long-term performance of buildings.

In construction, many problems arise not only because of design errors but also due to poor-quality materials, improper storage, incorrect mixing, inadequate curing, defective joints, moisture penetration, unsuitable finishes and lack of supervision. Therefore, this book emphasizes practical understanding along with technical knowledge. Readers are encouraged to view materials not as isolated products, but as part of a larger construction

system where selection, handling, application and maintenance are equally important.

The construction industry is also changing rapidly. Sustainability, resource efficiency, durability, thermal performance, waste reduction, recycling, low-carbon materials and smart technologies are becoming increasingly important. Keeping these developments in mind, the book includes both conventional materials and emerging alternatives so that readers can understand the continuity between established construction practices and future-oriented building technologies.

We have written this book in a simple, structured and instructional style without compromising technical accuracy. Our aim is to help readers understand what building materials are, how they behave, where they are used, what precautions are necessary during construction and how better material choices can improve the quality and sustainability of the built environment.

We hope this book will serve as a useful learning resource and practical reference for students, teachers, professionals and practitioners. Constructive suggestions from readers will be gratefully received and will help us improve future editions of this work.

Authors

Contents

BUILDING MATERIALS AND CONSTRUCTIONS

Building Materials and Construction Practices provides a clear and practical introduction to the materials, methods, and technologies used in modern building construction. The book covers stones, bricks, cement, aggregates, mortar, plaster, concrete, timber, steel, glass, plastics, paints, flooring, roofing, foundations, damp-proofing, and waterproofing. It explains their properties, selection, applications, and construction practices with emphasis on durability, safety, and performance. It also introduces sustainable materials, smart construction products, advanced composites, repair systems, retrofitting methods, and emerging construction technologies.

Designed for students, teachers, engineers, architects, and construction professionals, this book connects material knowledge with practical site applications and modern industry requirements

Authors:

Dr. Dattatreya Tripathy
Assistant Professor, Department of Civil Engineering,
Dr. Vishwanath Karad MIT World Peace University, Pune, Maharashtra, India

Dr. Bimalendu Dash
Assistant Professor (Senior grade), Department of Civil Engineering
GMR Institute of Technology (GMRIT)-Deemed to be University, Rajam

Mr. Laxmidhar Behera
Assistant Professor, Department of Civil Engineering,
Centurion University of Technology and Management, Paralakhemundi, Odisha

Dr. Krushna Chandra Sethi
Assistant Professor, Department of Civil Engineering,
Centurion University of Technology, & Management, Paralakhemundi, Odisha, India

NEXT GEN ACADEMIC SERVICES
CATALYZING KNOWLEDGE FOR TOMORROW

Next Gen Academic Services Private Limited
1942/2956, Lane R4, Jagamohan Nagar,
Khordha, Odisha, 751030, India
e-mail: books@ngenpub.com
Website: https://ngenbook.com/

ISBN: 978-81-686718-4-3