Construction industry is the largest consumer of material resources, of both the natural ones (like stone, sand, clay, lime) and the processed and synthetic ones. Each material which is used in the construction, in one form or the other is known as construction material (engineering material). No material, existing in the universe is useless; every material has its own field of application. Stone, bricks, timber, steel, lime, cement, metals etc. are some commonly used materials by civil engineers. Selection of building material, to be used in a particular construction, is done on the basis of strength, durability, appearance and permeability. The stone which is used in the construction works, in one form or another is always obtained from the rocks. The rocks may be classified in four ways; geological classification, physical classification, chemical classification and classification based on hardness of the stone. Various king of rocks come under these classification for example; igneous rocks, plutonic rocks, sedimentary rocks, silicious rocks, stratified rocks etc. brick is the most commonly used building material which is light, easily available, uniform in shape and size and relatively cheaper except in hilly areas. Bricks are easily moulded from plastic clays, also known as brick clays or brick earth. Bricks can be moulded by any of the three methods; soft mud process, stiff mud process and semi dry process. There are various kinds of bricks; specially shaped bricks, burnt clay bricks, heavy duty bricks, sand lime bricks, sewer bricks, refractory bricks, acid resistant bricks etc. lime is an important building material, it has been used since ancient times. Lime is used as a binding material in mortar and concretes, for plastering, for manufacturing glass, for preparing lime sand bricks, soil stabilization etc. Concrete is a construction material obtained by mixing a binder (such as cement, lime, mud etc.), aggregate (sand and gravel or shingle or crushed aggregate), and water in certain proportions. Based on the binding materials, the common concretes can be classified as; mud concrete, lime concrete, cement concrete and polymer concrete. World demand for cement and concrete additives is projected to increase 8.3 percent annually in next few years. This book basically deals with rock and stone, formation of rocks, classification of rocks, geological classification, metamorphism physical classification of rocks, chemical classification, classification based upon hardness of the stone composition of stone (rock forming minerals), igneous rock forming minerals, sedimentary rock forming minerals, texture of the rocks, types of fractures of rock, uses of stone, natural bed of stone, aluminium and magnesium alloys, mechanical properties of a partially cured resin, DMA characterization, chemical advancement of a partially cured resin, differential scanning calorimeter characterization, chemical mechanical relations, moisture content as a variable, wetability and water repellency of wood, fungal and termite resistance of wood etc.

The book provide wide coverage of building materials such as stone, bricks, lime, mortars, concrete, asbestos, gray iron, cast iron, steel castings, aluminium, wood, architectural paints and so many others with their applications in building construction. The book is resourceful for all professionals related to construction field, technocrats, students and libraries.

Contents
1. STONE
Introduction
Rock and Stone
Formation of Rocks
Classification of Rocks
Geological classification
Metamorphism
Physical classification of rocks
Chemical classification
Classification based upon hardness of the stone
Composition of Stone (Rock-forming Minerals)
Igneous rock forming minerals
Sedimentary Rock Forming Minerals
Texture of the Rocks
Types of Fractures of Rock
Uses of Stone
Natural bed of Stone
Seasoning of Stones
Characteristics or Qualities of Stones
Characteristics of principle Building Stones
Properties
Decay or Deterioration of Stones
Preservation of Stone
Artifical Stone
Important point to be Considered before Starting Quarrying
Methods of quarrying Stone
Various Operations of Blasting
Precautions in Blasting
Blasting materials
Making of Primer Cartridge
Storing of explosives
Handling of misfires
Dressing of Stone
Machines Required for Quarrying Stone

2. BRICKS AND OTHER CLAY PRODUCTS
Introduction
Brick Earth and its Constituents
Sources of Brick Earth
Qualities of Brick Earth
Chemical composition of Brick Earth
Functions of the constituents of Brick Earth
Harmful Ingredients
Pebbles of Stones and Gravel
Alkaline-Salts
Limestone and Kankar
Vegetation and Organic Matter
Manufacture of Clay Bricks
Selection of site
Preparation of Clay
Weathering Process
Tempering process
Moulding of bricks
Soft mud process
Procedure
Stiff Mud Process
Semi Dry Process
Drying of Bricks
Natural Drying
Artificial Drying
Burning of Bricks
Clamp
Intermittent Kilns
Continuous Kilns
Classification of Burnt Clay Bricks
Introduction
Properties of Burnt Clay Bricks
General Quality of Bricks
Dimensions and Tolerances
Water Absorption of Bricks
Efflorescence
Strength of Bricks
Testing of Bricks
Test for Compressive Strength
Test for Water Absorption
Test for efflorescence
Test for warpage
Special Bricks
Specially shaped Bricks
Burnt Clay Facing Bricks
Heavy Duty Bricks
Perforated building bricks
Sand lime Bricks
Sewer Bricks
Acid Resistant Bricks
Refractory Bricks
Manufacture
Acid bricks
Basic Bricks
Neutral Bricks
Building Tiles
Process for Manufacturing Roofing Tiles
Process for Manufacturing Flooring and Wall Tiles
Specifications for Building Tiles
Earthenwares
Glazed Earthenware Tiles
Terracotta
Stoneware

3. LIME
General
Properties of Lime
Uses of Lime
Source of Lime
Some Important Terms and their Definitions
Varieties of lime
Classification of Lime
Uses of fat lime
Classification of Lime According to I.S. 712-1984
Indian Standard Specification for Lime
Manufacturing process
Description of Each Stage of Operation
Field Control Test for Assessing Quality of Lime
Manufacture of Fat Lime
Advantages of continuous kiln
Manufacture of Natural Hydraulic Lime
Manufacture of Artificial Hydraulic Lime
Storage of Lime
Field Slaking of Lime and Preparation of Putty
Objective of Slaking
Slaking Process
Determining the Slaking Nature of Lime
Slaking Procedure for Quick Slaking Lime
Initial Preparation
Methods of Slaking Lime
General Precautions in Slaking
Slaking Procedure for Medium and Slow-slaking Limes
Running
Maturing
Making Coarse Stuff and Putty from Hydrated Lime or Powder
Coarse Stuff
Putty
Storage after slaking
Testing of Lime
Classification of binding materials
Precautions to be taken in handling lime
Properties of Lime

4. MORTARS
Definitions
Sand
Classification Based on Fineness
Bulking of Sand
Desirable Properties of Sand
Function of Sand in Mortars
Fineness Modulus of Sand
Tests for Sand
Selection of Sand for Use
Substitutes for Sand
Types of Mortars
Special Mortars
Properties of Good Mortar
Test for Mortars
Precautions in using Mortar

5. CONCRETE
Introduction
Lime Concrete
Preparation of lime Concrete
Laying of Lime Concrete
Properties of Lime Concrete
Use and Precautions
Water
Coarse Aggregate
Grading of Aggregate
Proportioning of Fine Aggregate to Coarse Aggregate
Maximum Size of the Aggregate
Measurement of Cement Concrete Ingredients
Significance of Bulking of Sand
Water Cement Ratio (W/C Ratio)
Proportioning of Concrete Mixes
Cube strength of Concrete
Properties of Cement Concrete
Slump Test
Factors Affecting Proportions of Concrete
Strength of Concrete
Mixing of Concrete
Transporting the Concrete
Placing of Concrete
Consolidation or Compaction of Concrete
Finishing
Curing of Concrete
Removal of Form Work
Joints in Concrete
Some other Types of Cement Concretes
Form Work

6. ASBESTOS
Introduction
Commercial Focus
Asbestos Sheets and Boards
Asbestos Cement Pipes

7. ASPHALT, BITUMEN AND TAR
Introduction
Terminology
Asphalt/Bitumen
Other Allied Terms
Bituminous Materials
Bitumen Felt/Tar Felt
Specifications and use
Other Bituminous Materials
Tests for Bitumen
Tar

8. GRAY IRON
The Metastable Iron-Iron Carbide System
Solidification of an Fe-C-Si Alloy
Chemical Composition Effects
Carbon
Silicon
Silicon Content and Graphitization
Sulfur and Manganese
Phosphorus
Gray-iron Specifications
Heat-treatment of Gray Iron
Machinability
Wear Resistance
Strength
Stress Relief
Alloying Elements
Effect on Microstructure
Chromium
Molybdenum, Molybdenum-Nickel
Nickel
Silicon
Copper
Aluminum and Titanium
Effect on Properties

9. CAST IRON
Definitions
Chemical Composition
Composition and Graphitization
Solidification Process
Microstructure
Graphite
Cementite
Ferrite
Pearlite
Steadite
Austenite
Properties of Cast Irons
White Irons
Chilled Iron

10. STEEL CASTINGS
Introduction
Molding Processes And Sands
Green-sand Molding
Refractoriness
High permeability and Low Moisture Content
Organic and Other Additions
Green-sand-molding Casing Defects
Dry-sand Molds and Skin-dried Molds
Other Types of Molds
Molding Methods
Cores
Hot-tear Formation
Metal penetration
Burn-on
Ceroxides
Core and Mold Washes

11. ALUMINIUM AND MAGNESIUM ALLOYS
ALuminum Alloying Principles
Copper
Heat-treatment of Cu-Al Alloys
Silicon
Magnesium
Magnesium and silicon

12. DUCTILE IRON
Solidification Of Ductile Iron
Development of Graphite Spheroids
Role of Magnesium
Control of the Common Elements
Carbon
Silicon
Sulfur
Phosphorus
Other Elements
Melting Practices
Acid Cupola Melting
Desulfurization
Basic Cupola Melting
Induction-furnace Melting
Magnesium Treatment
Inoculation
Engineering Properties

13. MALLEABLE IRON
Melting
Batch-Melting Process
Engineering Properties
Pearlitic Malleable Irons
Other Malleable Irons

14. RESIN CHARACTERIZATION
Introduction
Scope
Mechanical Properties of a Partially Cured Resin â€“ DMA Characterization
Chemical Advancement of a Partially Cured Resinâ€“Differential Scanning Calorimeter Characterization
Chemical-Mechanical Relations
Moisture Content as a Variable
Flake Bonding
Measurement of Pressing Environments
Resin Penetration
Practical Application

15. THERMO-GRAVIMETRY OF WOOD REACTED WITH FLAME RETARDANTS
Introduction
Experimental Methods
Results and Discussion
Phosphorus And Nitrogen
Thermogravimetry
Flame Test
Conclusions
16. WETTABILITY AND WATER REPELLENCY OF WOOD

Introduction
Experimental
Wood materials
Automated surface tension analyzer
Computer program: wood wettability study
Graph
Contact angle from attractive force
Contact angle from work of adhesion
Surface free energy estimation
Interaction parameter calculation
Aging effect
Results and Discussion
Aging effect
Surface free energy estimates
Interaction parameter calculation

17. FLAME RETARDANT TREATMENT OF WOOD

Introduction
Materials and Methods
Preparation of specimens
Treatment of specimens
Leaching
Dimensional stability tests
Thermogravimetric analysis
Results and Discussion
Treatment of specimens
Leach resistance
Dimensional stability
Thermal degradation
Conclusions

18. FUNGAL AND TERMITE RESISTANCE OF WOOD

Introduction
Materials and Methods
Fungal evaluations
Termite evaluations
Reaction time and chemical analysis
Results and Discussion
Decay Resistance
Chemical Analysis
Conclusions

19. WEATHERING OF WOOD

Introduction
Early History
The Weathering Process
Weathering Factors
Property Changes
Weathering of Wood-Based Materials
Protection Against Weathering
Film-forming Materials
Penetrating Finishes
Summary

20. ARCHITECTURAL PAINTS
Introduction
Exterior Paints for Wood
Characteristics of Wood Siding
Binders for Exterior House Paints
Pigments for Colored Paints
Microorganisms in Paints and Coatings
Formulating Exterior Paints for Wood
Interior Paints for Plaster and Wallboard
Exterior Emulsion Paints for Masonry
Exterior Solution Type Paints for Masonry
Interior and Exterior Enamels
Enamels for Wood and Concrete Floors

21. BUILDING CONSTRUCTION ADHESIVES
Introduction
Advantage of Using Adhesives in Construction
Elastomeric Adhesives
Gap-Filling Phenol Resorcinol Adhesives
Polyurethane Adhesives
Resorcinol Resin Adhesives
Casein Adhesives
Polyvinyl Acetate Resin Emulsion
Phenolic Resin Adhesives
Melamine-Urea Resin Adhesives
Urea Resin Adhesives
Epoxy Resin Adhesives
Contact Cement

22. FLOORING
Domestic Flooring
Institutional Flooring
Industrial Flooring
Types Of Epoxy Flooring
Self-levelling Floors
Trowelled Floors
Epoxy Terrazzo
Future Developments In Epoxy Floors

23. MINING
Adhesion And Grouting
Remedial Uses
Concrete Crack Repair
Bonding Concrete to Concrete
Bonding Reinforcements
Epoxy Bonding in New Structures
Fire Resistance
Bulk Mechanical Properties
Creep
24. GROUTS FOR LEVELLING: MISC. APPLICATIONS
Miscellaneous Applications
Soil consolidation
Tile grouts
Epoxy laminates for concrete moulds
Resin concrete

25. GLASS
Structure
Composition
Single-Phase Glasses
Properties
Manufacture and Processing
Economic Aspects

26. CEMENT
Clinker Chemistry
Hydration
Cement Paste Structure and Concrete Properties
Manufacture
Portland Cements
Special Purpose and Blended Cements
NonPortland Cements
Economic Aspects, Production, and Shipment
Specifications and Types
Uses

27. INSULATING MATERIALS
Introduction
Thermal Insulation
Terminology Related to Thermal Insulation
Requirements of Thermal Insulating Materials
Types of Insulating Materials
Air Spaces
Aerated Concrete
Gypsum
Expanded Blast Furnace Slag
Sprayed Asbestos
Vermiculite
Coconut Fibres
Cork Board
Rock Wool
Cellulose
Cellular Plastics
Fibre Glass
Sound Insulation
Terminology
Units of Sound
Velocity of Sound
Acoustics
Noise
Requirement of Sound Insulating Materials
Types of Acoustical Materials
Acoustic Pulp
Acoustical Plaster
Unifil Acoustical Plaster
Limpet Asbestos
Thermacoustic
Prefabricated Boards or Tiles
Glass Fibres
Composite Units

About NIIR

NIIR PROJECT CONSULTANCY SERVICES (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.


NPCS also publishes various process technology, technical, reference, self-employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit-making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the inputs in their research.