Lecture 12



Intersection Control

Outlines

- ✓ Objective: Reduce the conflict points at an intersection (Fig 8.3)
- ✓ Method of control depends on
  - Type of intersection (4-way, T-Intersection, etc.)
  - Traffic volume and speed in each conflicting stream
- ✓ Guidelines provided in Manual on Uniform Traffic Control Devices (MUTCD)
  - ✓ FHWA, TxDOT
- ✓ Guidelines presented in the form of warrants (i.e. conditions that call for intersection control)

Intersection Control Using Yield Signs

- ✓ Eliminates crossing conflicts
- ✓ Used at major road-minor road intersections
- Warrants:
  - Approach speed on minor road > 10 mph
  - When there is a separate channelized right-turn lane without adequate acceleration lane

Intersection Control Using Stop Signs

- ✓ Eliminates crossing & merging conflicts
- ✓ Inconvenient to motorists
- ✓ Used where approaching vehicle has to stop before the intersection
- Warrants for one-way stop sign:
  - Minor road intersects with major road
  - Presence of hazardous conditions such as high approach speed, restricted view and history of accidents

Intersection Control with Multi-Way Stop Sign

- ✓ Used when traffic volumes on all approaches are approximately equal
- ✓ For too high traffic volumes, use signals
- Warrants: (satisfy all, at least at 80%)
  - Total int. approach volume > 300 vph for any 8 hours of average day
  - Combined vehicle+pedestrian volume for minor approach > 200 units per hour for same 8-hr. period
  - Avg. vehicle delay on minor street > 30 sec/veh for max. hr
  - If 85th percentile approach speed on major approach is > 40 mph, minimum for volume can be reduced by 30%

Intersection Control Using Traffic Signals - Warrants

- Warrants (meet one of the eight)

1. Eight-hour volume

1. A. Minimum 8 hour traffic volume (Table 8.1)

1. B Interruption of continuous traffic (Table 8.2)

  - When minor road traffic suffers excessive delays

2. Four-hour volume (Fig. 8.5)

  - Traffic signal warranted when point falls above curve
  - Graphs for different intersection configurations, major approach speed, community size

3. Peak hour delay & Peak hour volume:

3.A: Delay and volume in any 4 consec. 15-min periods when controlled by stop sign is

> 4 veh-hrs & 100 vph for -lane minor street approach

> 5 veh-hrs & 150 vph for 2-lane minor street approach

3.B: Peak hour volume (Fig. 8.6)

4. Minimum pedestrian volume

Ped. Volume crossing major street > 100 for any 4 hrs

Ped. Volume crossing major street > 190 for any 1 hr

Traffic leaves less than 60 gaps accepted by pedestrians per hour

Nearest traffic signal > 300 ft. away

Use traffic actuated signal, push button operation for pedestrians

Intersection Control Using Traffic Signals - Warrants

5. School crossings
   - Used when traffic gaps are inadequate for safe crossing
   - Warrant: when no. of accepted gaps < minutes in period
   - No parking within 100 ft. before and 20 ft. after crossing
6. Coordinated Signals -progressive movement
   - Exception to other warrants when it helps to maintain grouping of vehicles to regulate the group speed
7. Crash experience (when signal is suitable)
   - 5 or more injury or PDO accidents in 12 months
   - Traffic+pedestrian volume > 80% of min. vehicle warrant, interruption warrant and min. ped. warrant

Intersection Control Using Traffic Signals - Warrants

8. Roadway network
   - Peak hour entering volume > 1000 veh
   - Projected volume in five years meet warrants 1,2, or 3.
   - Characteristics of the major street

     it's part of an arterial corridor;

     it's part of an arterial connecting the rural or suburban area;

     it's a designed major route (for the future)

Signal Timing - Terminology

- ✓ Controller - fixed or variable timing
- ✓ Cycle (one complete color sequence) - Fig. 8.8
- ✓ Phase-part of cycle allocated to a stream of traffic
- ✓ Interval - part of cycle when indications do not change
- ✓ Offset - time lapse between green @ successive intersections
- ✓ Change & clearance interval - Total time in seconds for yellow & all-red signal indications
- ✓ All-red interval - when display is red for all directions

Signal Timing Design

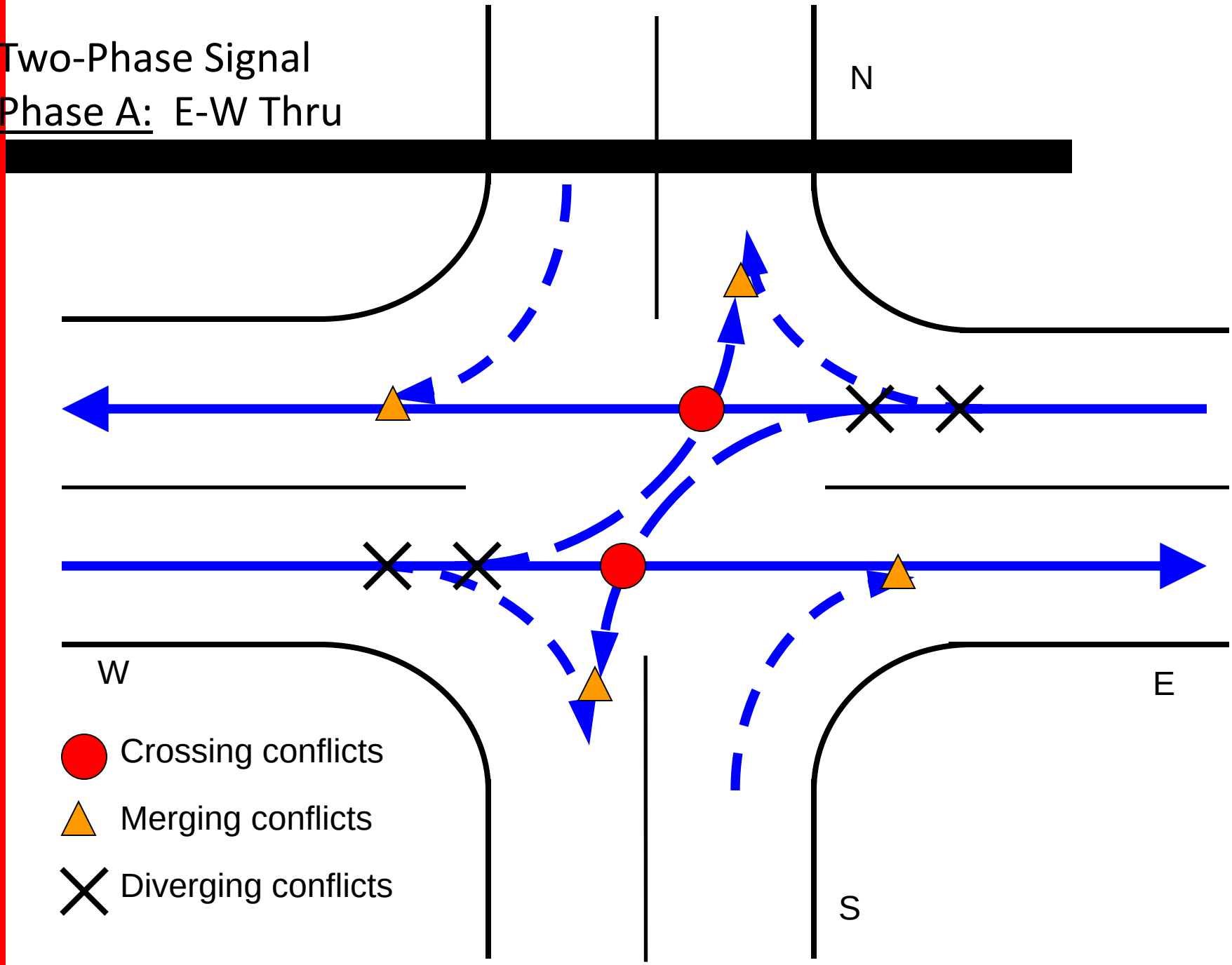
- Two-Phase Signals
- Four-Phase Signals
- Other Multi-Phase Signals

Two-Phase Signal

- Phase A
  - East-West Through Movement has Right-of-Way
- Phase B
  - North-South Through Movement has Right-of-Wa

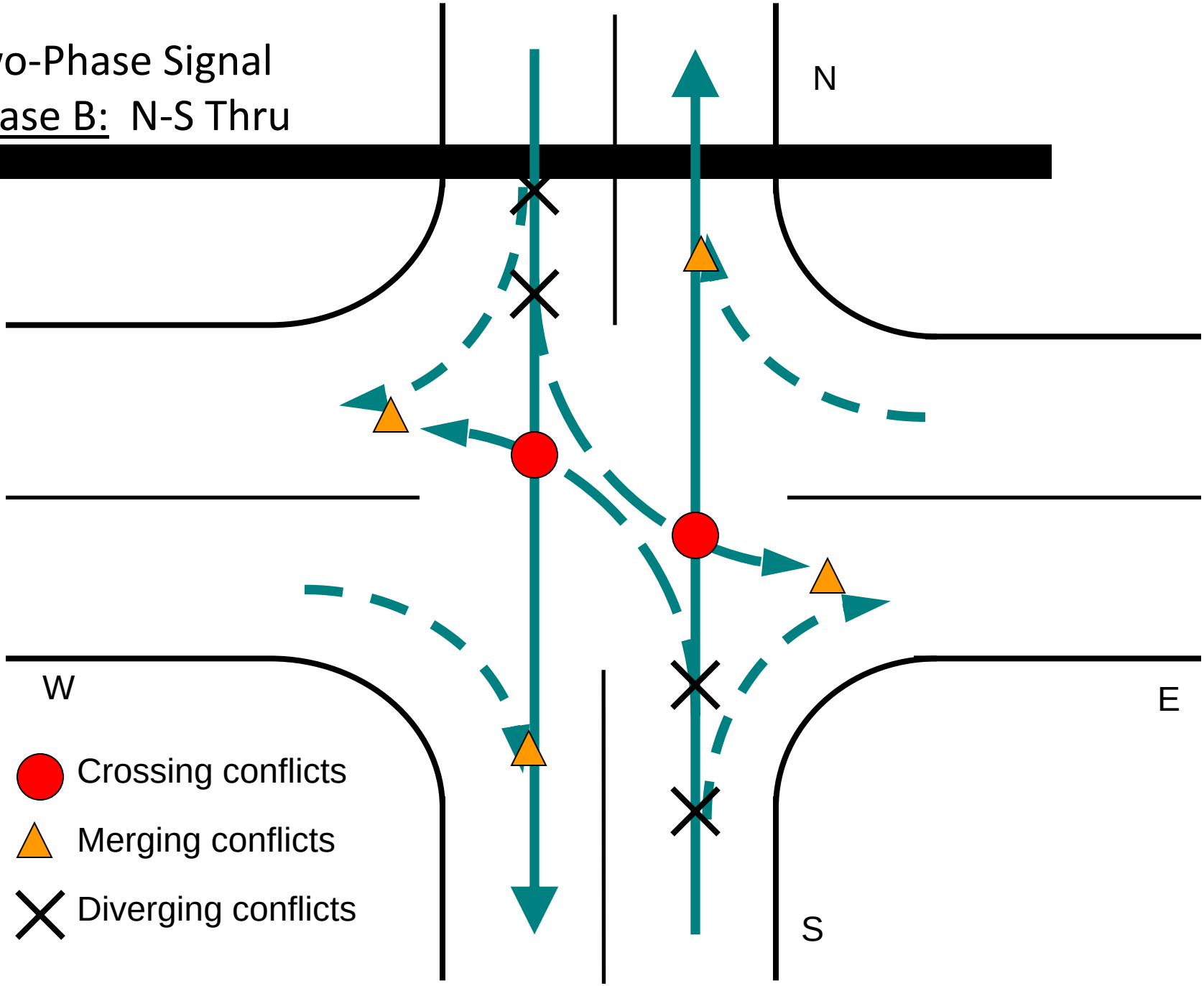
Two-Phase Signal

Phase A: E-W Thru



Two-Phase Signal

Phase B: N-S Thru

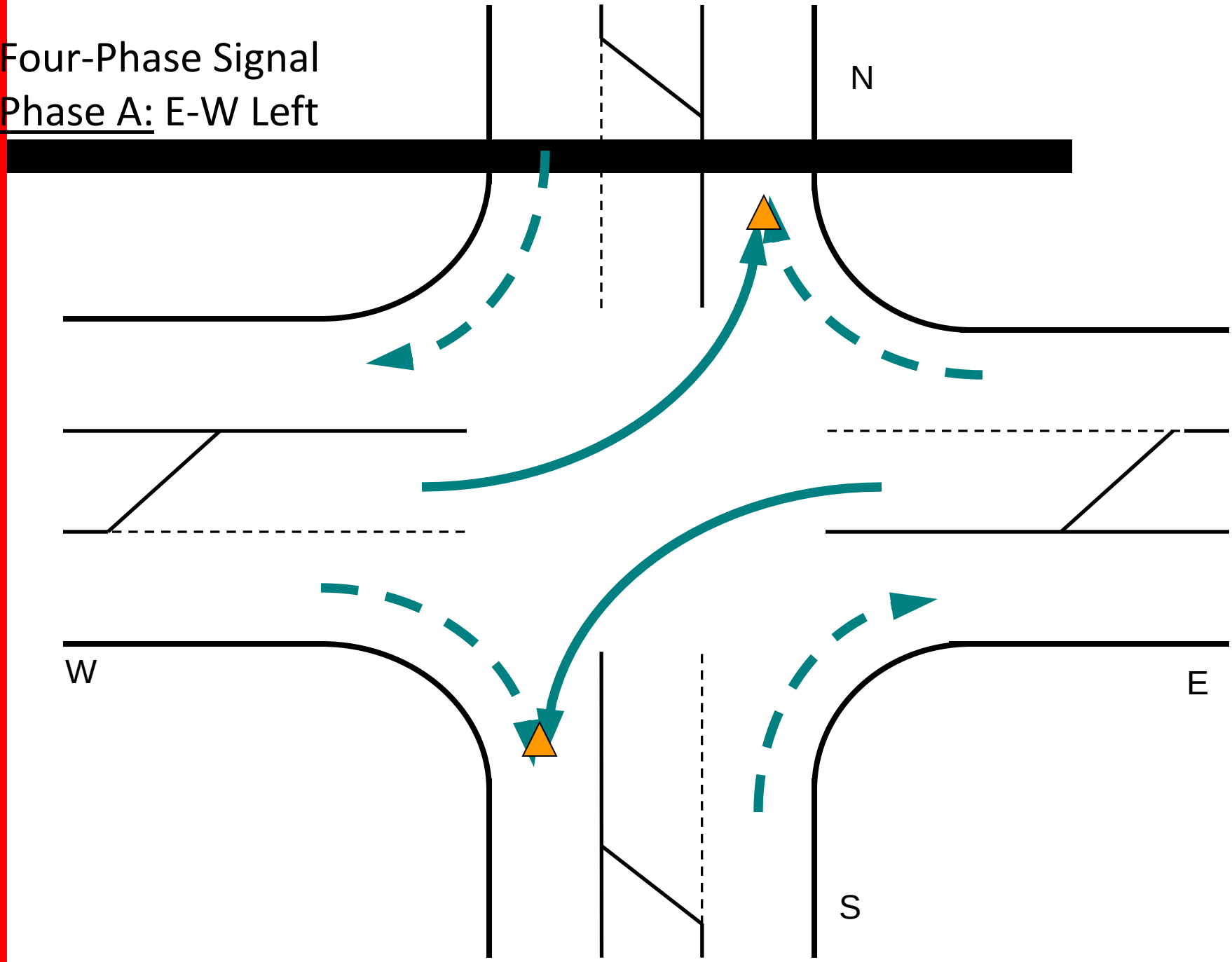


Four-Phase Signal

- Phase A
  - East-West Left Turn Movement has Right-of-Way
- Phase B
  - East-West Through Movement has Right-of-Way
- Phase C
  - North-South Left Turn Movement has Right-of-Way
- Phase D
  - North-South Through Movement has Right-of-Way

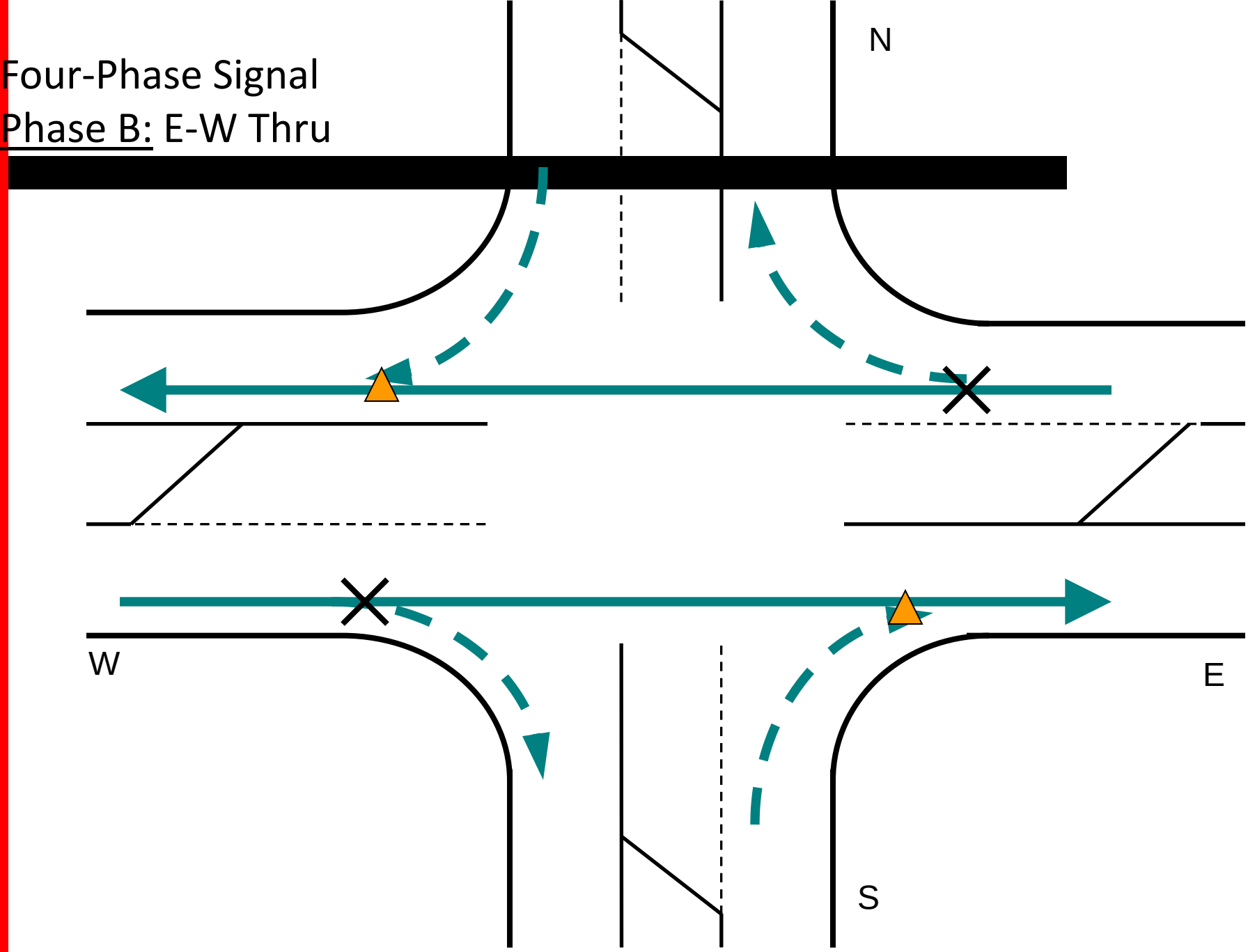
Four-Phase Signal

Phase A: E-W Left



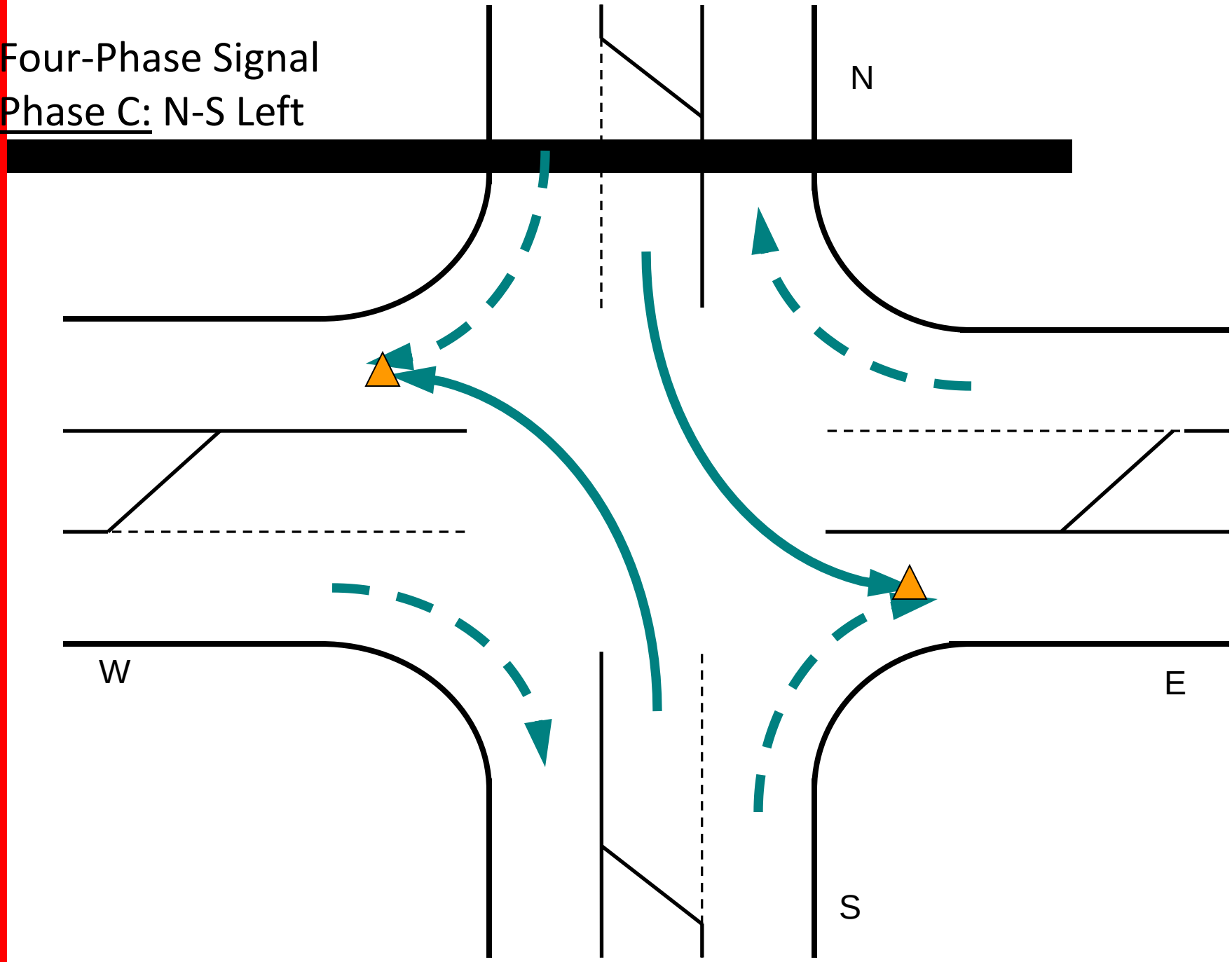
Four-Phase Signal

Phase B: E-W Thru



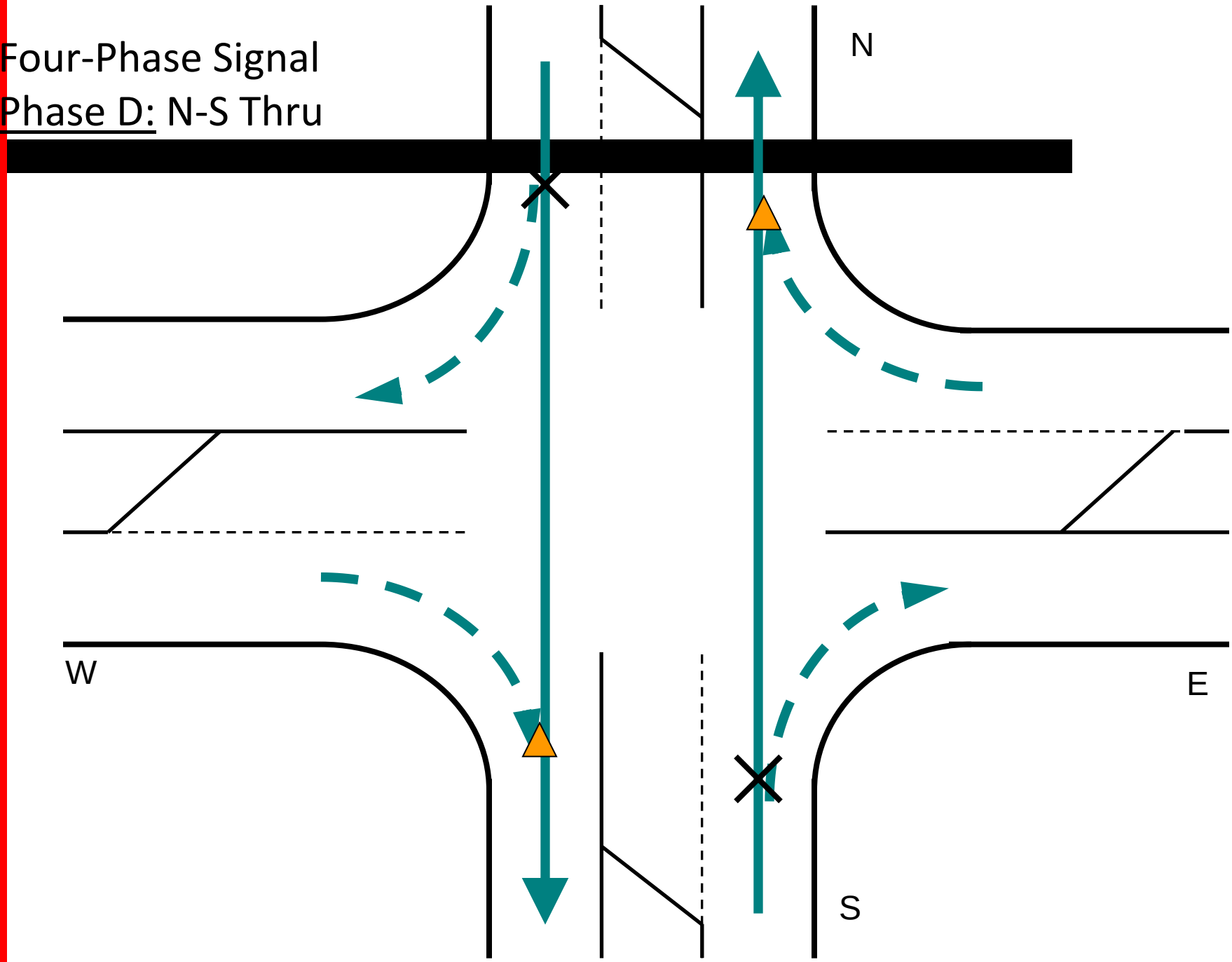
Four-Phase Signal

Phase C: N-S Left



Four-Phase Signal

Phase D: N-S Thru



Reduction in Conflicts Due to Traffic Signal

	No Signal	2-Phase	4-Phase
Merge Conflicts	8	8	8
Diverging Conflicts	8	8	4
Crossing Conflicts	16	4	0