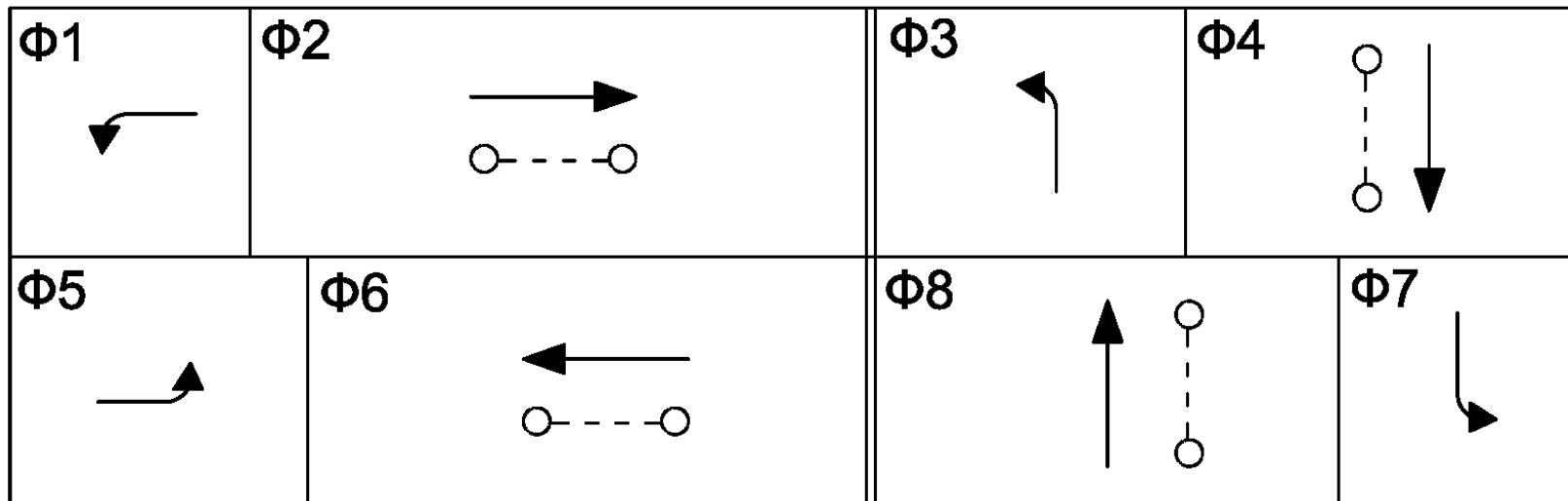


MANAGING MULTIPLE LONG PED. SERVICES WITHIN SHORT CYCLES

Joint TexITE / WesternITE District Meeting Keystone 2018

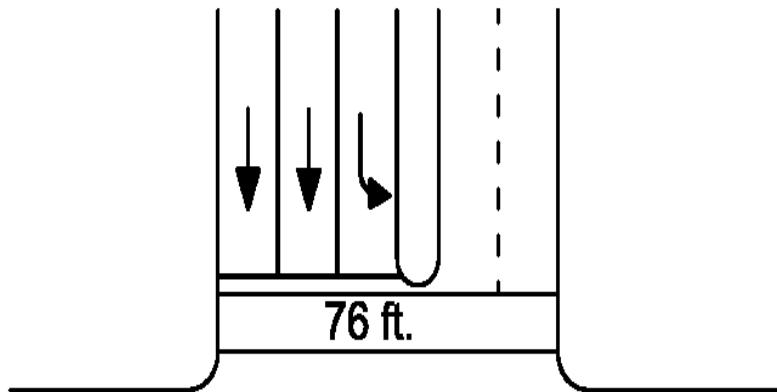
**A box around the industry's thinking for
over 40 years:
Ped. Timings are merely extra intervals in
through vehicle phases**

RING



BACK THEN ('70s, '80s & '90s)

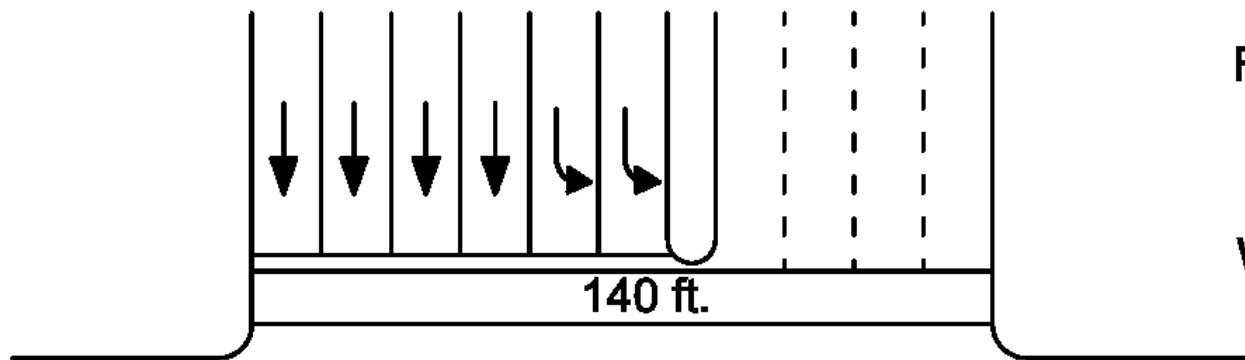
Not a significant problem – WALK & FDW intervals rarely totaled much more than the coord. split required for vehicle traffic



$$\text{FDW} = \frac{76 \text{ ft.}}{4 \text{ ft./sec.}} - (Y + R) = 14 \text{ sec.}$$

$$\text{WALK} + \text{FDW} = 18 \text{ sec.}$$

NOW: Ped. Times often total most of twice what their parent phases' vehicle movements require for discharge, especially during off-peak periods.



$$\text{FDW} = \frac{140 \text{ ft.}}{3.5 \text{ ft./sec.}} = 40 \text{ sec.}$$

$$\text{WALK} + \text{FDW} = 7 \text{ sec.} + 40 \text{ sec.} = 47 \text{ sec.}$$

THEN:

1. WALK
2. FDW

NOW:

BASIC

1. WALK
2. Walk “Advance”
3. Advance applies to..
4. APD (audible)
5. FDW
6. SPC (Steady Ped.
Clearance)

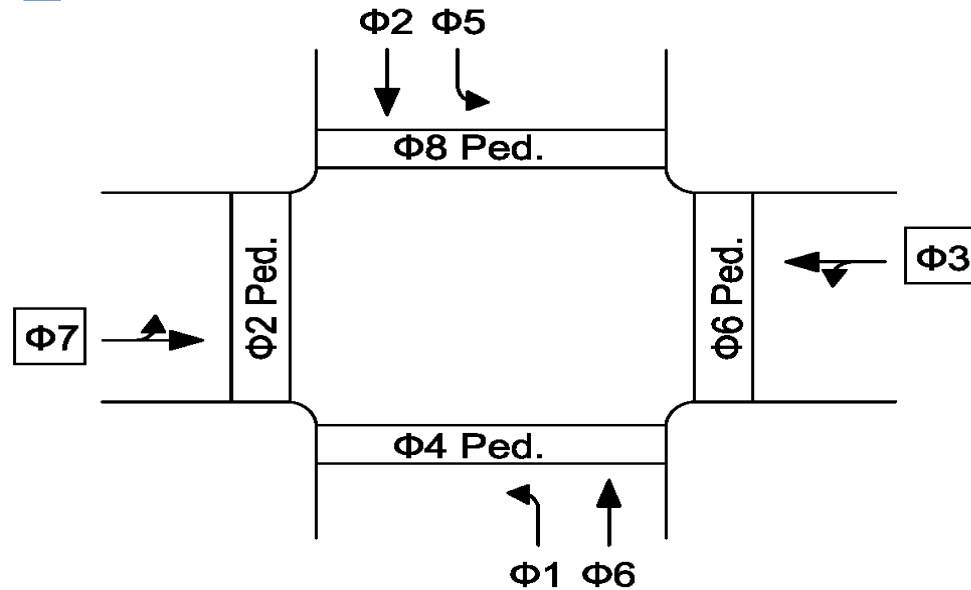
EXTENDED PRESS

7. EP Walk
8. EP Advance
9. EP ADP
10. EP SPC

PROPOSED MANAGEMENT TECHNIQUE

Placing Ped. Timings in separate phases and rings enables us to time them concurrently with multiple other Ped. and non-conflicting vehicle movements.

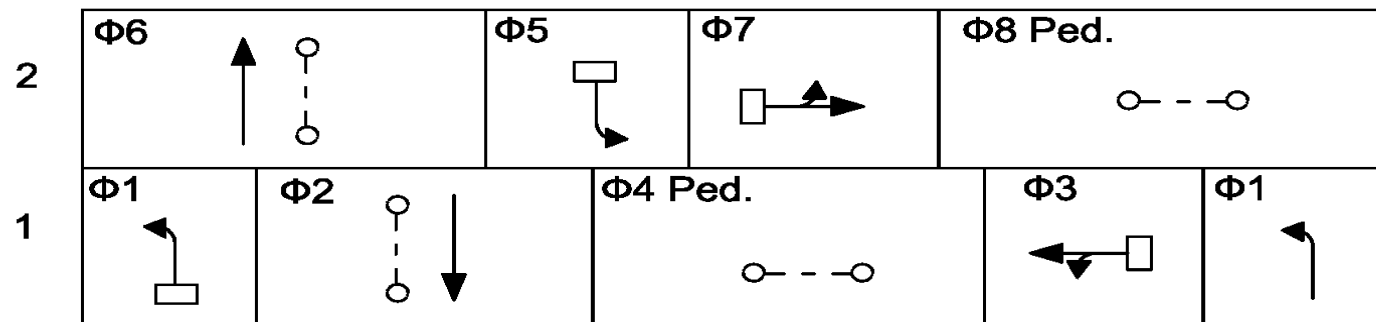
1. Enhanced Jacobson mode for 6 phase with split cross street



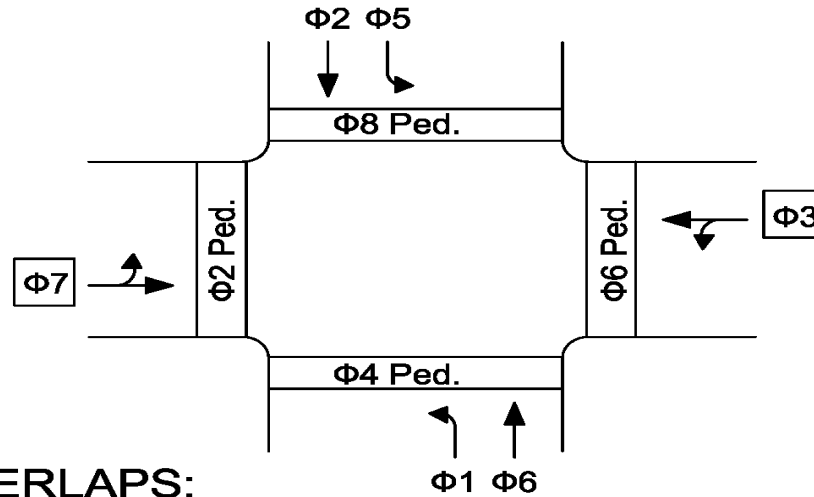
PHASE CONCURRENCIES:

RING		RING				
		1 2	Φ6	Φ5	Φ7	Φ8
1	2	Φ1	v	v		v
2	1	Φ2	v	v		
1	2	Φ4		v	v	v
2	1	Φ3				v

RING



2. de Camp's Split Vehicle Phases w/concurrent Cross Street Peds.



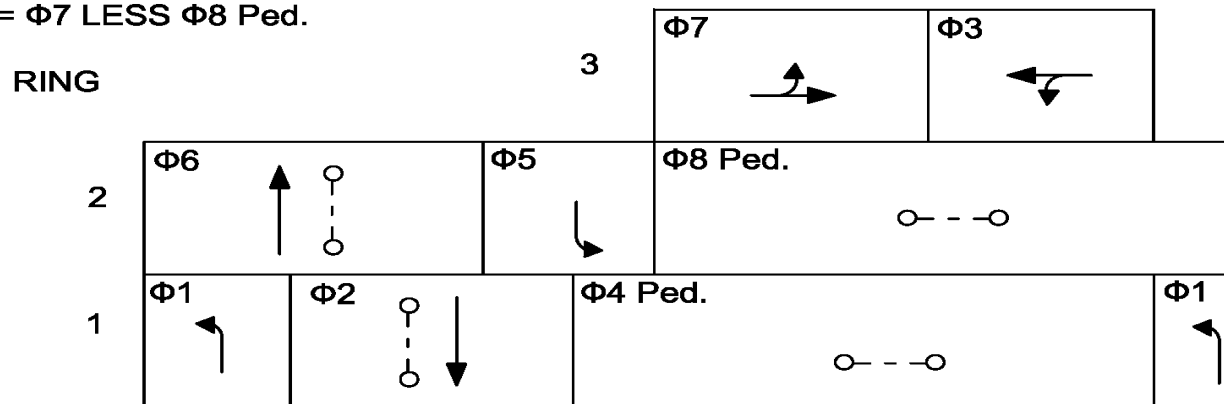
OVERLAPS:

OLC = $\Phi 3$ LESS $\Phi 4$ Ped.

OLD = $\Phi 7$ LESS $\Phi 8$ Ped.

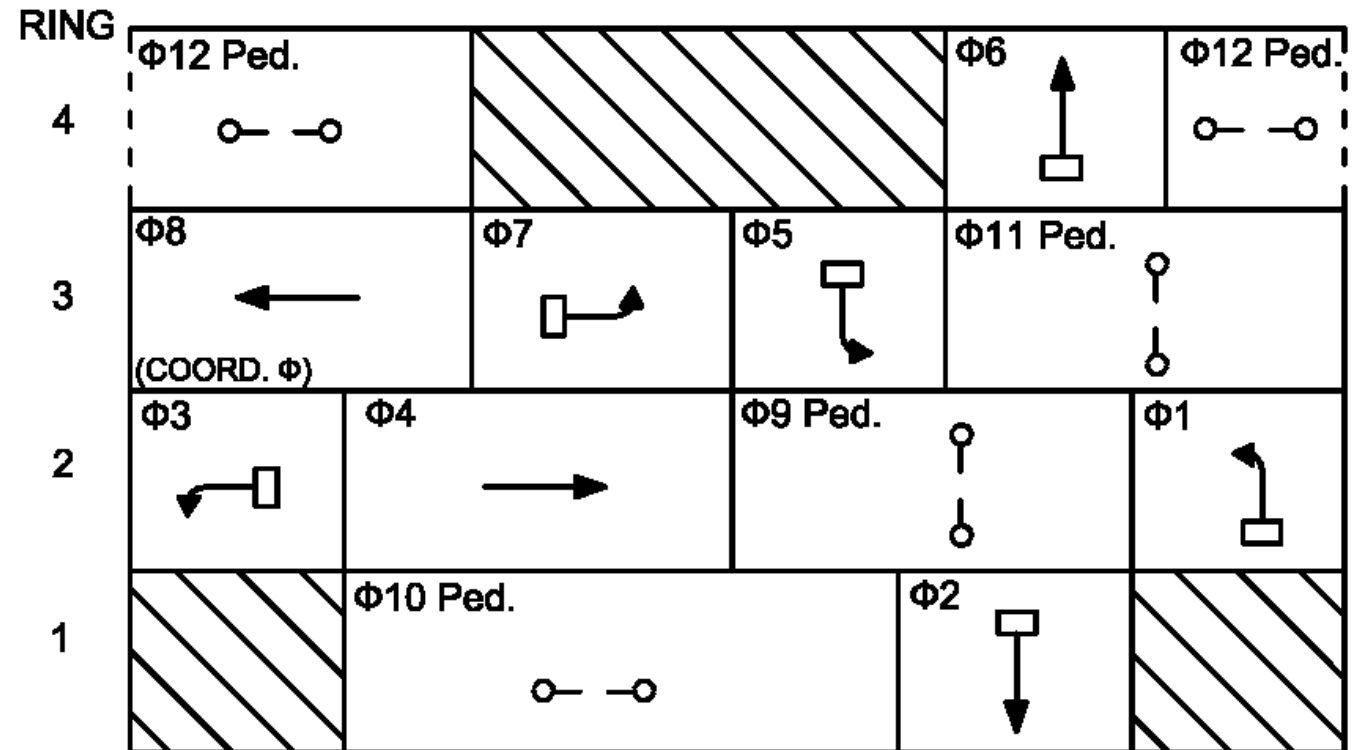
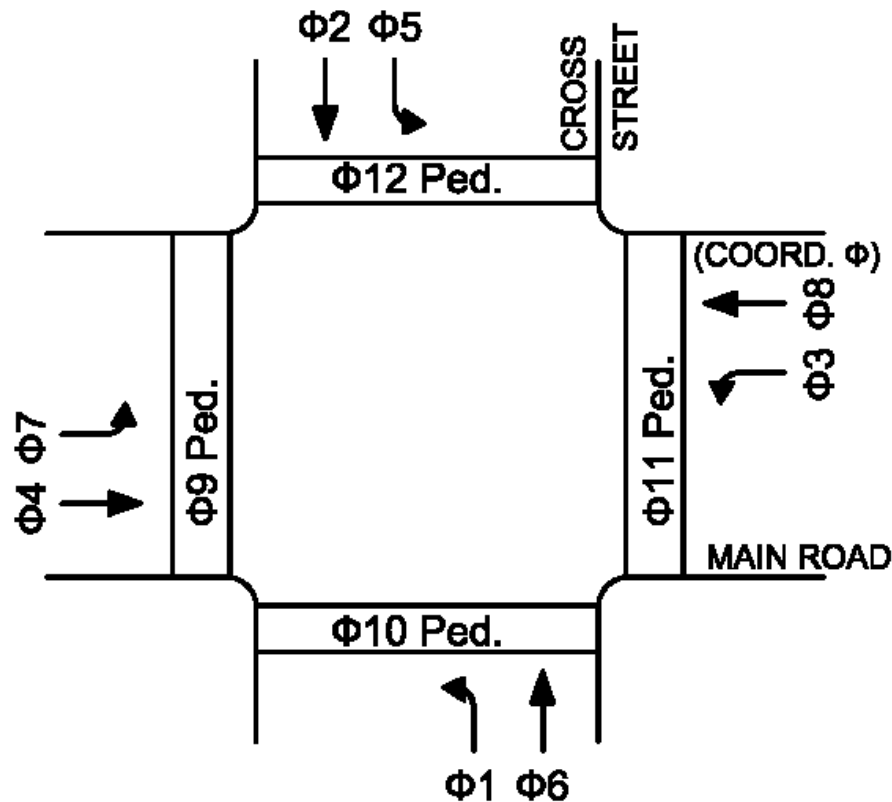
PHASE CONCURRENCIES:

RING		PHASE CONCURRENCIES:						
		1	2	$\Phi 6$	$\Phi 5$	$\Phi 8$	$\Phi 7$	$\Phi 3$
1	1	$\Phi 1$		v	v	v		
	2	$\Phi 2$		v	v			
2	1	$\Phi 4$			v	v	v	v
	2	$\Phi 7$				v	v	
3		$\Phi 3$				v		v

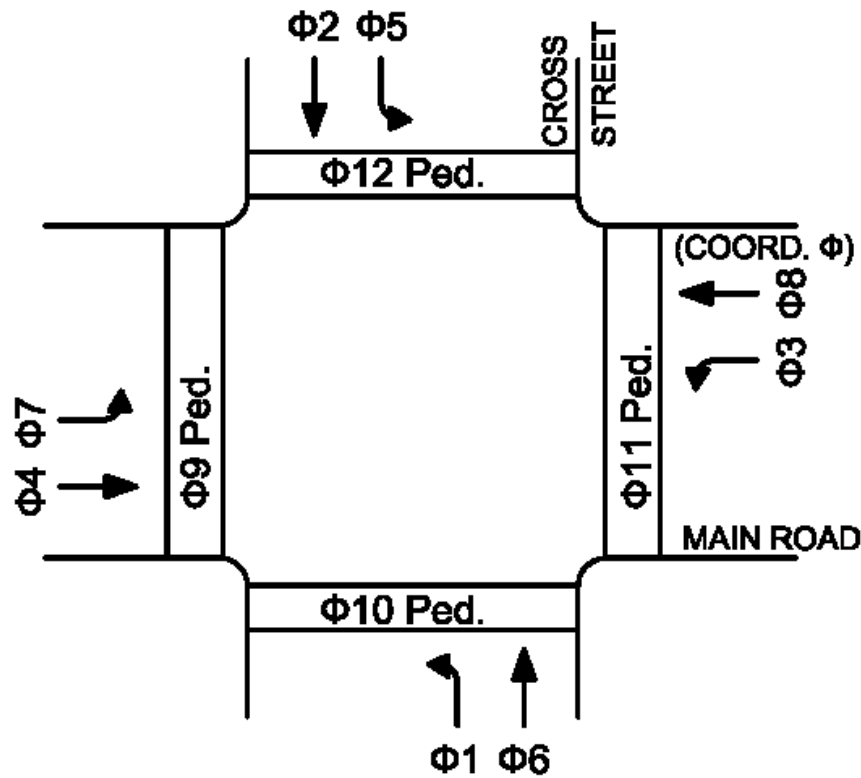


3. Quad Left w/ Lead-Lag LT Sequence

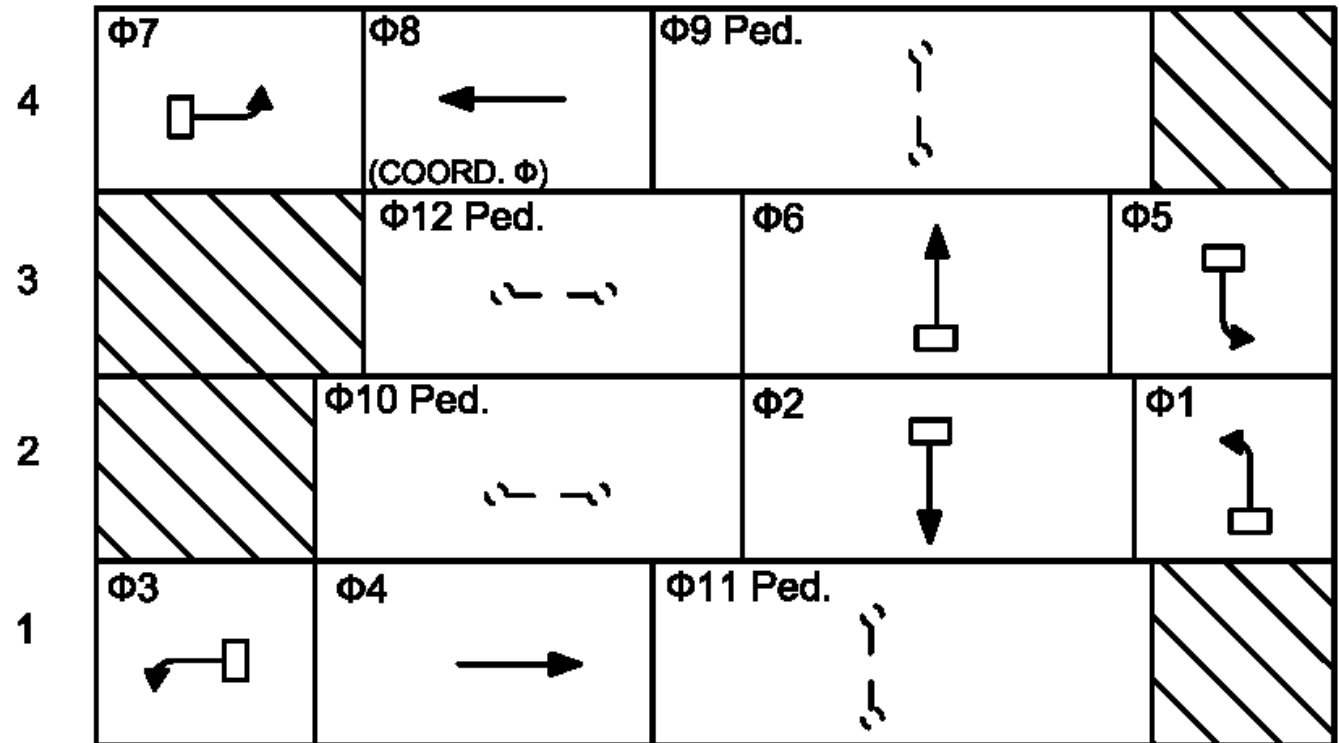
Peds on both streets able to Time Concurrently and with Cross Street LT Phases



4. Non Lead-Lag Long Ped. Sequence



RING



Non Lead-Lag Long Ped. Sequence

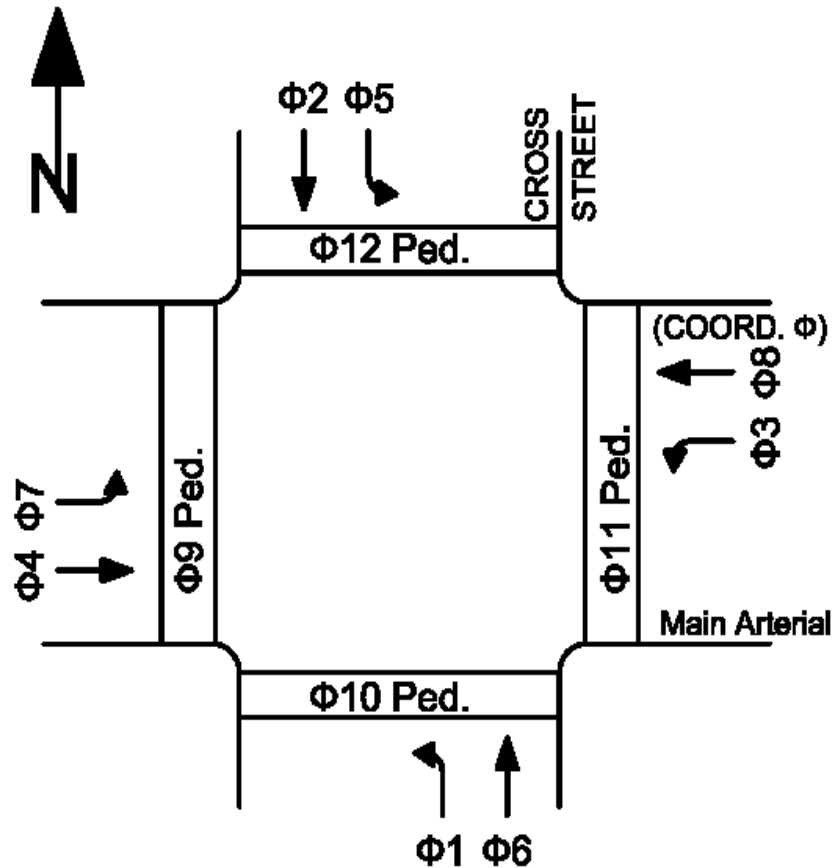
Phase Concurrency Chart:

Phase

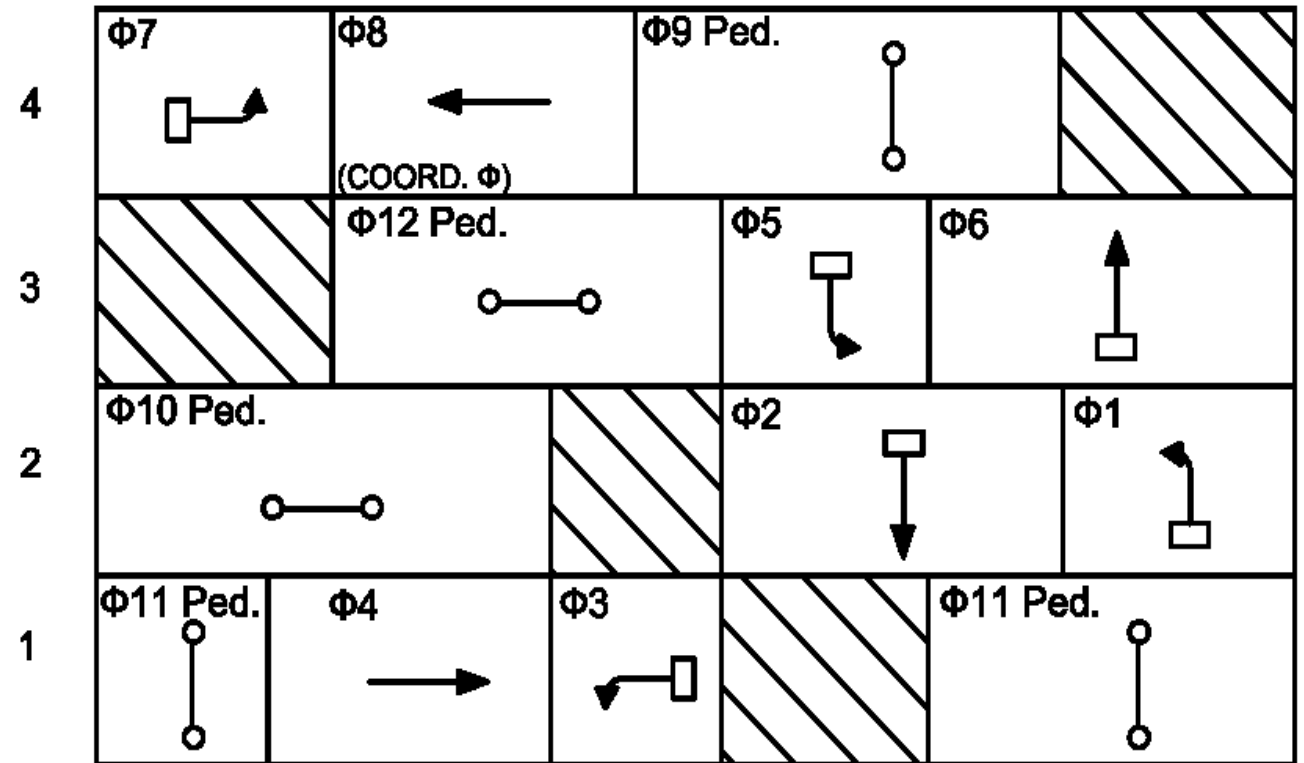
Time Concurrently With Phase:

1	5, 6, 11, 12
2	5, 6, 9, 11
3	7, 8, 9, 12
4	7, 8, 10, 12
5	9, 10
6	9, 11
7	10, 11
8	10, 12
9 - 12	9 - 12

5. Quad Left w/ Lead-Lag Sequence and Peds timed w/ Main Rd. LT Phases



RING



Conclusion – These Techniques allowed for:

1. Greater use of Phase Numbers higher than 8 and Rings 3 & 4.
2. Utilization of NTCIP-standard phase concurrency tables, rather than barriers across all rings.
3. Thoroughly test-bench checked to insure against controller program bugs and unintended effects.
4. Implementation will vary based on specific equipment and controller software programs.