

Transportation Engineering



A decorative horizontal grid line consisting of a series of small squares, spanning the width of the slide below the title.



A vertical decorative border on the left side of the slide, resembling a road with a dashed yellow center line and a grey asphalt surface.

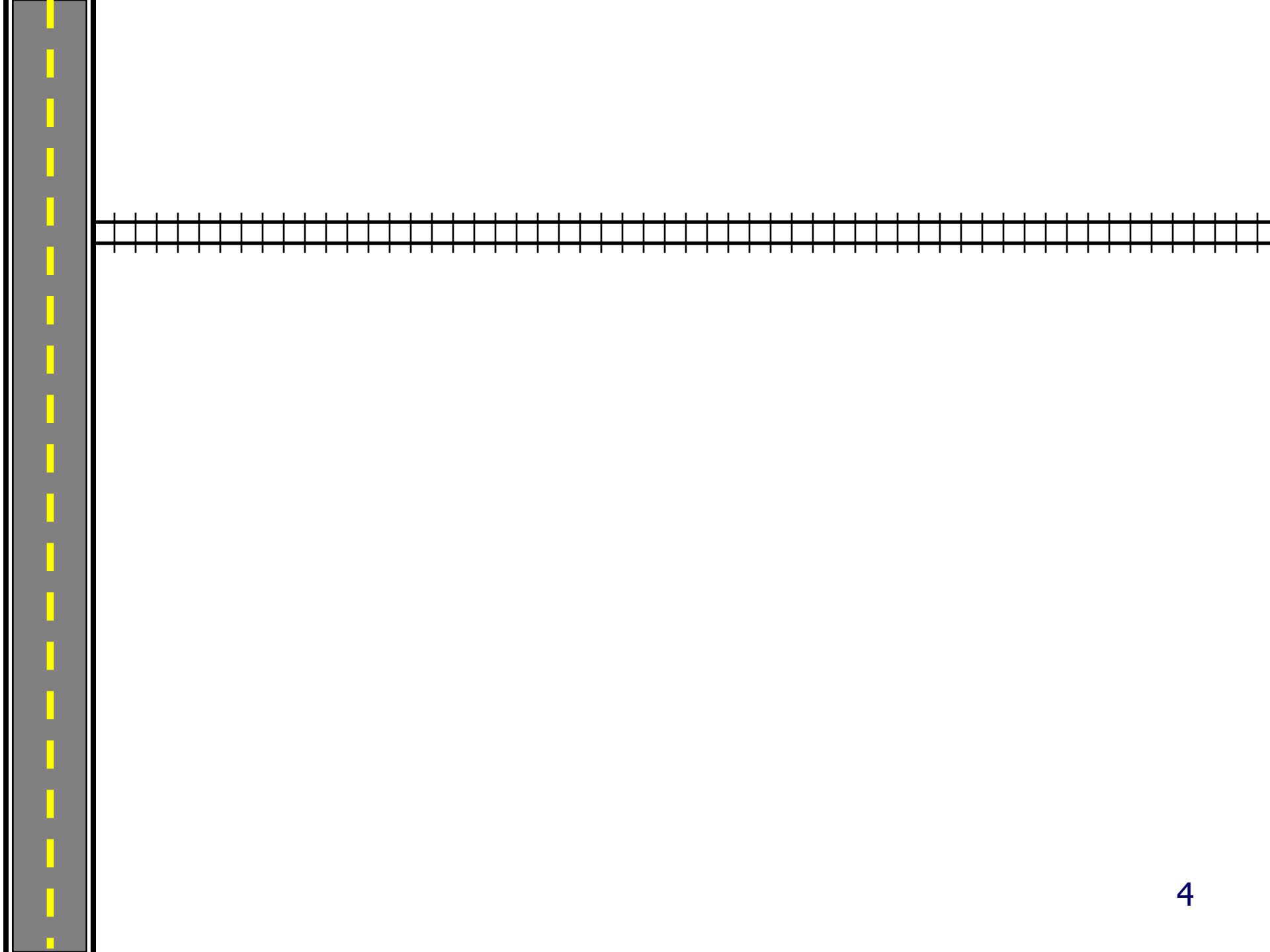
- **Role of Transportation in National Development.**
- **Transportation Ways.**
- **Surface Transportation and Aviation.**
- **BOT Projects for Highways.**
- **BOOT Projects for Highways.**
- **Elements of Traffic Engineering and Traffic**
- **Control.**

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**

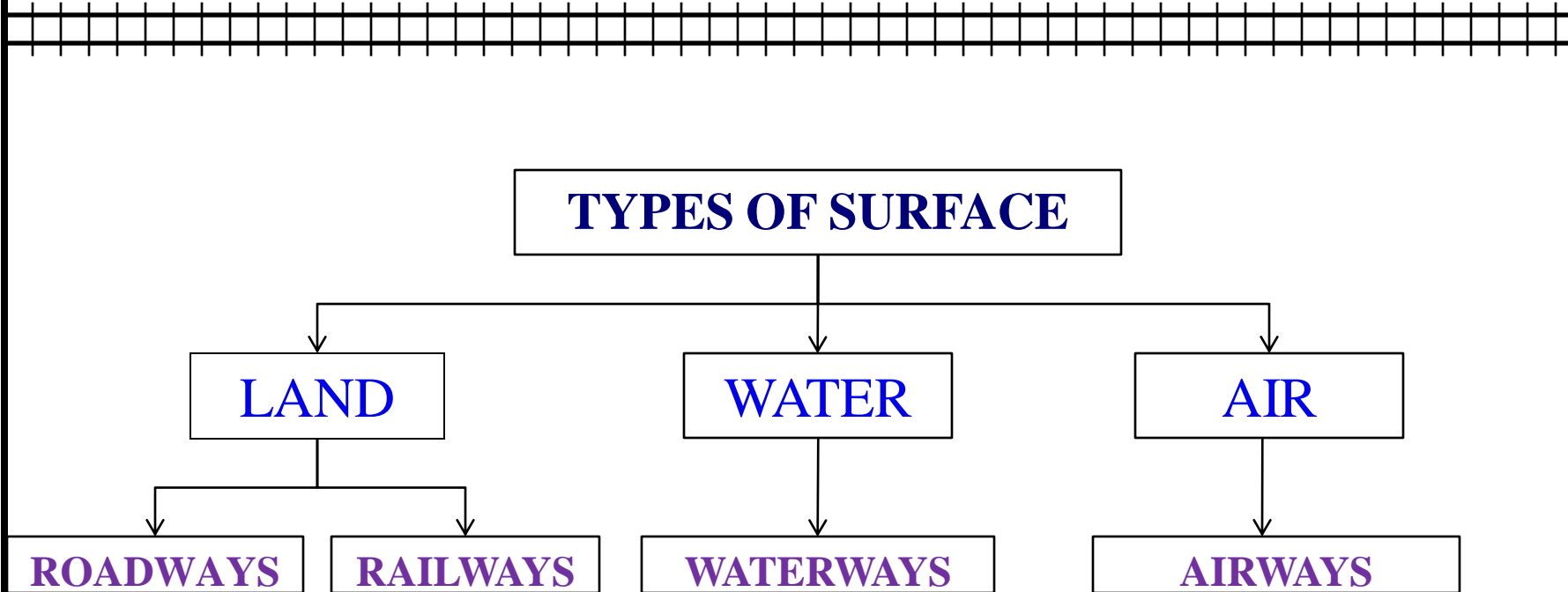


Transportation Ways

- 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**

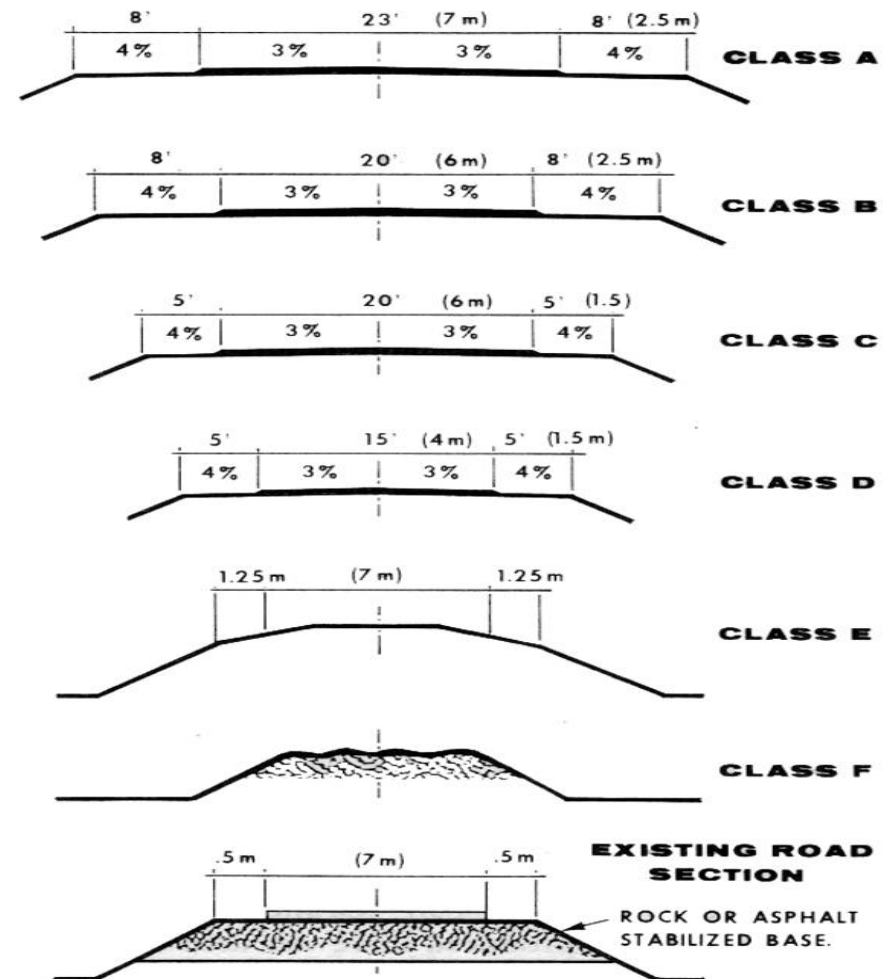
- ALL WEATHER ROADS
- FAIR WEATHER ROADS

❖ **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

- ✓ MAXIMUM FLEXIBILITY FOR TRAVEL
- ✓ IT PERMITS ANY MOAD OF ROAD VEHICAL
- ✓ IT PROVIDES DOOR-TO-DOOR SERVICE
- ✓ IT SAVES TIME FOR SHORT DISTANCE
- ✓ CONSTRUCTION AND MAINTAINANCE COST IS LOW

DISADVANTAGES OF ROADWAYS

- ✓ GOODS CARRYING CAPACITY IS LOW
- ✓ SPEED IS LOW COMPARE TO AIR AND WATERWAY
- ✓ LESS COMFORT AND SAFE
- ✓ UNECONOMICAL FOR LONG DISTANCE
- ✓ NUMBER OF ROAD ACCIDENT IS HIGH

ADVANTAGES OF RAILWAYS

- ✓ GOODS CARRYING CAPACITY IS HIGH
- ✓ SPEED IS HIGH COMPARE TO ROADWAYS
- ✓ CHEAPER THEN AIRWAYS
- ✓ COMFORTABLE FOR LONG DISTANCE TRAVEL
- ✓ IT INCREASES TRADE, COMMERS AND BUSINESS

DISADVANTAGES OF RAILWAYS

- ✓ IT IS NOT FLEXIBLE.
- ✓ IT DEPENDENT ON ROADWAY
- ✓ TRAIN RUNS AS PER SCHEDULES
- ✓ MAINTAINANCE COST IS HIGH
- ✓ 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

- ✓ NO NEED OF CONSTRUCTING TRACKS
- ✓ IT REQUIRES CHEAP MOTIVE POWER
- ✓ CHEAPEST MODE OF TRANSPORTATION
- ✓ IT PROVIDES EFFICIENT MODE OF DEFENCE
- ✓ IT HELPS IN GROWTH OF INDUSTRIES

DISADVANTAGES OF WATERWAYS

- ✓ IT IS SLOW
- ✓ STORMS CAN CAUSE GREAT LOSS
- ✓ IT IS USEFUL ALONG PARTICULAR ROUTES
- ✓ MAINTAINANCE COST IS HIGH
- ✓ 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 DOES NOT 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

Regulatory Signs

R1-1	R1-2	R1-2a	R1-4	R1-5a	R2-1	R3-1	R3-2		
R3-3	R3-4	R3-5	R3-5a	R3-6	R3-7	R3-8	R3-8a	R3-8b	
R3-9a	R3-10a	R3-11b	R3-14b	R3-18	R4-1	R4-3	R4-5	R4-6	
R4-7	R4-7a	R4-7b	R4-8	R4-10	R5-1	R5-1a	R5-2		
R5-6	R5-10a	R5-10c	R6-1	R6-2	R6-3	R6-3a	R7-8b	R7-9	R8-4
R8-8	R9-2	R9-3	R9-3a	R9-3b	R10-3	R10-4	R10-4b	R10-6	R10-7
R10-12	R10-15	R11-2	R12-1	R12-5	R14-1	R15-1	R15-2	S4-2	S5-2

TRAFFIC WARNING SIGNS

Warning Signs



Dangerous bend to right



Dangerous bend to left



Dangerous bend first to right



Dangerous bend first to left



Dangerous intersection



Give Way



from side roads



from the right



from the left



from the right



from the left

Dangerous intersection where traffic on secondary road must give way



Roundabout



Children



Pedestrian crossing ahead



Loose stones



Traffic signals



Low-flying aircraft



Two-way traffic



Tunnel



Slippery road



High road surface edge



Soft road shoulder



Gusts of wind



Pedestrian crossing ahead



Horses crossing



Cyclists



Road narrows on both sides



Road narrows from right-hand side



Road narrows from left-hand side



Roadworks



Steep hill downwards



Steep hill upwards



Uneven road



Speed reduction bump



Risk of falling rocks or avalanche from right



Risk of falling rocks or avalanche from left



Quayside



Cattle



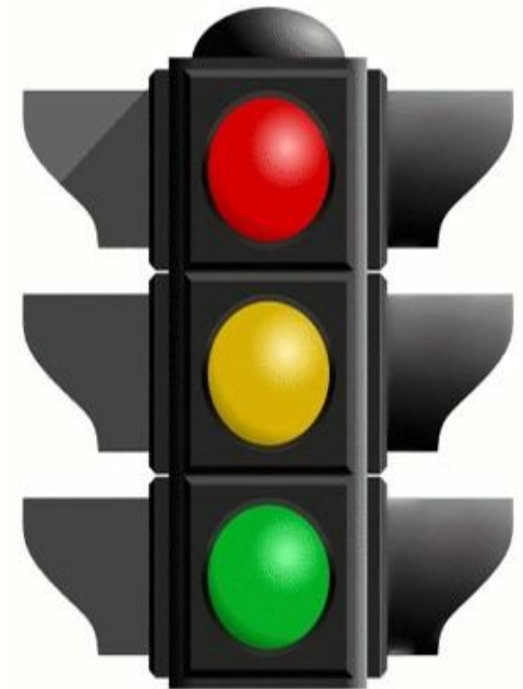
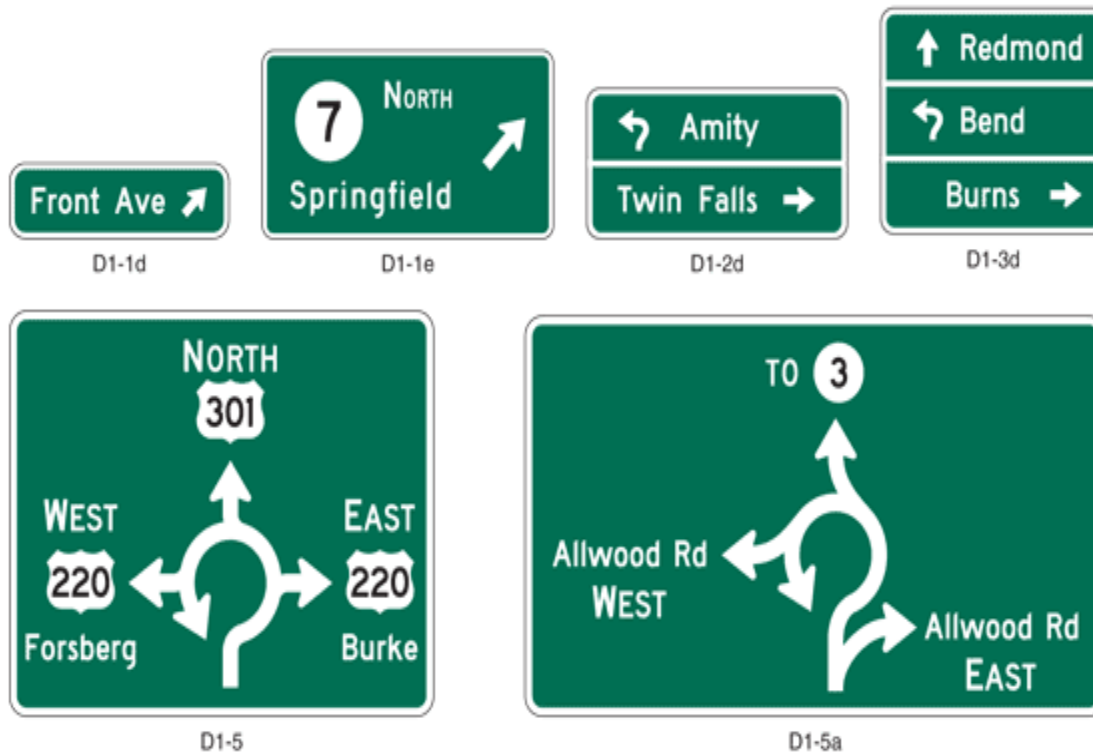
Sheep



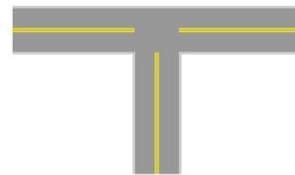
Other danger

DESTINATION SIGNS AND SIGNAL

Figure 2D-8. Destination Signs for Roundabouts



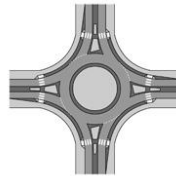
TRAFFIC INTERSECTION SIGNS



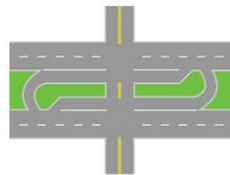
T-Intersection



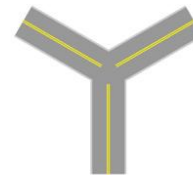
Cross-Intersection (four legs)



Roundabout



Non-conventional intersection (e.g., superstreet, median U-turn, displaced left turn)



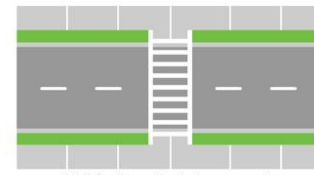
Y-Intersection



Five or more legs and not circular



Other circular intersections (e.g., rotaries, neighborhood traffic circles)



Midblock pedestrian crossing

Questions...

