



Ch. 8: Intersection Control (1)



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 1-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

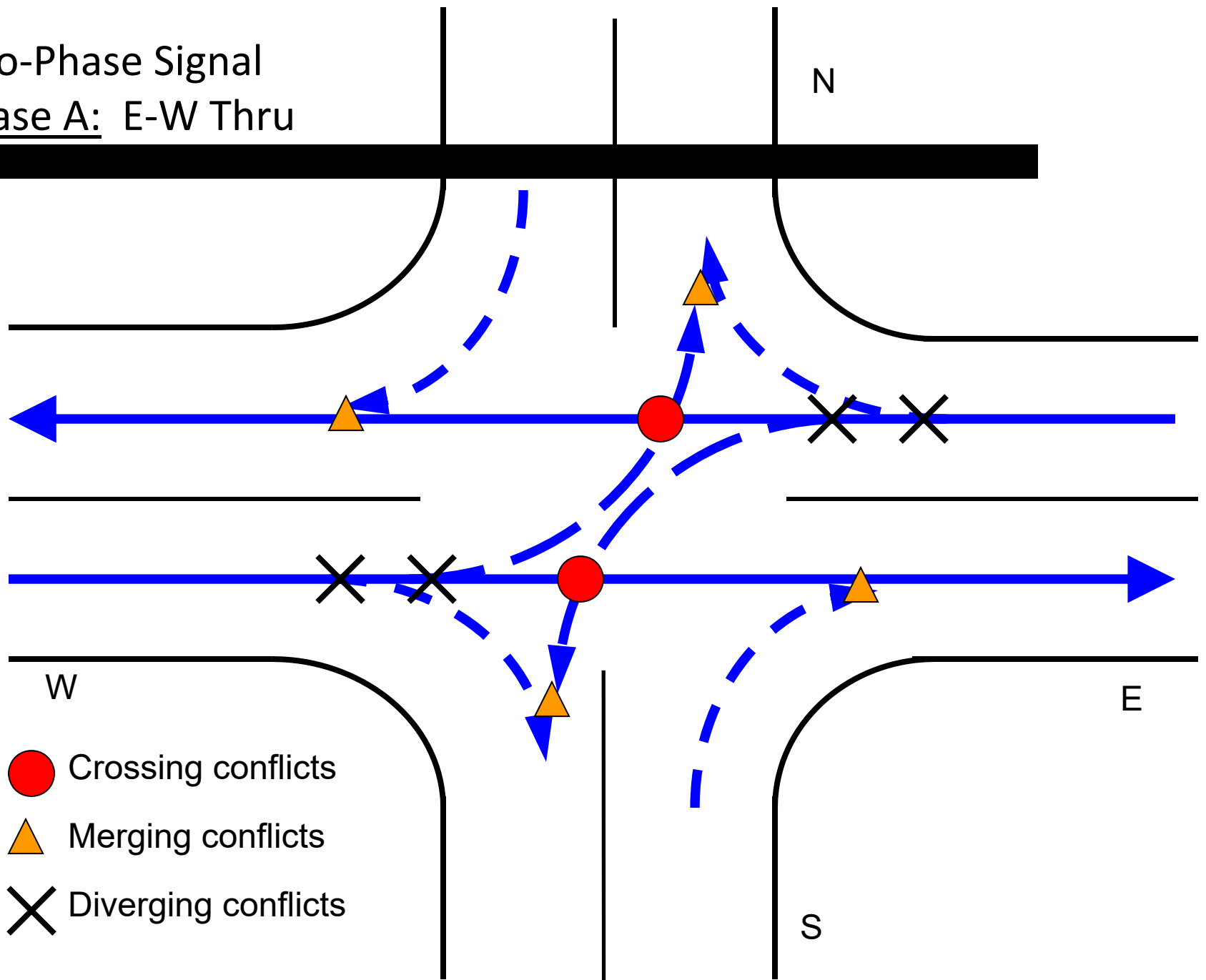
- Two-Phase Signals
- Four-Phase Signals
- Other Multi-Phase Signals



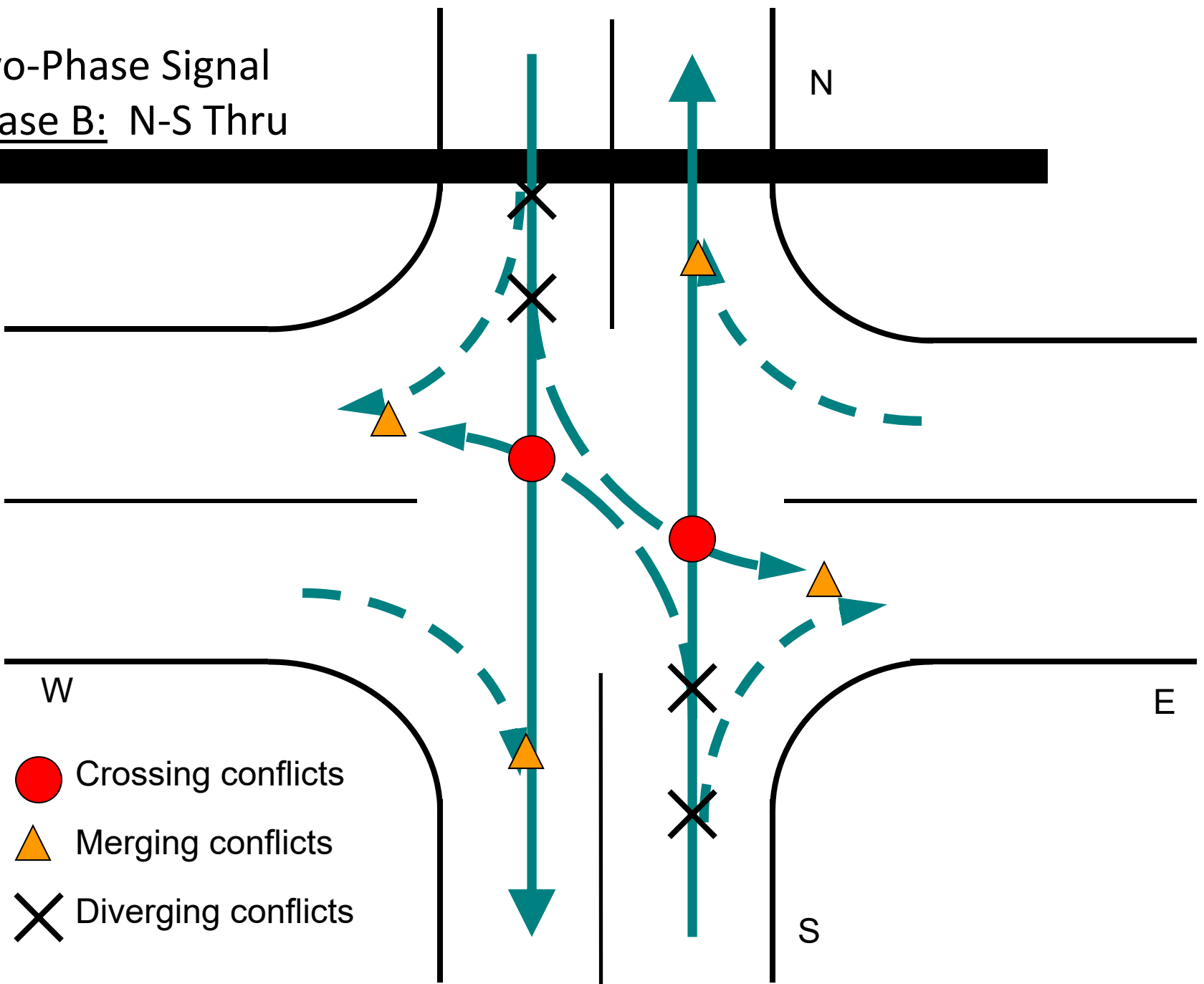
Two-Phase Signal

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

Two-Phase Signal
Phase A: E-W Thru



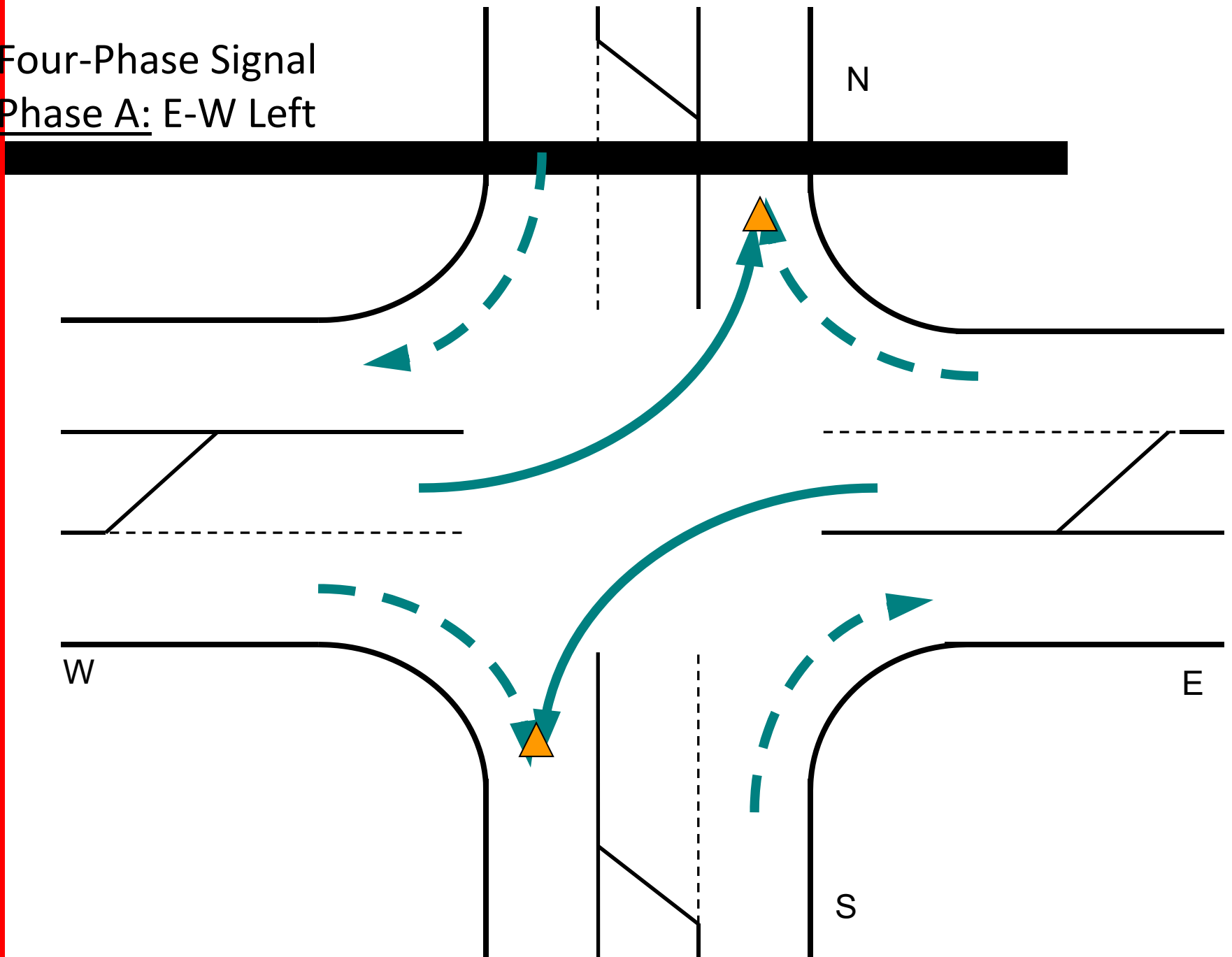
Two-Phase Signal
Phase B: N-S Thru



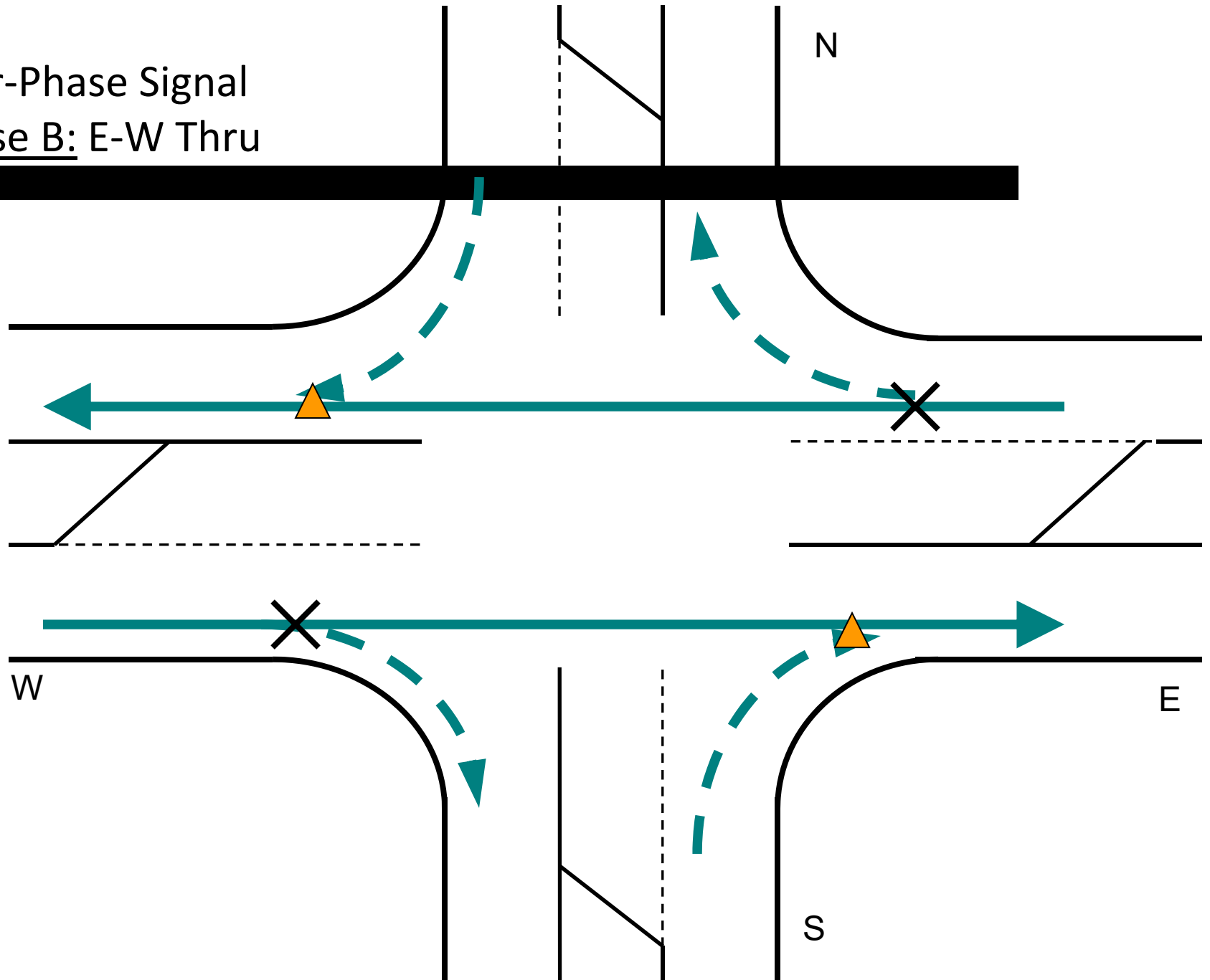
Four-Phase Signal

- 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

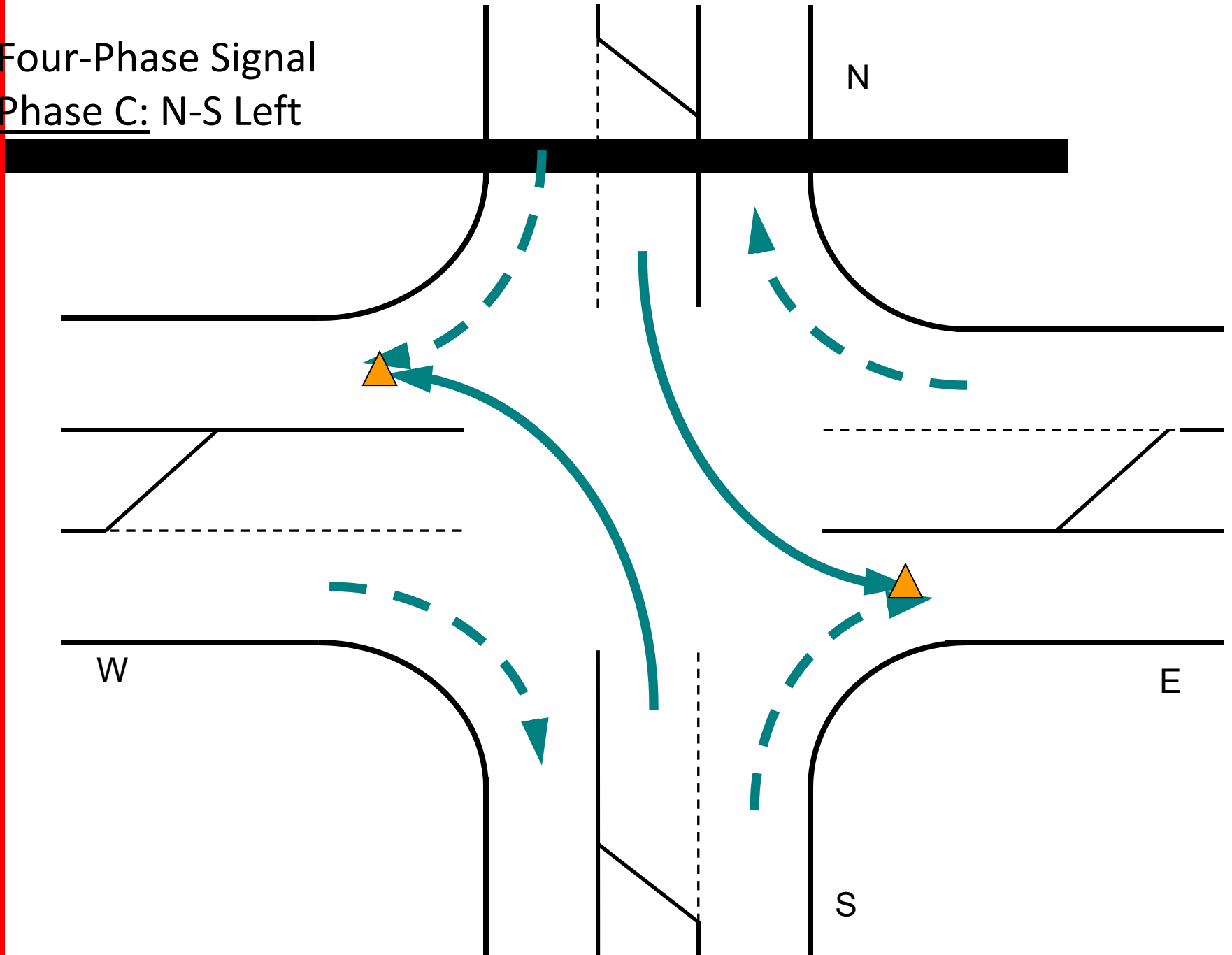
Four-Phase Signal
Phase A: E-W Left



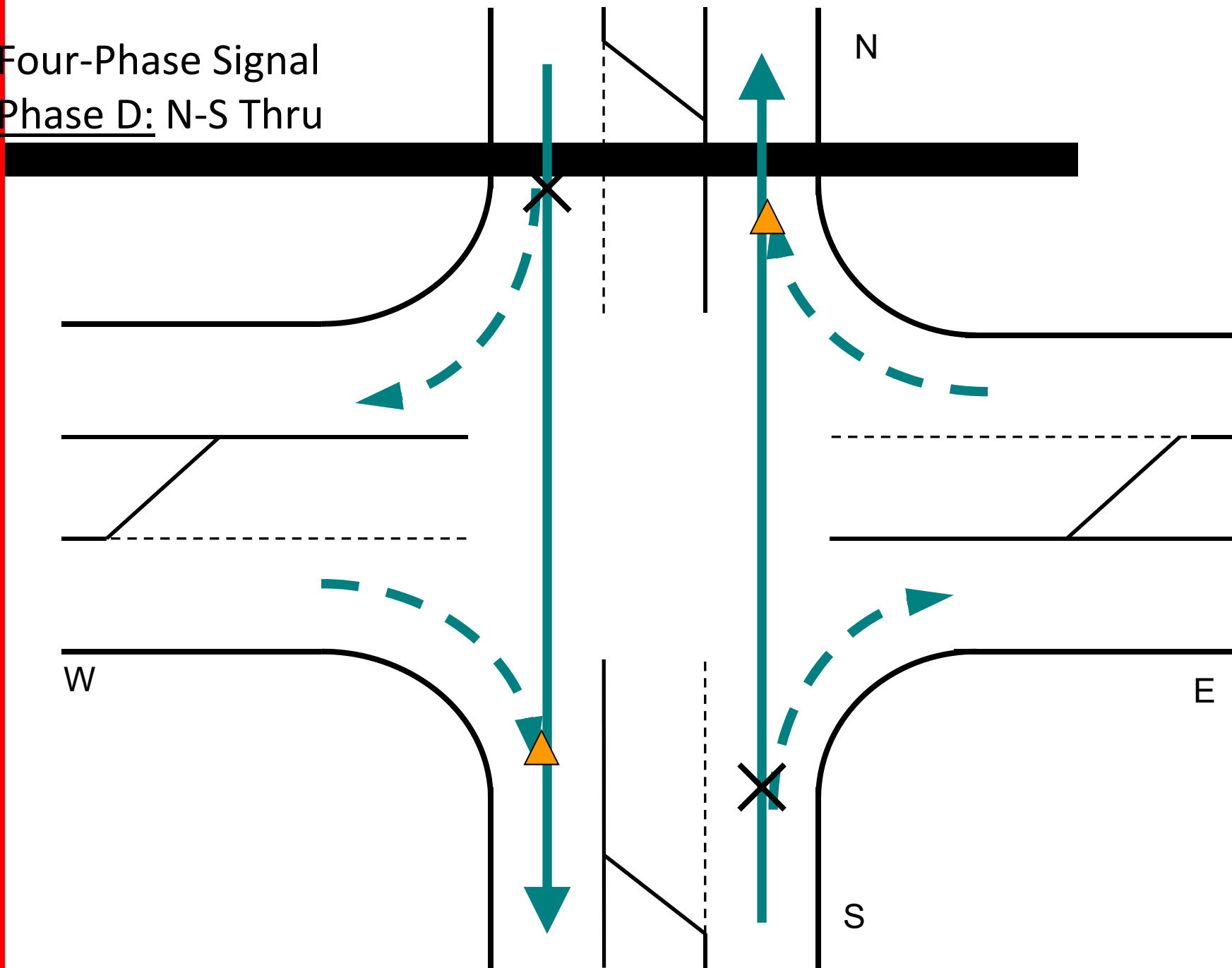
Four-Phase Signal
Phase B: E-W Thru



Four-Phase Signal
Phase C: N-S Left



Four-Phase Signal
Phase D: N-S Thru



Reduction in Conflicts Due to Traffic Signal

	<u>No Signal</u>	<u>2-Phase</u>	<u>4-Phase</u>
Merge Conflicts	8	8	8
Diverging Conflicts	8	8	4
Crossing Conflicts	16	4	0