Transportation Engineering

- Role of Transportation in National Development.
- Transportation Ways.
- Surface Transportation and Aviation.
- BOT Projects for Highways.
- BOOT Projects for Highways.
- Elements of Traffic Engineering and Traffic
- Control.

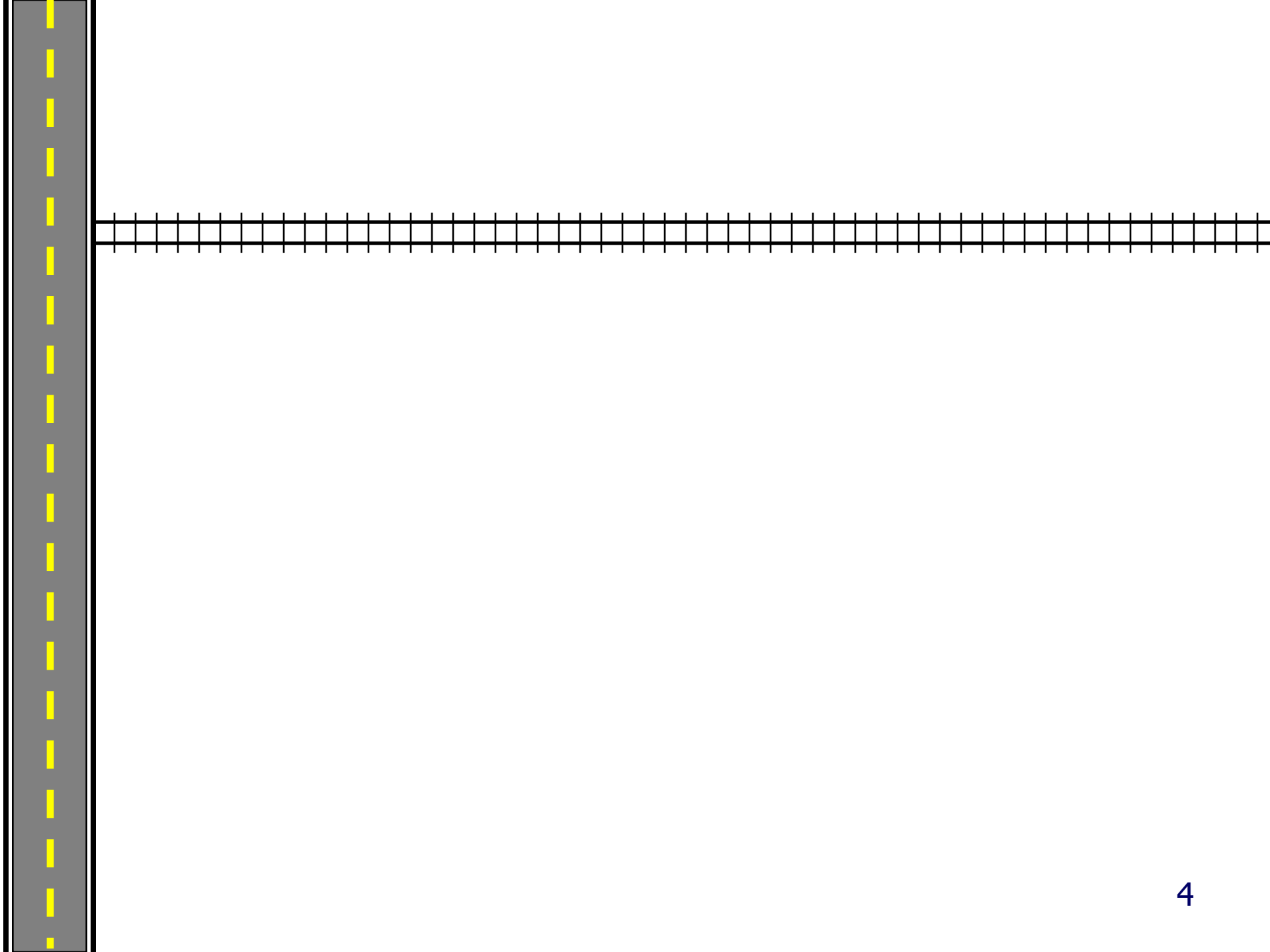
What Is Transportation Engineering?

- **Transportation engineering is the application of the principles of engineering, planning, analysis, and design to the disciplines comprising transportation: its vehicles, its physical infrastructure, safety in travel, environmental impacts, and energy usage.**

- **It involves “hard” physical sciences and “soft” sciences**

Role of Transportation in National Development

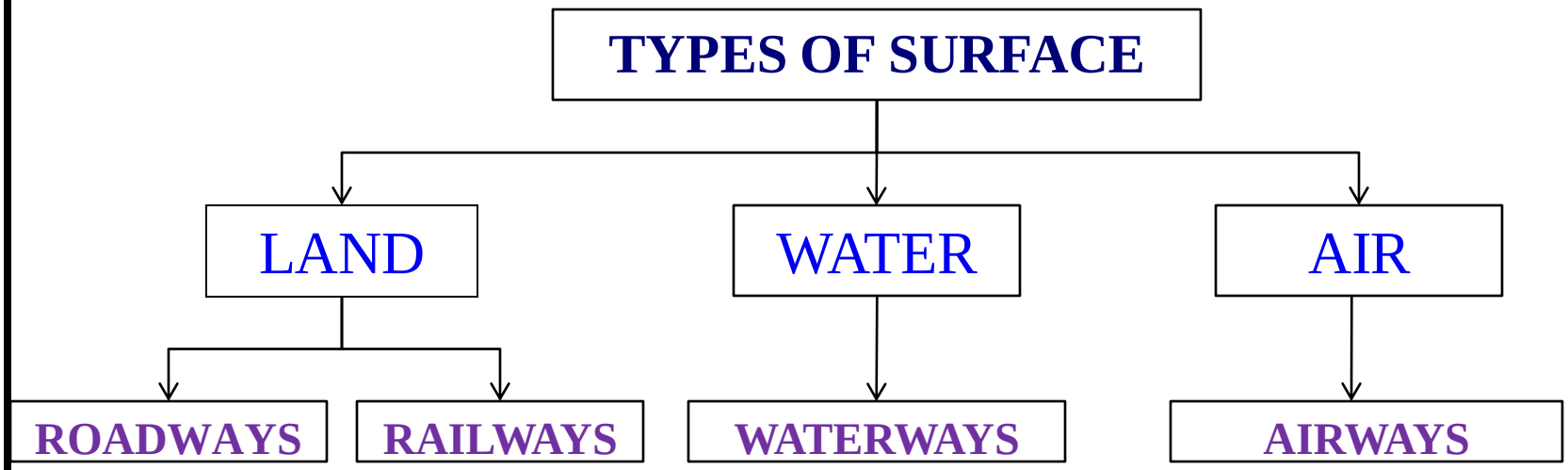
- Economic growth
- Place utility of goods
- Time utility of goods
- Preservation of quality of goods
- Mass production
- Exploitation of natural resources
- Urbanization
- Industrial development
- Agricultural development
- Costs of goods
- Defense and strategic needs
- Transport facilities and social activities



Transportation Ways

- Railways
  - Surface
  - Underground
  - Elevated
  - Light rail transit (LRT)
- Road Transport
- Air Transport
- Water Transport

Surface Transportation and Aviation



ROADWAYS

- **CLASSIFICATION OF ROADS**
  - NATIONAL HIGHWAY **(NH)**
  - STATE HIGHWAY **(SH)**
  - MAJOR DISTRICT ROAD **(MDR)**
  - OTHER DISTRICT ROAD **(ODR)**
  - VILLAGE ROAD **(VR)**

- **BASED ON CARRIAGE WAY**
  - PAVED ROADS
  - UNPAVED ROADS

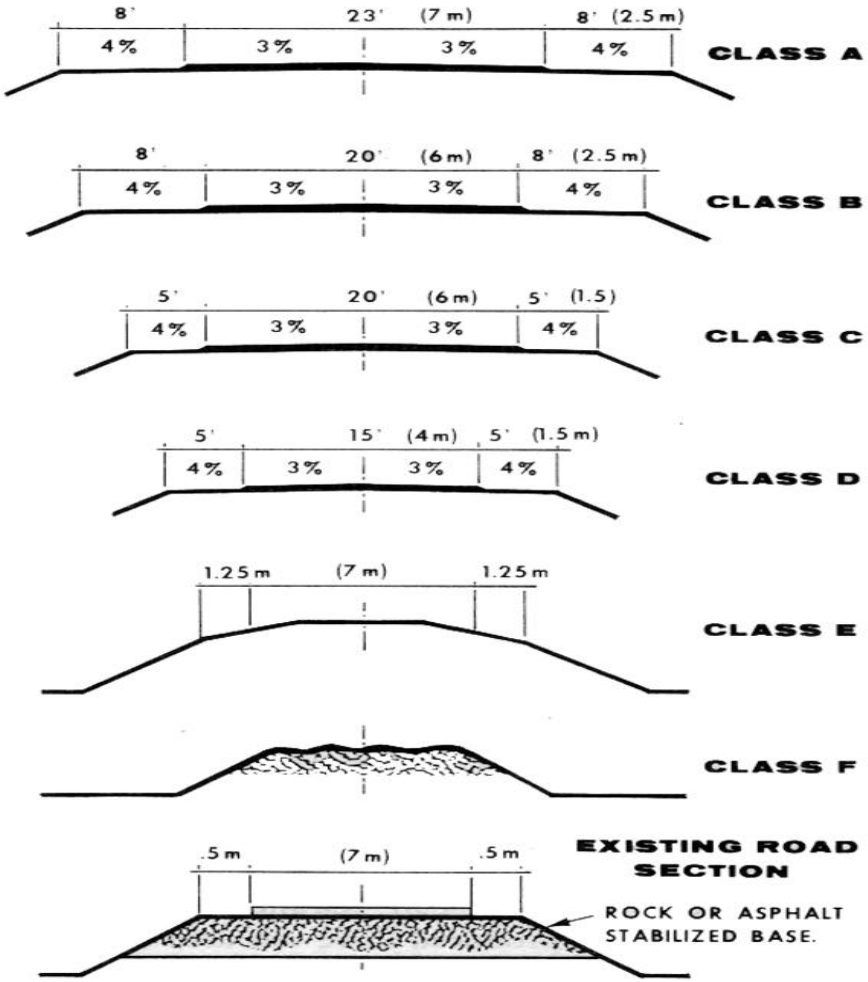
- **BASED ON PAVEMENT**
  - SURFACE ROADS
  - UNSURFACED ROADS

- **AS PER USABILITY**
  - ALL WEATHER ROADS
  - FAIR WEATHER ROADS

- **URBAN ROADS**
  - ARTERIAL ROADS
  - SUB-ARTERIAL ROADS
  - COLLECTOR STREETS
  - LOCAL STREETS

GEOMETRIC ELEMENTS OF A ROAD

- CAMBER (CROSS SLOPE)
- CARRIAGEWAY WIDTH
- SHOULDER
- KERB
- WIDTH OF ROADWAY
- RIGHT OF WAY
- SLIGHT DISTANCE
- HORIZONTAL CURVE
- SUPERELEVATION
- GRADIENT
- VERTICAL CURVE
- ALIGNMENT



ADVANTAGES OF ROADWAYS	DISADVANTAGES OF ROADWAYS
✓ MAXIMUM FLEXIBILITY FOR TRAVEL	✓ GOODS CARRYING CAPACITY IS LOW
✓ IT PERMITS ANY MOAD OF ROAD VEHICAL	✓ SPEED IS LOW COMPARE TO AIR AND WATERWAY
✓ IT PROVIDES DOOR-TO-DOOR SERVICE	✓ LESS COMFORT AND SAFE
✓ IT SAVES TIME FOR SHORT DISTANCE	✓ UNECONOMICAL FOR LONG DISTANCE
✓ CONSTRUCTION AND MAINTAINANCE COST IS LOW	✓ NUMBER OF ROAD ACCIDENT IS HIGH

ADVANTAGES OF RAILWAYS	DISADVANTAGES OF RAILWAYS
✓ GOODS CARRYING CAPACITY IS HIGH	✓ IT IS NOT FLEXIBLE.
✓ SPEED IS HIGH COMPARE TO ROADWAYS	✓ IT DEPENDENT ON ROADWAY
✓ CHEAPER THEN AIRWAYS	✓ TRAIN RUNS AS PER SCHEDULES
✓ COMFORTABLE FOR LONG DISTANCE TRAVEL	✓ MAINTAINANCE COST IS HIGH
✓ IT INCRESES TRADE, COMMERS AND BUSINESS	✓ IT PERMITS DEFINITE MODE OF TRANSPORT

WATERWAVES

- **TYPES OF HARBOUR**
  1. **NATURAL HARBOUR**
  2. **SEMINATURAL HARBOUR**
  3. **ARTIFICIAL HARBOUR**
- **TYPES OF PORTS**
  1. **MAJOR**
  2. **INTERMEDIATE**
  3. **MINOR**
- **TYPES OF DOCKS**
  1. **WET DOCK**
  2. **DRY DOCK**

ADVANTAGES OF WATERWAYS	DISADVANTAGES OF WATERWAYS
✓ NO NEED OF CONSTRUTING TRACKS	✓ IT IS SLOW
✓ IT REQUIRES CHEAP MOTIVE POWER	✓ STROMS CAN CAUSE GREAT LOSS
✓ CHEAPEST MODE OF TRANSPORTATION	✓ IT IS USEFUL ALONG PARTICULAR ROUTES
✓ IT PROVIDES EFFICIENT MODE OF DEFENCE	✓ MAINTAINANCE COST IS HIGH
✓ IT HELPS IN GROWTH OF INDUSTRIES	✓ IT HAS LIMITED CONNECTIVITY

AIRWAYS

- **TYPES OF AIRPORTS**
  1. INTERNATIONAL AIRPORT
  2. DOMESTIC AIRPORT
  3. MILITARY AERODROMES
- **TYPES OF AIR FIELD**
  1. FLEXIBLE (BITUMINOUS)
  2. RIGID (CEMENT CONCRETE)

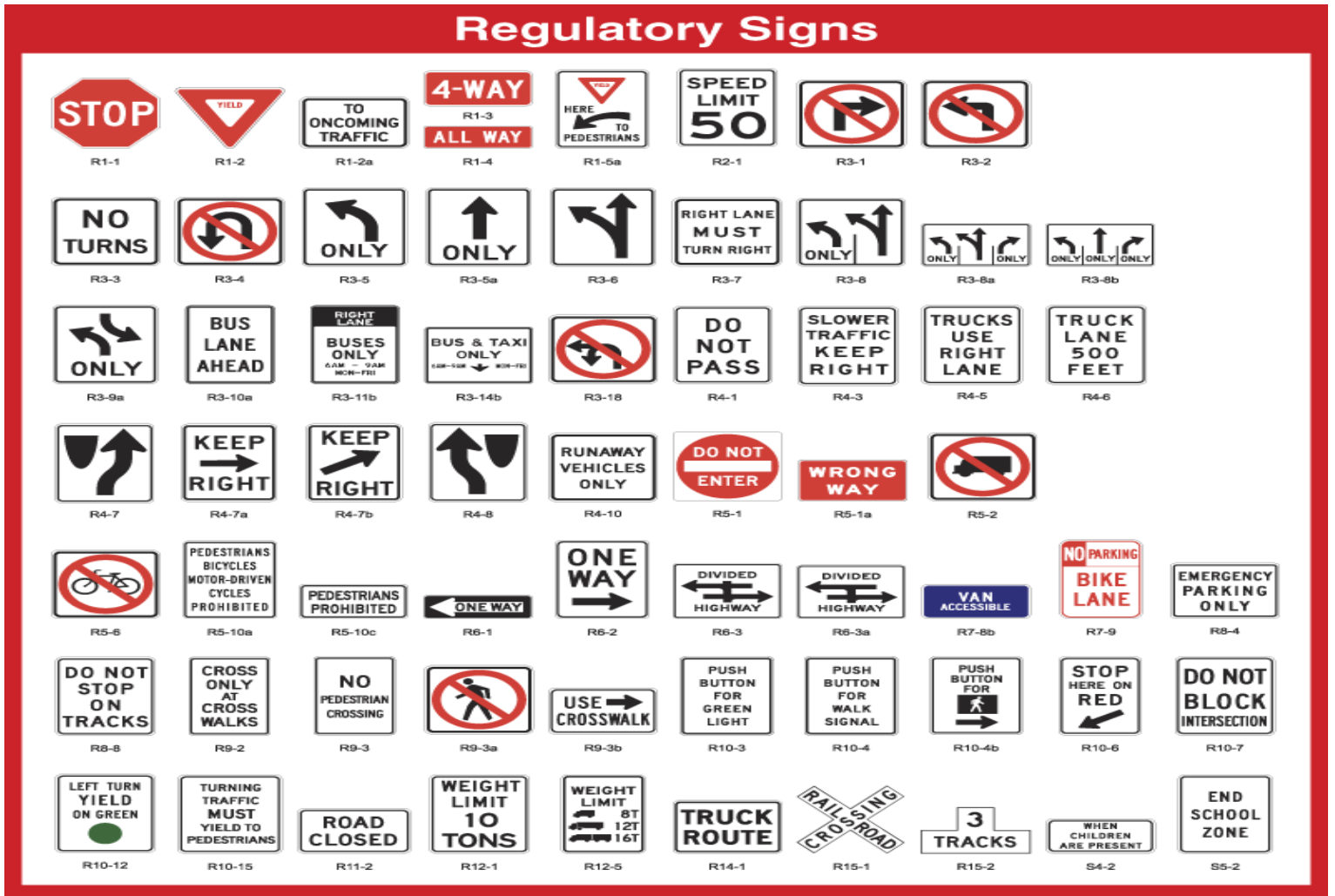
ADVANTAGES OF AIRWAYS	DISADVANTAGES OF AIRWAYS
✓ IT DOESNOT REQUIRE A TRACKS	✓ IT IS MOST EXPENSIVE
✓ IT IS USEFUL IN MILITARY ACTIVITIES	✓ CONSTRUCTION COST IS HIGH FOR AIRPORTS AND AIRCRAFTS
✓ FASTEST MODE OF TRANSPORTATION	✓ FUEL CONSUMPTION IS HIGH
✓ IT IS A POWERFUL MEAN OF ATTACK	✓ MAINTAINANCE COST IS HIGH FOR AIRCRAFTS
✓ IT HELPS IN AERIAL PHOTOGRAPHY	✓ ACCIDENT CAUSES HIGH LOSS

Elements of Traffic Engineering and Traffic Control

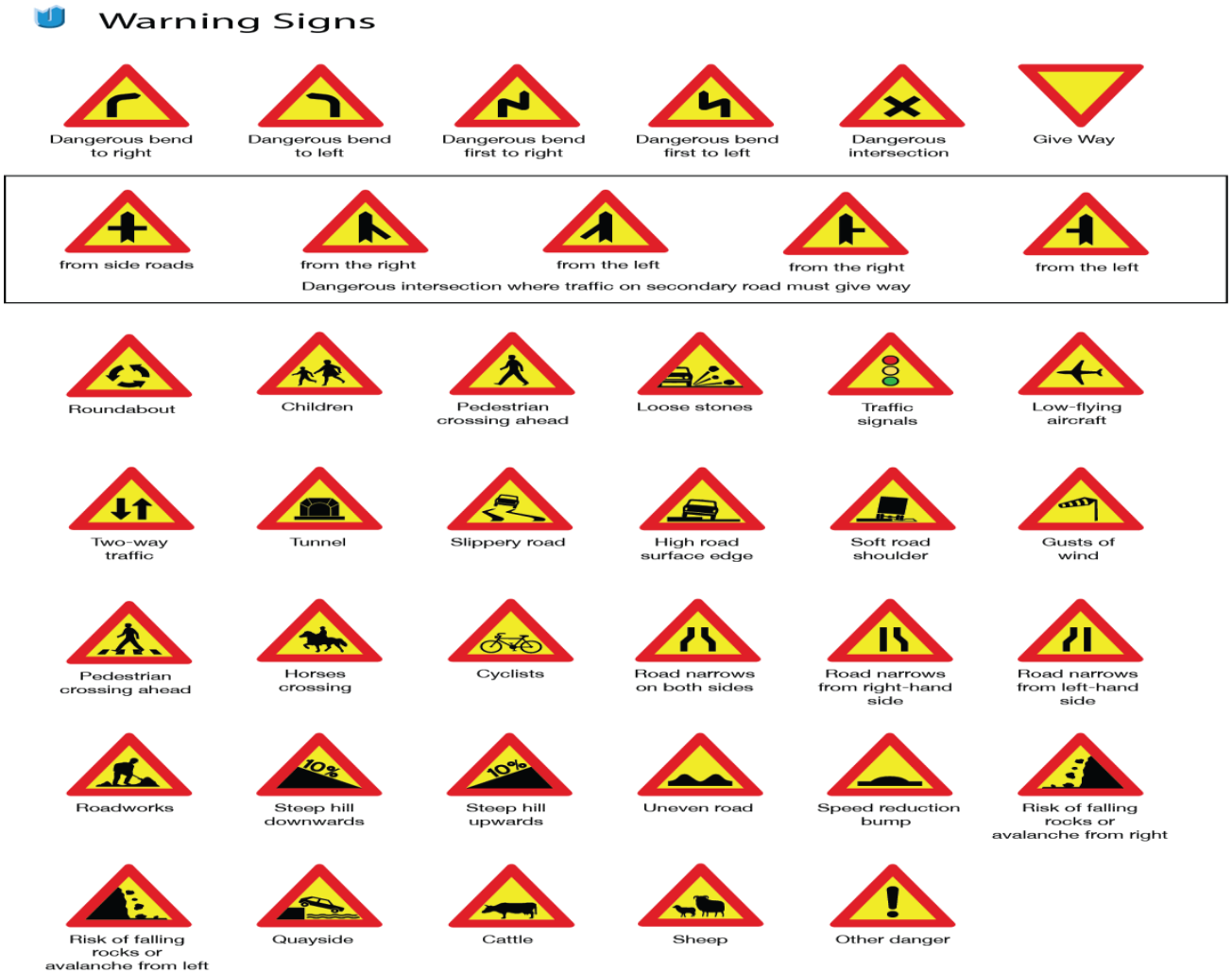
❖ TRAFIC SURVEY

1. TRAFFIC VOLUME STUDY
2. SPOT SPEED SURVEY
3. SPEED AND DELAY STUDY
4. ORIGIN AND DESTINATION (O-D) SURVEY
5. TRAFFIC FLOW STUDY
6. TRAFFIC VAPACITY STUDY
7. PARKING SURVEY
8. ACCIDENT SURVEY

TRAFFIC REGULATORY SIGNS

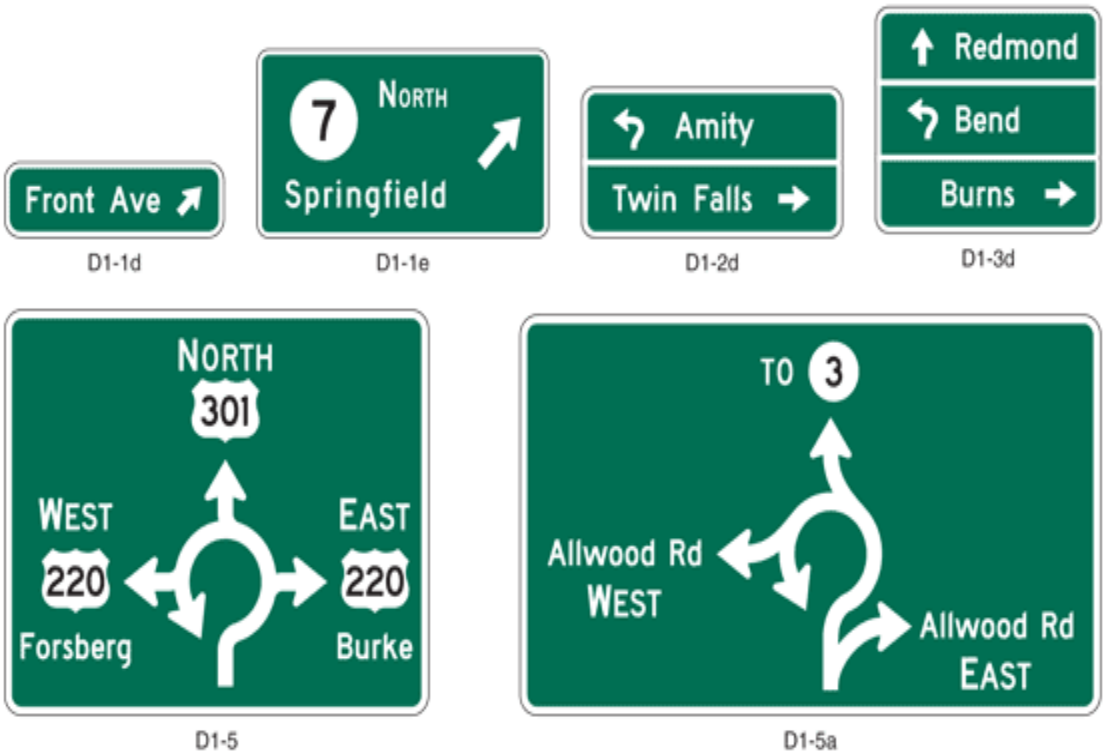


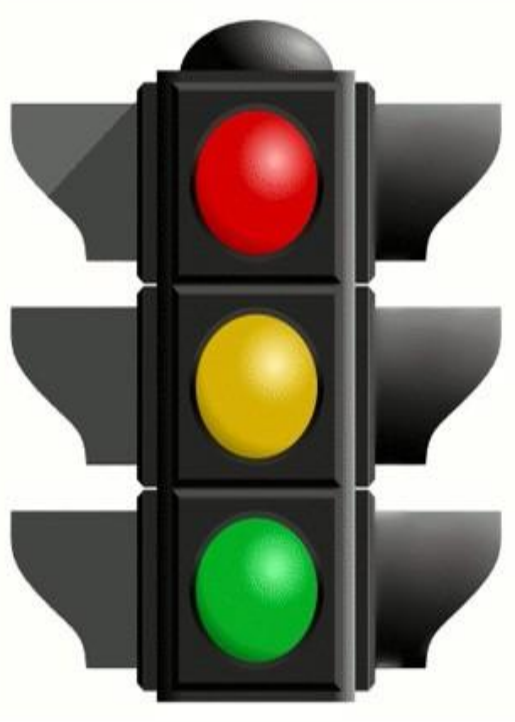
TRAFFIC WARNING SIGNS



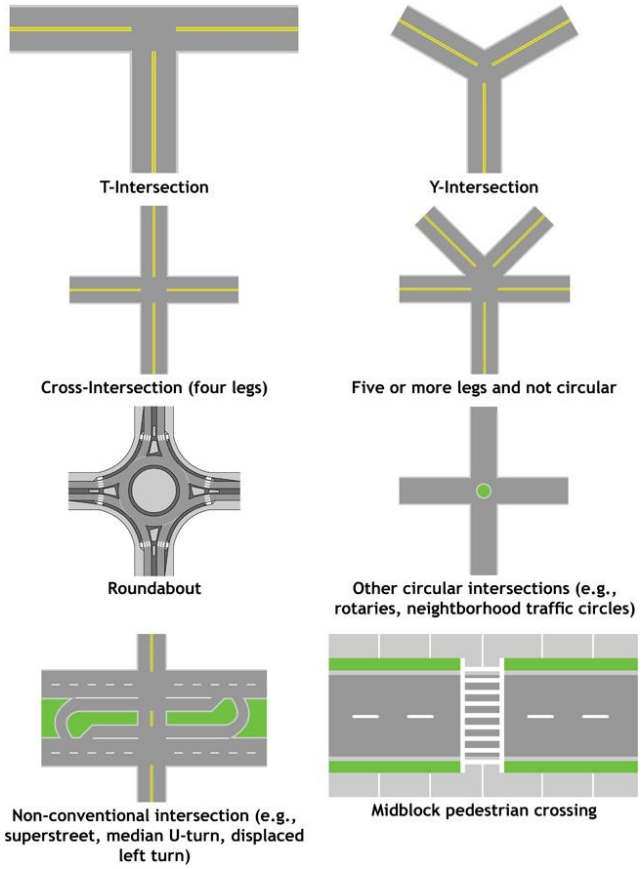
DESTINATION SIGNS AND SIGNAL

Figure 2D-8. Destination Signs for Roundabouts





TRAFFIC INTERSECTION SIGNS



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