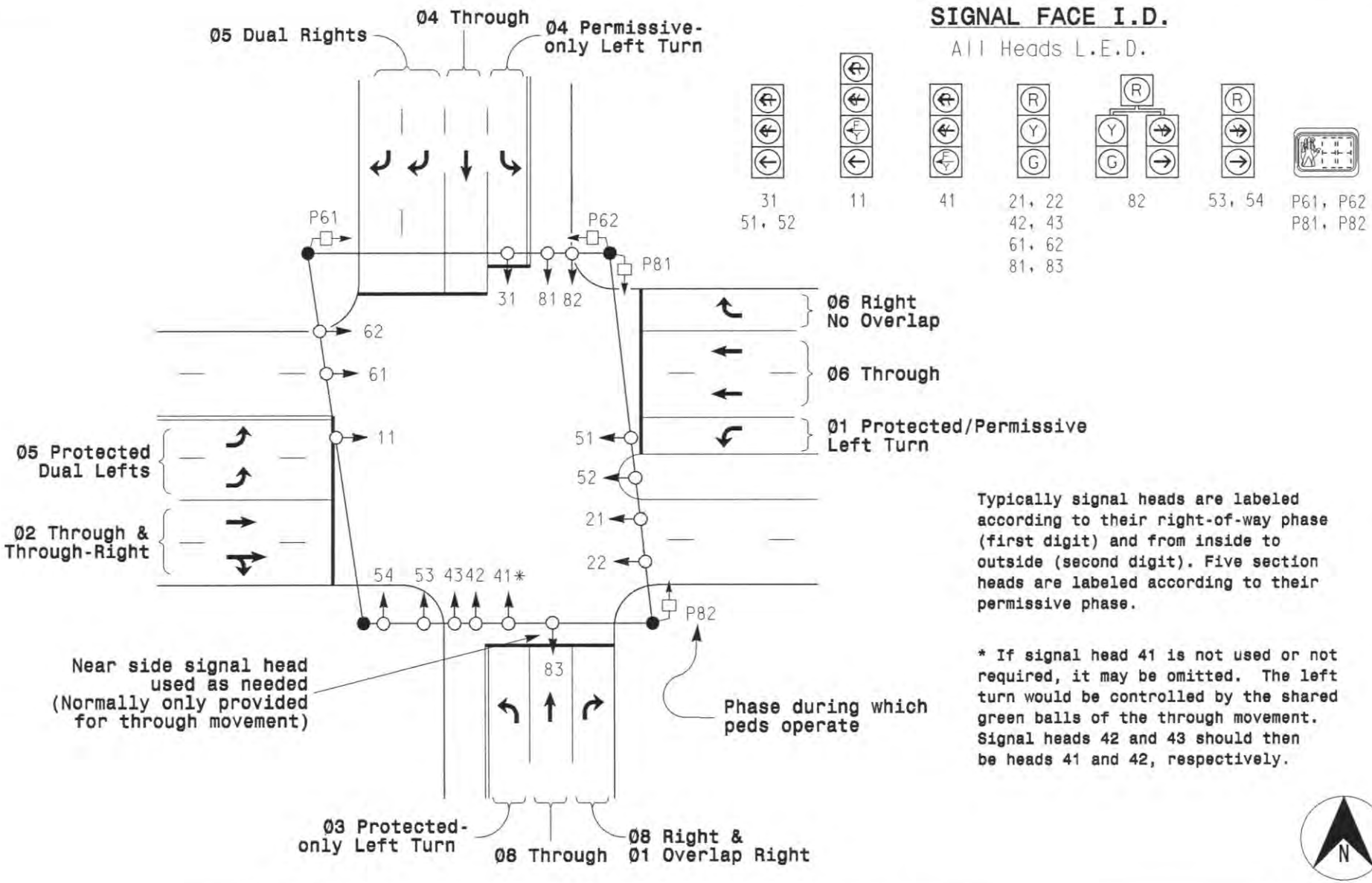

Typically signal heads are labeled according to their right-of-way phase (first digit) and from inside to outside (second digit). Five section heads are labeled according to their permissive phase.

* If signal head 41 is not used or not required, it may be omitted. The left turn would be controlled by the shared green balls of the through movement. Signal heads 42 and 43 should then be heads 41 and 42, respectively.

Typical Numbering of Signal Heads

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TRANSPORTATION MOBILITY AND SAFETY DIVISION
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3.0
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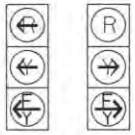
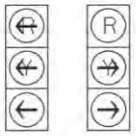
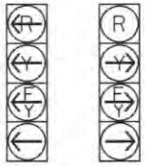
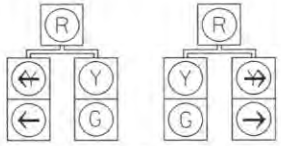
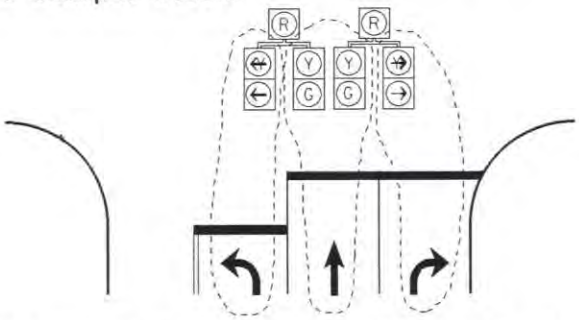
Signal Head Types

CONFIGURATION	3-Section	 3-Section	 3-Section	4-Section Vertical	 4-Section	 5-Section
USAGE	All situations where other signal heads are not recommended	Permitted Turn	Protected Turn	Split Side Street RR Clearance Phasing EV Preempt Phasing	Protected/ Permissive Turn	Protected/ Permissive Turn
PLACEMENT	Lane Line or Lane ℄	Lane ℄	Lane ℄	Lane Line or Lane ℄	Lane ℄	Lane Line

Number of Signal Faces

A minimum of two signal faces is required for the through movement. This total includes the through signal face belonging to the 5-section "shared" head that may control adjacent left or right turn lanes.

Clarification: A 5-section head is an assembly of 2 signal faces which share a common red ball indication. See example below.



This approach display has 2 signal heads each of which is comprised of 2 signal faces for a total of 4 signal faces. Two of the faces belong to the through move, and one each belongs to the left and right turns. Because the center two faces control the through (major) move, it is in conformance with the above requirement.

Per Section 4D.11 of the 2009 MUTCD, if the 85th percentile, posted, statutory, or design speed is 45 MPH or more, one signal head should be used per each through lane on the approach.

General Guidelines for Signal Head Usage

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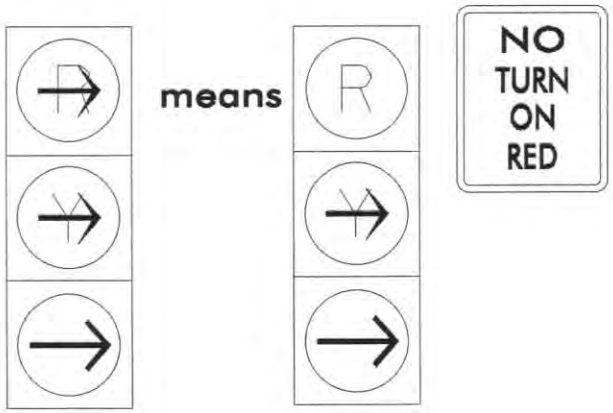
Use of CIRCULAR RED vs. RED ARROW

(Section 4D.04 of the 2009 MUTCD)

As stated in the MUTCD, and in accordance with NC General Statute 20-158, vehicles facing a steady CIRCULAR RED signal shall stop at the marked stop line and shall remain stopped until a signal indication to proceed is displayed unless the vehicle is turning right. A vehicle is permitted to make a right on CIRCULAR RED, subject to applicable traffic laws and yielding the right of way to other roadway users, unless a traffic control device, such as a sign, is in place prohibiting a turn on red.

As stated in the MUTCD, vehicles facing a steady RED ARROW signal shall stop at the marked stop line and shall remain stopped until a signal indication to proceed is displayed. A vehicle shall NOT make a right turn on a RED ARROW.

In North Carolina, vehicles are prohibited from making a left turn on red from a one way street onto another one way street at all times.



It shall be the NCDOT practice to display a CIRCULAR RED whenever possible and allow right turns on red. This may include the use of a CIRCULAR RED indication in a head otherwise containing GREEN and YELLOW ARROWs.

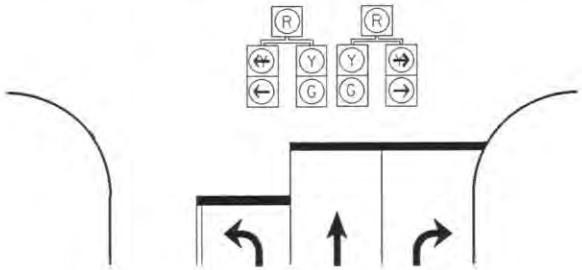
If it is intended to prohibit right turns on red at an intersection, one of the following shall be displayed:

- If the signal head contains CIRCULAR YELLOW and GREENs, a CIRCULAR RED shall be used in conjunction with a "NO TURN ON RED" sign (R10-16).
- If the signal head only has YELLOW and GREEN ARROWs, a RED ARROW shall be used. No sign is needed as a RED ARROW means no turn on red.

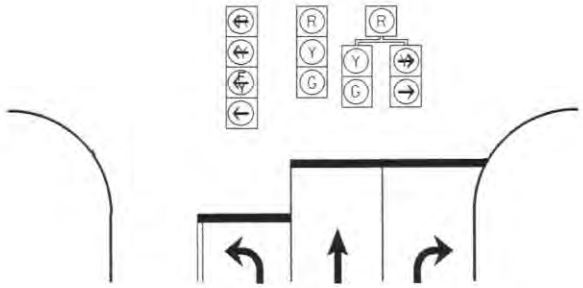
Use of 4 Section (Protected/Permissive) Flashing Yellow Arrow Signal Faces

Traditionally, a 5 section "doghouse" head has been used for protected/permissive turning movements. This head has a combination of CIRCULAR and ARROW displays, and is often used as "shared" head between the turning movement and the through movement, although the head could be used exclusively for the turning movement.

The new preferred display for protected/permissive left turns is the Flashing Yellow Arrow (FYA). This head is intended to be an exclusive head for the turn lane and displays only ARROW indications. A FYA is displayed for the permissive movement, instead of the traditional CIRCULAR GREEN. Vehicles may make the turn indicated by the FYA after yielding to pedestrians and conflicting movements. A solid GREEN ARROW is used to indicated a protected movement. The FYA head should be centered over the turn lane(s). Note that the FYA head is an exclusive for the left turn, and 2 signal heads containing CIRCULAR RED, YELLOW, and GREEN displays are still required for the through movement.



This approach display has 2 signal heads each of which is comprised of 2 signal faces for a total of 4 signal faces. Two of the faces belong to the through move, and one each belongs to the left and right turns. Because the center two faces control the through (major) move, it is in conformance with the requirement for 2 signal faces for the through movment. The 5 section head may still be used in limited situations.



FYAs for left turns should be used:

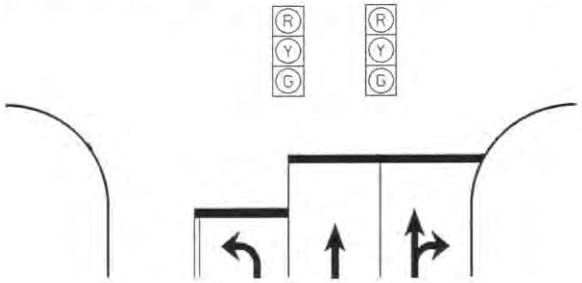
- When the turn lanes are offset (separated from the through lanes)
- When the opposing travel lanes use (3-section or 4-section) FYAs or fully protected (single or dual) lefts to avoid "yellow trap"
- Along corridors, where other FYA displays are used for left turns
- At Railroad preempt locations, which eliminate the need for blankout signs

When FYAs are used for left turns, the yellow and red clearance times should be the same for concurrent through phases (2+6 and/or 4+8).

NOTE: FYAs for right turns may be used on a limited basis as determined by Engineering judgment. When used, the FYA head should replace the 5 section shared "doghouse" head for the right turn. As a result, it may be necessary to add an addtional 3 section CIRCULAR head for the through movement.

Use of 3–Section (Permissive) Left Turn Flashing Yellow Arrow Signal Faces

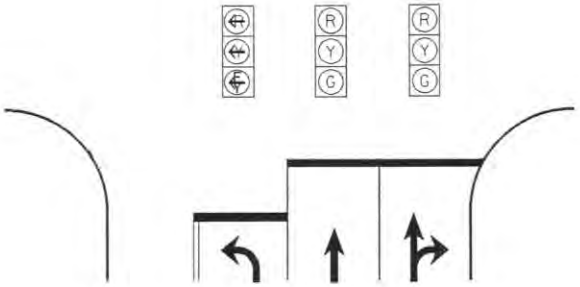
Traditionally, a CIRCULAR GREEN display has been used to indicate a permissive movement. Vehicles may turn right or left as allowed on a CIRCULAR GREEN after yielding to pedestrians and conflicting movements.



A CIRCULAR GREEN may be used as a shared display with the through movement. In the example shown, the signal heads are mounted over the lane lines (extended) and are classified as shared heads, because the head display is "shared" by vehicles in adjacent lanes (left and through or the through and through-right). The two "shared" heads meet the requirements for through signal displays. When an FYA is not used for the left turn display, the signal heads should be mounted over the lane line extended instead of as shown in Std. 3.2. IN NO CASE shall a CIRCULAR GREEN display be located directly over or in front of a left turn lane.

Optional Permissive Left Turn Signal Display

An optional display for permissive turns is the Flashing Yellow Arrow (FYA). Vehicles observing an FYA may make the turn indicated by the flashing yellow arrow after yielding to pedestrians and conflicting movements, the same as a CIRCULAR GREEN. The FYA head should be centered over the turn lane(s). Note that the FYA is an exclusive head for the left turn, and 2 signal heads containing CIRCULAR RED, YELLOW, and GREEN displays are still required for the through movement.



FYAs for left turns should be used:

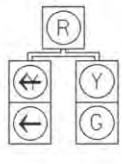
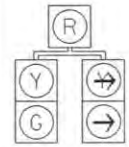
- When the turn lanes are offset (separated from the through lanes)
- When the opposing travel lanes use (3-section or 4-section) FYAs or fully protected (single or dual) lefts to avoid "yellow trap"
- Along corridors, where other FYA displays are used for left turns
- At Railroad preempt locations, which eliminate the need for blankout signs

When FYAs are used for left turns, the yellow and red clearance times should be the same for concurrent through phases (2+6 and/or 4+8).

FYAs for right turns may be used on a limited basis as determined by Engineering judgment.

Programming for Flashing Operation of Signal Heads

Signals typically may flash during certain types of malfunctions or equipment failures. For statewide consistency, traffic signal heads should be set to flash the displays shown in the event of flashing operation:

SIGNAL HEAD										
MAJOR STREET	R	Y	Y	Y	Y	Y	Y	Y	Y	Y
MINOR STREET	R	R	R	R	R	R	R	R	R	R

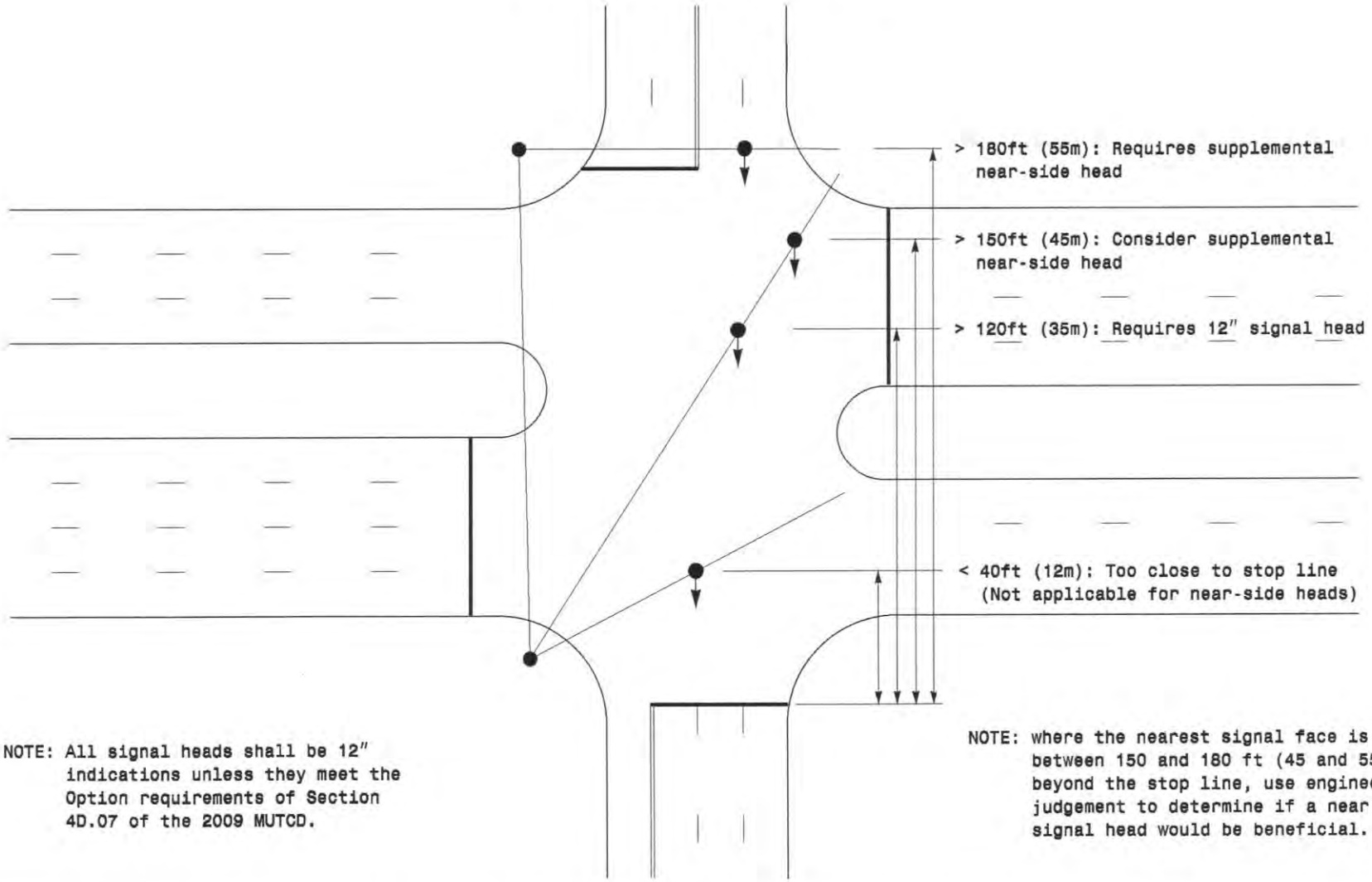
Flashing display does not change if a RED ARROW is used in place of a CIRCULAR RED for right turn displays.

At some intersections, such as those utilizing Railroad Preemption, engineering judgement may be used to modify or alter the flashing operation. This modification may include flashing the minor street through movements yellow and the main street red or using a red flash on all approaches (equivalent of an all way stop).

Program all signal heads on the same approach to flash concurrently.

Allowable Signal Head Distance from Stopbar

(Section 4D.14 of the 2009 MUTCD)



NOTE: All signal heads shall be 12" indications unless they meet the Option requirements of Section 4D.07 of the 2009 MUTCD.

NOTE: where the nearest signal face is located between 150 and 180 ft (45 and 55 m) beyond the stop line, use engineering judgement to determine if a near side signal head would be beneficial.

MUTCD Requirements for Signal Heads

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TRANSPORTATION MOBILITY AND SAFETY DIVISION
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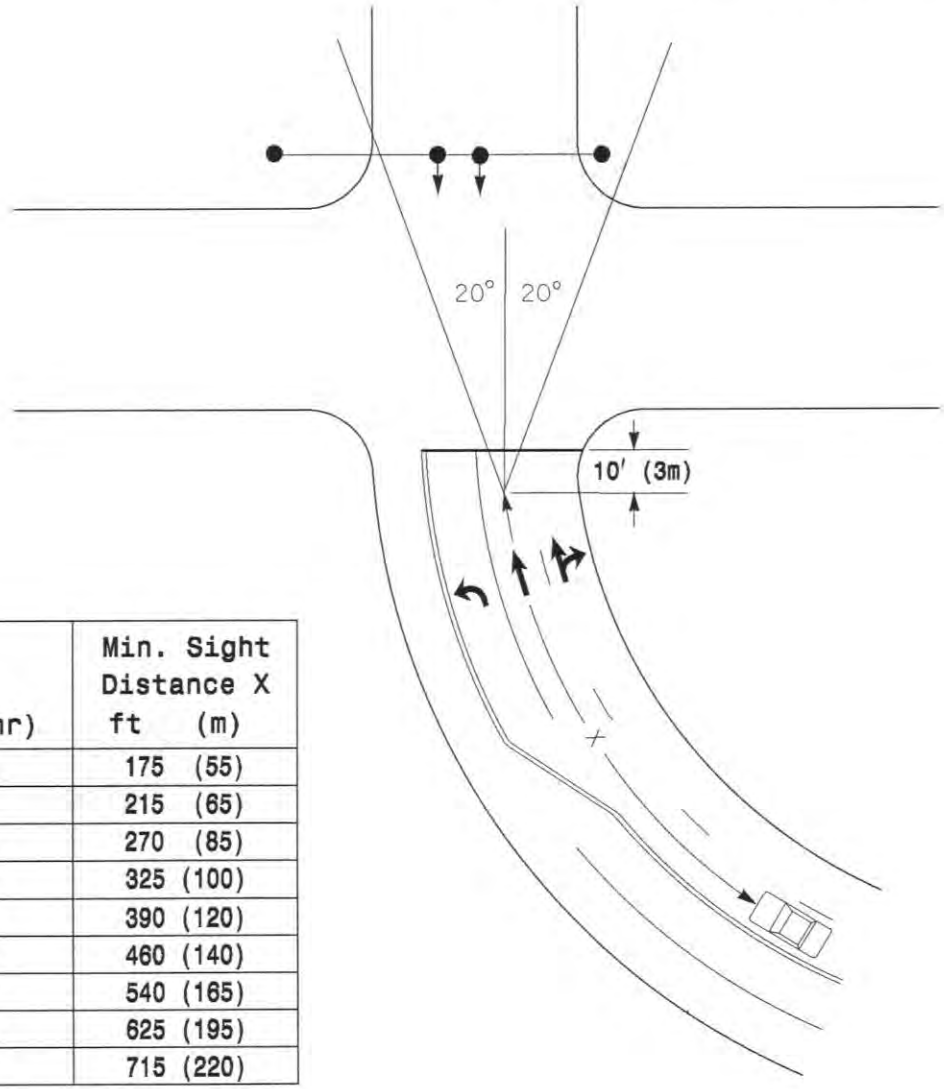
Signal Face Visibility Parameters



Speed mph (km/hr)	Min. Sight Distance X ft (m)
20 (32)	175 (55)
25 (40)	215 (65)
30 (48)	270 (85)
35 (56)	325 (100)
40 (64)	390 (120)
45 (72)	460 (140)
50 (80)	540 (165)
55 (88)	625 (195)
60 (96)	715 (220)

To conform to section 4D.13 of the 2009 MUTCD, locate one, and preferably both, signal heads within a cone of vision extending 20 degrees to the left and right of the centerline of all the approach lanes in the direction of travel.

To conform to section 4D.12 of the 2009 MUTCD, the driver should be able to continuously view the signal face from the minimum sight distance for the 85th percentile speed.

Where this visibility requirement cannot be met, erect a suitable sign (such as a Signal Ahead Sign) to warn approaching traffic (Section 4D.12 of the 2009 MUTCD) or install a supplemental near side head.

MUTCD Requirements for Signal Heads

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STD. NO.
3.1
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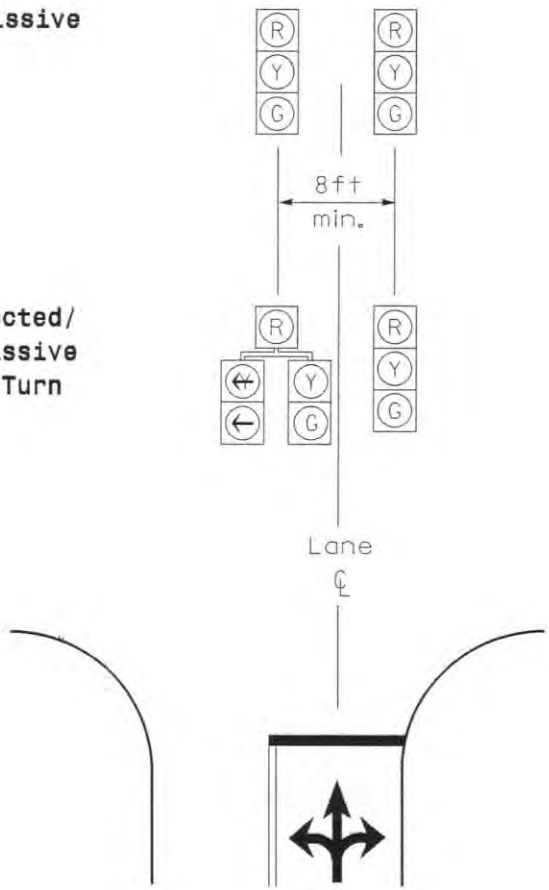
CASE 1

Standard Main or Side Street Signal Head Configuration

1A - Permissive Only

1B - Protected/ Permissive Left Turn



CASE 2

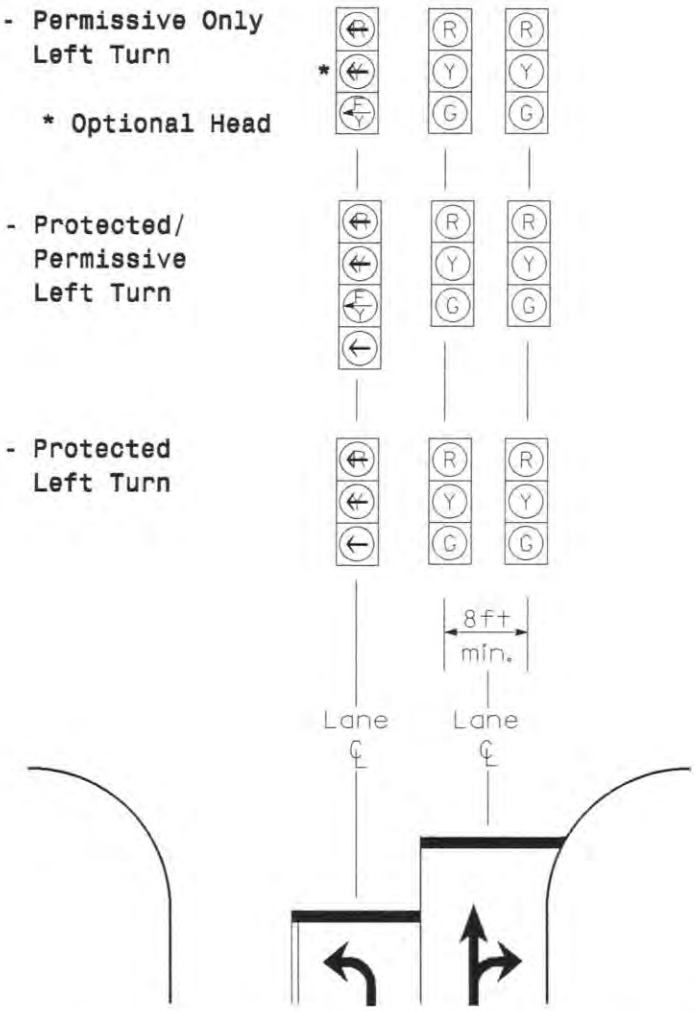
Standard Main or Side Street Signal Head Configuration

2A - Permissive Only Left Turn

* Optional Head

2B - Protected/ Permissive Left Turn

2C - Protected Left Turn



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

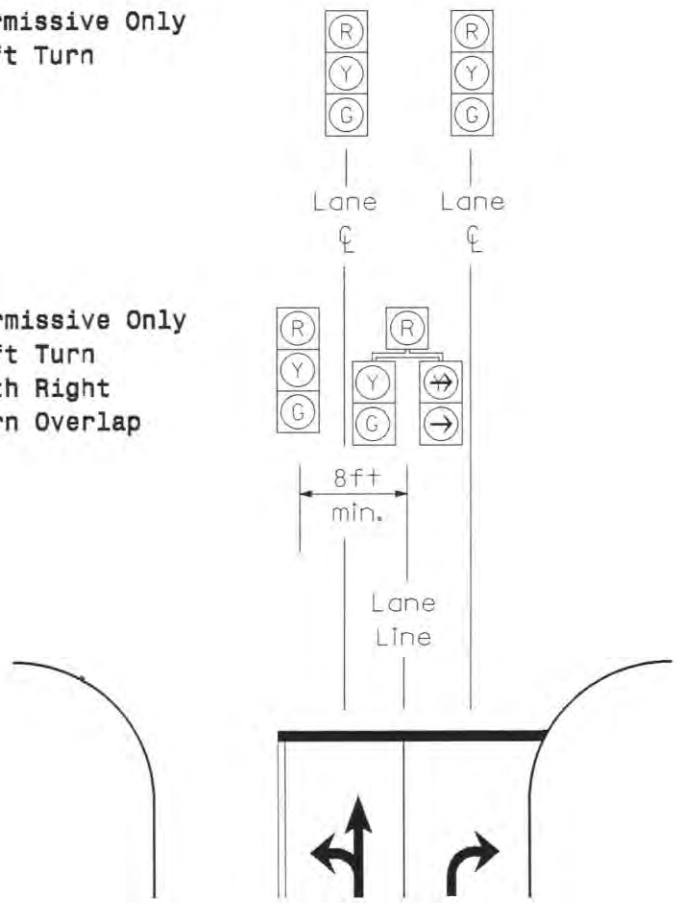
STD. NO.
3.2
SHEET 1 OF 24

CASE 3 (1 OF 2)

Standard Main or Side Street Signal Head Configuration

3A - Permissive Only Left Turn

3AR - Permissive Only Left Turn with Right Turn Overlap

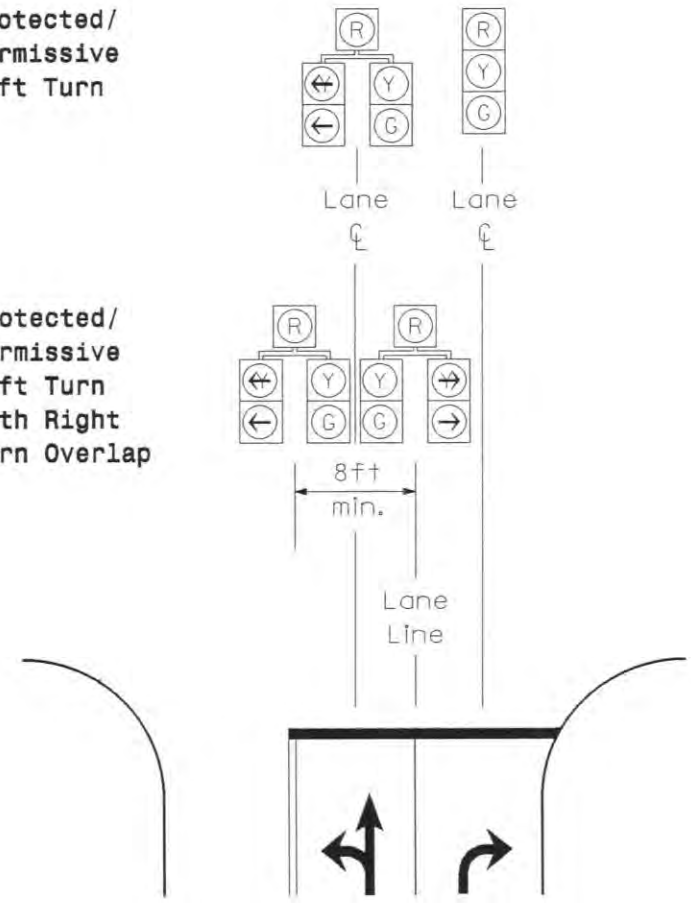


CASE 3 (2 OF 2)

Standard Main or Side Street Signal Head Configuration

3B - Protected/ Permissive Left Turn

3BR - Protected/ Permissive Left Turn with Right Turn Overlap



Signal Head Approach Displays and Alignment

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TRANSPORTATION MOBILITY AND SAFETY DIVISION
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3.2
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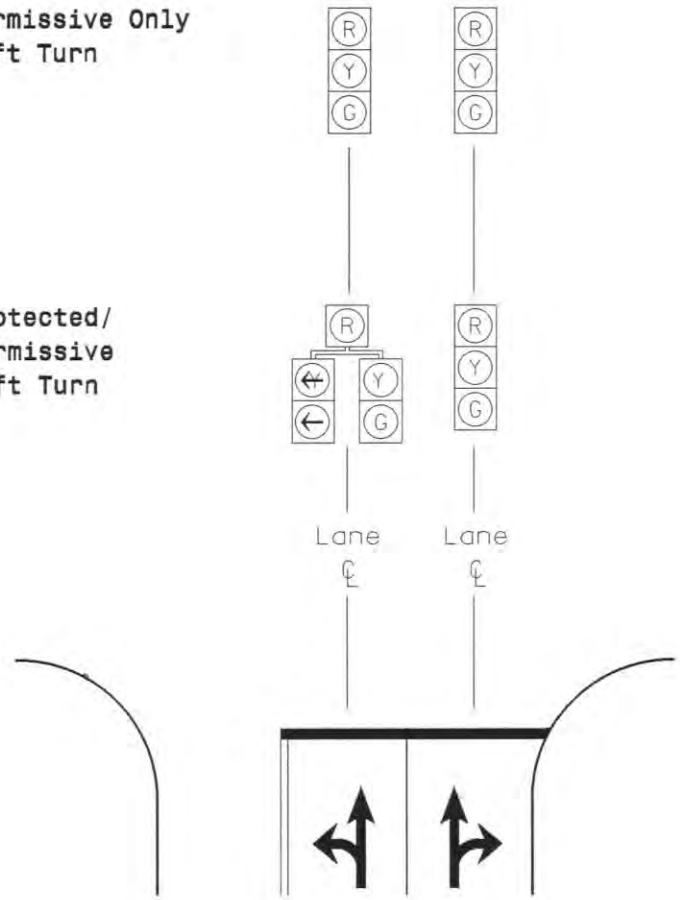
CASE 4

Standard Main or Side Street Signal Head Configuration

4A - Permissive Only Left Turn

4B - Protected/ Permissive Left Turn



CASE 5 (1 OF 3)

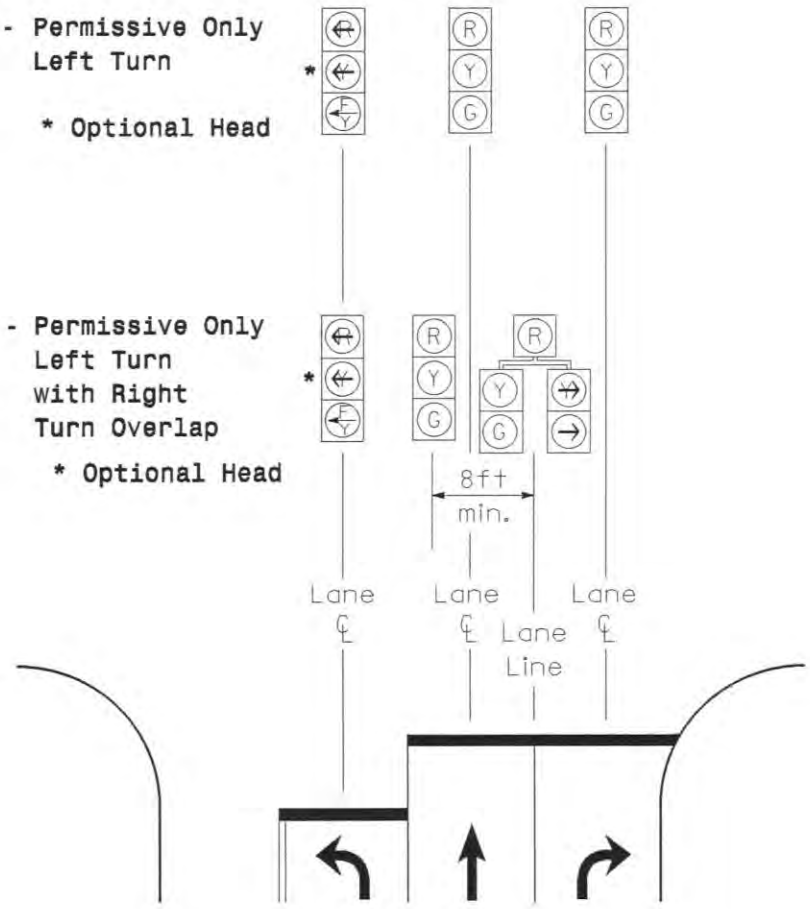
Standard Main or Side Street Signal Head Configuration

5A - Permissive Only Left Turn

* Optional Head

5AR - Permissive Only Left Turn with Right Turn Overlap

* Optional Head



Signal Head Approach Displays and Alignment

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TRANSPORTATION MOBILITY AND SAFETY DIVISION
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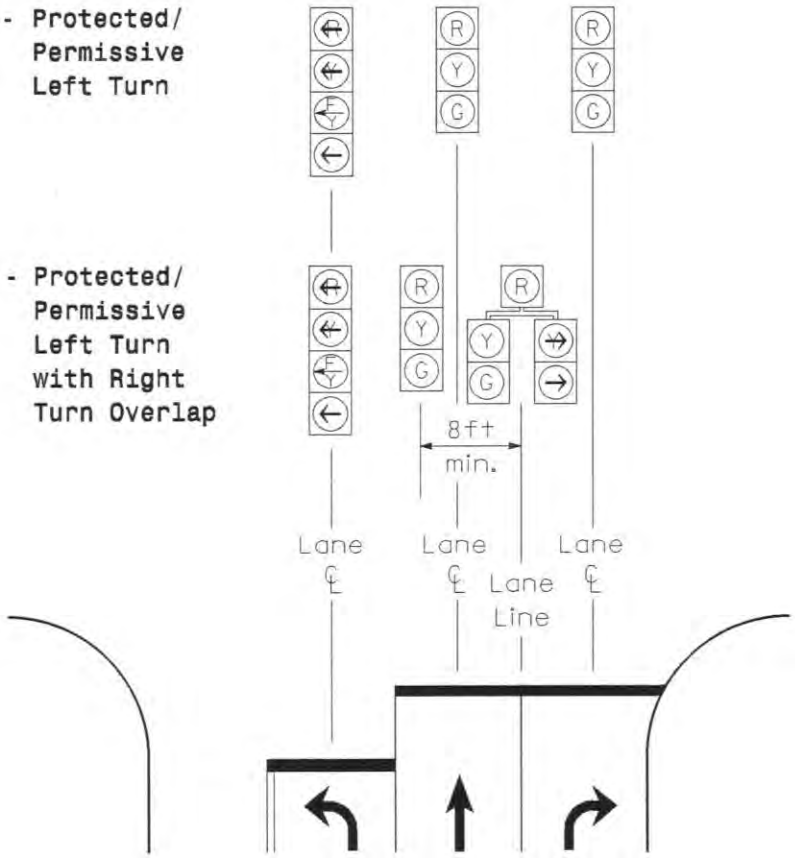
CASE 5 (2 OF 3)

Standard Main or Side Street Signal Head Configuration

5B - Protected/ Permissive Left Turn

5BR - Protected/ Permissive Left Turn with Right Turn Overlap

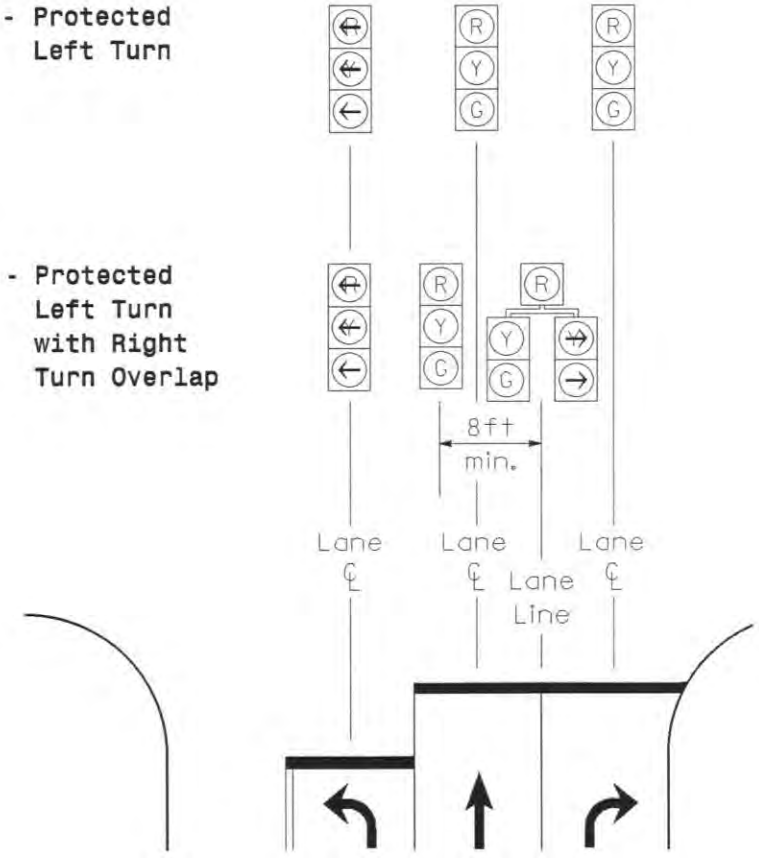


CASE 5 (3 OF 3)

Standard Main or Side Street Signal Head Configuration

5C - Protected Left Turn

5CR - Protected Left Turn with Right Turn Overlap



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
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STD. NO.
3.2
SHEET 4 OF 24

CASE 6

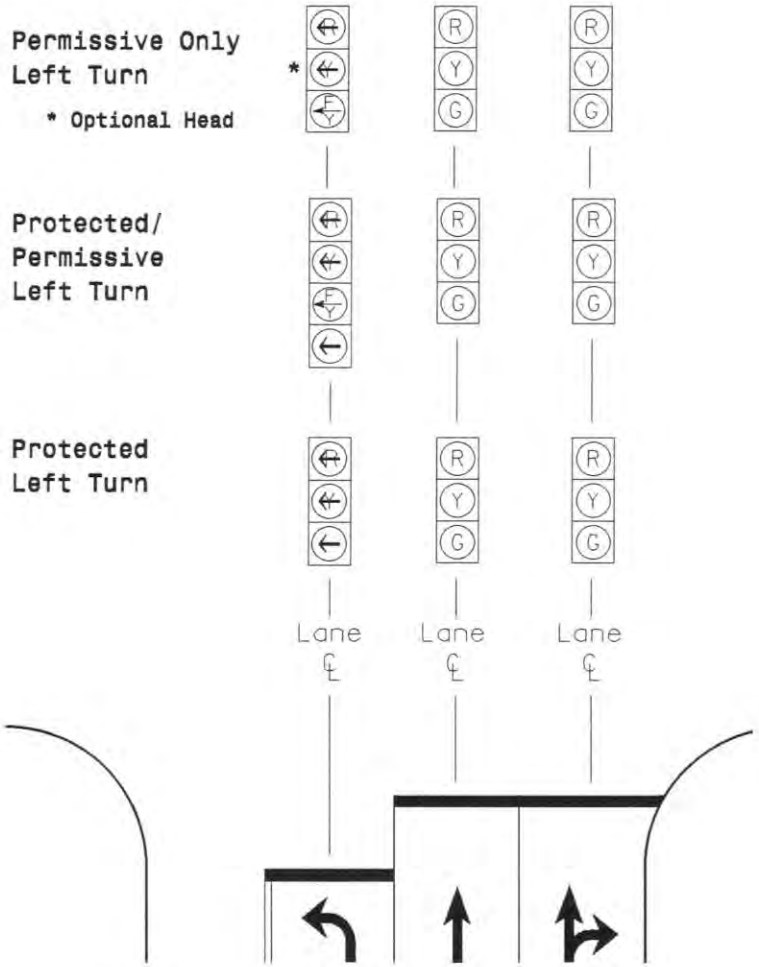
Standard Main or Side Street Signal Head Configuration

6A - Permissive Only Left Turn

* Optional Head

6B - Protected/ Permissive Left Turn

6C - Protected Left Turn



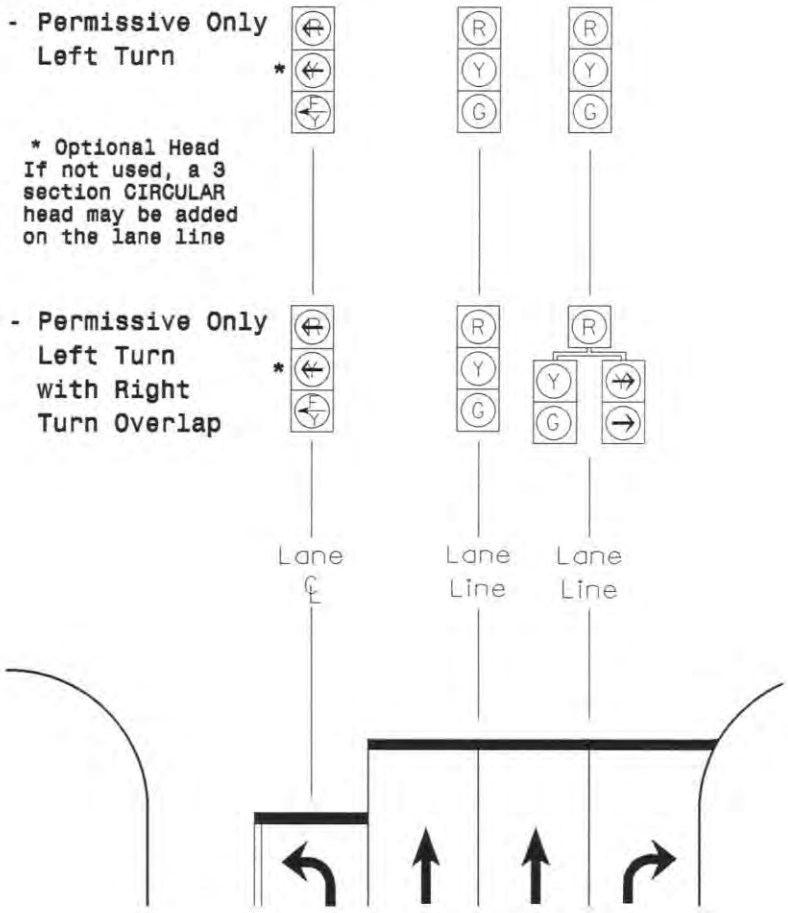
CASE 7 (1 OF 3)

Standard Main or Side Street Signal Head Configuration

7A - Permissive Only Left Turn

* Optional Head If not used, a 3 section CIRCULAR head may be added on the lane line

7AR - Permissive Only Left Turn with Right Turn Overlap



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
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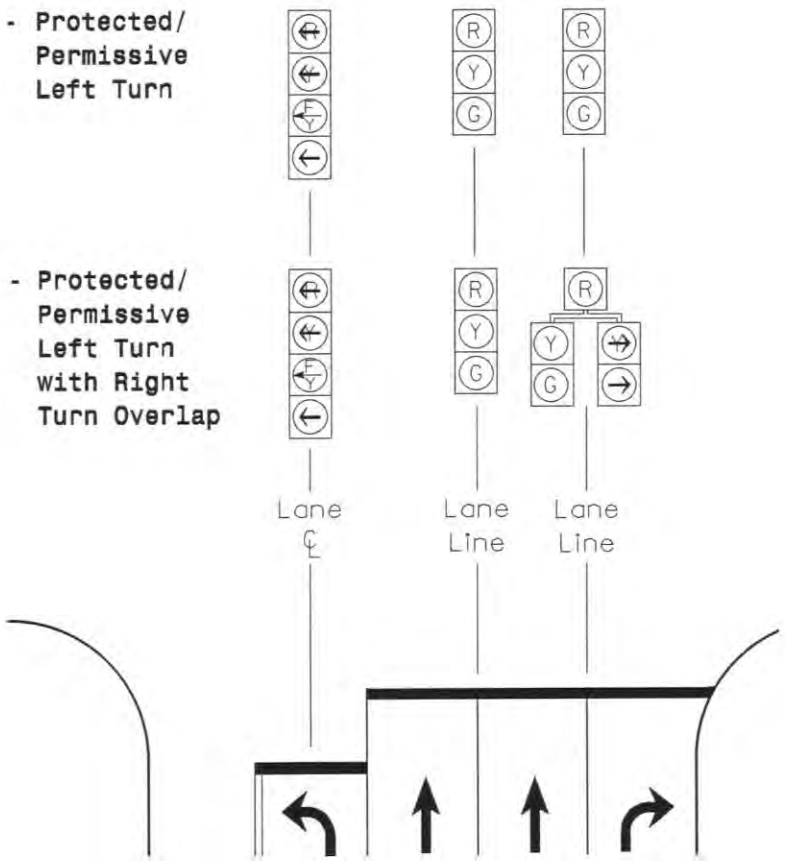
CASE 7 (2 of 3)

Standard Main or Side Street Signal Head Configuration

7B - Protected/ Permissive Left Turn

7BR - Protected/ Permissive Left Turn with Right Turn Overlap

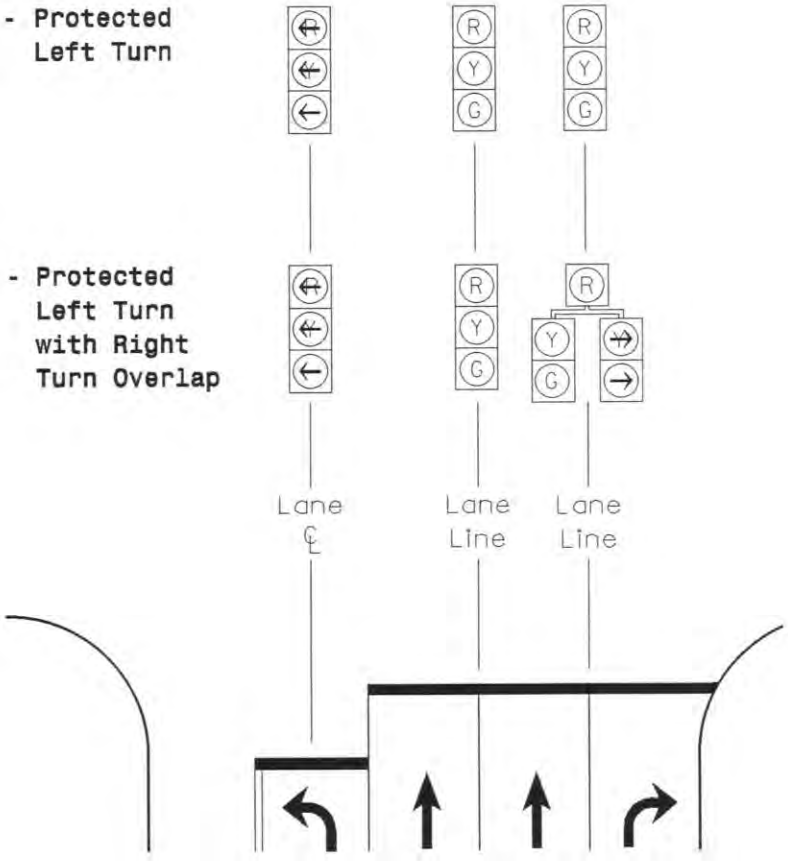


CASE 7 (3 OF 3)

Standard Main or Side Street Signal Head Configuration

7C - Protected Left Turn

7CR - Protected Left Turn with Right Turn Overlap



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
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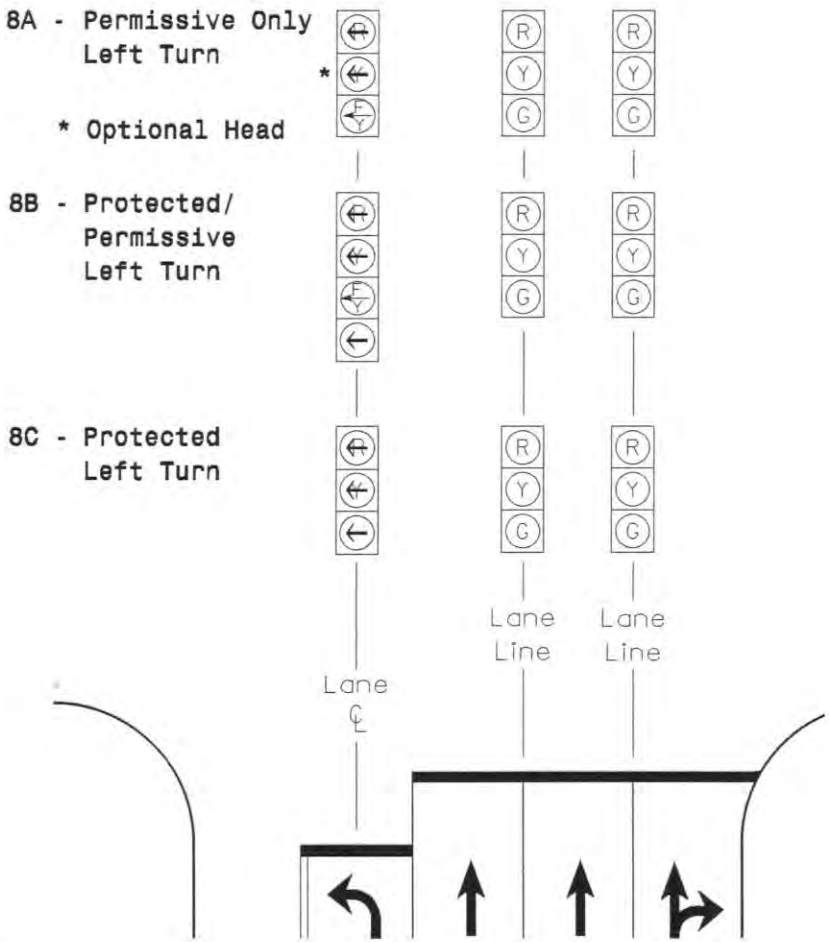
3.2
SHEET 6 OF 24

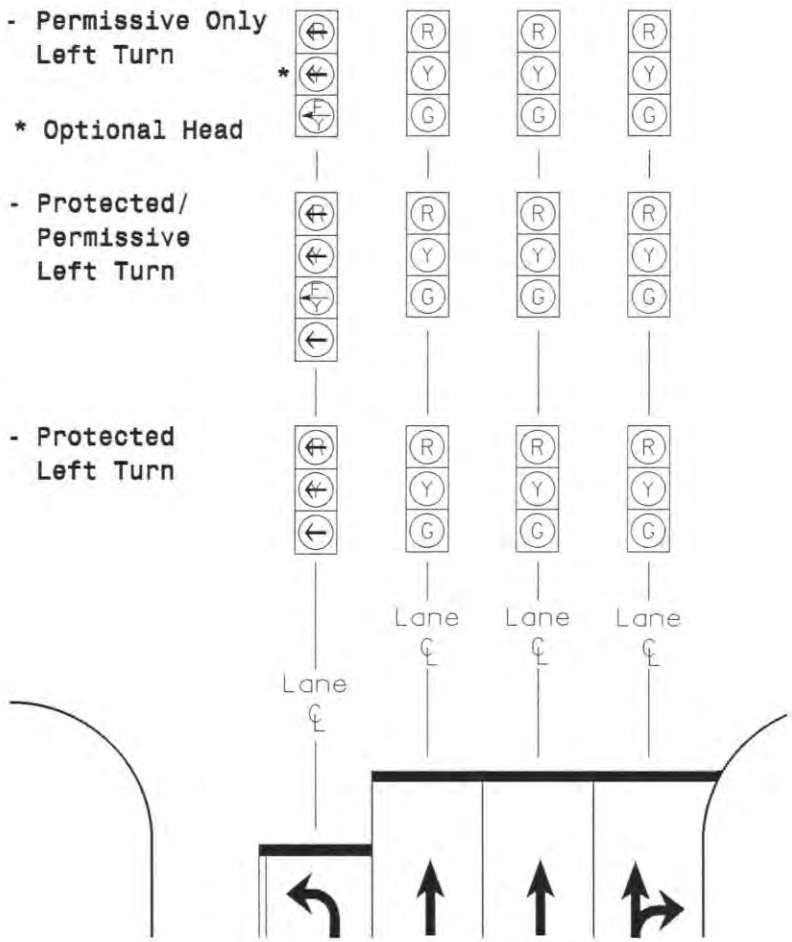
CASE 8 (1 OF 2)
(Speeds less than 45 MPH)

Standard Main or Side Street Signal Head Configuration



CASE 8 (2 OF 2)
(Speeds 45 MPH or above)

Standard Main or Side Street Signal Head Configuration



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
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3.2
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CASE 9 (1 OF 3)

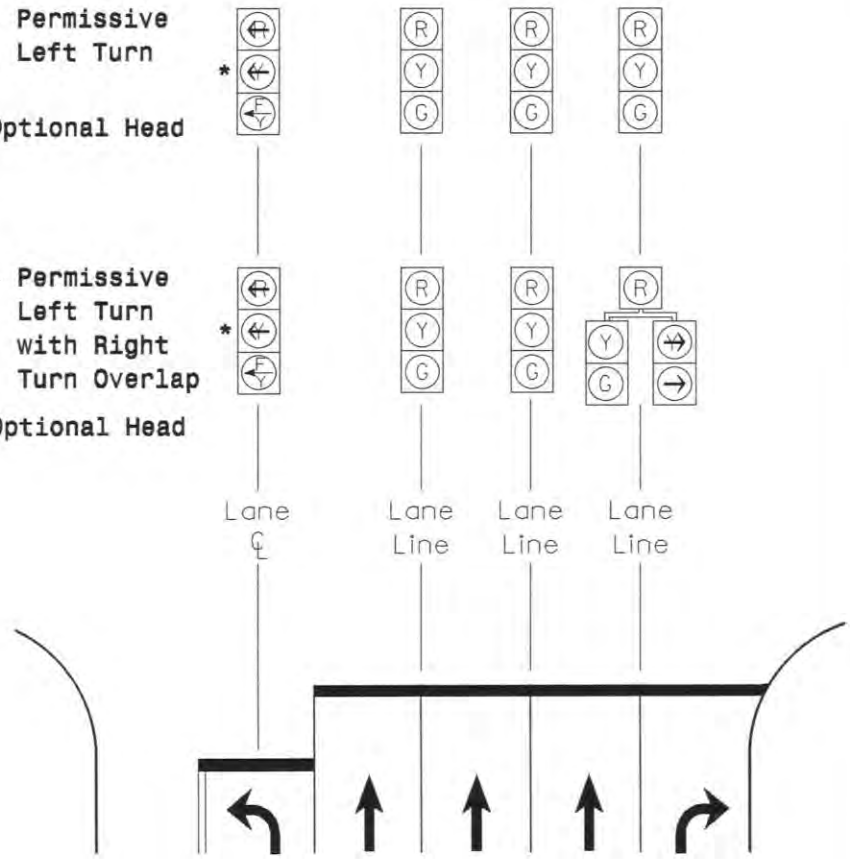
Standard Main or Side Street Signal Head Configuration

9A - Permissive Left Turn

* Optional Head

9AR - Permissive Left Turn with Right Turn Overlap

* Optional Head

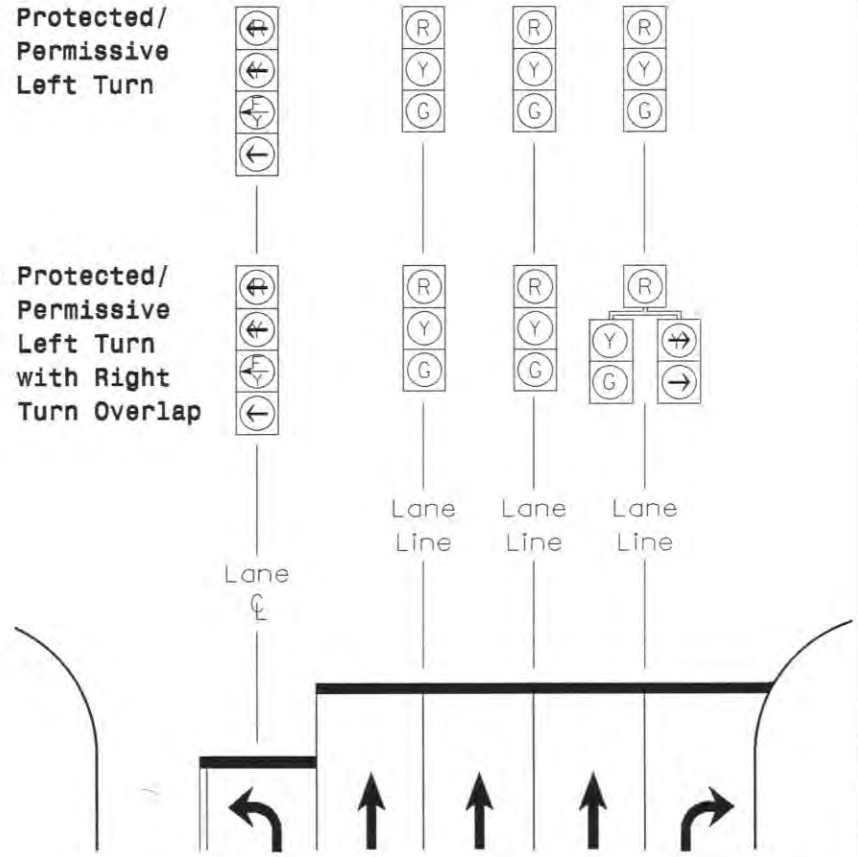


CASE 9 (2 OF 3)

Standard Main or Side Street Signal Head Configuration

9B - Protected/ Permissive Left Turn

9BR - Protected/ Permissive Left Turn with Right Turn Overlap



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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STD. NO.
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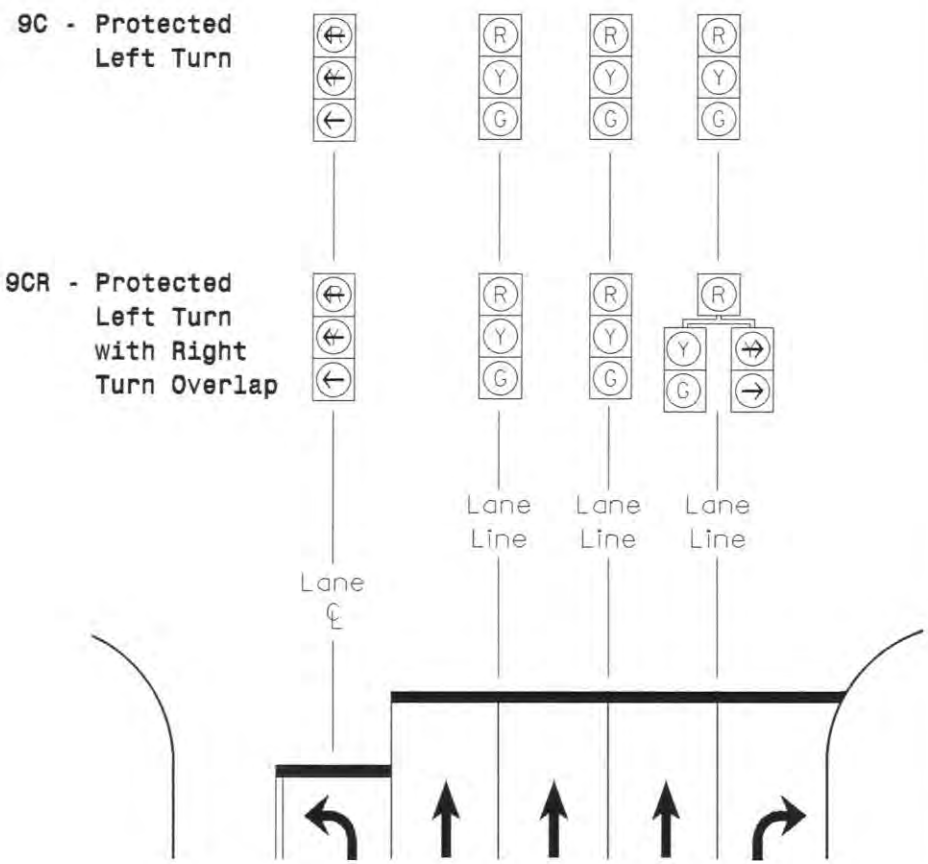
CASE 9 (3 OF 3)

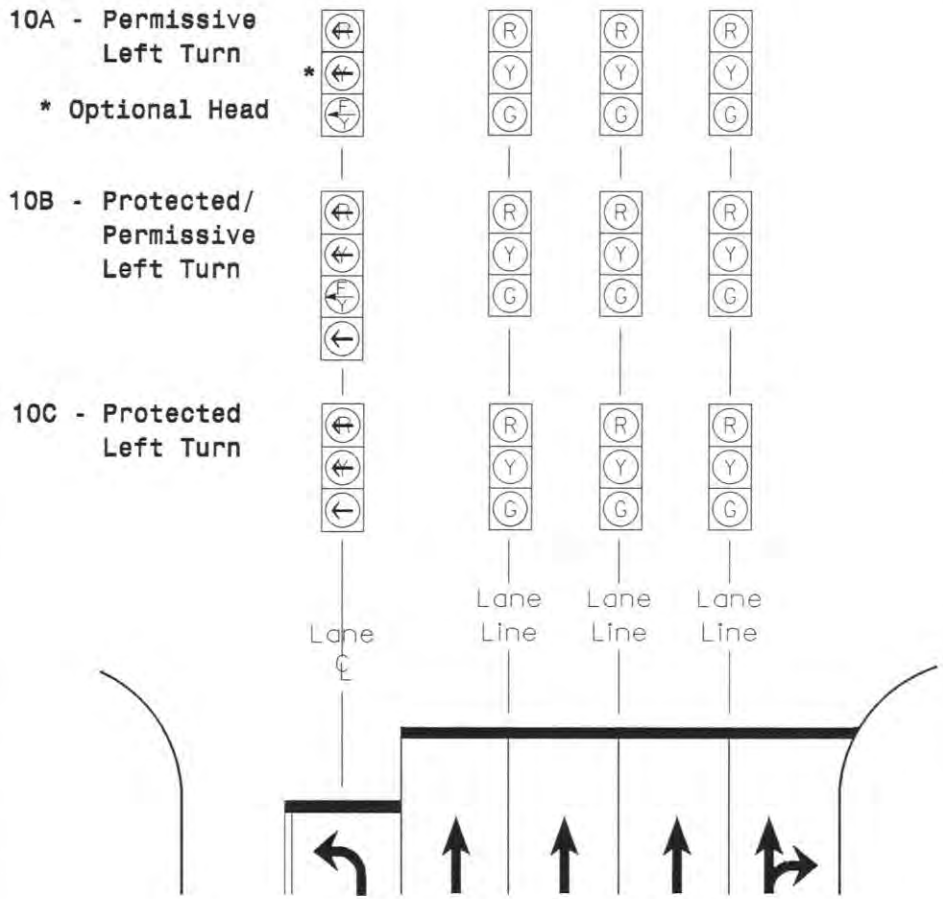
Standard Main or Side Street Signal Head Configuration



CASE 10 (1 OF 2)

(Speeds less than 45 MPH)

Standard Main or Side Street Signal Head Configuration



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

STD. NO.
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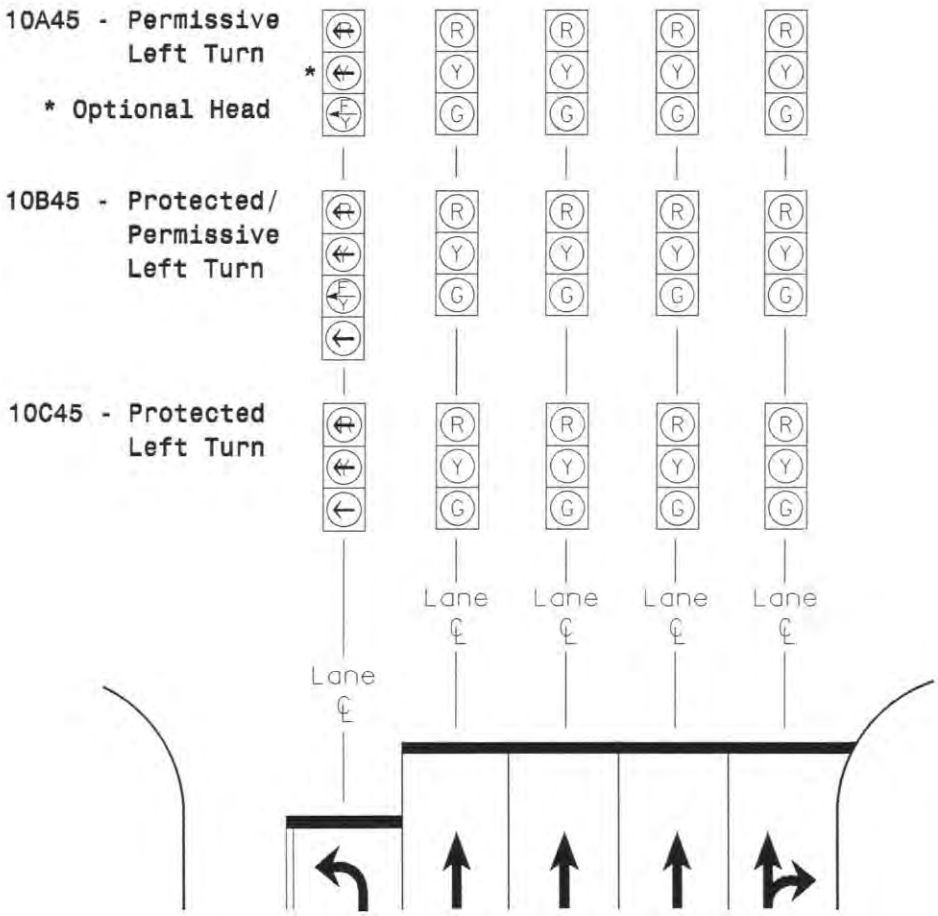
SHEET 9 OF 24

CASE 10 (2 OF 2)

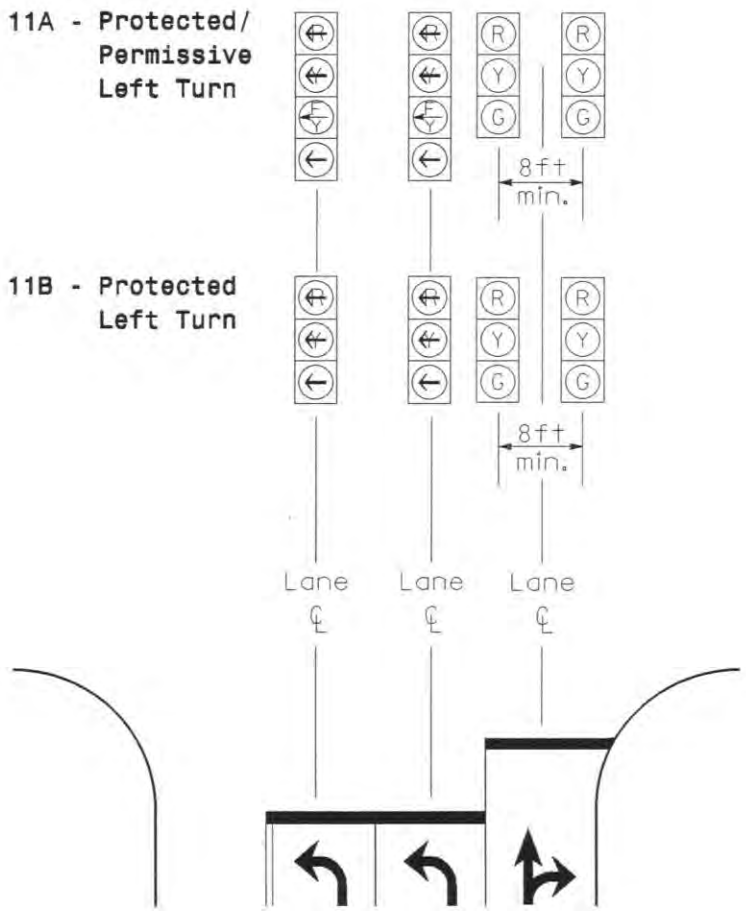
(Speeds 45 MPH or above)

Standard Main or Side Street Signal Head Configuration



CASE 11

Main or Side Street Signal Head Configuration for Dual Left Turn Movements



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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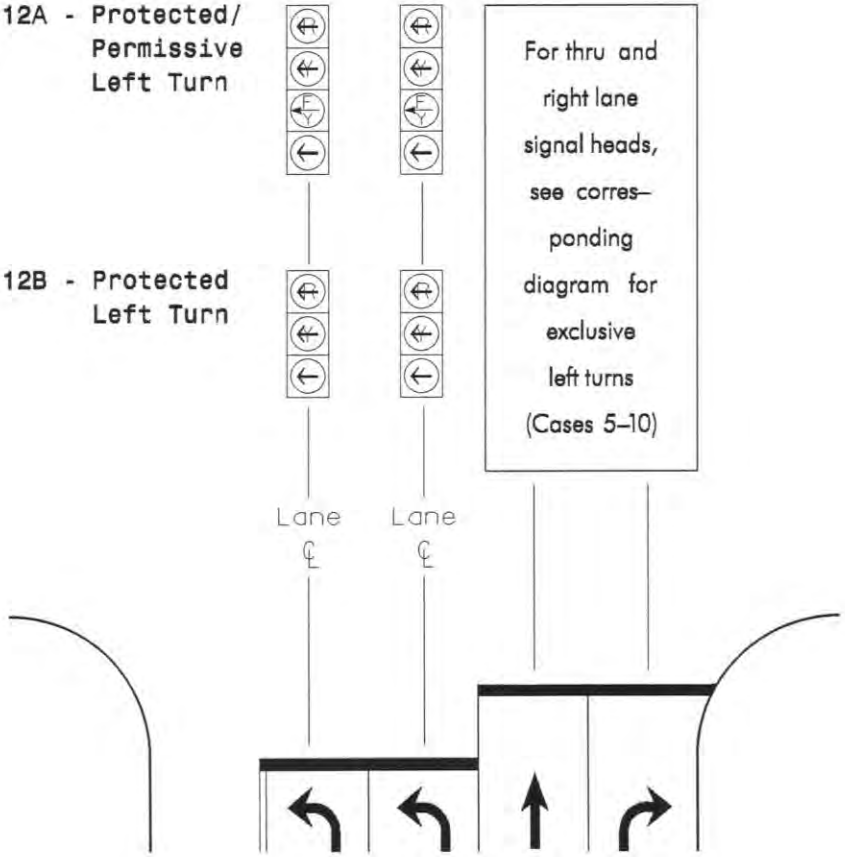
STD. NO.
3.2

CASE 12

Main or Side Street
Signal Head Configuration
for Dual Left Turn Movements

12A - Protected/ Permissive Left Turn

12B - Protected Left Turn

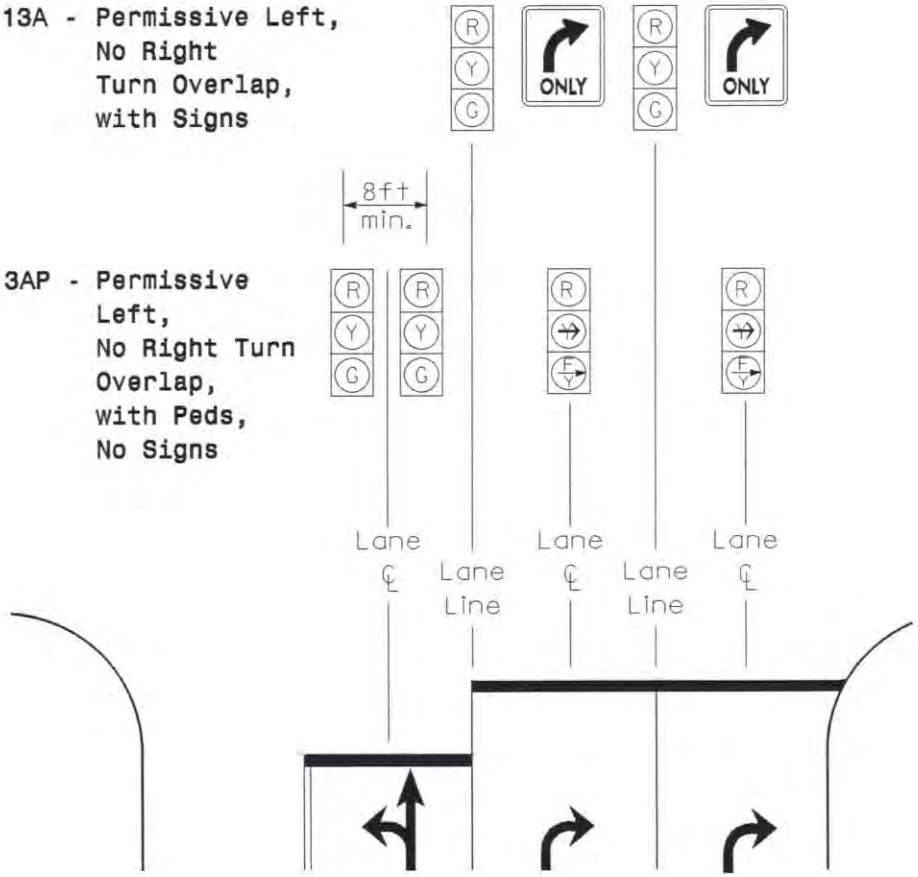


CASE 13 (1 OF 2)

Main or Side Street
Signal Head Configuration
for Dual Right Turn Movements

13A - Permissive Left, No Right Turn Overlap, with Signs

13AP - Permissive Left, No Right Turn Overlap, with Peds, No Signs



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

STD. NO.
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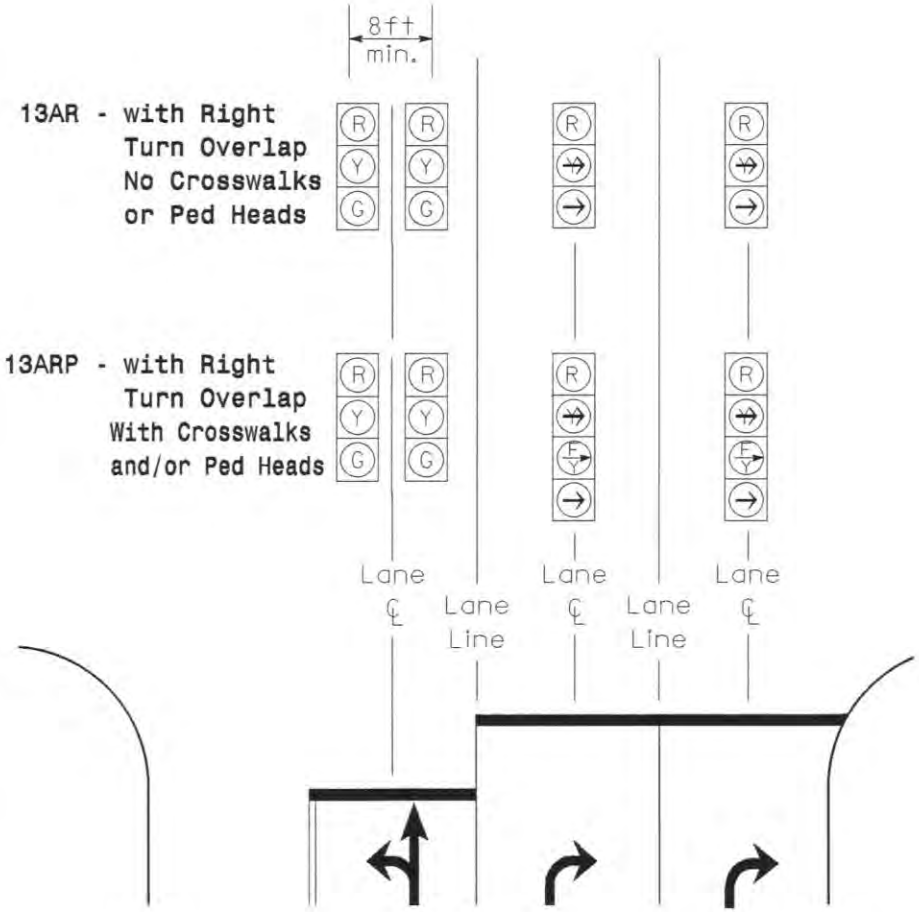
SHEET 11 OF 24

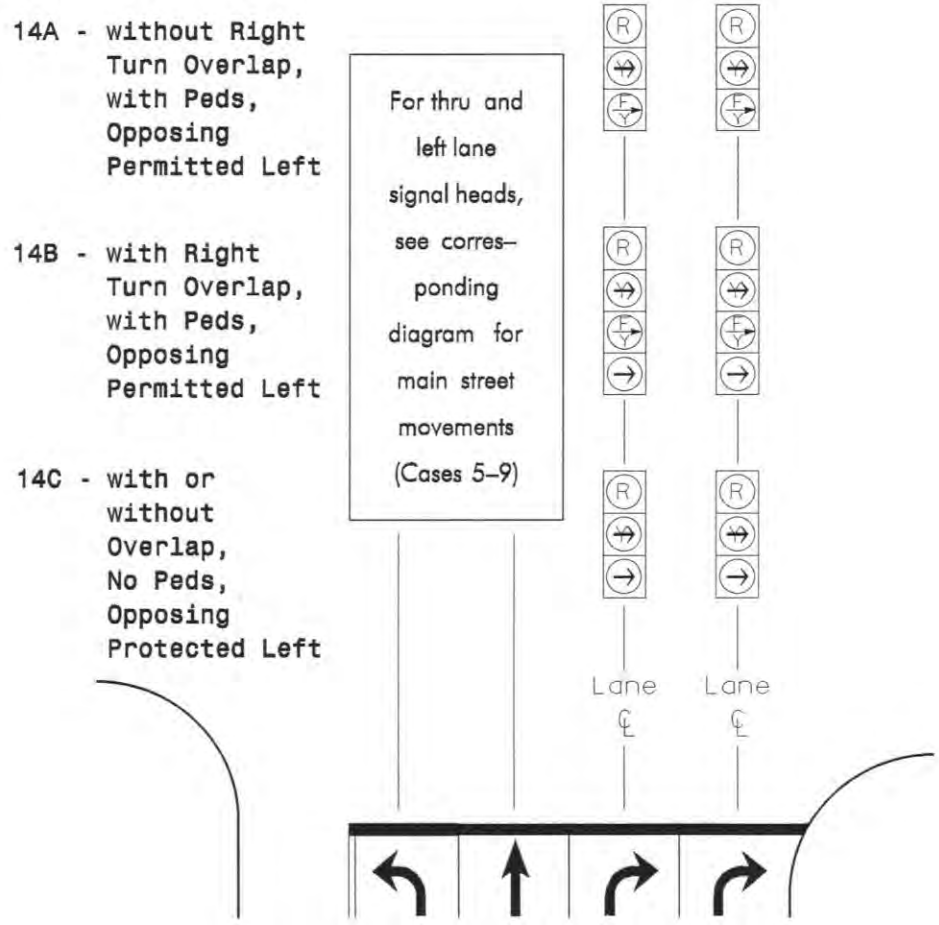
CASE 13 (2 of 2)

Main or Side Street
Signal Head Configuration
for Dual Right Turn Movements



CASE 14

Main or Side Street
Signal Head Configuration
for Dual Right Turn Movements



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

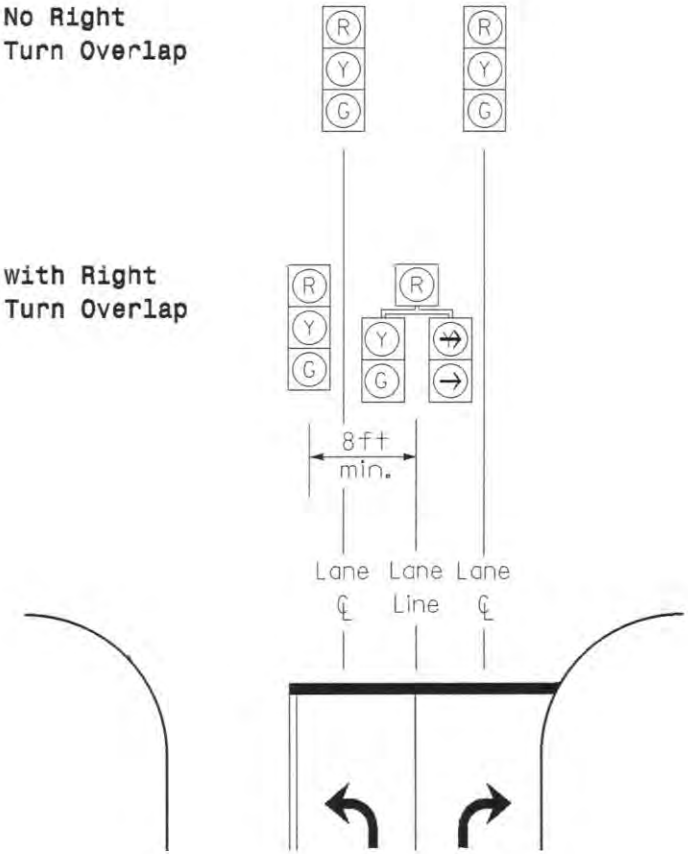
STD. NO.
3.2

CASE 15

Stem of "Tee" Intersection or Ramp Terminal or One–Way Situation Signal Head Configuration

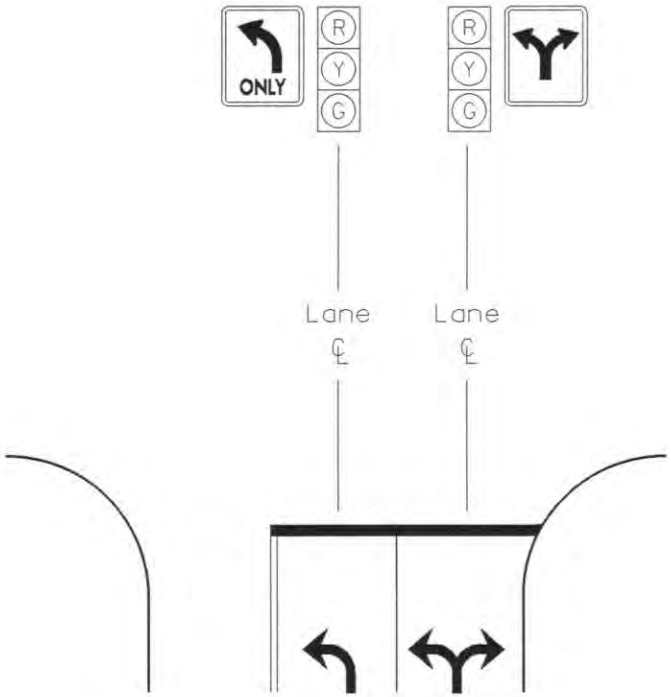
15A - No Right Turn Overlap

15AR - with Right Turn Overlap



CASE 16

Stem of "Tee" Intersection or Ramp Terminal or One–Way Situation Signal Head Configuration



Signal Head Approach Displays and Alignment

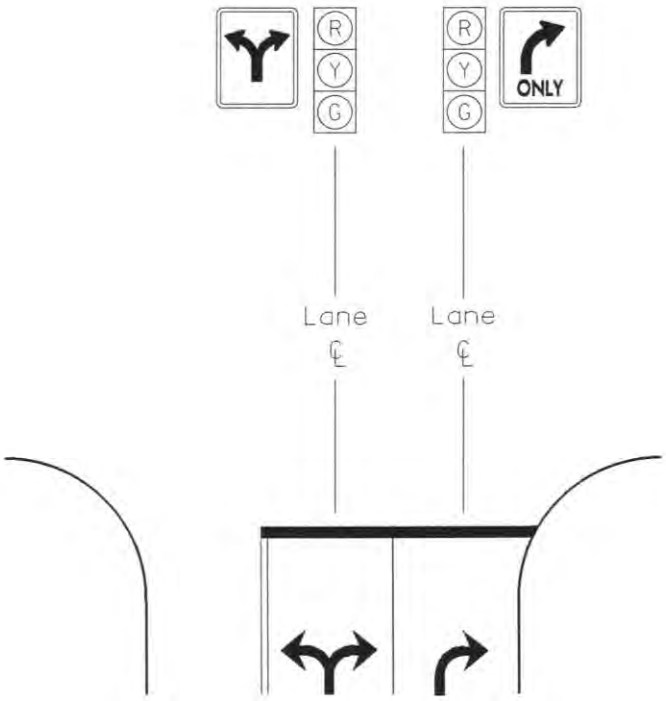
SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

STD. NO.
3.2
SHEET 13 OF 24

CASE 17

Stem of "Tee" Intersection or Ramp Terminal or One–Way Situation Signal Head Configuration



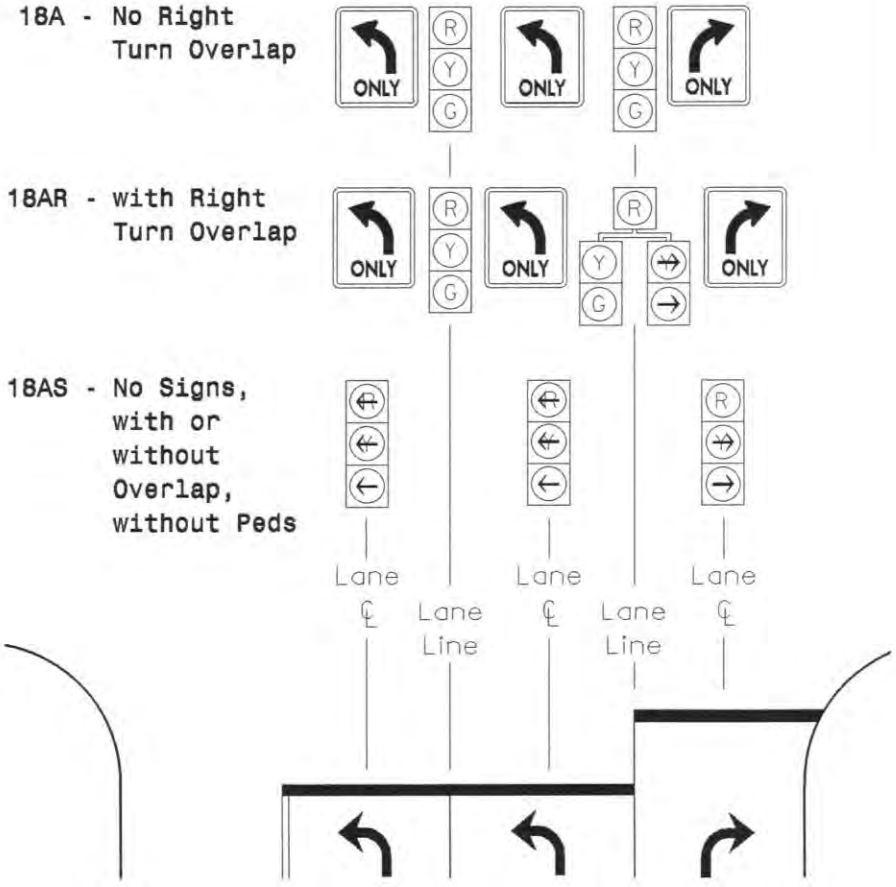
CASE 18

Stem of "Tee" Intersection or Ramp Terminal or One–Way Situation Signal Head Configuration

18A - No Right Turn Overlap

18AR - with Right Turn Overlap

18AS - No Signs, with or without Overlap, without Peds



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

STD. NO.
3.2
SHEET 14 OF 24

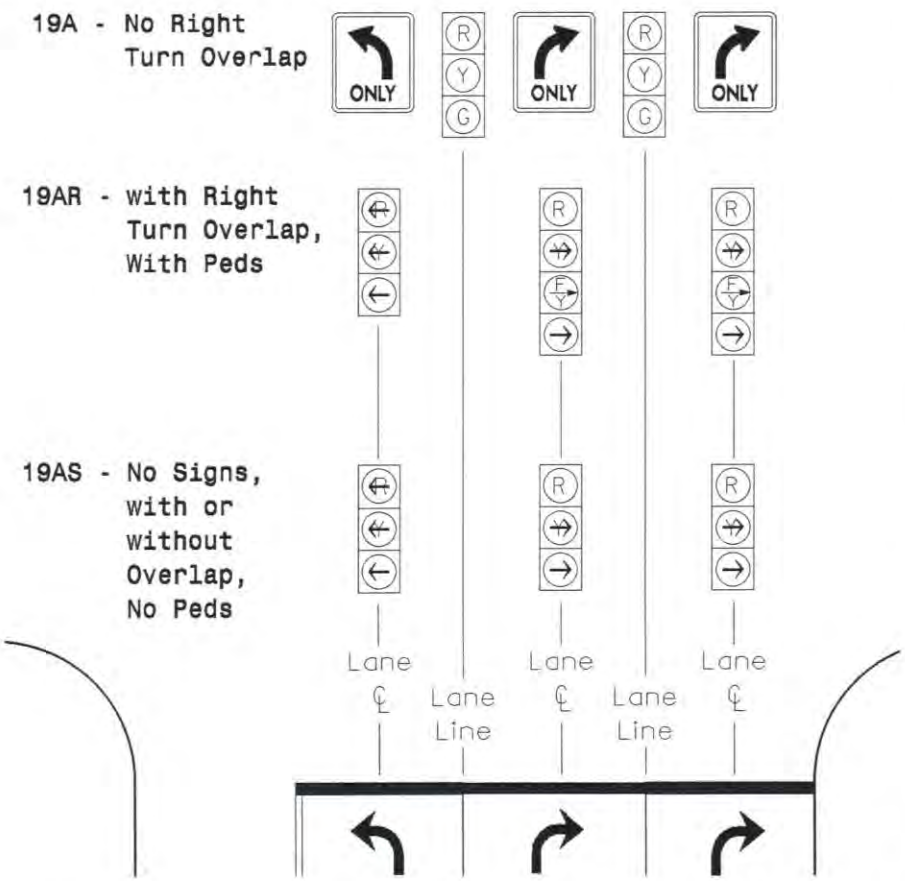
CASE 19

Stem of "Tee" Intersection or Ramp Terminal or One–Way Situation Signal Head Configuration

19A - No Right Turn Overlap

19AR - with Right Turn Overlap, With Peds

19AS - No Signs, with or without Overlap, No Peds



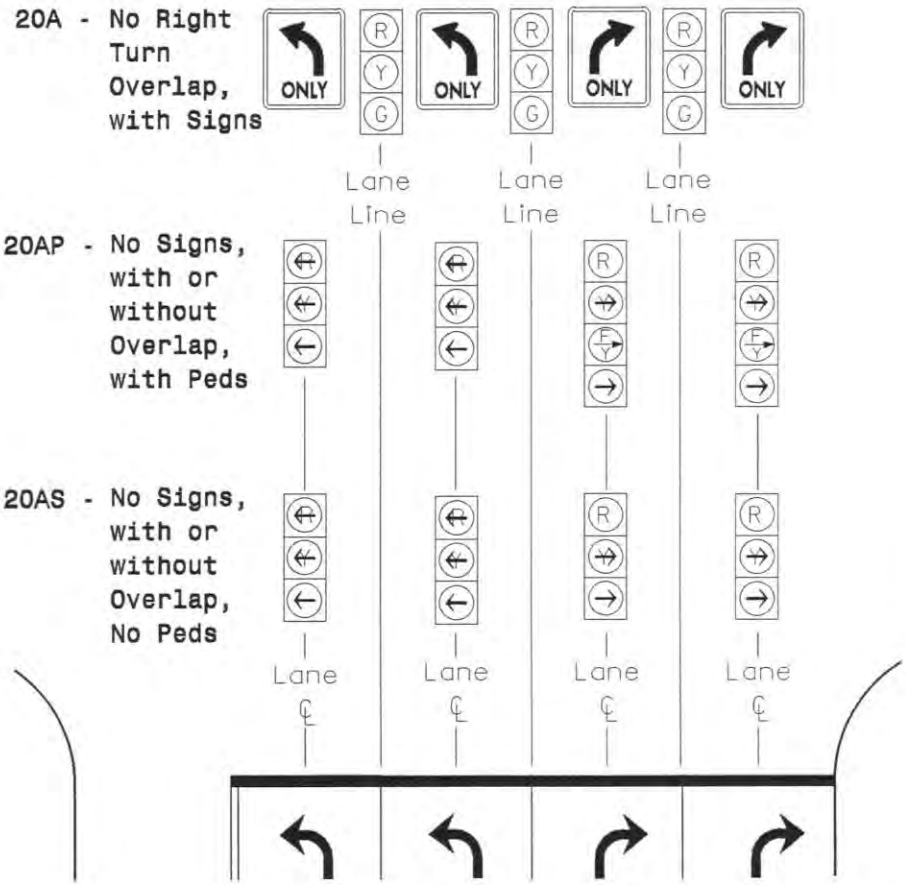
CASE 20

Stem of "Tee" Intersection or Ramp Terminal or One–Way Situation Signal Head Configuration

20A - No Right Turn Overlap, with Signs

20AP - No Signs, with or without Overlap, with Peds

20AS - No Signs, with or without Overlap, No Peds



Signal Head Approach Displays and Alignment

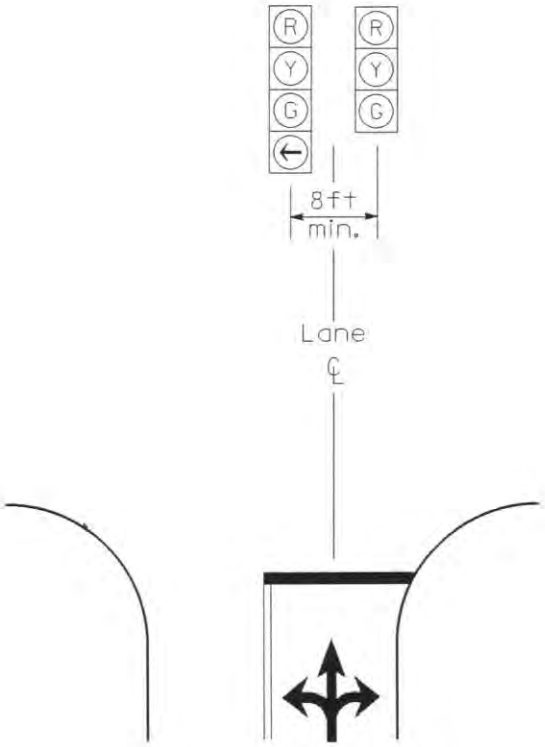
SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

STD. NO.
3.2
SHEET 15 OF 24

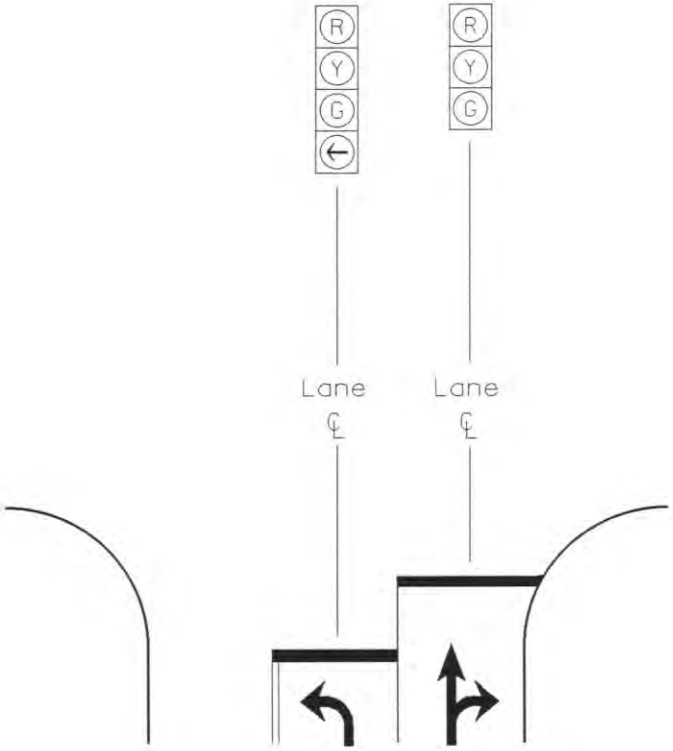
CASE 21

Split Phasing
Signal Head Configuration



CASE 22

Split Phasing
Signal Head Configuration



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

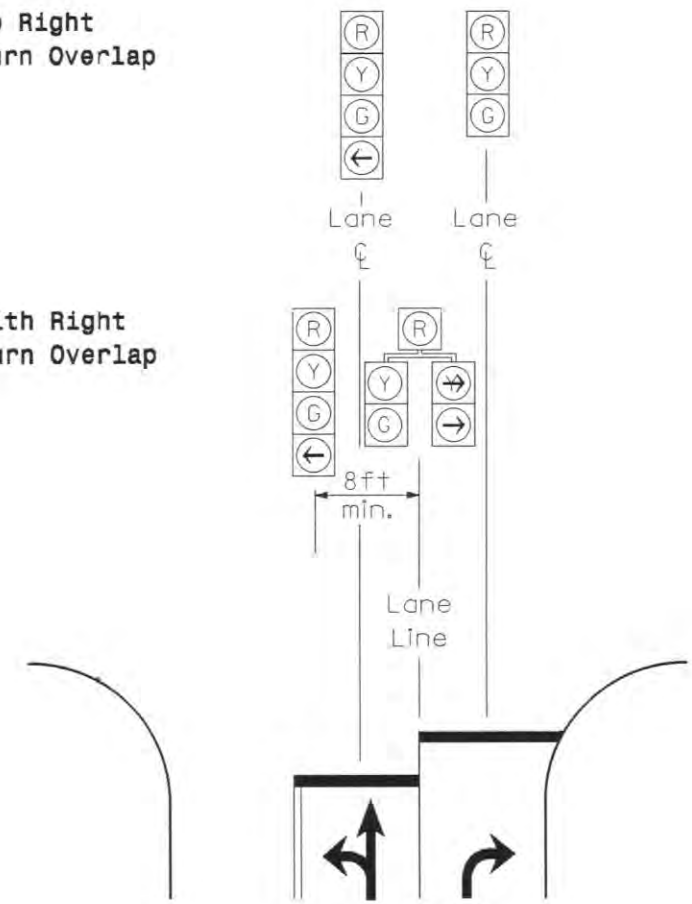
STD. NO.
3.2
SHEET 16 OF 24

CASE 23

Split Phasing
Signal Head Configuration

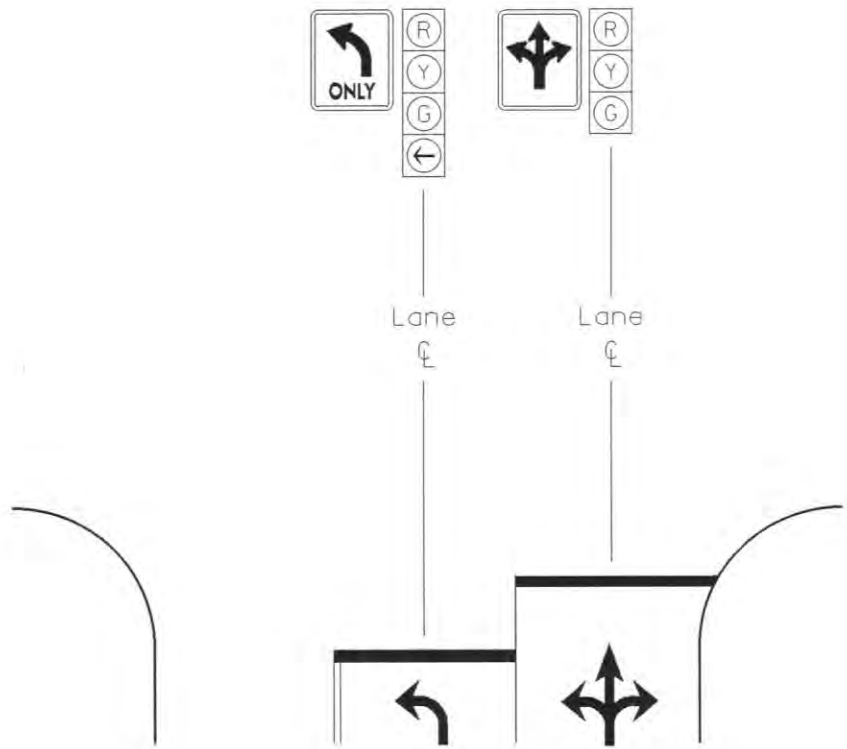
23C - No Right Turn Overlap

23CR - with Right Turn Overlap



CASE 24

Split Phasing
Signal Head Configuration



Signal Head Approach Displays and Alignment

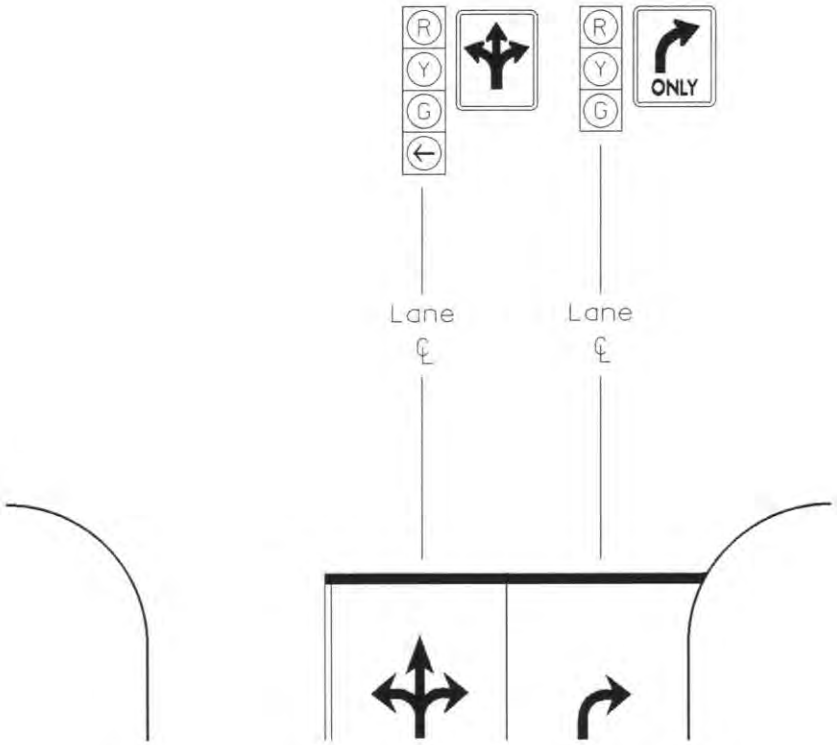
SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

STD. NO.
3.2
SHEET 17 OF 24

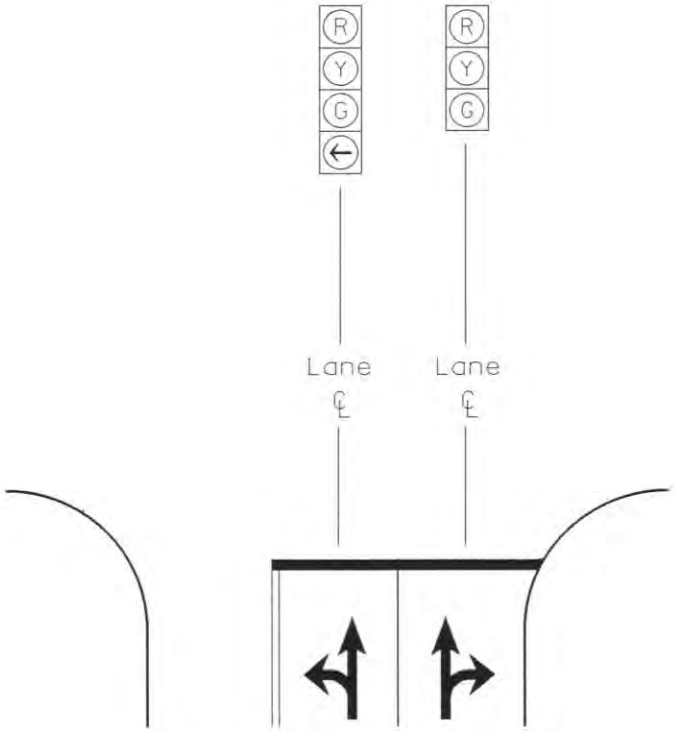
CASE 25

Split Phasing
Signal Head Configuration



CASE 26

Split Phasing
Signal Head Configuration



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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STD. NO.
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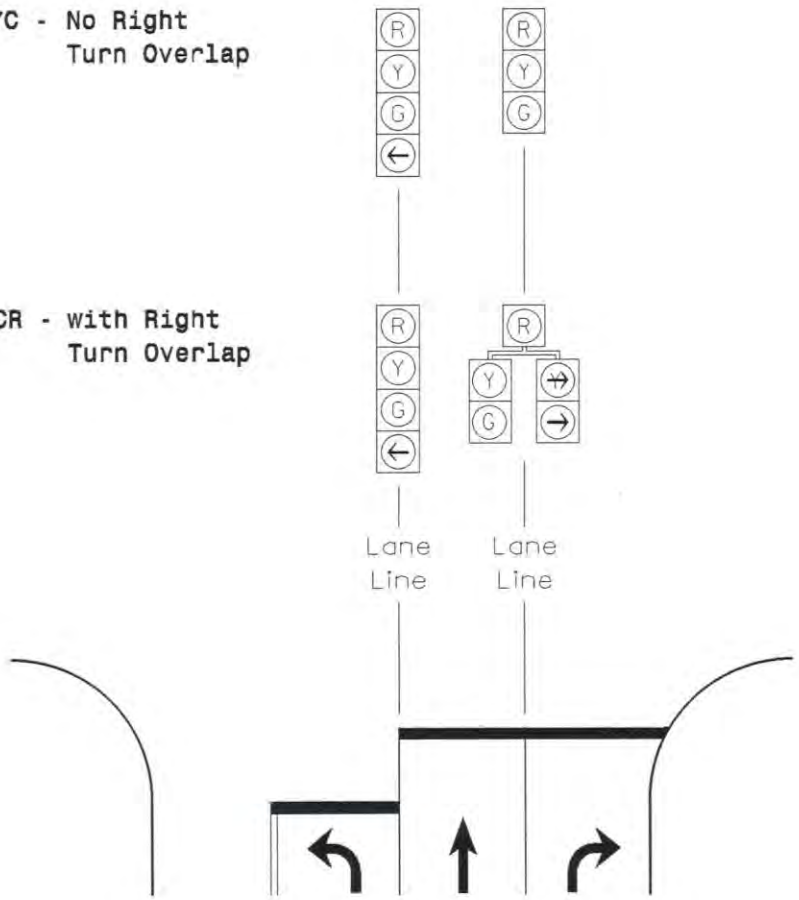
CASE 27

Split Phasing
Signal Head Configuration

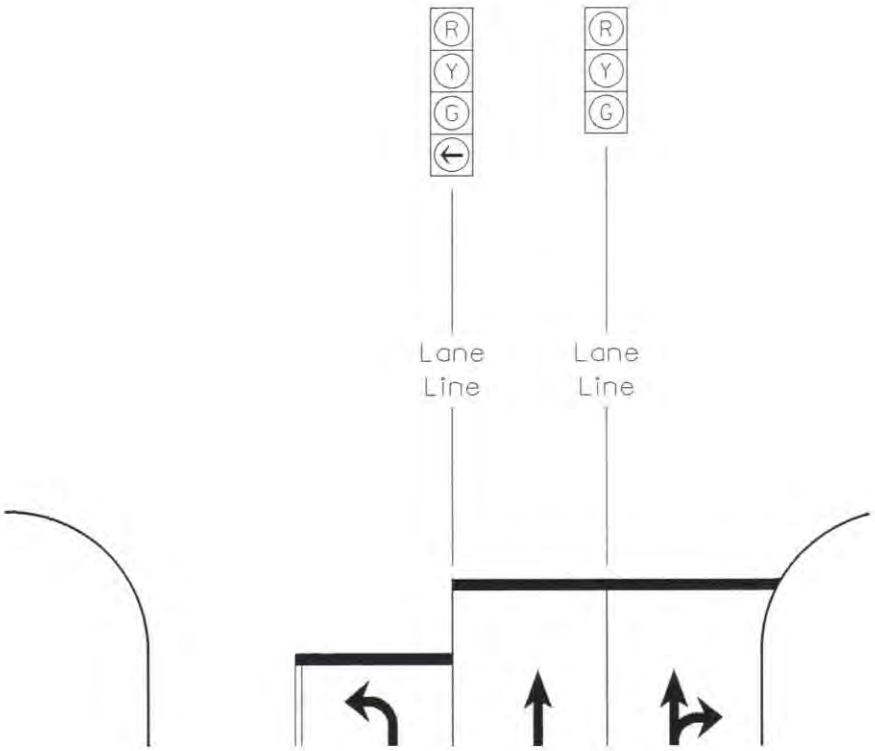
27C - No Right Turn Overlap

27CR - with Right Turn Overlap



CASE 28

Split Phasing
Signal Head Configuration



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

12-10

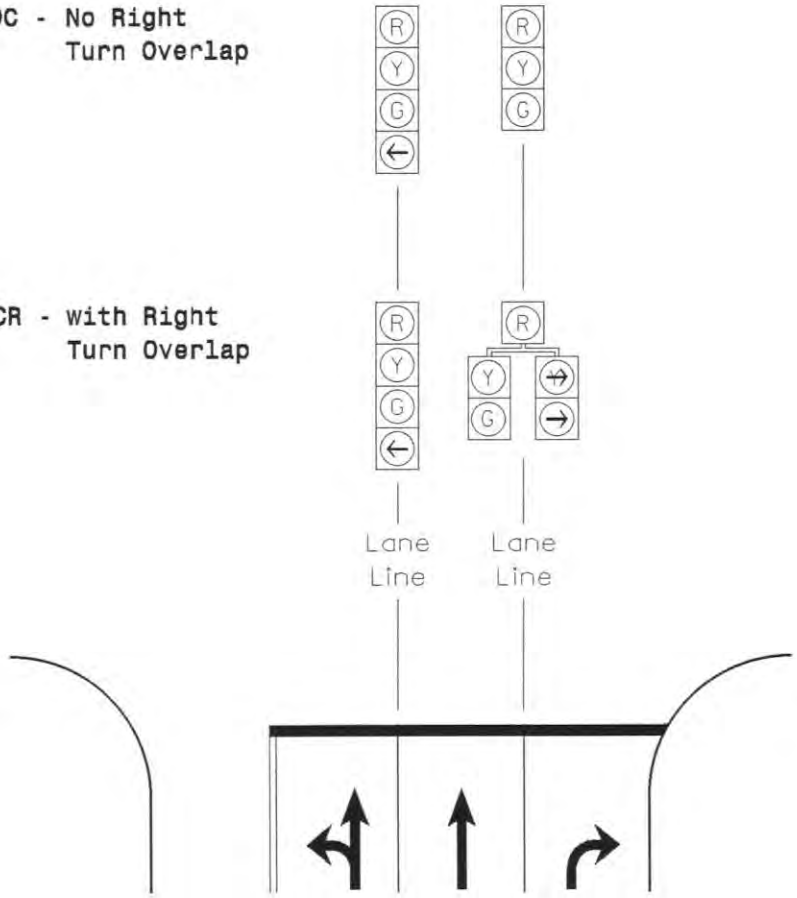
STD. NO.
3.2
SHEET 19 OF 24

CASE 29

Split Phasing
Signal Head Configuration

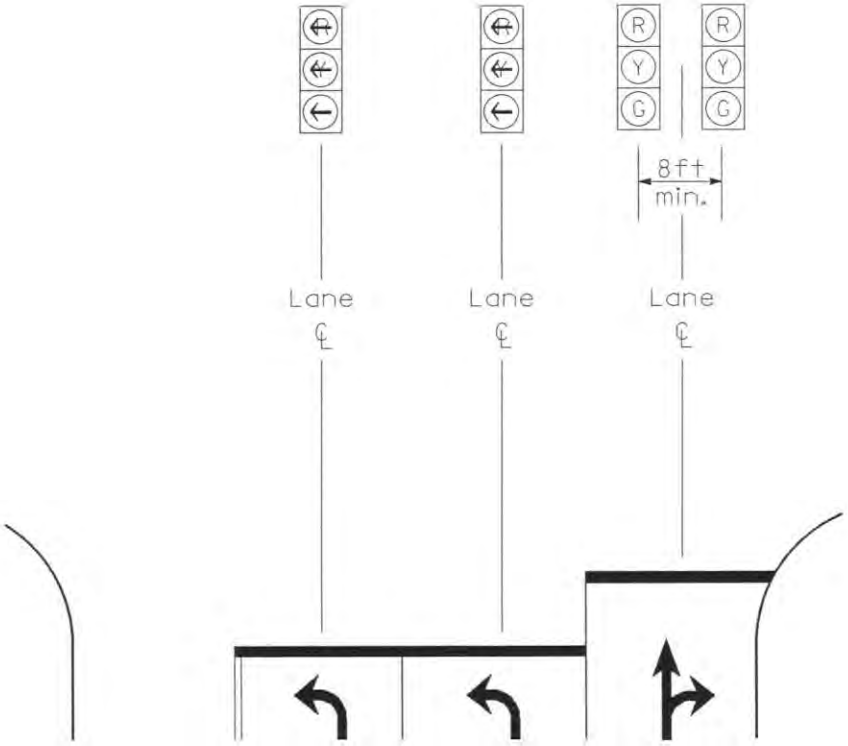
29C - No Right Turn Overlap

29CR - with Right Turn Overlap



CASE 30

Split Phasing
Signal Head Configuration



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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STD. NO.
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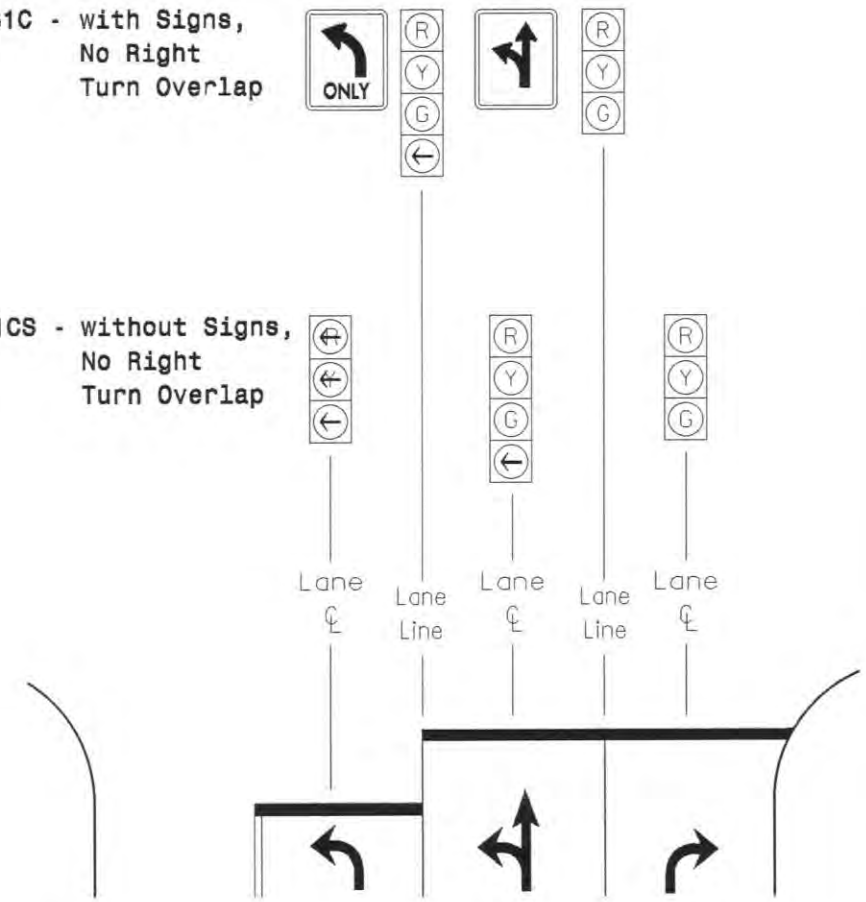
CASE 31 (1 OF 2)

Split Phasing
Signal Head Configuration

31C - with Signs,
No Right
Turn Overlap

31CS - without Signs,
No Right
Turn Overlap

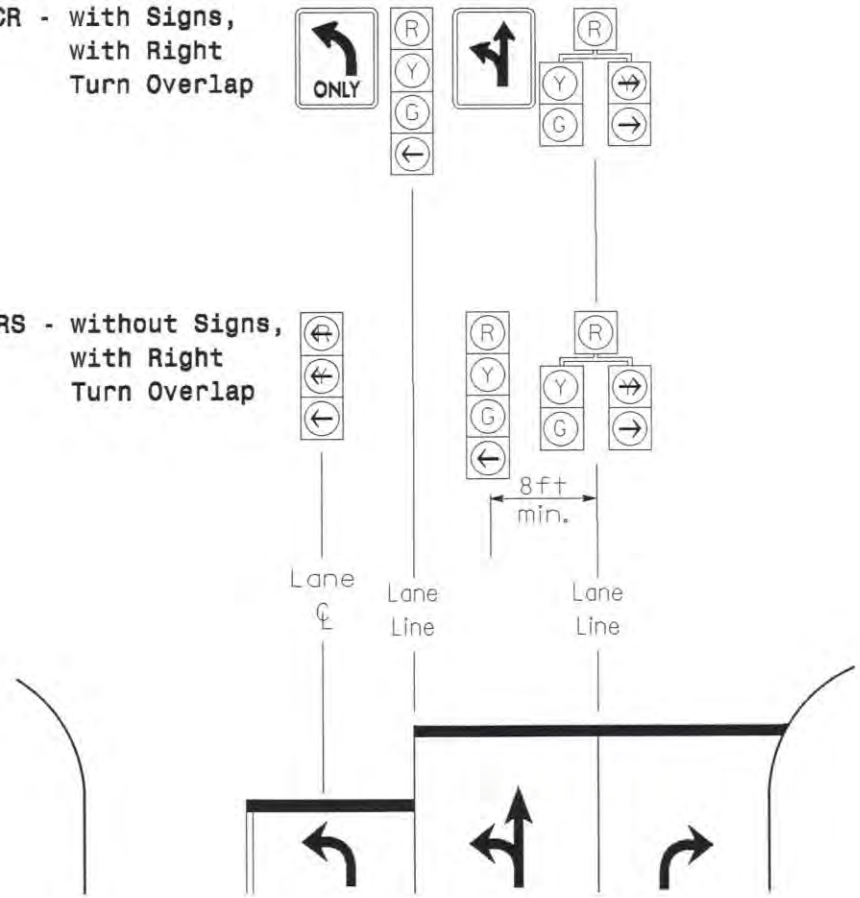


CASE 31 (2 OF 2)

Split Phasing
Signal Head Configuration

31CR - with Signs,
with Right
Turn Overlap

31CRS - without Signs,
with Right
Turn Overlap



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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STD. NO.
3.2
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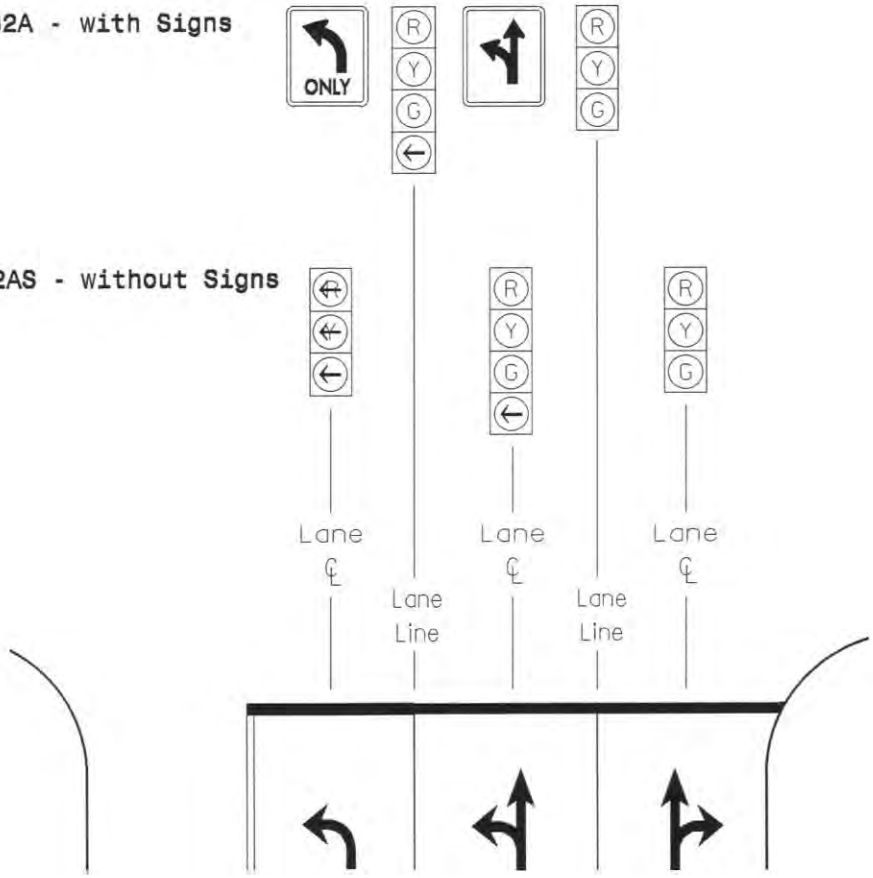
CASE 32

Split Phasing
Signal Head Configuration

32A - with Signs

32AS - without Signs



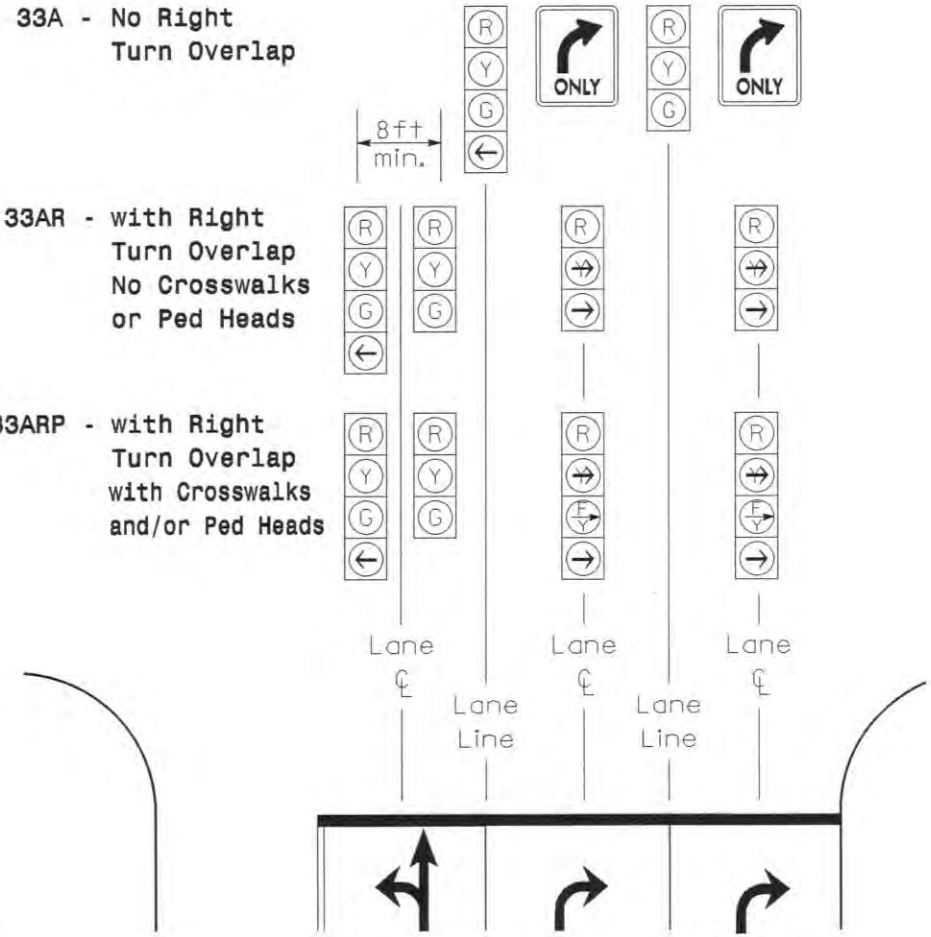
CASE 33

Split Phasing
Signal Head Configuration
for Dual Right Turn Movements

33A - No Right Turn Overlap

33AR - with Right Turn Overlap No Crosswalks or Ped Heads

33ARP - with Right Turn Overlap with Crosswalks and/or Ped Heads



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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STD. NO.
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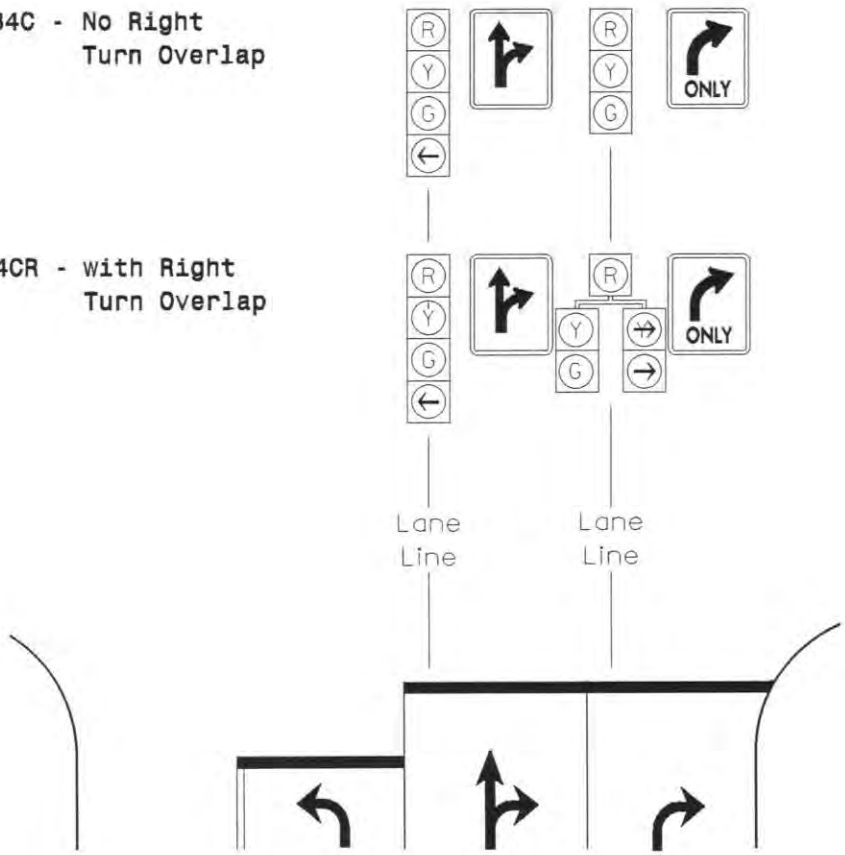
CASE 34

Split Phasing
Signal Head Configuration

34C - No Right Turn Overlap

34CR - with Right Turn Overlap

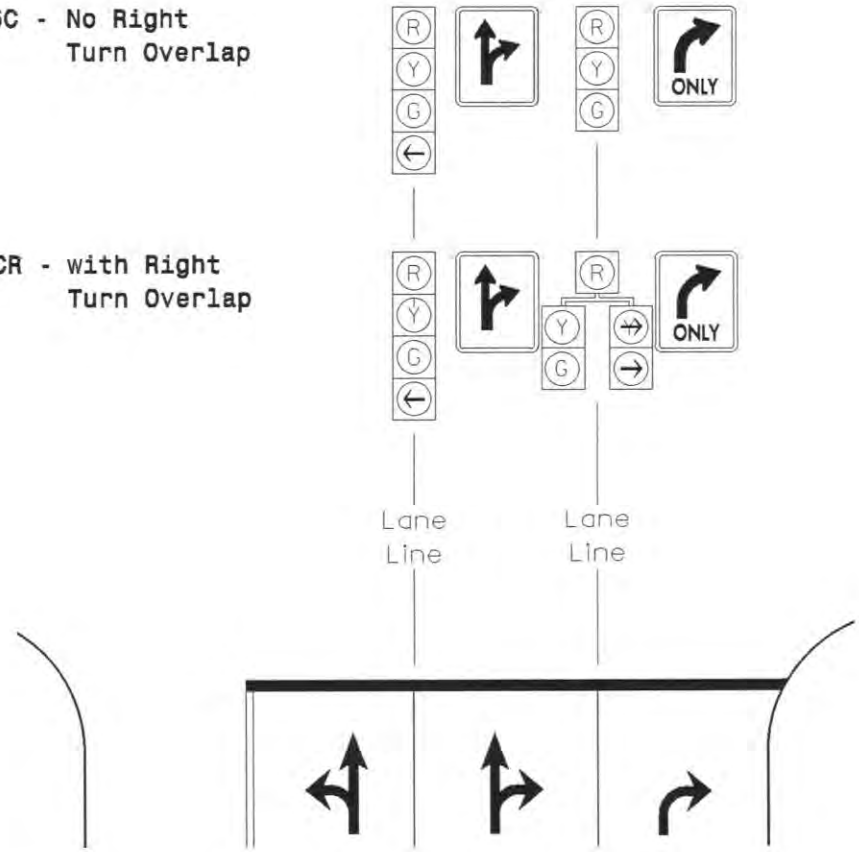


CASE 35

Split Phasing
Signal Head Configuration

35C - No Right Turn Overlap

35CR - with Right Turn Overlap



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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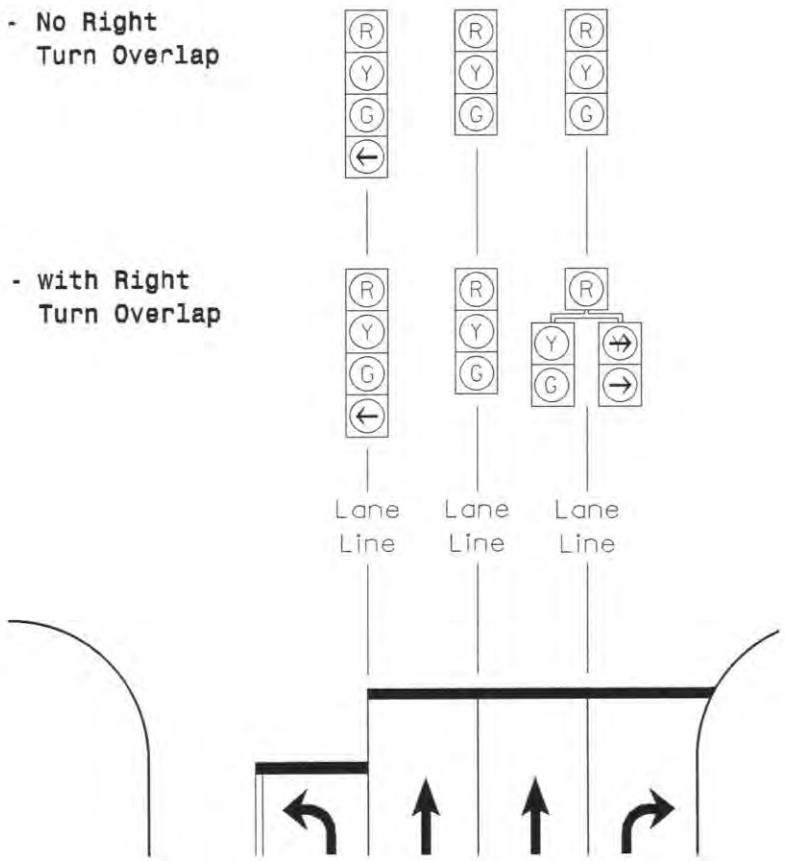
STD. NO.
3.2
SHEET 23 OF 24

CASE 36

Split Phasing
Signal Head Configuration

36C - No Right Turn Overlap

36CR - with Right Turn Overlap

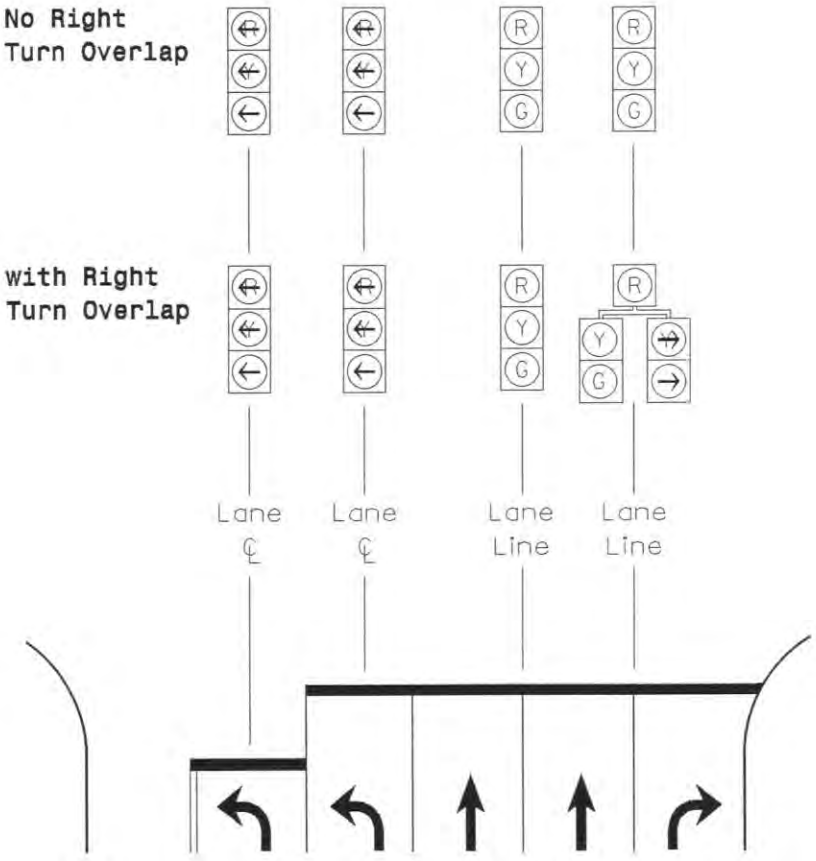


CASE 37

Split Phasing
Signal Head Configuration

37C - No Right Turn Overlap

37CR - with Right Turn Overlap



Signal Head Approach Displays and Alignment

SIGNAL DESIGN SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
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STD. NO.
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