

# Unit 1

## Built Environment & Elements of Built Environment

### **BUILT ENVIRONMENT**

#### **DEFINITION**

The built environment is defined as the human-made surroundings that provide the setting for human activity. This includes buildings, parks, transportation systems, utilities, and all the infrastructure created by humans to support life. According to BTU's syllabus, it involves:

- Homes, offices, commercial areas, recreation zones
- Roads, railways, culverts, airport infrastructure
- Water supply and drainage systems
- Structural infrastructure such as bridges, tunnels, canals
- Support systems for land and subsoil stability

#### **NEED AND PURPOSE**

The need for the built environment arises from the basic human requirement for shelter, safety, workspaces, mobility, health, sanitation, and recreational opportunities. Key purposes include:

- Facilitating human activities in daily life
- Enabling economic growth through commercial infrastructure
- Providing access to services and resources
- Enhancing aesthetics, comfort, and safety
- Encouraging social interaction through shared public spaces

Modern built environments are designed to improve quality of life, promote sustainability, and reduce environmental impact through green technologies and smart systems.

### **ELEMENTS OF BUILT ENVIRONMENT**

#### **HOMES, OFFICES AND COMMERCIAL BUILDINGS, PARKS AND RECREATION CENTRES**

##### **Homes**

- Serve as a shelter for individuals and families
- Include spaces for cooking, sleeping, sanitation, studying, and recreation
- Should be structurally sound, ventilated, insulated, and economical

##### **Offices**

- Workspaces for professional, administrative, and business operations
- Require ergonomic layouts, communication infrastructure, and utilities
- Range from government offices to IT parks and banks

## Commercial Buildings

- Structures for economic activities like trading, storage, services
- Includes malls, shops, supermarkets, warehouses
- Must follow fire safety, ventilation, zoning laws

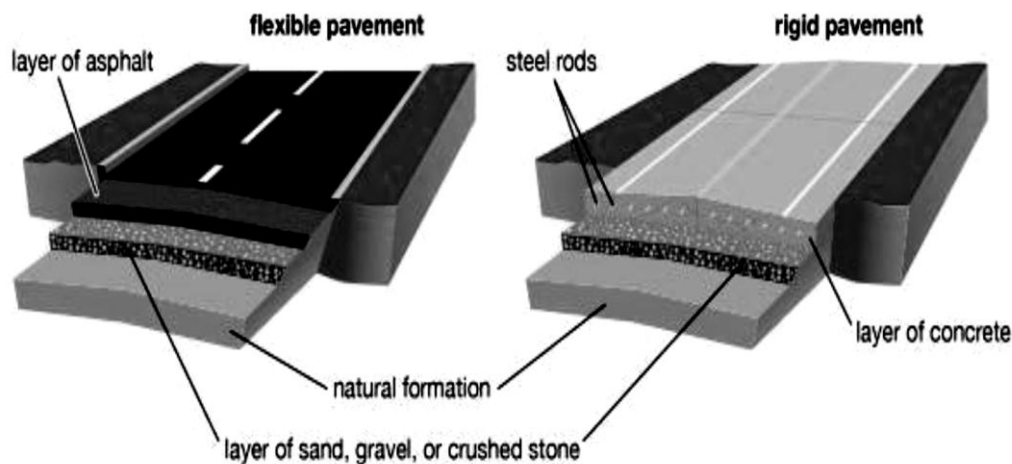
## Parks and Recreation Centres

- Provide space for physical activity, relaxation, and community gatherings
- Include parks, sports facilities, gymnasiums, walking tracks, cultural centres
- Promote environmental well-being and public health

## TRANSPORTATION SYSTEMS: ROADS, RAILWAY TRACKS, CULVERTS, AIRPORT RUNWAYS

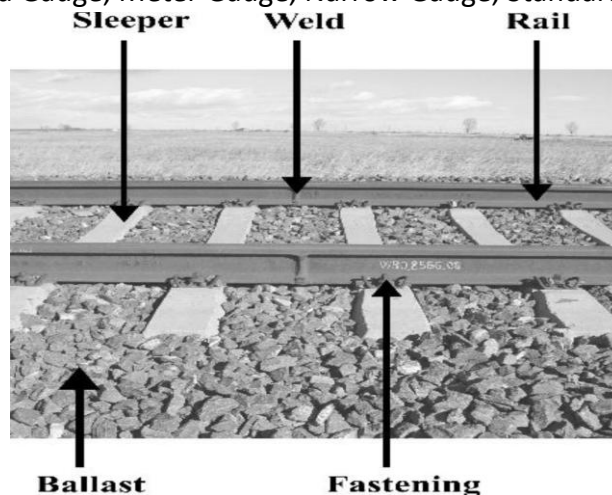
### Roads

- Surface transport pathways made from bitumen, concrete, or soil
- Types: National Highways, State Highways, Rural Roads, Expressways
- Components: Carriageways, shoulders, medians, sidewalks, drainage



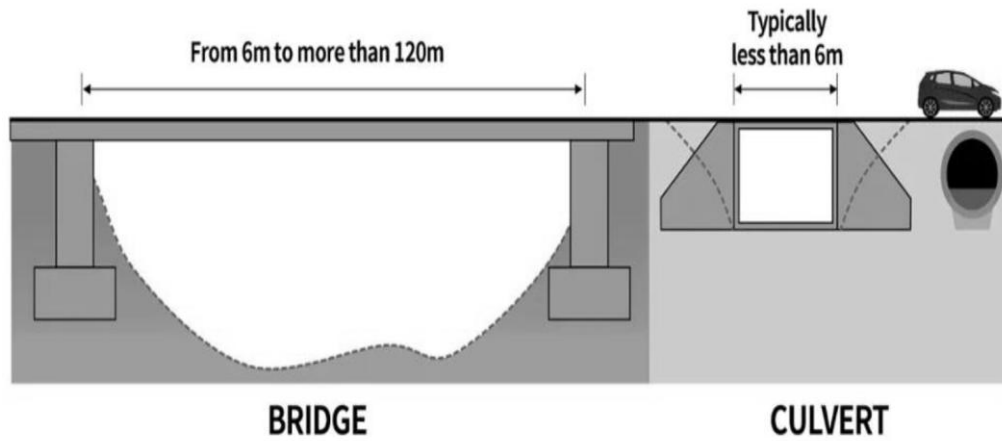
### Railway Tracks

- Parallel steel rails fixed on sleepers over ballast
- Used for transport of passengers and freight
- Types of gauges: Broad Gauge, Meter Gauge, Narrow Gauge, Standard Gauge



### Culverts

- Small bridge-like structures to allow water to pass under roads/rail lines
- Types: Pipe culverts, Box culverts, Arch culverts
- Materials: Concrete, Corrugated Steel, Polymer



### Airport Runways

- Paved strips for aircraft take-off and landing
- Made from high-strength asphalt or concrete
- Includes: Taxiways, Hangars, Control Towers, Aprons

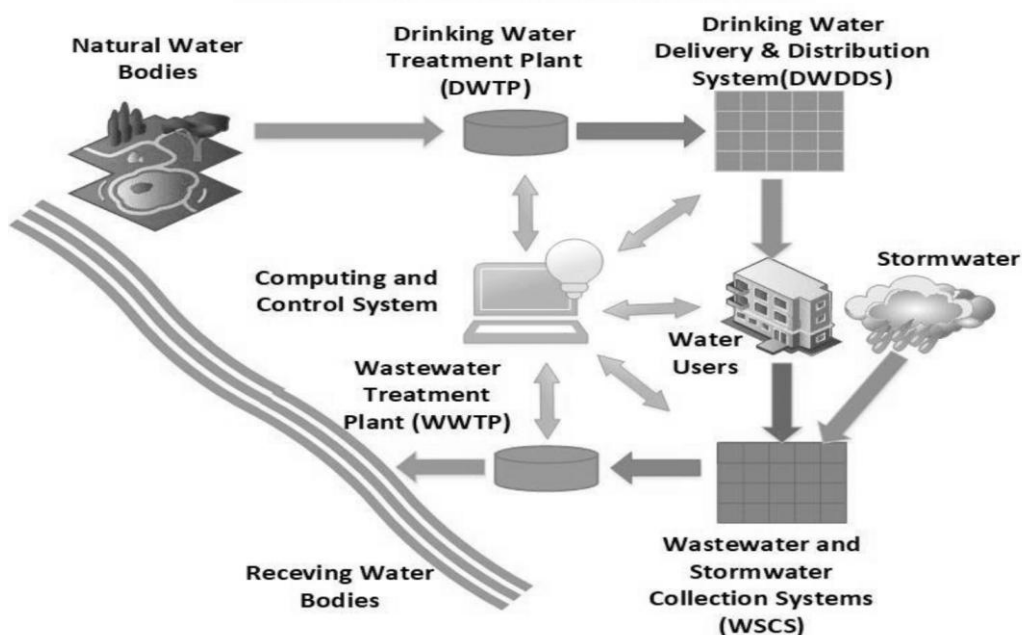
## WATER RESOURCES AND WATER SYSTEMS

### Water Resources

- Surface water: Rivers, lakes, ponds
- Groundwater: Wells, aquifers
- Artificial sources: Recycled or desalinated water

### Water Systems

- Infrastructure for collection, purification, storage, distribution, and disposal
- Components
  - Raw water collection points
  - Treatment plants (filtration, chlorination)
  - Distribution pipelines
  - Storage facilities (tanks, reservoirs)
  - Pumping stations
  - Sewerage and wastewater connections



Water systems are vital for drinking water, irrigation, firefighting, industry, and sanitation.

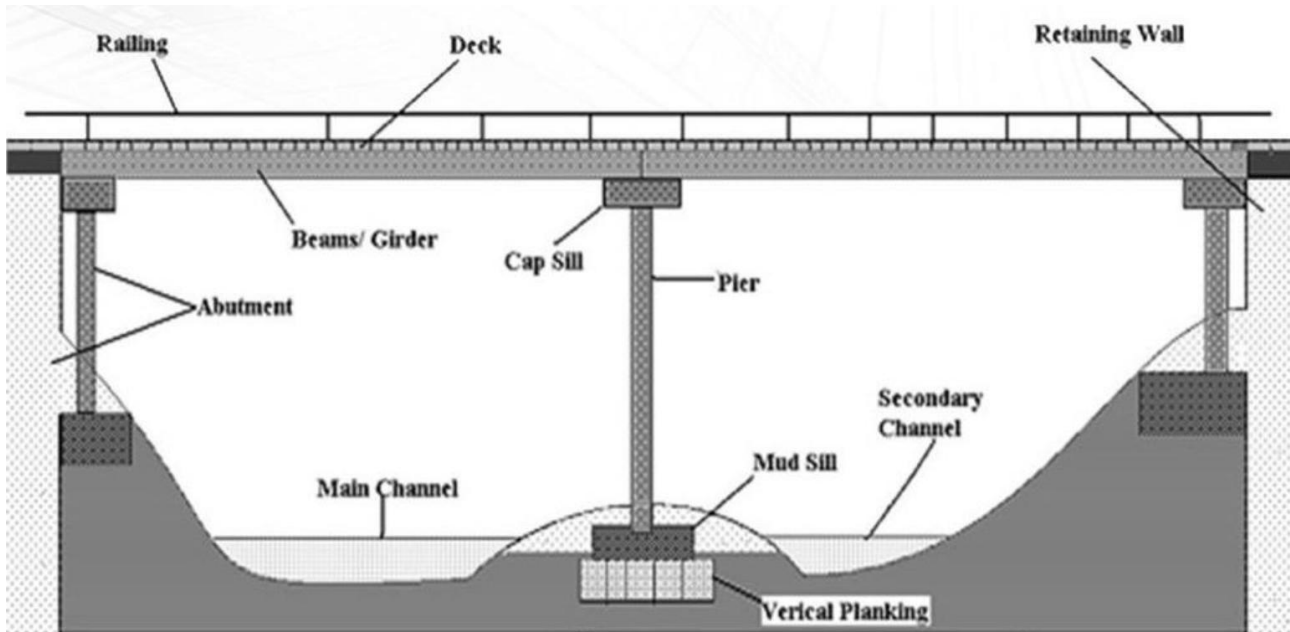
# INFRASTRUCTURE: BUILDINGS, BRIDGES, TUNNELS, DAMS, CANALS, SEWER SYSTEMS

## Buildings

- Structures for residence, work, education, and healthcare
- Require sound architectural design, ventilation, lighting, and safety compliance
- Materials: Brick, concrete, steel, wood, glass

## Bridges

- Provide passage over rivers, roads, or valleys
- Types: Beam, Arch, Cantilever, Suspension
- Must withstand loads and environmental stresses

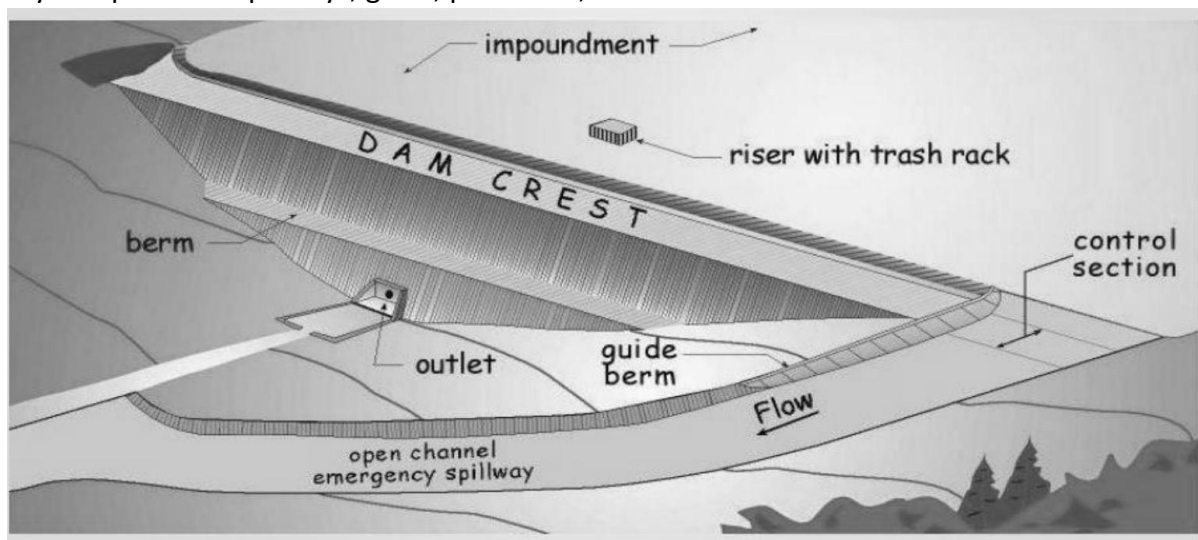


## Tunnels

- Underground routes for roads, railways, or utilities
- Benefits: Save surface space, reduce travel time, shield from weather
- Methods: TBM (Tunnel Boring Machine), NATM, cut and cover

## Dams

- Block or divert rivers for water storage, flood control, and power generation
- Types: Gravity, Arch, Earth-fill, Rock-fill
- Key components: Spillways, gates, penstocks, turbines



## Canals

- Man-made channels to transport water for irrigation or navigation
- Require: Aqueducts, locks, embankments, regulators

## Sewer Systems

- Networks to carry domestic, industrial, and storm wastewater
- Components: Pipes, manholes, pumping stations, treatment plants
- Types: Separate and combined sewer systems

## GROUND SUPPORT SYSTEMS

These systems ensure safety and stability during and after excavation, particularly in underground structures and deep foundations.

### Types

- Natural: Room-and-pillar methods in mining
- Artificial:
  - Surface support: Shotcrete, mesh, timbering
  - Internal reinforcement: Rock bolts, cable bolts, steel ribs, hydraulic props

### Applications

- Metro tunnels
- Mining operations
- Bridge abutments
- Deep excavations and foundations

Proper ground support is crucial to prevent collapse, reduce deformation, and ensure structural longevity.

