Unit 4: Transport Operations Control Strategies and Systems

Module 4-2

# Signalised Intersections – Operations and Control Strategies

Traffic Management Training Module

Austroads

# Today’s presenter

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# Outline of this Module

- Intersection Selection
- Types of Traffic Signal Timing Methods
- Fixed-Time Signal Timing
- Movements and Phase
- Pedestrian
- Coordination

Section 3 of Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management
and
Section 6 of Guide to Traffic Management Part 9: Transport Control Systems – Strategies and Operations
Austroads (2020)

# Perspective

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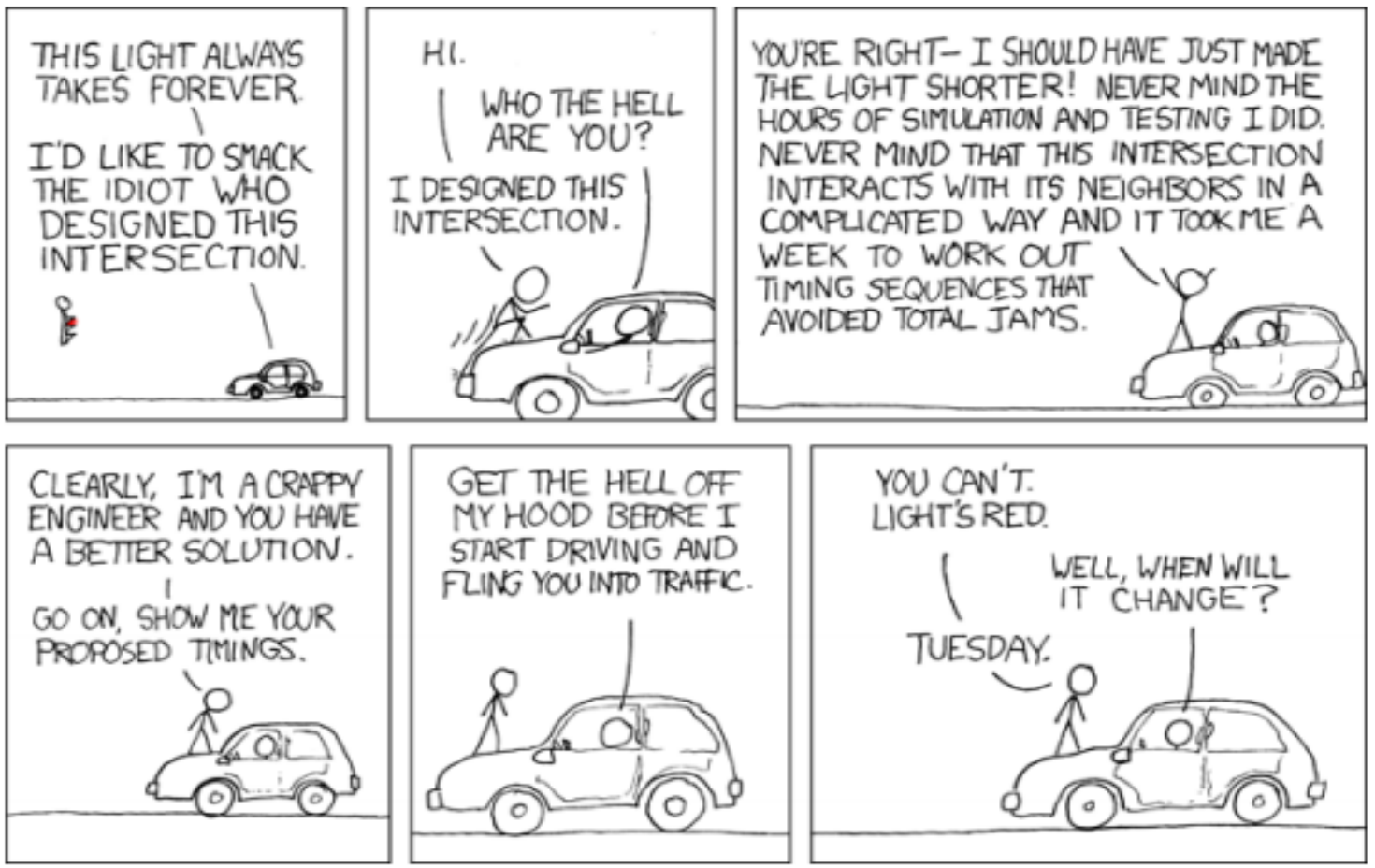


You can look at practically any part of anything manmade around you and think 'some engineer was frustrated while designing this.' It's a little human connection.

*(http://xkcd.com/277)*

# Intersection Selection

- Safety of all road users (light and heavy vehicles, motorcyclists, pedestrians and cyclists)
- Traffic volumes, capacity, delay and level of service, both generally and for specific road users
- Planning policy and objectives
- Compatibility with adjacent intersection treatments
  - link to network operations; vary by time of day to promote certain activities or modes
- Topography at the site
- Speed environment

Section 3.3 of Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management Austroads (2020)

# Intersection Selection

- The natural and built environment (including rural/urban, number of legs and through lanes, available space, adjacent property access and land use)
- Road hierarchy
- Public transport
- Community views

# Signalised Intersections

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Advantage:

- Provide orderly movement of traffic
- Reduce frequency and severity of certain form of crash
- Coordinate smooth and continuous traffic movement
- Interrupt heavy traffic at intervals to permit other traffic

Disadvantage:

- May increase total intersection delay and fuel consumption (off-peak period)
- Increase in frequency of rear-end collisions
- Improperly timed, cause excessive delay, increase driver irritation

# Traffic Signal Timing

# Types of Traffic Signal Timing Methods

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Fixed-time

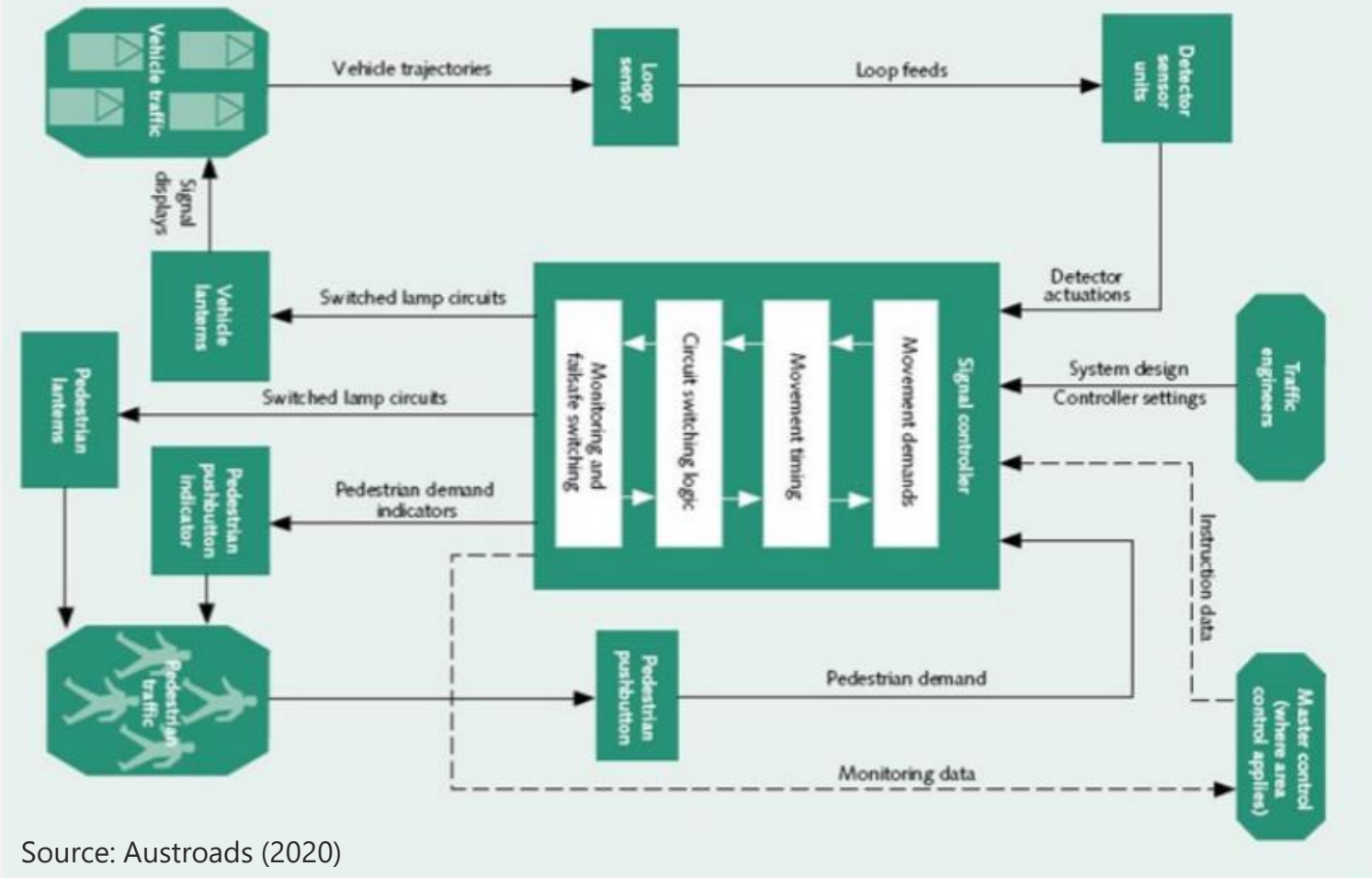
- Repeat a preset fixed cycle and signal plan (not necessarily diurnal)

Actuated

- Respond to the presence of vehicles and pedestrians
- Need to be used in conjunction with vehicle detectors
- Semi-actuated
- Fully actuated

# Schematic Architecture

## Traffic signal system process overview




Source: Austroads (2020)

# Basic Definitions

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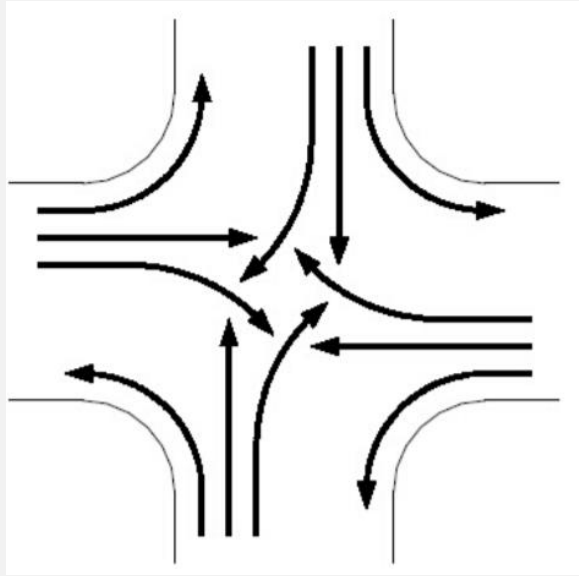
Movements

- vehicles turning left
- vehicles travelling straight through
- vehicles turning right



Phase

- Interval which the controller uses to share time among various compatible movements
- A phase may consist of a set of non-conflicting movements or certain conflicting movements where the priority is defined by traffic regulations

# Pedestrian

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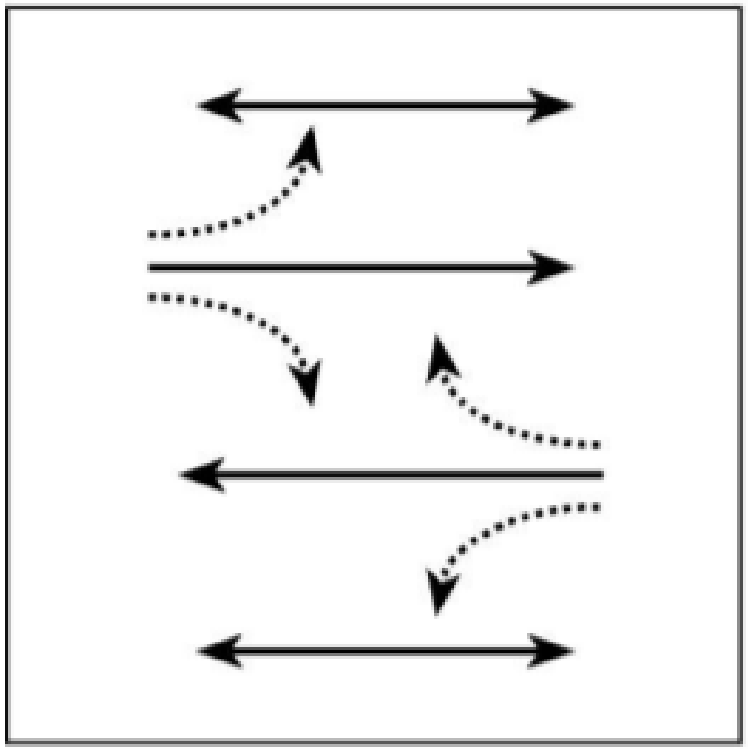
Pedestrian protection

- Pedestrians are normally grouped with vehicle movements to form a phase
- Pedestrian movement run concurrently with parallel vehicle movements when appropriate
- Where turning vehicles can cross a pedestrian movement, it may be necessary to provide pedestrian protection

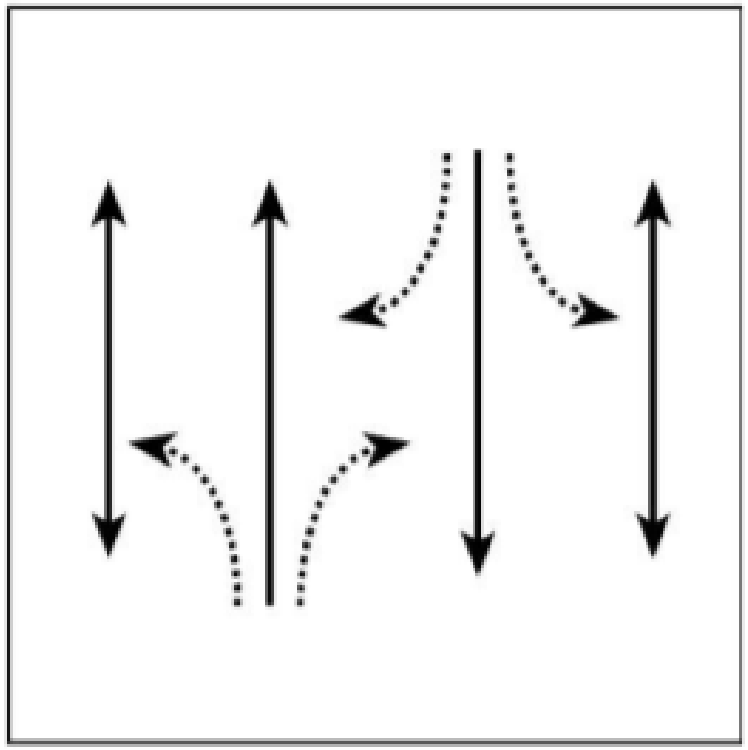
# Phase

**Two phase system, filter right turns and parallel pedestrian movements**

Phase A



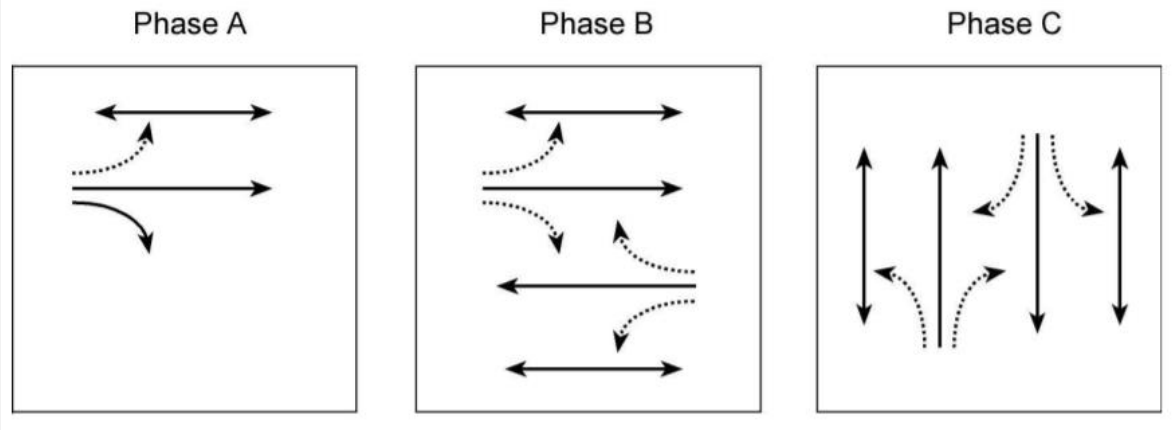
Phase B



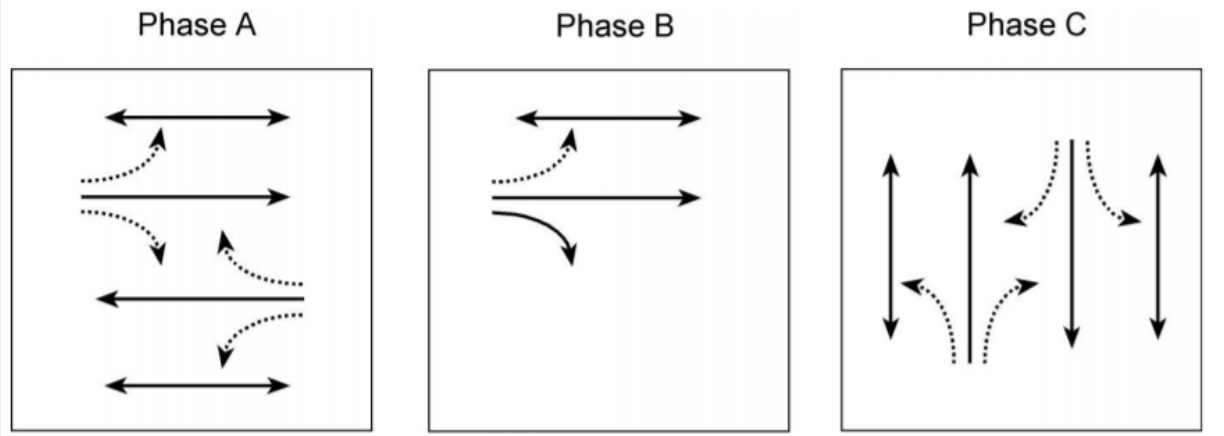
Source: Austroads (2020)

# Phase

**Three phase system, leading right turn phasing on east-west road**




**Three phase system, lagging right turn phasing on east-west road**




Source: Austroads (2020)

# Cycle

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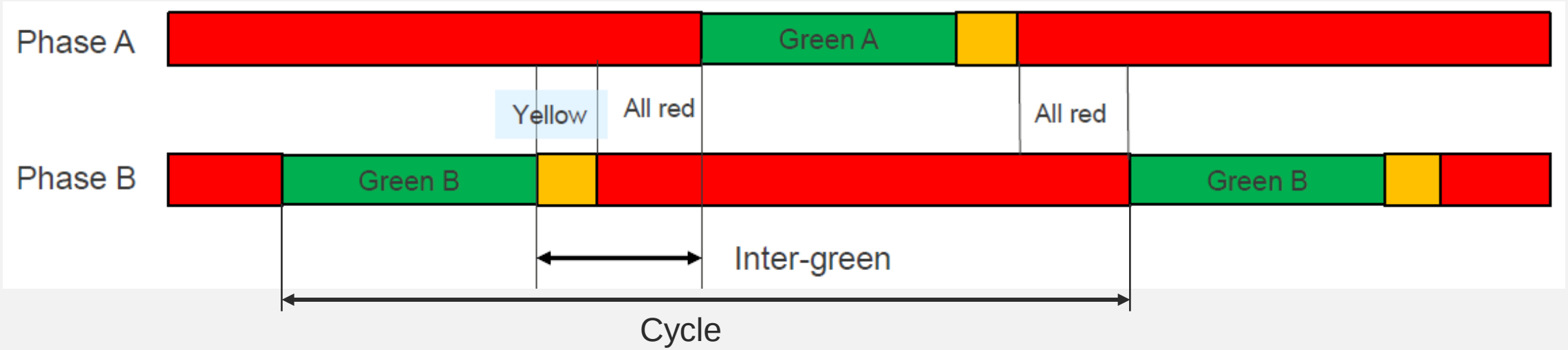
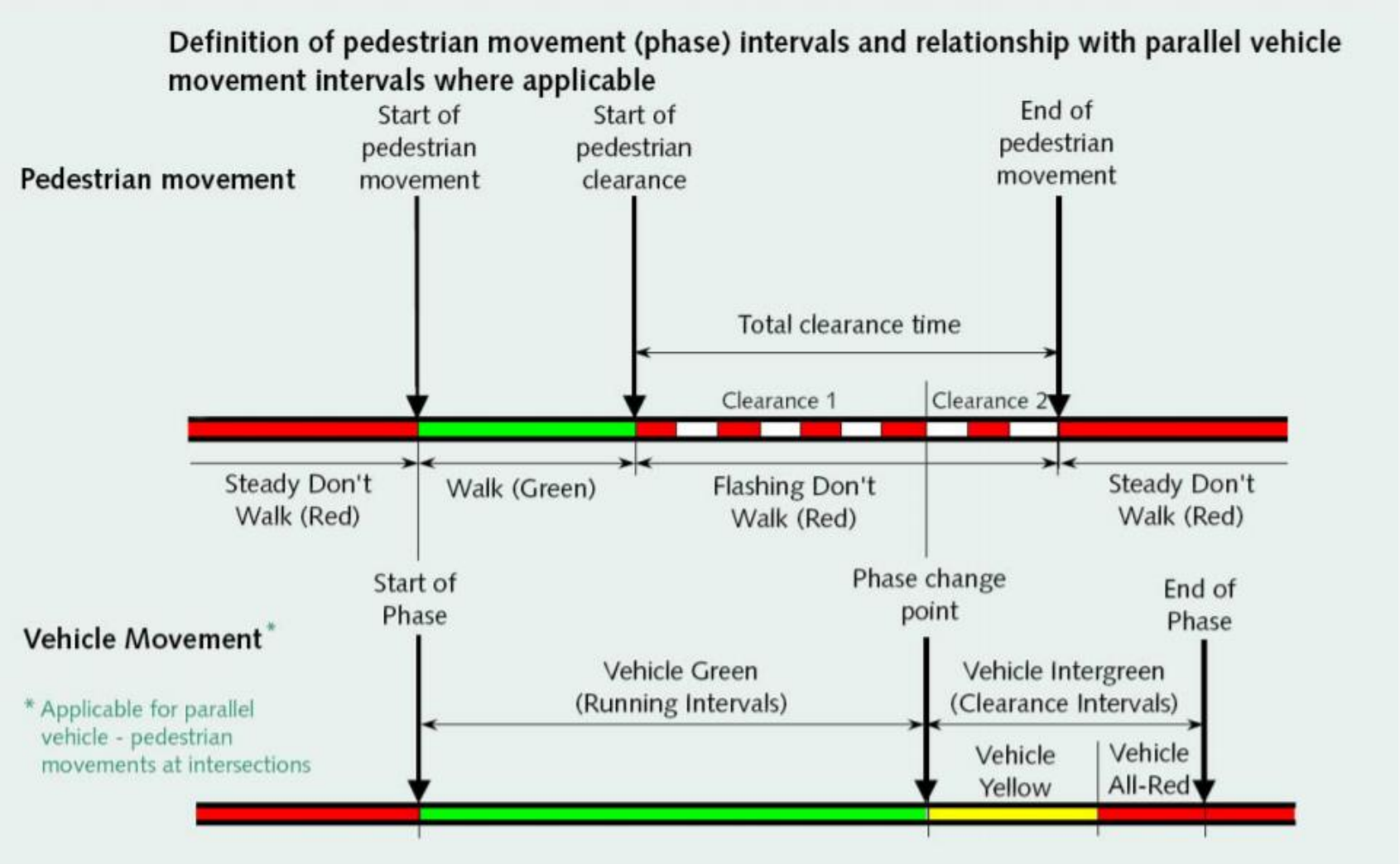
## Cycle (cycle length or cycle time)

- Time needed for a complete sequence of signal phases



# Pedestrian




Source: Austroads (2020)

# Fixed-time Signal Control

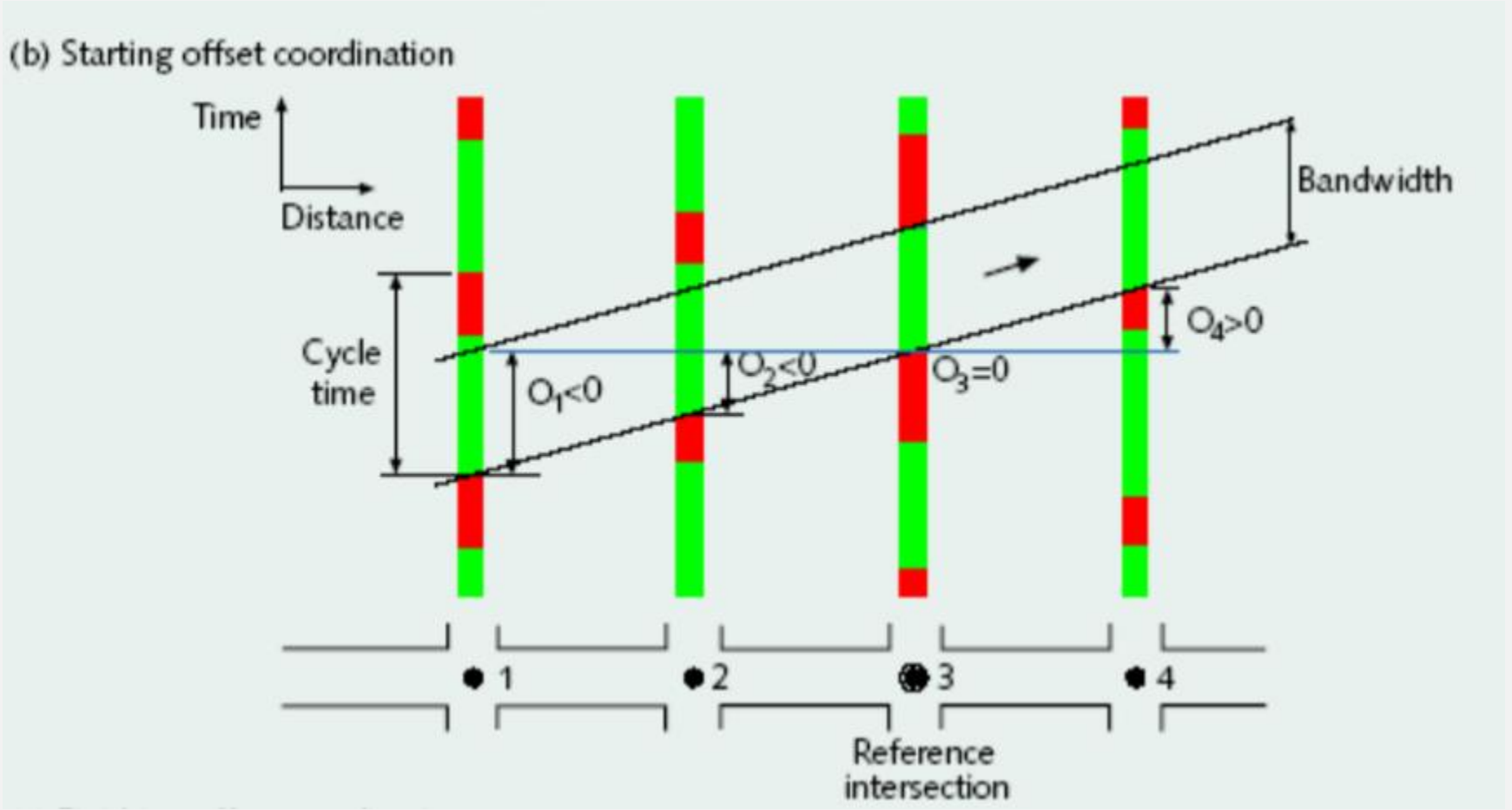
Fixed-time operations have constant (fixed):

- Cycle length
- Phase sequence
- Green time
- Change interval (yellow and all red)

- Simpler and less expensive than other options
- Less efficient where demand fluctuates

# Coordination

# Coordination




Source: Austroads (2020)

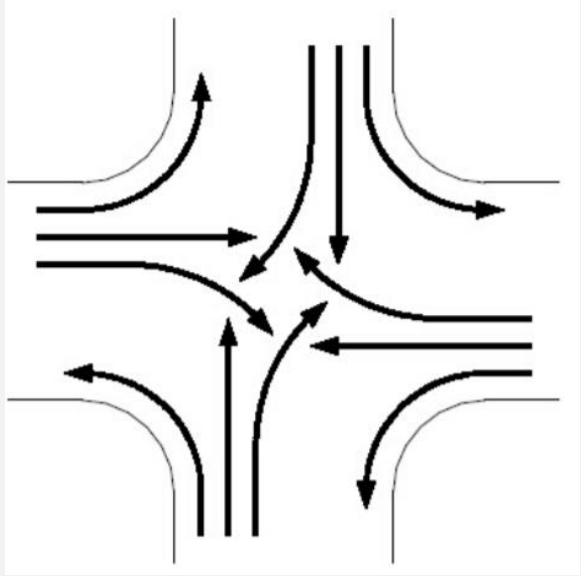
# Time to Reflect

**Q1. For the intersection in the figure, how many phase at least are required to accommodate all the car movements with dedicated turns?**

A. 2

B. 4

C. 5



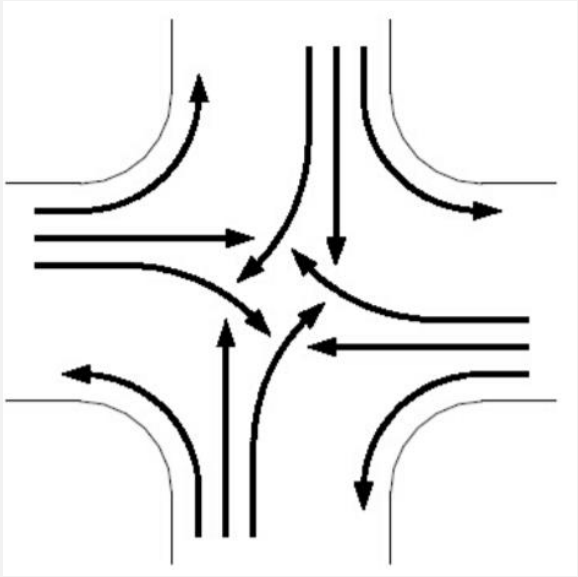
# Time to Reflect

**Q1. For the intersection in the figure, how many phase at least are required to accommodate all the car movements with dedicated protected turns?**

A. 2

B. 4

C. 5



**Explanation**:

Answer B is correct!

# References


Austroads (2020). Guide to Traffic Management Part 2: Traffic Theory Concepts. AGTM02-20, Austroads, Sydney, NSW. https://austroads.com.au/publications/traffic-management/agtm02/media/AGTM02-20-Part-2-Traffic-Theory-Concepts.pdf

Austroads (2020). Guide to Traffic Management Part 9: Transport Control Systems – Strategies and Operations. AGTM09-20, Austroads, Sydney, NSW. https://austroads.com.au/publications/traffic-management/agtm09/media/AGTM09-20_Part_9_Transport_Control_Systems_Strategies_and_Operations.pdf

# Thank you for participating

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