New European Bauhaus Academy

Week 2: Material Science and Mix Design

Volupte Studio

Circular Bio-based Europe Joint Undertaking

Bio-based Industries Consortium

Co-funded by the European Union

Learning Objectives

Content:

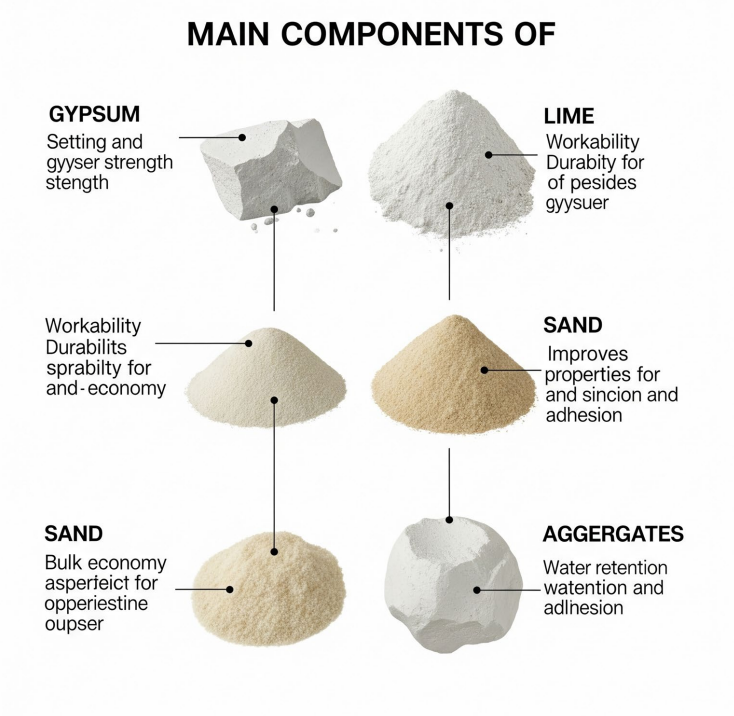
- Understand the main components of plaster and their functions
- Identify sustainable sources of recycled materials
- Learn how to design mixes for different wall finishes
- Explore the role of additives, fibers, and pigments

What Is Plaster?

A paste of binders, aggregates, and water applied to surfaces

Hardens through evaporation or chemical reaction

Used for protection, texture, and aesthetics



Common Binder Types

- **Gypsum** (common & recyclable)
- **Clay** (natural, breathable)
- **Lime** (air & hydraulic, traditional and eco-friendly)

Recycled Plaster as Binder

Recovered from drywall, casting waste

Requires crushing and sieving

Can replace commercial gypsum in eco-friendly finishes

Aggregates – Strength and Texture

Sand (most common)

Crushed brick, marble powder, bio-based fillers (e.g., hemp)

Local materials reduce footprint and enhance texture

Mix Design Ratios

Standard base coat (e.g., 1 part binder : 2.5 parts sand)

Adjusting water for workability

Additives: 2–5% by weight (e.g., starch, clay)

Additives and Enhancers

Fibers (straw, jute, cellulose): reduce cracking

Pigments: natural earth or mineral-based

Bind Enhancers: casein, linseed oil (optional)

Understanding Setting and Curing

Setting Time: begins 10–60 minutes after mixing

Curing: requires slow drying (up to 7 days) to reduce cracking

Importance of moisture retention and temperature

Pigment Compatibility

pH of plaster can affect pigment stability

Test small samples before full application

Most stable: iron oxides, ochres, sienna

Designing for Breathability

Avoid vapor barriers

Clay and lime finishes allow walls to “breathe”

Prevent mold and regulate interior humidity

Troubleshooting Common Issues

Cracking = too little fiber / drying too fast

Powdery surface = too much water or poor binder

Peeling = bad surface prep or wrong ratio

Sustainable Sourcing Tips

- Partner with construction sites for offcut gypsum
- Source aggregates from demolition or natural sites
- Use local clays or sands when possible

What’s Next

Trowel types and uses

Layering finishes

Site prep and masking tips

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