

CE474: Traffic Systems Design-Fall 2004

Lab 5 – Actuated Operation in Corsim
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Today's Activities

- ◆ 11:00 – 11:20 Review of resources available
- ◆ 11:20 – 11:40 Future volume prediction
- ◆ 11:40 – 12:30 Fixed-Time Signal Design [NIATT Web-tutorial]
- ◆ 12:30-12:40 Break
- ◆ 12:40 – 1: 20 CORSIM/HCS OUTPUT

Similarities & Differences

◆ Fixed Time

- Set Timing Values for Peak Period Traffic
- No Adjustment to Traffic Demand
- Easy to Program

◆ Semi-Actuated

- Set Timing Values for Peak Period Traffic

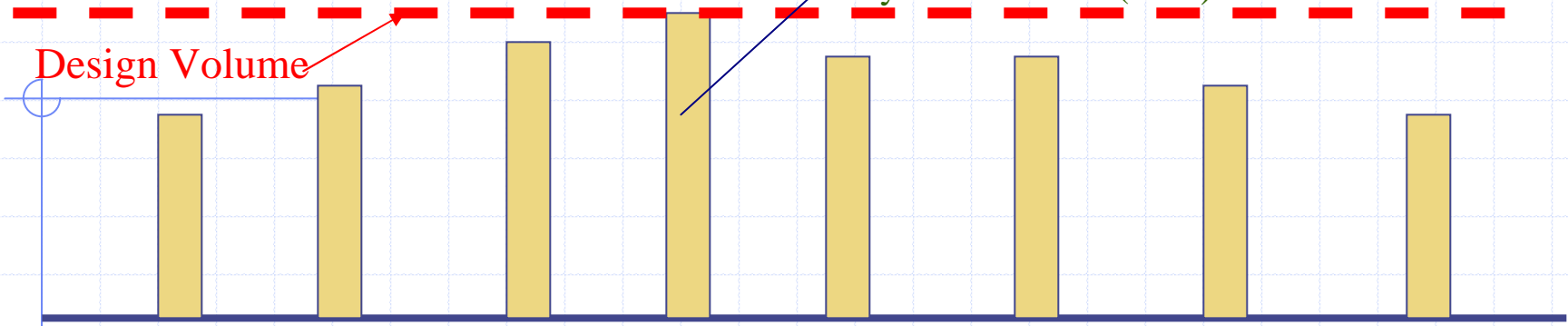
- Adjusts to Side Street Traffic Demand
- Combination of Fixed Time & Actuated

◆ Actuated

- Set Timing Values for Peak Period Traffic
- All Movements Adjust to Traffic Demand
- Difficult to Program

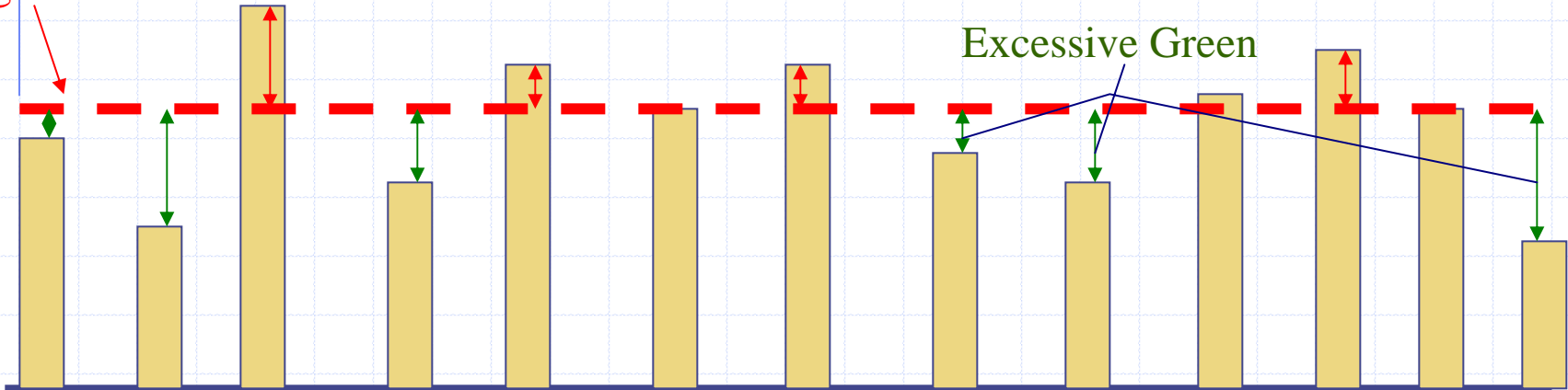
The Concept of Actuation

Maximum number of vehicles counted during any time interval (PHF)



Design Volume

Excessive Green



Typical cycle-by-cycle volumes

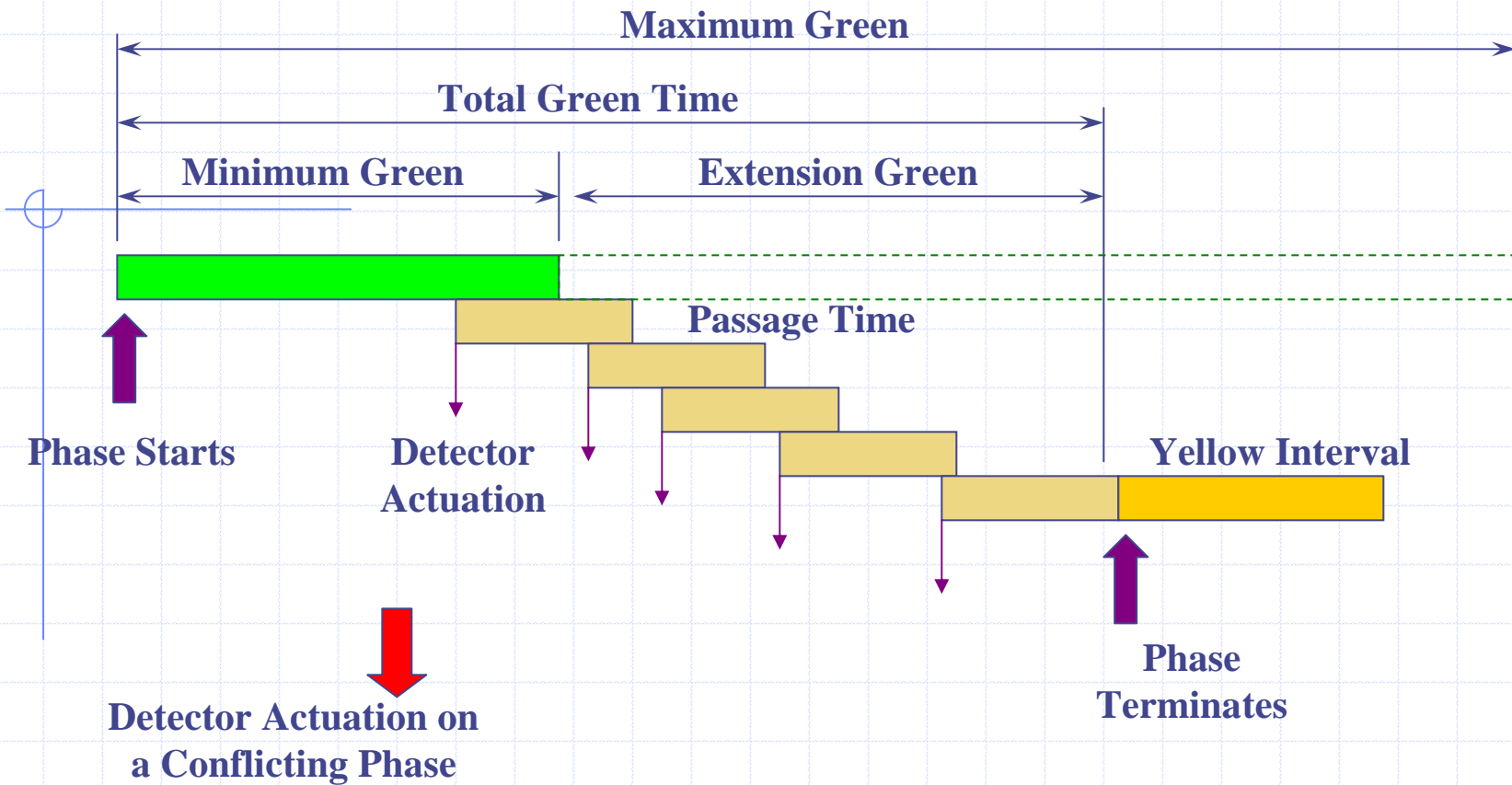
Semi-Actuated and Fully-Actuated Signals

Semi-Actuated Signals

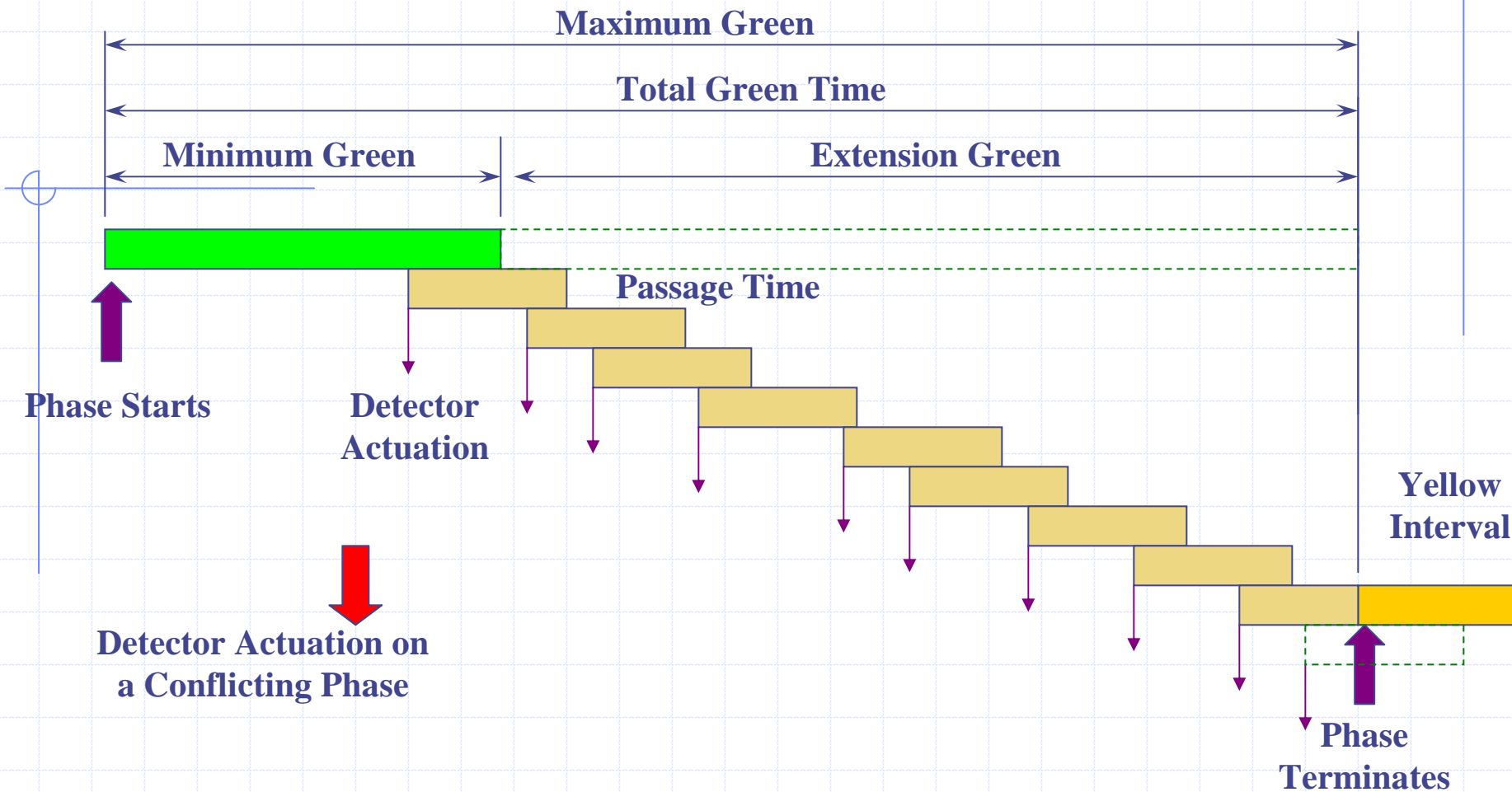
- Green time allocated to major street except when there is a detector call on minor street
- Detectors on minor street ONLY
- Usually used in rural areas where side streets carry low volumes

Fully-Actuated Signals

- Fully adjusts to traffic demand on ALL approaches
- Green time allocation based on detector actuation and minimum and maximum green time setting
- Detectors on all approaches



Operation of an Actuated Phase – Maximum Green Not Reached



Operation of an Actuated Phase-Maximum Green Reached

Actuated Signal Control Settings

- ◆ Minimum Green Time
- ◆ Gap/Passage Time
- ◆ Pedestrian Times
- ◆ Maximum Green Time
- ◆ Yellow Time
- ◆ All Red Time

Actuated Signal Control Settings

Definition

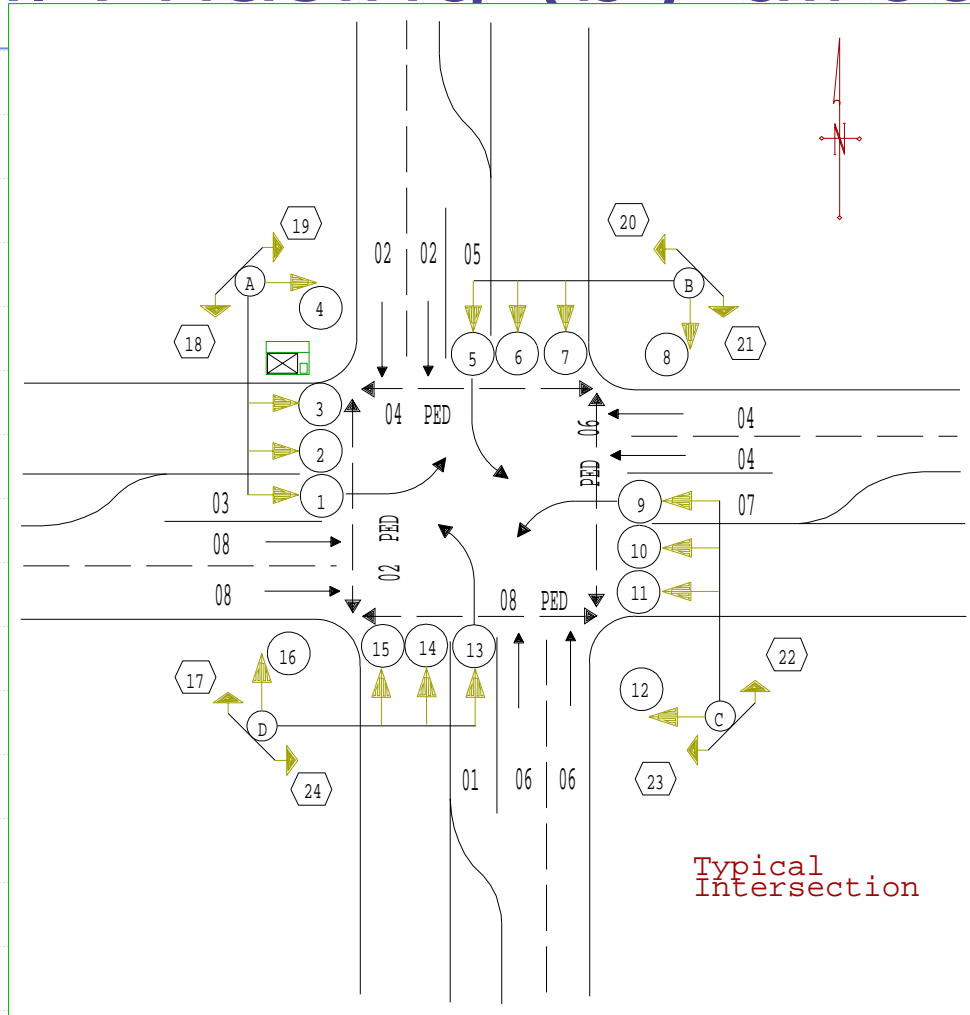
◆ Phase [*What is a phase?*]

A unique movement for which separate timing intervals are provided

Examples:

- Protected Left Turn
- Through or Through / Right combination

Typical Phasing (by direction)

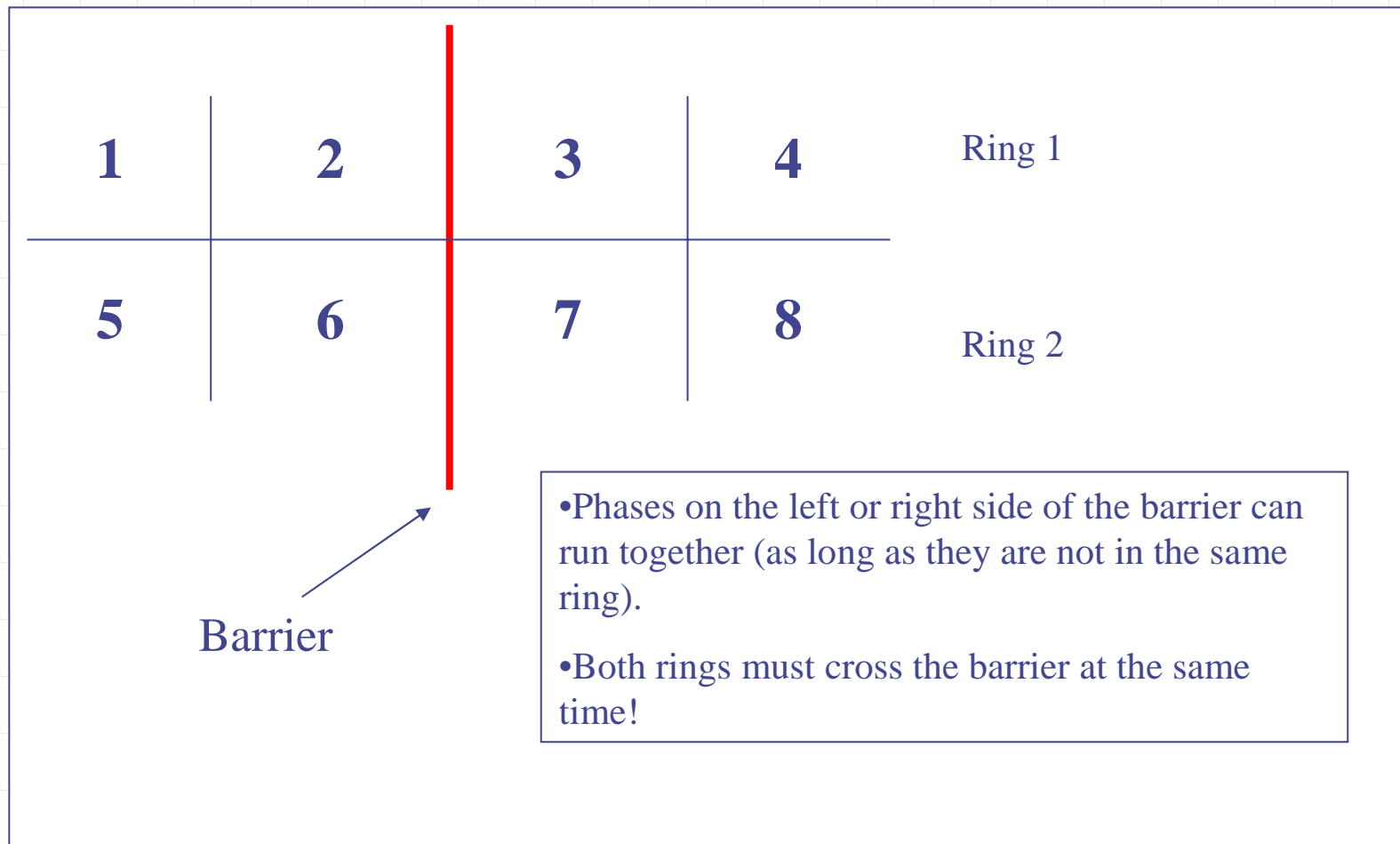


Typical
Intersection

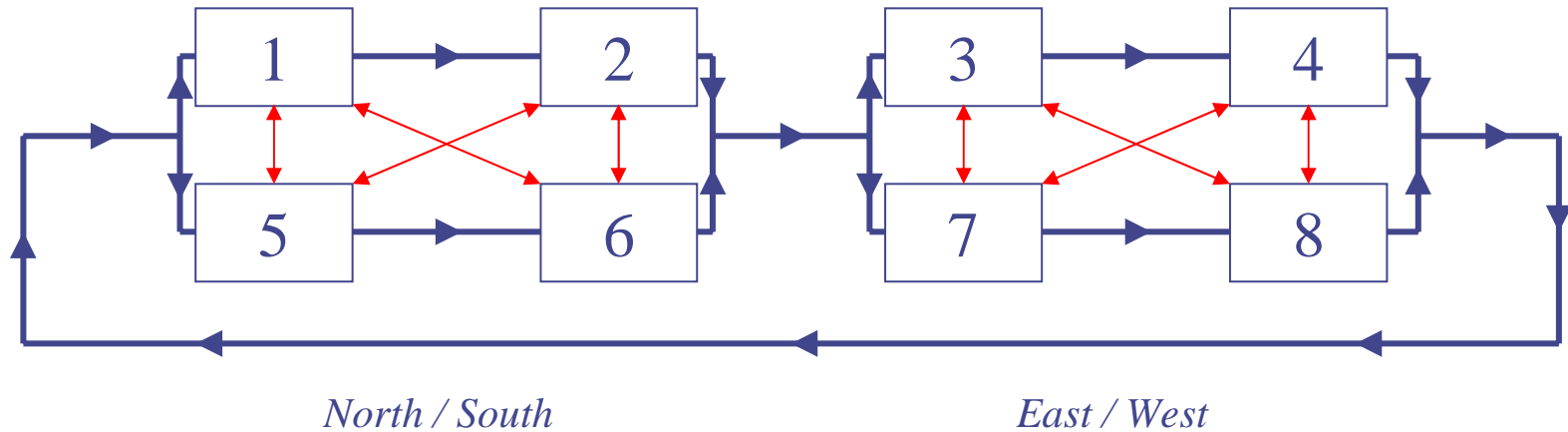
Operation of Dual-Ring Controllers

Each of the respective phase groups in the two rings must cross the barrier simultaneously to select and time phases in the phase group on the other side of the barrier

Ring / Barrier Diagram



Standard 8 Phase Sequence



→ = NEMA Phase Sequence

↔ = Phases that CAN run concurrently

Actuated Signal Control Settings

◆ Gap/Passage Time

- Set according to loop spacing and travel speed of the road.
 - ◆ A vehicle traveling at 25 mph covers nearly 37 feet per second. You want to allow a gap of 75 feet between vehicles. The gap/passage time should be 2.0 seconds. $(75 \div 37 = 2.027)$
- Gap/Passage time determines how “snappy” or “sluggish” signal operation will be.

Fully-Actuated Signals – Basic Definitions

Minimum Green Time

Minimum green time allowed for the green phase

Gap/Passage Time

Maximum gap between vehicles arriving at the detector to retain a given green phase

Maximum Green Time

Maximum green time allowed for the green phase

Volume Density Settings

During peak period, it might be necessary to increase the maximum green time for the phase through volume/density setting

Actuated Signal Control Settings

- Yellow Time (Yellow Change)
- All Red Time (Red Clearance)

$$Y + R = T + \frac{V}{2A \pm 2G} + \frac{W + L}{V}$$

Y	length of the yellow interval;
R	length of the all-red interval;
T	driver perception/reaction time, recommended at 1.0 seconds;
V	velocity of approaching vehicle in meters/second;
A	vehicle deceleration rate;
G	Grade of the signal approach in percent;
W	width of intersection measured in meters;
L	length of vehicle clearance.

Actuated Signal Control Settings

Max Green

•Maximum Green Time

Equation for through, right-turn and protected left-turn traffic.

$$G = 3.7 + 2.1N$$

Where N = Expected number of vehicles in the critical lane

Equation for unprotected left-turn, through, and right-turn traffic.

$$G = 3.7 + 2.1N + 2.7L$$

Where N = Number of opposing through, and right-turn vehicles in the critical lane, L = number of left-turn vehicles in the critical lane.

Actuated Signal Control Settings

Minimum Green Time

- Time for one vehicle to move into the intersection from the point of detection.
- Minimum green time setting should be at 4.0 to 5.0 seconds.

Gap/Passage Time

Set according to loop spacing and travel speed of the road. The gap/passage time should not be less than 2.0 seconds.

Actuated Signal Control Settings

Pedestrian Times

Must be coordinated with vehicle signal phase
(Minimum green values)

4 to 7 seconds recommended by MUTCD

Don't Walk Clearance

Must guarantee adequate crossing time for
pedestrian safety (Average pedestrian walking
speed is 3.5 to 4.0 feet/sec (elderly?????))