

# 2070L Preemption Chart

Used to designate this interval as the preemption dwell interval. This interval will use Dwell Min. Time below. Selecting 255 sec. green indicates dwell (hold) phase.

Clearance times for dwell (hold) phase. Using 0.0 sec. for each will allow controller to use times set in normal operation.

Amount of time signal is in exit phase before preemption ends. Select 0 for controller to return to normal operation after preemption. Select 1 to designate an exit phase.

Clearance time not used when Interval 5 is exit interval.

Delay time after preempt call is received before going to preempt phase. Usually 0.0 sec. for Opticom systems; may need delay for pushbutton locations.

Minimum green time assured for current phase before transitioning into preempt phase. Usually 1 sec., so as to begin preemption sequence immediately (0 sec. will default to normal minimum green time).

Time provided to display Flashing "DON'T WALK" for pedestrians to clear intersection before beginning preemption sequence.

Clearance times provided to clear current phase before transitioning into preemption. Using 0.0 sec. for each will allow controller to use times set in normal operation.

Minimum time preemption dwell phase will run. Opticom systems typically use the same time as the phase in normal operation. Minimum time for pushbutton locations needs to be based on trial runs (typically by the Division).

Select yes to clear to all red before going into preemption to prevent yellow trap.

"Y" (for Yes) will time the "Ped Clear Before Pre" and "Yellow Clear Before Pre" simultaneously, thereby reducing overall clearance time needed before preemption. Select "N" to time "FDW" and then yellow clear and red clear before going into preempt.

Time to extend preempt dwell phase after call is dropped (usually 2 sec.) Prevents the call from being dropped accidentally. Typically used for Opticom systems.

## 2070L EV PREEMPTION

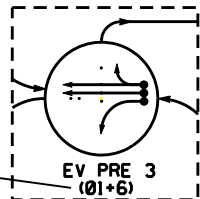
FUNCTION	PRE 3	PRE 4	PRE 5	PRE 6
Interval 1 - Dwell Green	255	255	255	255
Interval 1 - Dwell Yellow	0.0 *	0.0 *	0.0 *	0.0 *
Interval 1 - Dwell Red	0.0 *	0.0 *	0.0 *	0.0 *
Interval 5 - Exit Green	1	1	1	1
Interval 5 - Yellow	0.0	0.0	0.0	0.0
Interval 5 - Red	0.0	0.0	0.0	0.0
Delay Time	0.0	0.0	0.0	0.0
Min Green Before Pre	1	1	1	1
Ped Clear Before Pre	0	0	0	0
Yellow Clear Before Pre	0.0 *	0.0 *	0.0 *	0.0 *
Red Clear Before Pre	0.0 *	0.0 *	0.0 *	0.0 *
Dwell Min Time	10	7	10	7
Enable Backup Protection	Y/N	Y/N	Y/N	Y/N
Ped Clear Through Yellow	Y/N	Y/N	Y/N	Y/N
Preempt Extend **	2	2	2	2

\* Time defaults to time used for phase during normal operation

\*\* Program Timing on Optical Detection Unit

### Notes:

- 1) For pushbutton operation, use EV PRE 2.
- 2) For Opticom type operation:  
For 1 preempt, use EV PRE 3  
For 2 preempts, use EV PRE 3 and 5  
For 3 preempts, use EV PRE 3, 4, and 5  
For 4 preempts, use EV PRE 3, 4, 5, and 6
- 3) Include corresponding regular phases in phasing diagram



## Emergency Vehicle Preemption

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## NEMA Preemption Chart

Delay time after preempt call is received before going to preempt phase. Usually 0 sec. for Opticom systems. May need delay for pushbutton locations, typically Division will determine delay needed.

Time provided to display Flashing "DON'T WALK" for pedestrian to clear intersection before beginning preempt sequence. This time may be reduced if necessary.

Minimum green time assured for current phase before transitioning into preempt phase. Usually 1 sec., so as to begin preemption sequence immediately (0 sec. will default to normal minimum green time).

Highest yellow and highest red clear times needed to clear normal operation phases (may come from different phases).

Minimum time preemption dwell phase will run. Opticom systems typically use the same time as the phase in normal operation. Minimum time for pushbutton locations needs to be based on trial runs (typically by the Division).

Clearance times for dwell (hold) phase. Use clearance times from corresponding normal phase (See Std. 5.2.2, Sheet 4).

Some NEMA controllers allow Ped Clear time and Yellow Clear time Before Preempt to time simultaneously, while other brands do not. If in doubt about type of equipment being used, select "N."

Time to extend preempt dwell phase after call is dropped (usually 2 sec.) Prevents the call from being dropped accidentally. Typically used for Opticom systems.

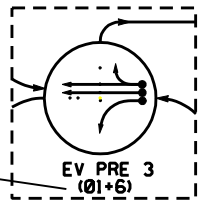
### NEMA EV PREEMPTION

FUNCTION	PRE 3	PRE 4	PRE 5	PRE 6
Delay Before Preempt	0	0	0	0
Ped Clear Before Preempt	—	—	—	—
Min. Green Before Preempt	1	1	1	1
Yellow Clear Before Preempt	4.0	4.0	4.0	4.0
Red Clear Before Preempt	1.0	1.0	1.0	1.0
Preempt Dwell Min. Green	10	7	10	7
Yellow Clr After Preempt	4.0	4.0	4.0	4.0
Red Clear After Preempt	1.0	1.0	1.0	1.0
Ped Clear Through Yellow	Y/N	Y/N	Y/N	Y/N
Preempt Extend **	2.0	2.0	2.0	2.0

\*\* Program Timing on Optical Detection Unit

Notes:

- 1) For pushbutton operation, use EV PRE 2.
- 2) For Opticom type operation:  
For 1 preempt, use EV PRE 3  
For 2 preempts, use EV PRE 3 and 5  
For 3 preempts, use EV PRE 3, 4, and 5  
For 4 preempts, use EV PRE 3, 4, 5, and 6
- 3) Include corresponding regular phases in phasing diagram



## 170 Preemption Chart

(See Above)

Time needed for pedestrians to clear intersection before going into preempt phase.

(See Above)

Preemption dwell phase minimum green (times after call is released).

(See Above)

### 170 EV PREEMPTION

FUNCTION	EVA	EVB	EVC	EVD
Delay Before Preempt	0	0	0	0
Ped. Clear Before Preempt	—	—	—	—
Min. Green Before Preempt	1.0	1.0	1.0	1.0
Clearance Time	7	7	7	7
Preempt Extend **	2.0	2.0	2.0	2.0

\*\* Program Timing on Optical Detection Unit

## Emergency Vehicle Preemption

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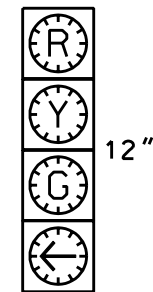
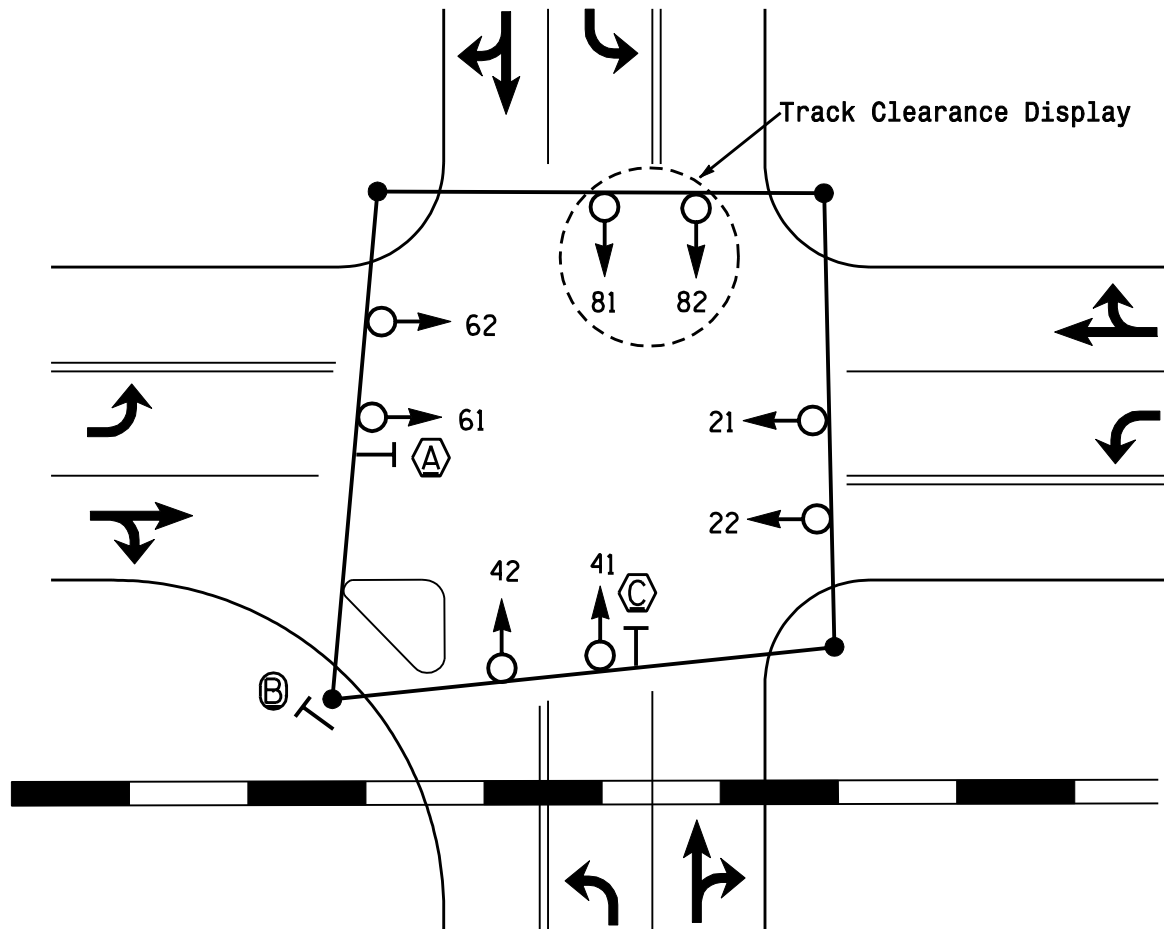
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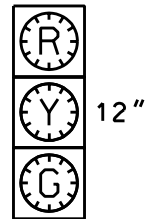
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# Use of Signal Heads and Blankout Signs Permissive Only Displays

NOTE: BLANKOUT SIGNS ARE NOT  
USED IN CONJUNCTION WITH  
"YIELD" SIGN CONTROLLED  
MOVEMENTS



81



21, 22  
41, 42  
61, 62  
82

- (A) No Left Turn Blankout Sign
- (B) Yield Sign (R1-2)
- (C) "ONCOMING TRAFFIC MAY  
HAVE EXTENDED GREEN"  
Sign (W25-2)

## Railroad Preemption

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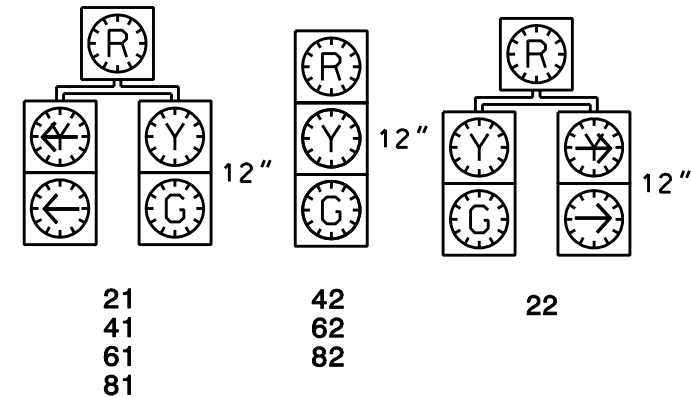
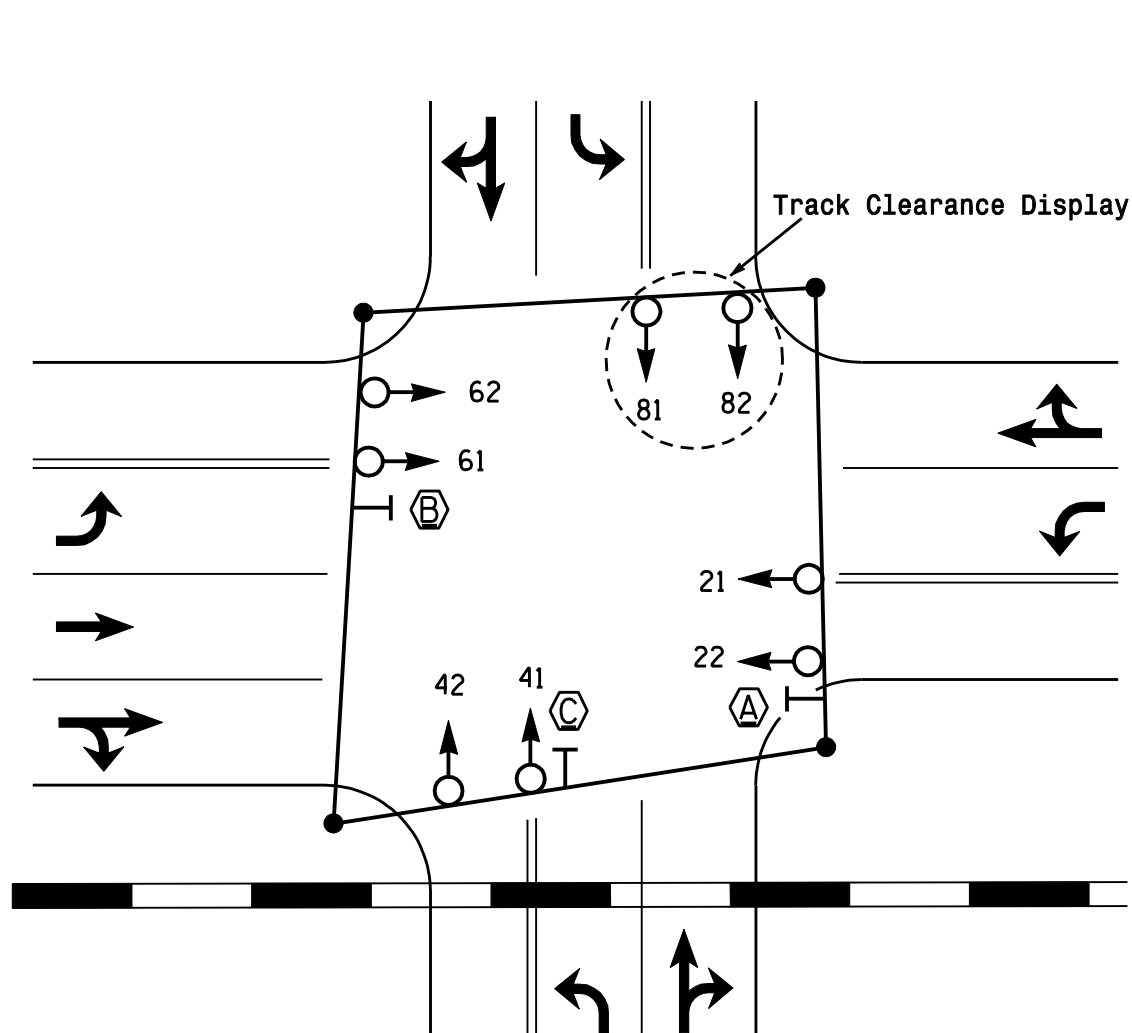
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## Use of Signal Heads and Blankout Signs Protected /Permissive Displays



- (A) No Right Turn Blankout Sign
- (B) No Left Turn Blankout Sign
- (C) "ONCOMING TRAFFIC MAY HAVE EXTENDED GREEN" Sign (W25-2)

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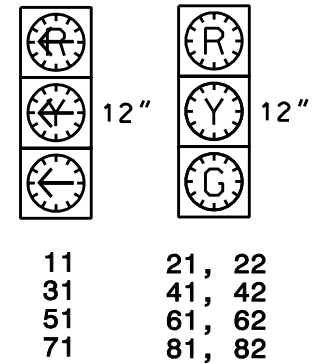
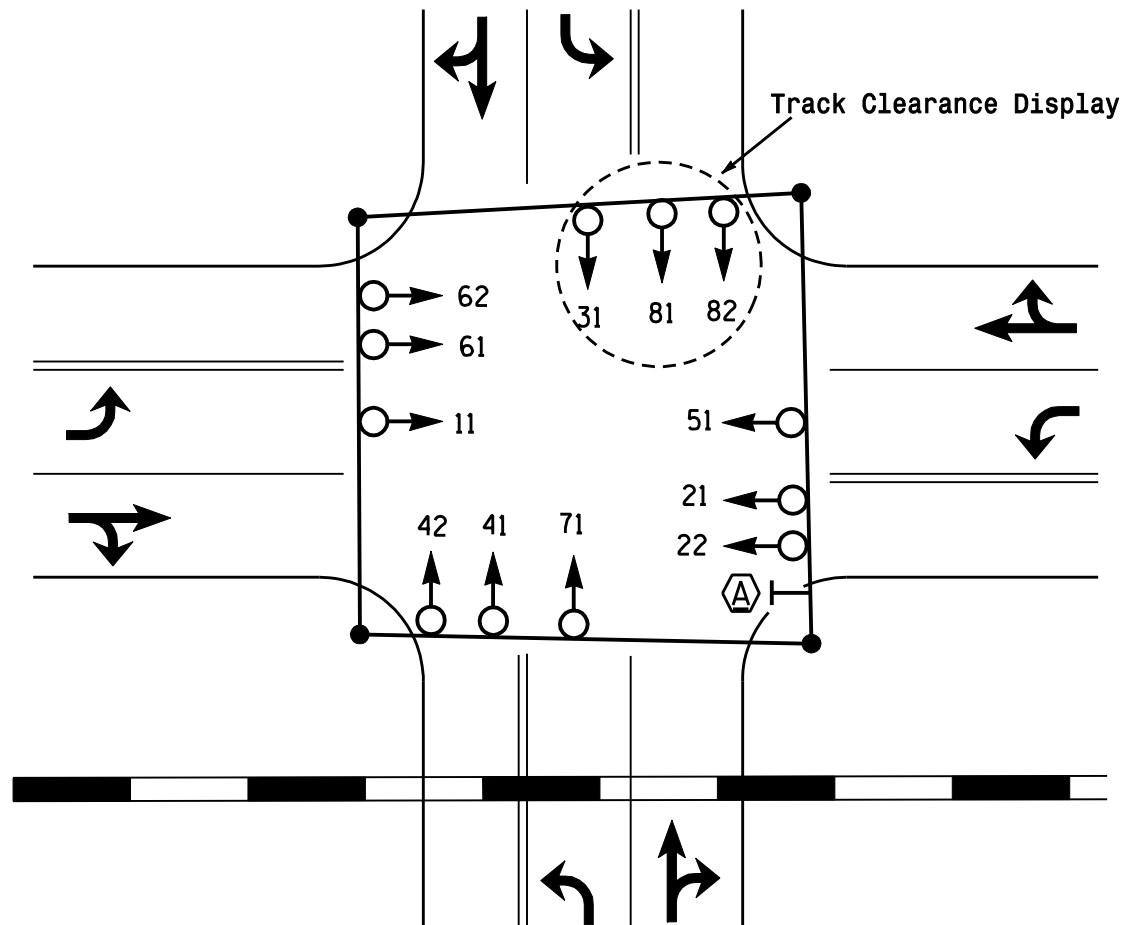
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# Use of Signal Heads and Blankout Signs Protected Only Displays

NOTE: BLANKOUT SIGNS ARE NOT  
USED IN CONJUNCTION  
WITH "RED ARROW" SIGNAL  
DISPLAYS



 No Right Turn Blankout Sign

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# Use of Signal Heads and Blankout Signs

## Advance Signal Heads (With Adequate Storage)

### Design Consideration:

When active crossing warning devices consists only of flashers (no gates present) and there is room to store vehicles between the tracks and the intersection.

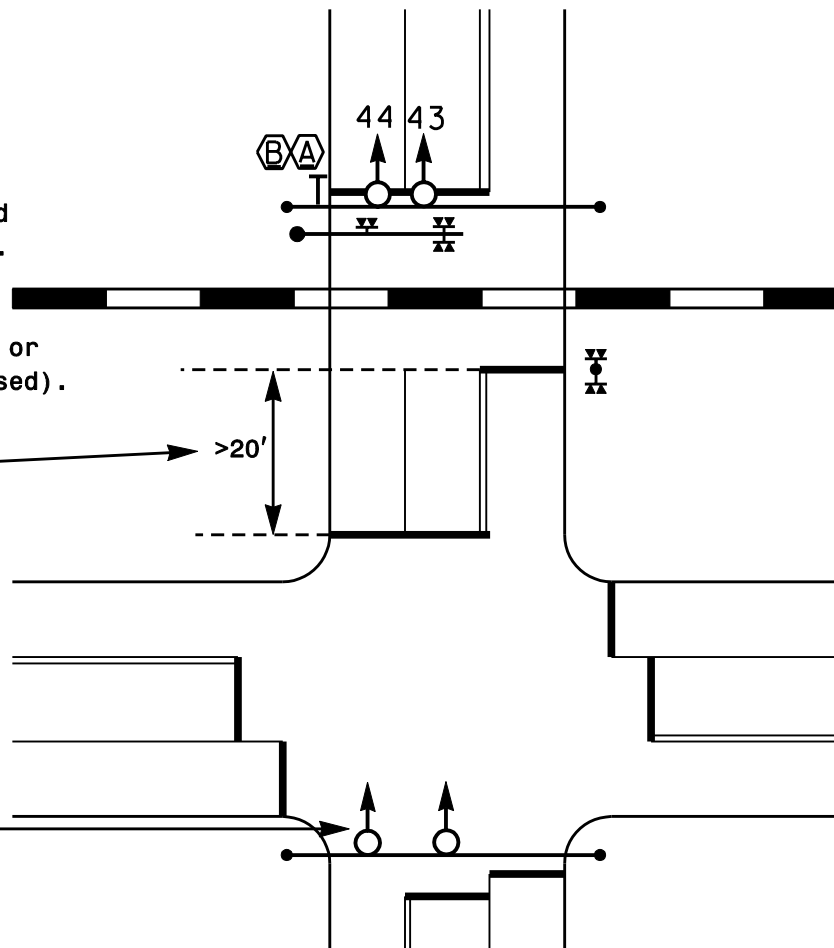
Advance signal faces should be located as near as practical to the stop line.

Advance signal heads should not block or obstruct flashers on cantilever (if used).

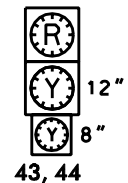
Adequate storage space to hold at least one design vehicle (typically assumed to be 20').

NOTE: Based on engineering judgement, advance signal heads may be placed downstream (across) of the railroad tracks.

NOTE: When advance heads are used, consider visibly limiting the signal heads for the approach from the railroad at the intersection.



### SIGNAL FACE I.D.



### SIGN I.D.

- (A) "STOP HERE ON RED" Sign (R10-6)
- (B) "DO NOT STOP ON TRACKS" Sign (R8-8)

TABLE OF OPERATION					
SIGNAL FACE	PHASE				
	0 2 + 6	0 4 + 8	R R C L R	R R P R E	F L A S H
43; 44	F·Y	F·Y	R	R	R

FY = 8" Flashing Yellow  
(See Note 125 in Section 5.0)

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# Use of Signal Heads and Blankout Signs Advance Signal Heads (Without Adequate Storage)

## Design Consideration:

When there is no room to store vehicles between the tracks and the intersection.

A Track Clearance Phase is generally not used in this situation.

A supplemental signal head should be used due to the potential for a train to block the signal heads.

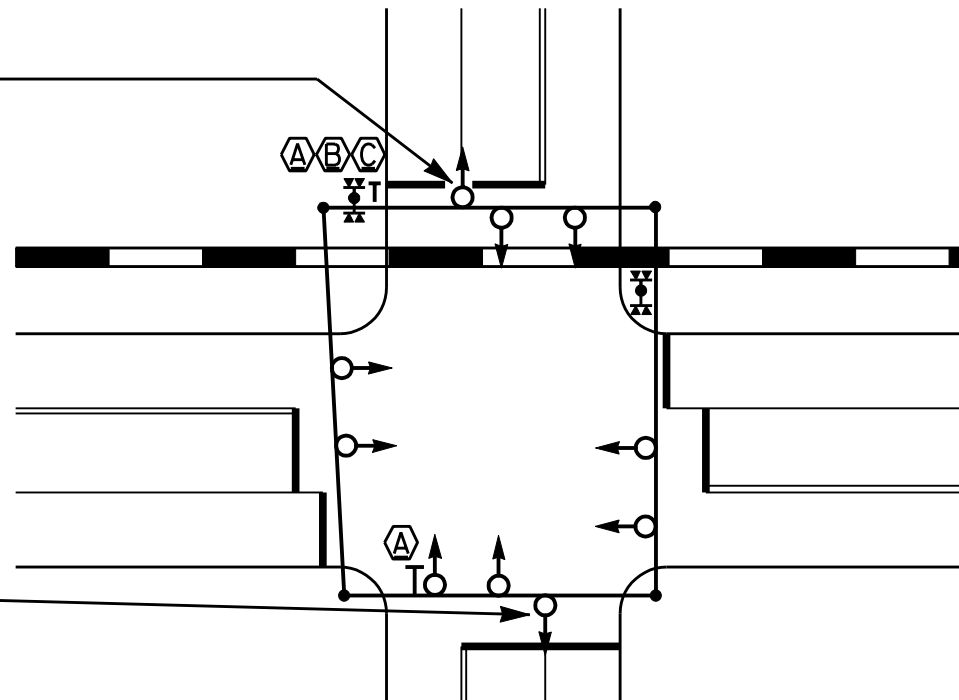
Traffic must stop at stopbar prior to railroad track for signal. A "NO TURN ON RED" sign should be used.

Advance signal heads should not block or obstruct flashers on cantilever (if used).

A supplemental signal head may be needed due to the potential for a train to block the signal heads.

## SIGN I.D.

- Ⓐ "NO TURN ON RED" Sign (R10-11)
- Ⓑ "STOP HERE ON RED" Sign (R10-6)
- Ⓒ "DO NOT STOP ON TRACKS" Sign (R8-8)



## Railroad Preemption

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# Track Clearance Phase Times

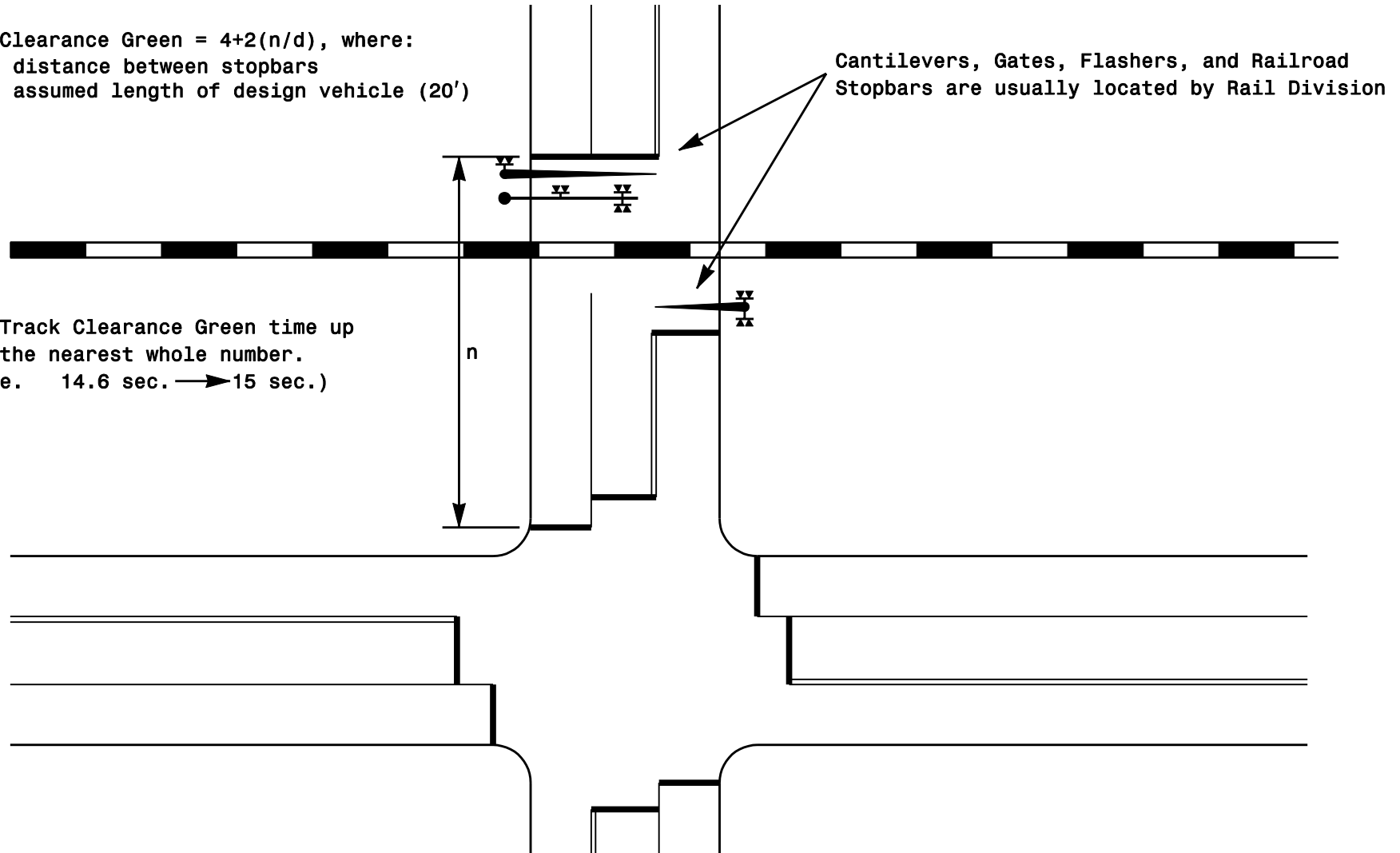
Greenshield's Formula:

Track Clearance Green =  $4 + 2(n/d)$ , where:

n = distance between stopbars

d = assumed length of design vehicle (20')

Round Track Clearance Green time up  
to the nearest whole number.  
(i.e. 14.6 sec. → 15 sec.)



## Railroad Preemption

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## 2070L Preemption Chart

Based on Greenshield's Formula (see Sheet 6).  
Typically minimum is 10 seconds.

Times for track clearance phase. Should be the same times as if the phase were used in normal operation.

Used to designate this interval as the preemption dwell interval. This interval will use Dwell Min. Time below. Selecting 255 sec. green indicates dwell (hold) phase.

Clearance times for dwell (hold) phase. Using 0.0 sec. for each will allow controller to use times set in normal operation.

Amount of time signal is in exit phase before preemption ends. Select 0 for controller to return to normal operation after preemption. Select 1 to designate an exit phase.

Clearance time not used when Interval 5 is exit interval.

Delay time after preempt call is received before going to preemption sequence. Typically use 0 sec.

Minimum green time assured for current phase before transitioning into preempt phase. Usually 1 sec., so as to begin preemption sequence immediately (0 sec. will default to normal minimum green time).

Time provided to display Flashing "DON'T WALK" for pedestrians to clear intersection before beginning preemption sequence. This time may be reduced if necessary.

Clearance times provided to clear current phase before transitioning into preemption. Using 0.0 sec. for each will allow controller to use times set in normal operation.

Minimum Green Time for Dwell (hold) phase. Typically, same as time used in normal operation.

"Y" (for Yes) will time the "Ped Clear Before Pre" and "Yellow Clear Before Pre" simultaneously, thereby reducing overall clearance time needed before preemption. Select "N" to time "FDW" and then yellow clear and red clear before going into preemption.

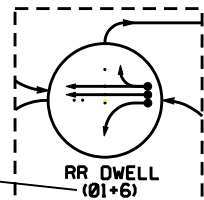
### 2070L RR PREEMPTION 1

Interval 1 – Track Clearance Green	12
Interval 1 – Track Clearance Yellow	3.7
Interval 1 – Track Clearance Red	1.8
Interval 2 – Dwell Green	255
Interval 2 – Dwell Yellow	0.0*
Interval 2 – Dwell Red	0.0*
Interval 5 – Exit Green	1
Interval 5 – Yellow	0.0
Interval 5 – Red	0.0
Delay Time	0
Min Green Before Pre	1
Ped Clear Before Pre	0
Yellow Clear Before Pre	0.0*
Red Clear Before Pre	0.0*
Dwell Min Time	7
Ped Clear Through Yellow	Y/N

\* Time defaults to time used for phase during normal operation

Notes:

- 1) Use Preemption 1
- 2) Include corresponding regular phases in phasing diagram



## Railroad Preemption

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# NEMA (TS-1 and TS-2) Preemption Chart

Delay time after preempt call is received before going into preempt sequence: Typically use 0 sec.

Time provided to display Flashing "DON'T WALK" for pedestrian to clear intersection before beginning preempt sequence. This time may be reduced if necessary.

Minimum green time assured for current phase before transitioning into preempt phase. Usually 1 sec., so as to begin preemption sequence immediately (0 sec. will default to normal minimum green time).

Highest yellow and highest red clearance times needed to clear normal operation phases (may come from different phases).

Based on Greenshield's Formula (see Sheet 6).

Times for Track Clearance phase. Should be the same times as if the phase were used in normal operation (See Std. 5.2.2, Sheet 4).

Min Green Time for Dwell (hold) phase. Typically same as time used in normal operation.

Yellow and Red Times of Dwell (hold) phase. Use highest yellow and red times if more than 1 Dwell phase is used.

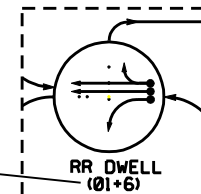
Some NEMA controllers allow Ped Clear time and Yellow Clear time Before Preempt to time simultaneously, while other brands do not. If in doubt about type of equipment being used, select "N."

## NEMA RR PREEMPTION 1

Delay Before Preempt	0
Ped. Clear Before Preempt	—
Min. Green Before Preempt	1
Yellow Clear Before Preempt	—
Red Clear Before Preempt	—
Track Clearance Green	—
Track Clearance Yellow	—
Track Clearance Red	—
Preempt Dwell Min. Green	—
Yellow Clear After Preempt	—
Red Clear After Preempt	—
Ped Clear Through Yellow	Y/N

### Notes:

- 1) Use Preemption 1
- 2) Include corresponding regular phases in phasing diagram



## Railroad Preemption

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## 170 Preemption Chart

Delay time after preempt call is received before going into preempt sequence: Typically use 0 sec.

Based on Greenshield's Formula (see Sheet 6).

### 170 RAILROAD PREEMPTION

Delay Before Preempt	0
Track Clearance Green	—

NOTE: The Railroad preemption calls are immediate with 170 equipment. 170 Bi-Trans Software does not clear pedestrian times before entering Railroad Preemption. Ped displays go directly from a solid WALK to a solid DON'T WALK display and does not provide any clearance time (flashing DON'T WALK display).

### Railroad Preemption

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## Elements on a Signal Plan with Railroad Preemption

- AAR DOT Crossing Number on Plan.
- Name of Railroad(s) operating on tracks.
- Show all gates, flashers, and cantilevers on signal plan.
- Railroad Preemption Timing Chart.
- Be sure all phases (including any timed overlaps) lead directly to a Track Clearance phase.
- Railroad Preemption should have priority over Emergency Vehicle Preemption.
- "NO RIGHT (LEFT) TURN" Blankout signs as needed.
- Show blankout signs in Table of Operation. Illuminate blankout signs during track clearance and all preempt hold phases.
- Include blankout sign operation during flash mode in the Notes.
- When entering the preemption sequence, yellow traps are permitted if necessary to provide immediate and proper track clearance. Use an "ONCOMING TRAFFIC MAY HAVE EXTENDED GREEN" sign (W25-2) on the approach(es) subjected to a yellow trap.
- Use a "DO NOT STOP ON TRACKS" sign (R8-8) on approach crossing tracks leading to signal (add any other time there is potential for traffic to queue across tracks).
- Use a "STOP HERE ON RED" sign (R10-6) if traffic is to stop prior to tracks and there is little or no storage room between tracks and the intersection.
- When possible, the street crossing the tracks should flash YELLOW in flashing operation, even if it is not the main phase (2+6). If the side street flashes yellow, then the main street flashes red. An all red flashing indication may also be used at some locations.
- 2070 and most NEMA equipment can designate an exit phase upon leaving Railroad Preemption. Typically, exit to the primary phase that was unable to move due to the presence of a train.

## Elements for Calculating Minimum Advance Warning Time

Delay Before Preempt

\* Ped Clear Before Preempt

Min Green Before Preempt

\* Yellow Clear Before Preempt

Red Clear Before Preempt

Track Clear Green

\*\* Track Clear Yellow

\*\* Track Clear Red

\*\* Time for Exit Gates

Safety Equipment Reaction Time

(Usually 5 Seconds)

Add the above to find the Advance Warning Time needed to clear signal for preemption and request this time from Rail Division.

\* These values may clear simultaneously with some types of signal equipment.

\*\* If 4 quadrant (exit) gates are used, do not include Track Clear Yellow and Track Clear Red times in this equation. Instead add:  
12 Seconds for exit gates to descend to horizontal position.  
5 seconds (exit gates should be horizontal 5 seconds prior to train arrival).

## Railroad Preemption

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