

Introduction to Road Construction

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Key concepts, phases, materials, and best practices

1. Purpose & Scope

- **Why roads matter**
 - Connect communities, facilitate trade, support emergency services.
 - Influence economic development, land use, and environmental impact.
 - **Types of roads**
 - **Highways / Expressways** – high speed, limited access.
 - **Arterial roads** – major city routes, moderate speed.
 - **Collector roads** – gather traffic from local streets.
 - **Local streets** – provide direct access to residences and businesses.
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2. Planning & Design Fundamentals

Step	Description	Typical Outputs
Feasibility Study	Traffic forecasts, cost-benefit analysis, environmental screening	Project justification report
Survey & Alignment	Topographic surveys, geotechnical investigations, route selection	Alignment drawings, ground condition maps
Geometric Design	Cross-section, horizontal & vertical alignment, sight distance	Design speed, lane width, superelevation tables
Structural Design	Pavement thickness, subgrade preparation, drainage	Pavement design sheet (e.g., AASHTO, EN1997)
Environmental & Social Review	Impact assessment, mitigation plans, public consultation	EIA report, mitigation matrix

- **Design standards** vary by country (AASHTO, CEN, Indian Roads Congress, etc.) but share common parameters: design speed, traffic volume (ESALs), climate, soil class.
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3. Pavement Types

Pavement	Composition	Typical Use	Advantages	Limitations
Flexible (Asphalt)	Bitumen binder + aggregates	High?traffic highways, urban roads	Quick construction, smooth ride, easy maintenance	Sensitive to temperature, requires periodic resurfacing
Rigid (Concrete)	Portland cement concrete slabs	Heavy?load corridors, airports	Long life, high load capacity, lower maintenance frequency	Higher initial cost, longer curing time
Composite	Concrete base + asphalt surface	Transitional projects	Combines strengths of both	More complex design & construction
Unpaved (Gravel / Earth)	Compactable soil, gravel, stabilizers	Rural, low? traffic roads	Low cost, simple construction	Poor durability, dust, requires frequent grading

4. Construction Phases

1. Site Preparation

- Clearing & grubbing (vegetation removal)
- Earthwork: cut?and?fill, leveling, compaction
- Sub?grade stabilization (lime, cement, geotextiles)

2. Sub?Base & Base Installation

- **Sub?base:** coarse aggregates, provides drainage & load distribution.
- **Base:** finer aggregates, higher bearing capacity.

3. Pavement Layer Placement

- **Flexible pavement:** tack coat ? asphalt binder ? wearing course.
- **Rigid pavement:** formwork ? concrete placement ? finishing (troweling, jointing).

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4. Drainage & Structures

- Side ditches, culverts, storm drains.
- Bridges, retaining walls, traffic signs, lighting.

5. Finishing Works

- Pavement marking, signage, road furniture.
- Landscaping & erosion control.

6. Testing & Acceptance

- Compaction (Proctor, nuclear density gauge)
 - Smoothness (International Roughness Index)
 - Strength (California Bearing Ratio, concrete compressive strength)
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5. Materials Overview

| Material | Function | Key Properties | Typical Quality Tests |