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NORTH CAROLINA
Department of Transportation

Designing for Sight Distance

LUNCH & LEARN – NOVEMBER 30TH

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OVERVIEW OF TODAY'S PRESENTATION

- **Define Sight Distance:** The length of Roadway visible to a driver.
- **Increase awareness** on designing for sight distance and safety while making design decisions.
- Explain the **impacts of mitigation** required when a project is built with inadequate sight distance.
- Show how to use the **Greenbook** formulas to compute minimum sight distance requirements.
- Show how to use a **graphical** check to confirm sight distance is achieved.
- Show examples of **poor sight distance**.

Think About Safety – Put yourself into the Design https://ncvisionzero.org/

NC VISION ZERO

Vision Zero is a multi-national road traffic safety project that aims to achieve a roadway system with no fatalities or serious injuries involving road traffic.

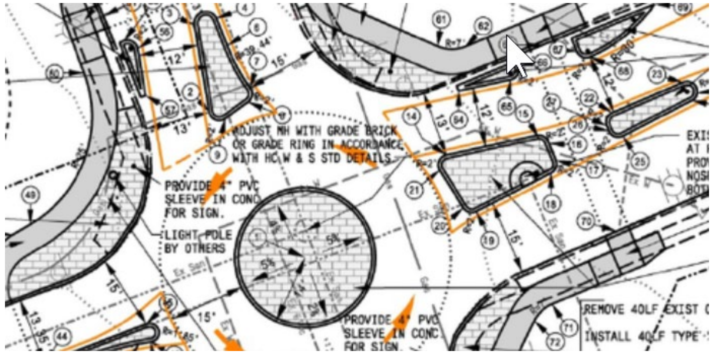
The Federal Highway Association, has proposed six key, organizing principles of the Safe System approach (United States Department of Transportation, 2022):

- **Deaths and serious injuries are unacceptable:** While no crashes are desirable, the Safe System approach prioritizes crashes that result in death and serious injuries, since no one should experience either when using the transportation system.
- **Humans make mistakes:** People will inevitably make mistakes that can lead to crashes, but the transportation system can be designed and operated to accommodate human mistakes and injury tolerances and avoid death and serious injuries.
- **Humans are vulnerable:** People have limits for tolerating crash forces before death and serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates human vulnerabilities.
- **Responsibility is shared:** All stakeholders (transportation system users and managers, vehicle manufacturers, etc.) must ensure that crashes don't lead to fatal or serious injuries.
- **Safety is proactive:** Proactive tools should be used to identify and mitigate latent risks in the transportation system, rather than waiting for crashes to occur and reacting afterwards.
- **Redundancy is crucial:** Reducing risks requires that all parts of the transportation system are strengthened, so that if one part fails, the other parts still protect people.

Why is Sight Distance Important?

Adequate Sight Distance provides drivers with sufficient time to identify and appropriately react to all elements of the road environment, including hazards and other road users (including pedestrians and bicyclists).

WHAT HAPPENS IF SIGHT DISTANCE IS NOT ACHIEVED IN YOUR DESIGN?



- A short amount of time on a calculation is very valuable compared with the cost of mitigation, which can be:
  - Grading sight lines and associated additional right of way costs.
  - The addition of traffic signals (and associated power, r/w, etc).
  - Reconstruction to achieve adequate sight distances.

SIGHT DISTANCE ELEMENTS TO EVALUATE WHEN REPLACING AN INTERCHANGE BRIDGE

- **Raising the structure** and associated mainline for additional vertical clearance
- The **steepening the ramp grades** to meet the new mainline elevation can impact sight lines
- **Maintaining ramp location**, regardless of proximity of bridge (to minimize cost) may not be desirable.
- **Upgrading the bridge barrier rail** replacing antiquated low height rails can negatively impact sight lines.
- **Placement of proposed guardrail** could impact sight lines as well.

Example Project:

- Updated bridge rail; Raised grade and increased ramp grades to tie; Replaced GR

SIGHT DISTANCE RESOURCES:

This PDF is available at http://nap.nationalacademies.org/25081

Guidance for Evaluating the Safety Impacts of Intersection Sight Distance (2018)

DETAILS

44 pages | 8.5 x 11 | PAPERBACK

ISBN 978-0-309-44681-5 | DOI 10.17226/25081

- AASHTO Green Book
- NCHRP 875 (2018) above
- NCHRP Roundabout Guidance
- NCDOT Roadway Design Manual
- Roadside Design Guide
- Internet

- Stopping Sight Distance
- Passing Sight Distance
- Decision Sight Distance
- Vertical Sight Distance
- Horizontal Sight Distance
- Intersection Sight Distance

SIGHT DISTANCE GRADING:

- GRADING AT INTERSECTION CORNERS IS OCCASIONALLY NEEDED TO ACHIEVE ADEQUATE SIGHT LINES.

- PROVIDE VISIBILITY TO –
  - TRAFFIC
  - BICYCLES AND PEDESTRIANS
  - SIGNPOSTS

- DAYLIGHTING –
  - PROCESS OF GRADING AND REMOVING OBSTRUCTIONS TO INCREASE VISIBILITY.

GRADING FOR SIGHT DISTANCE REQUIRED?

DAYLIGHTING?

Stage2_Roadway_DesignRecPlanSet_QC_Checklist.docx

1.7.35	Notes where sight distance grading is required at intersections are shown, if applicable.	☐	☐	☐

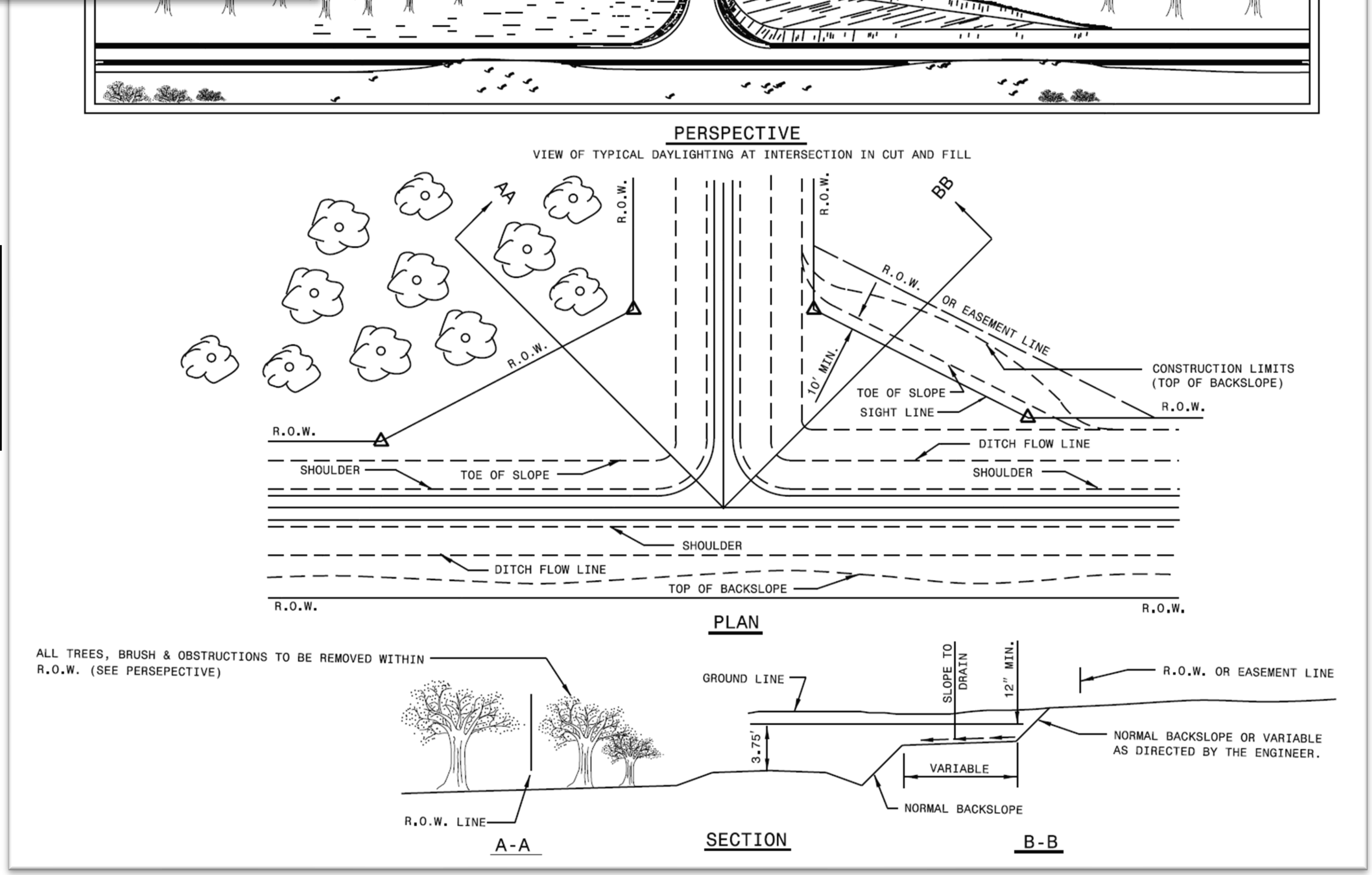
225.06 SHEET 1 OF 1

ROADWAY STANDARD DRAWING FOR
METHOD OF GRADING SIGHT DISTANCE AT INTERSECTIONS

1-24

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

DAYLIGHTING AT INTERSECTION IN CUT AND FILL



- Unsignalized intersection.

- Median landscaping can create sight distance issues. Trees trimmed up from bottom here to try to mitigate lack of sight distance after installation.

MAKE SURE YOUR SIGHT LINES ARE CONTAINED IN RIGHT OF WAY SO THEY CAN BE MAINTAINED AND CLEARED OF ANY OBSTRUCTIONS AT ANY TIME.

8.4 Intersection Sight Distance

Different types of vehicular conflicts can occur at an intersection. These conflicts can be reduced if the intersection design provides adequate sight distances and traffic controls. Sight distance at intersections should allow the driver to detect potential conflicts and provide enough time to stop or adjust speed to avoid the conflict. Proper stopping sight distance is necessary on each leg of an intersection for intersection operation.

Provide sight triangles at all intersections, see Figure 8-7 below. Avoid any obstruction in these areas on the approach leg and the corners that may block the driver's view of potential conflicts. The dimensions of the sight triangles are dependent upon the design speed of the roadways and the type of traffic control at the intersection. There are two types of sight triangles: approach sight triangles and departure sight triangle.

Sight triangle dimensions vary depending on the type of traffic control utilized at the intersection.

Refer to GB Chapter 9 Section 9.5.3 for information about the different types of traffic control for determining intersection sight distance:

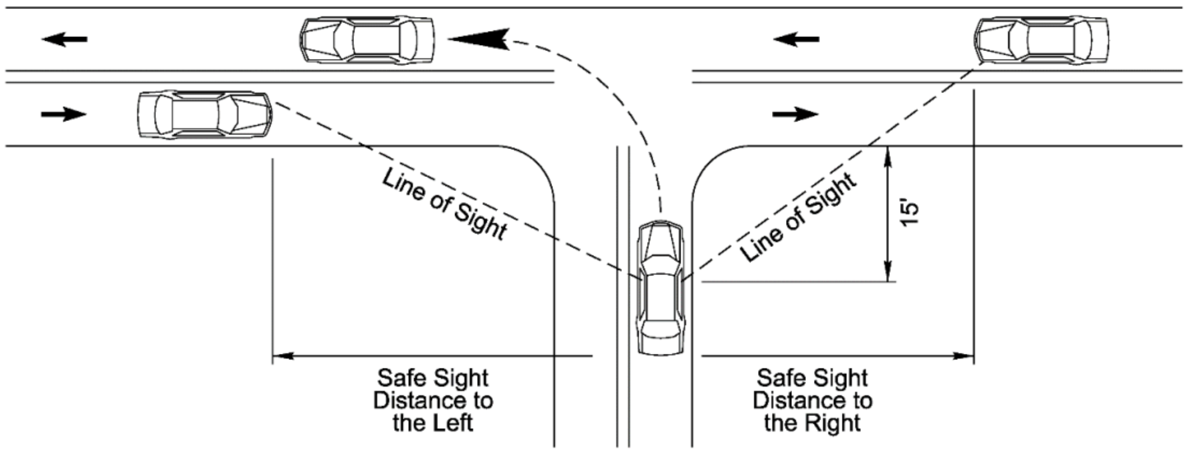
- Case A – Intersections with no control (GB, Section 9.5.3.1)
- Case B – Intersections with stop control on minor road (GB, Section 9.5.3.2)
  - Case B1 – Left turn from minor road (GB, Section 9.5.3.2.1)
  - Case B2 – Right turn from minor road (GB, Section 9.5.3.2.2)
  - Case B3 – Crossing maneuver from the minor road (GB, Section 9.5.3.2.3)
- Case C – Intersections with yield control on minor road (GB, Section 9.5.3.3)
  - Case C1 – Crossing maneuver from minor road (GB, Section 9.5.3.3.1)
  - Case C2 – Left or right turn from minor road (GB, Section 9.5.3.3.2)
- Case D – Intersections with traffic signal control (GB, Section 9.5.3.4)
- Case E – Intersections with all-way stop control (GB, Section 9.5.3.5)
- Case F – Left turns from major road (GB, Section 9.5.3.6)
- Case G – Roundabouts (GB, Section 9.5.3.7)

DEPARTURE LEG / DECISION POINT OFFSET:

- NCDOT RDM Recommends 15' minimum offset
- AASHTO provides a range between 14.5' to 18' offset

The AASHTO Green Book covers each in detail. We will focus on several today (Highlighted to the left). We will also look at horizontal curve sight distance.

Figure 8-7 Intersection Sight Distance



Refer to GB Chapter 9 Section 9.5 for more detail on intersection sight distance.

2018 AASHTO Green Book section 9.5 Intersection Sight Distance:

U.S. Customary

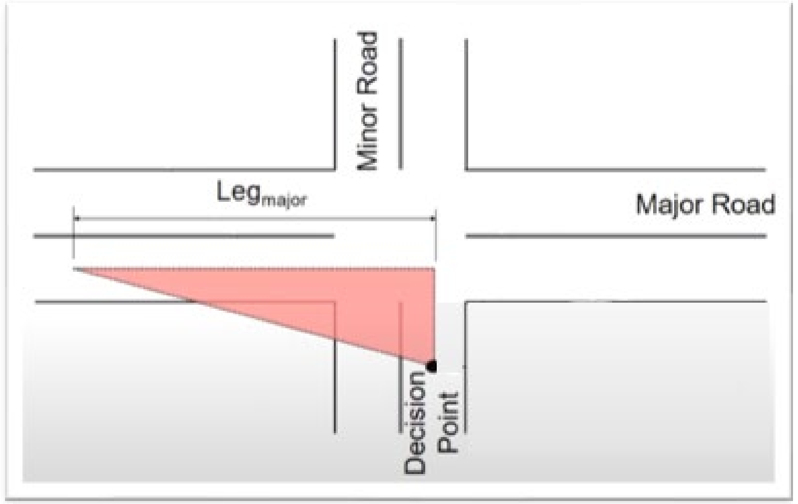
$$ISD = 1.47\, V_{major}\, t_g$$

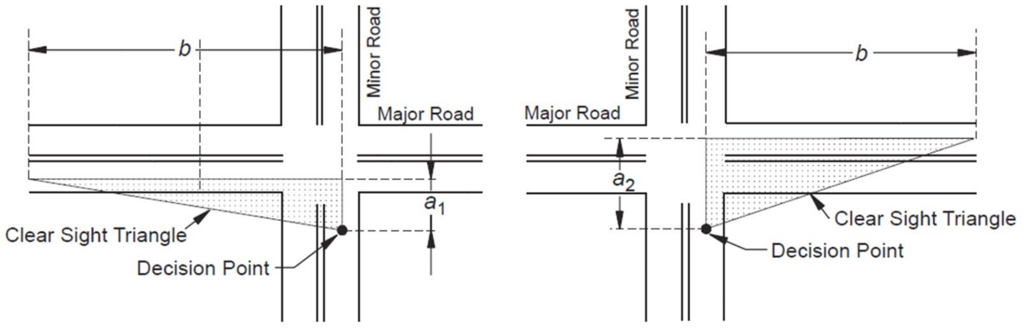
where:

ISD = intersection sight distance (length of the leg of sight triangle along the major road) (ft)

V_{major} = design speed of major road (mph)

t_g = time gap for minor road vehicle to enter the major road (s)





Departure Sight Triangle for Viewing Traffic Approaching the Minor Road from the Left

Departure Sight Triangle for Viewing Traffic Approaching the Minor Road from the Right

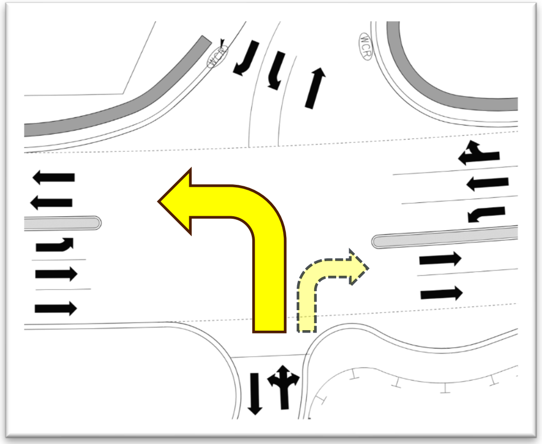
Departure Sight Triangles (Stop-Controlled)

Figure 9-17. Departure Sight Triangles for Intersections

CASE B1: Left Turn From Minor Road (Unsignalized)

Table 9-6. Time Gap for Case B1, Left Turn from Stop

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	7.5
Single-unit truck	9.5
Combination truck	11.5



Note: Time gaps are for a stopped vehicle to turn left onto a two-lane highway with no median and with minor-road approach grades of 3 percent or less. The time gaps are applicable to determining sight distance to the right in left-turn maneuvers. The table values should be adjusted as follows:

For multilane roadways or medians—For left turns onto two-way roadways with more than two lanes, including turn lanes, add 0.5 s for passenger cars or 0.7 s for trucks for each additional lane, from the left, in excess of one, to be crossed by the turning vehicle. Median widths should be converted to an equivalent number of lanes in applying the 0.5 and 0.7 s criteria presented above; for example, an 18-ft [5.5-m] median is equivalent to one and a half lanes, and would require an additional 0.75 s for a passenger to cross and an additional 1.05 s for a truck to cross.

For minor-road approach grades—If the approach grade is an upgrade that exceeds 3 percent, add 0.2 s for each percent grade by which the approach grade exceeds zero percent.

CASE B1: Left Turn From Minor Road (Unsignalized)

- PASSENGER CAR
- TWO-LANE ROAD
- NO MEDIAN
- LESS THAN 3 % SLOPE

Table 9-7. Design Intersection Sight Distance—Case B1, Left Turn from Stop

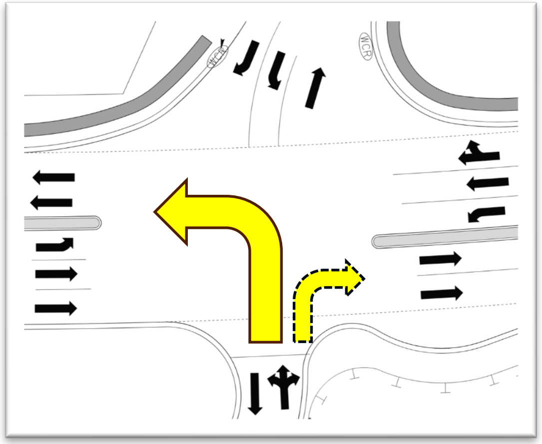
U.S. Customary			
Design Speed (mph)	Stopping Sight Distance (ft)	Intersection Sight Distance for Passenger Cars Calculated (ft)	Intersection Sight Distance for Passenger Cars Design (ft)
15	80	165.4	170
20	115	220.5	225
25	155	275.6	280
30	200	330.8	335
35	250	385.9	390
40	305	441.0	445
45	360	496.1	500
50	425	551.3	555
55	495	606.4	610
60	570	661.5	665
65	645	716.6	720
70	730	771.8	775
75	820	826.9	830
80	910	882.0	885

Metric			
Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars Calculated (m)	Intersection Sight Distance for Passenger Cars Design (m)
20	20	41.7	45
30	35	62.6	65
40	50	83.4	85
50	65	104.3	105
60	85	125.1	130
70	105	146.0	150
80	130	166.8	170
90	160	187.7	190
100	185	208.5	210
110	220	229.4	230
120	250	250.2	255
130	285	271.1	275

Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3 percent or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

CASE B1: Left Turn From Minor Road (Unsignalized)

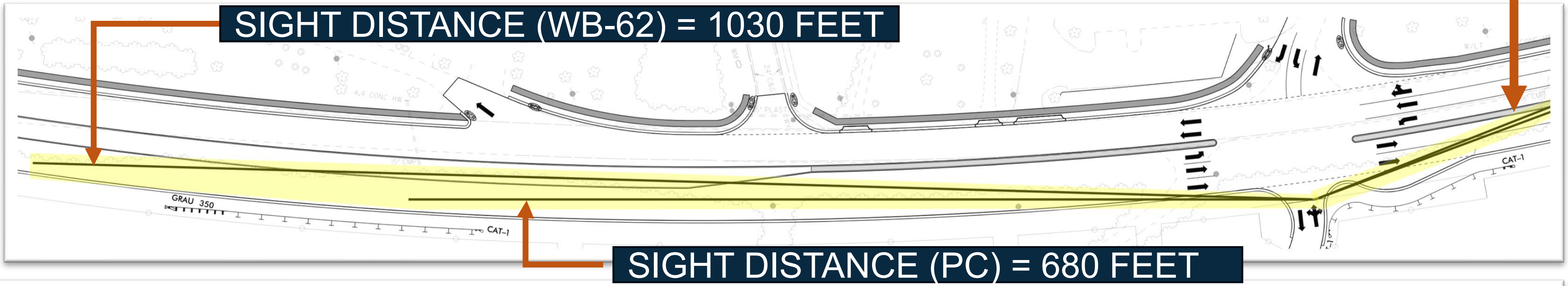
EXAMPLE:

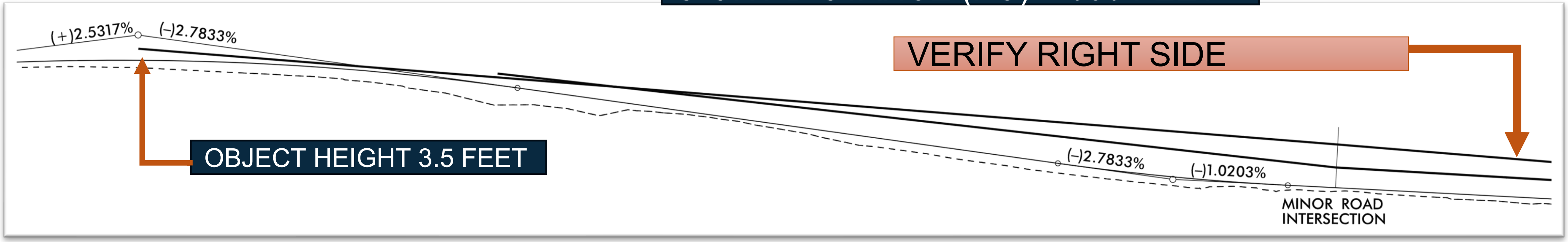


$Leg_{major} = 1.47 \times V_{major} \times t_g$

- V_{major} = 50 mph
- Combination Truck base t_g = 11.5 sec
- Crossing 3 lanes
- Add median timing
- CALCULATED ISD = 1025.32 feet
- **DESIGN ISD = 1030 feet**

CALCULATE FOR RIGHT SIDE





CASE B2:
RIGHT TURN FROM MINOR ROAD (UNSIGNALIZED)

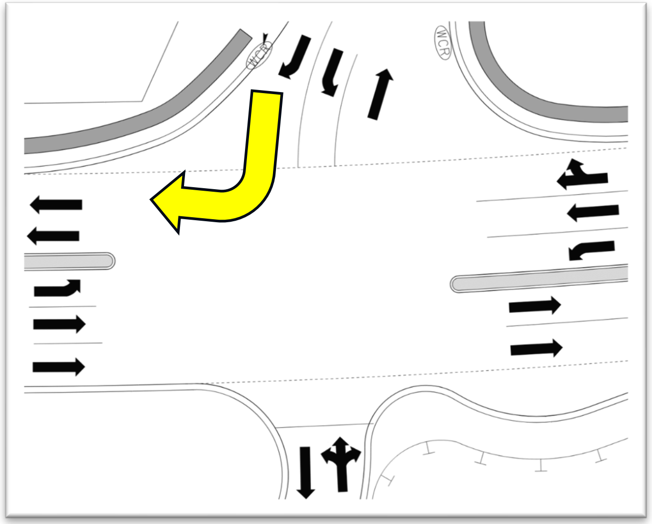


Table 9-8. Time Gap for Case B2—Right Turn from Stop

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	6.5
Single-unit truck	8.5
Combination truck	10.5

Note: Time gaps are for a stopped vehicle to turn right onto or to cross a two-lane roadway with no median and with minor-road approach grades of 3 percent or less. The table values should be adjusted as follows:

For minor-road approach grades—If the approach grade is an upgrade that exceeds 3 percent, add 0.1 s for each percent grade by which the approach grade exceeds zero percent.

CASE B2: Right Turn From Minor Road (Unsignalized):

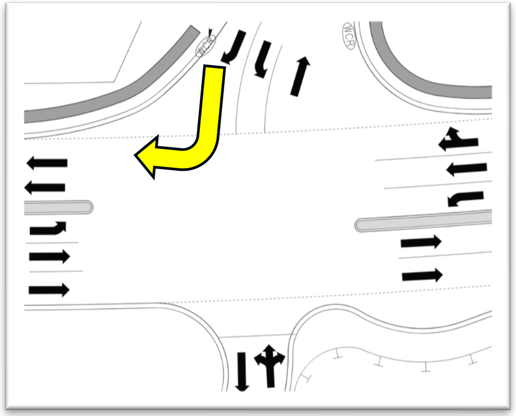
- PASSENGER CAR
- TWO-LANE ROAD
- NO MEDIAN
- LESS THAN 3 % SLOPE

Table 9-9. Design Intersection Sight Distance—Case B2, Right Turn from Stop

U.S. Customary				Metric			
Design Speed (mph)	Stopping Sight Distance (ft)	Intersection Sight Distance for Passenger Cars		Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (ft)	Design (ft)			Calculated (m)	Design (m)
15	80	143.3	145	20	20	36.1	40
20	115	191.1	195	30	35	54.2	55
25	155	238.9	240	40	50	72.3	75
30	200	286.7	290	50	65	90.4	95
35	250	334.4	335	60	85	108.4	110
40	305	382.2	385	70	105	126.5	130
45	360	430.0	430	80	130	144.6	145
50	425	477.8	480	90	160	162.6	165
55	495	525.5	530	100	185	180.7	185
60	570	573.3	575	110	220	198.8	200
65	645	621.1	625	120	250	216.8	220
70	730	668.9	670	130	285	234.9	235
75	820	716.6	720				
80	910	764.4	765				

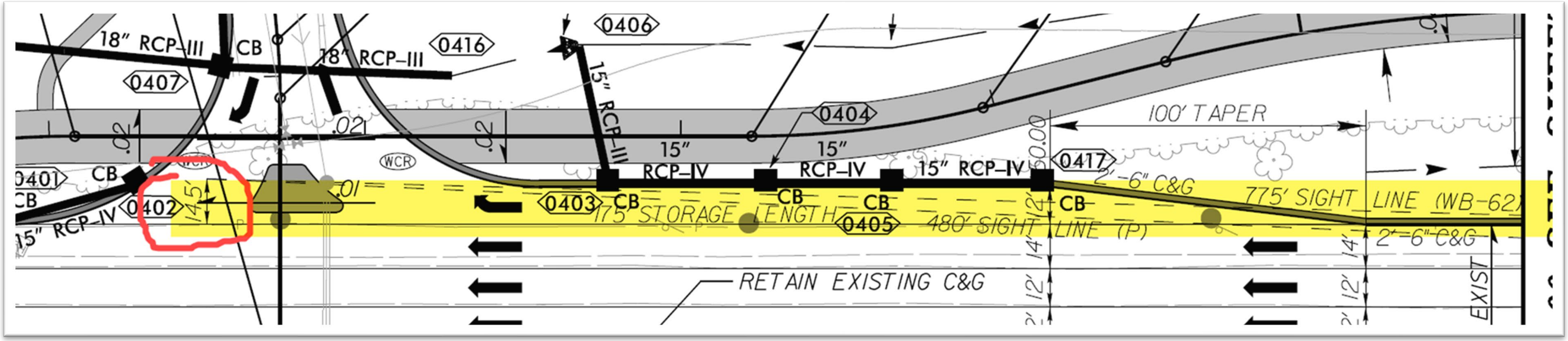
Note: Intersection sight distance shown is for a stopped passenger car to turn right onto or to cross a two-lane roadway with no median and with grades of 3 percent or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

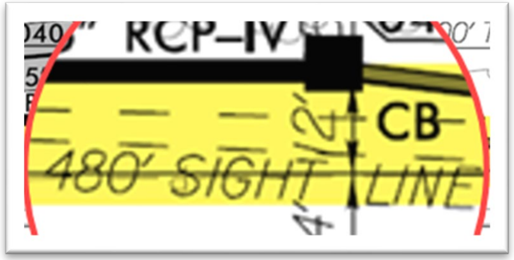
CASE B2: RIGHT TURN FROM MINOR ROAD (UNSIGNALIZED)



$Leg_{major} = 1.47 \times V_{major} \times t_g$

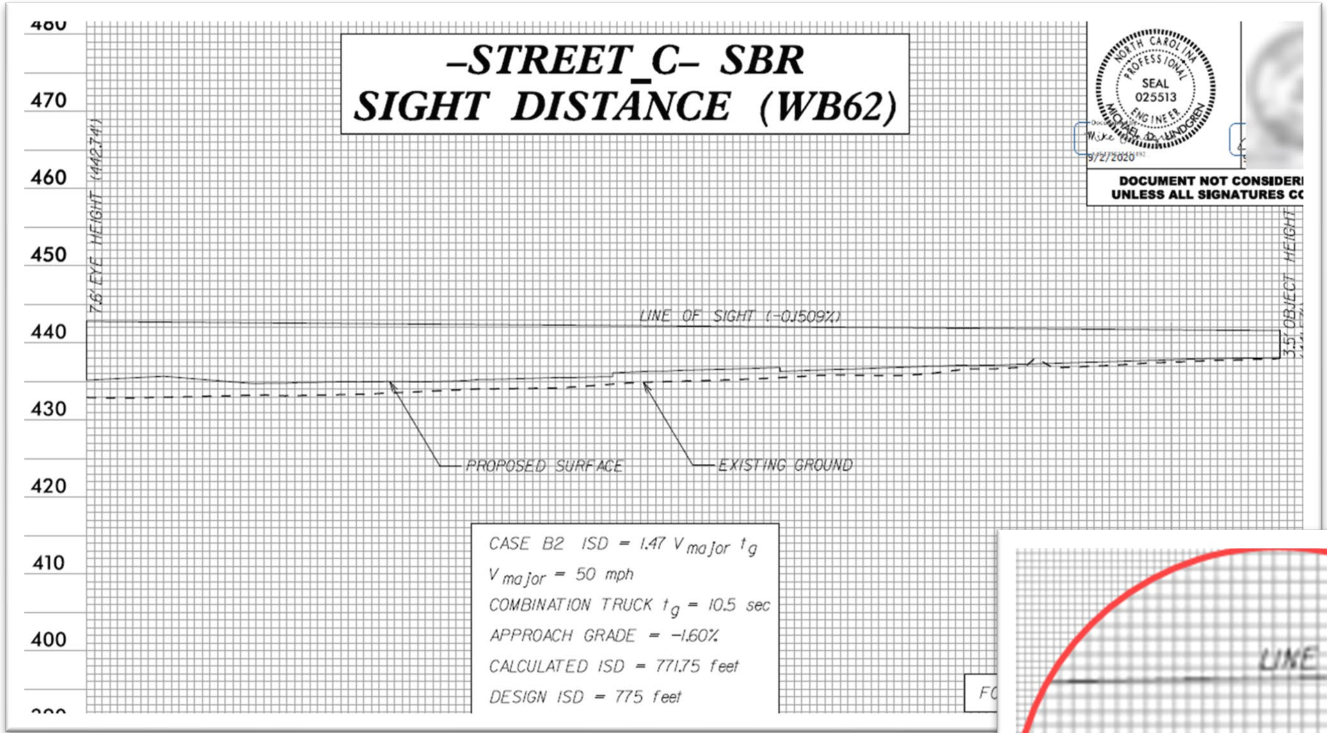
- V_{major} = 50 mph
- Combination Truck base t_g = 10.5 sec
- No lanes crossing
- No median timing
- CALCULATED ISD = 771.75 feet
- **DESIGN ISD = 775 feet**

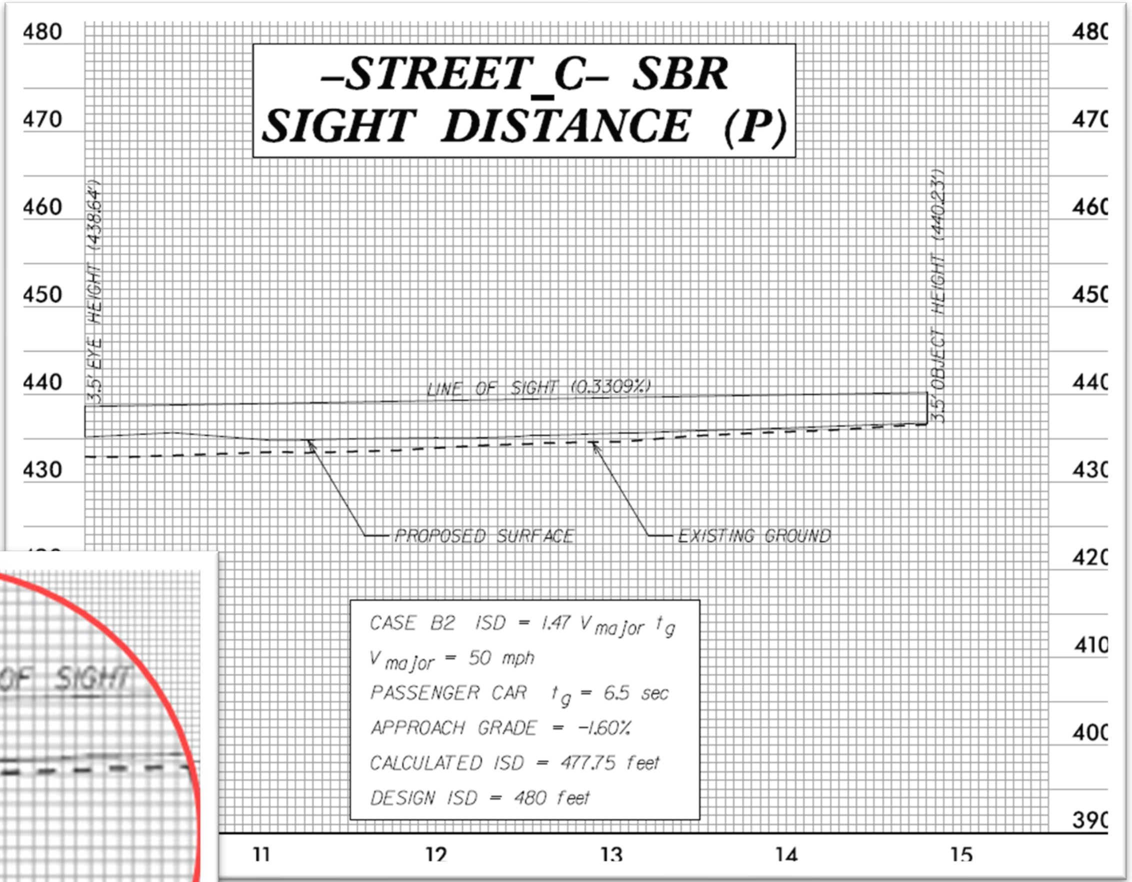


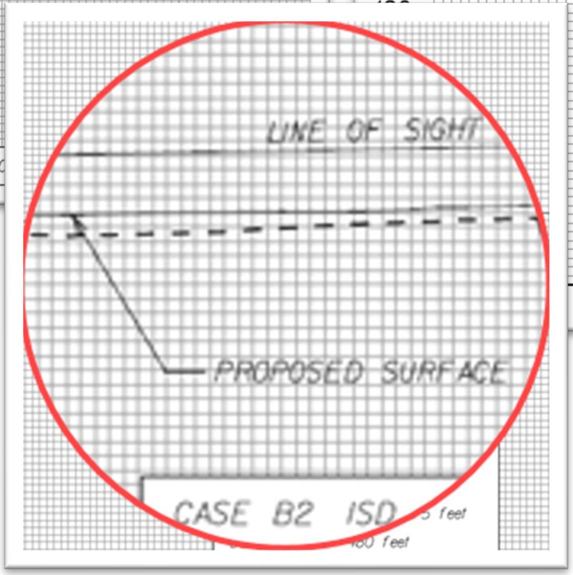


CASE B2: RIGHT TURN FROM MINOR ROAD (UNSIGNALIZED):

ISD = (1.47)(50)(10.5)=771.75FT; ROUND TO 775 FT







CASE F:
LEFT TURN FROM MAJOR ROAD (UNSIGNALIZED)

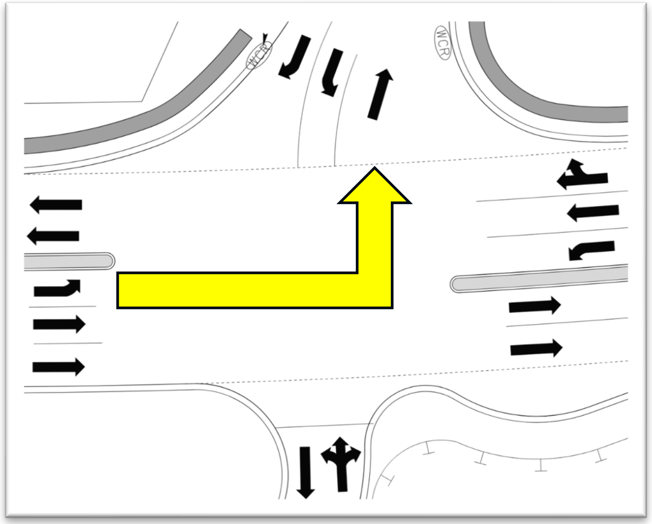


Table 9-16—Time Gap for Case F, Left Turns from the Major Road

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	5.5
Single-unit truck	6.5
Combination truck	7.5

Note: Time gaps are for a stopped vehicle turning left from a two-lane highway with no median

For multilane and/or divided roadways—For left turns on two-way roadways across more than one opposing lane, including turn lanes, add 0.5 s for passenger cars or 0.7 s for trucks for each additional lane to be crossed in the left-turn maneuver in excess of one lane. Where the left-turning vehicle must pass through a median, the median width should be converted to an equivalent number of lanes; for example, an 18-ft [5.5-m] median would be equivalent to one and a half lanes and crossing through the median would require an additional 0.75 s for a passenger car and 1.05 s for a truck. The table also contains appropriate adjustment factors for the number of major-road lanes to be crossed by the turning vehicle. The unadjusted time gap in Table 9-16 for passenger cars was used to develop the sight distances in Table 9-17.

CASE F: Left Turn From Major Road (Unsignalized):

- PASSENGER CAR
- TWO-LANE ROAD
- NO MEDIAN

Table 9-17. Intersection Sight Distance—Case F, Left Turn from the Major Road

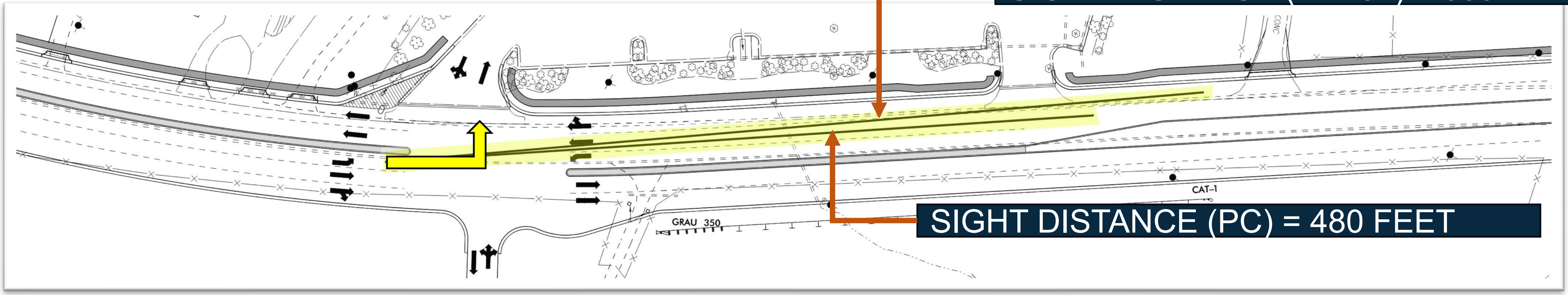
U.S. Customary			
Design Speed (mph)	Stopping Sight Distance (ft)	Intersection Sight Distance Passenger Cars Calculated (ft)	Intersection Sight Distance Passenger Cars Design (ft)
15	80	121.3	125
20	115	161.7	165
25	155	202.1	205
30	200	242.6	245
35	250	283.0	285
40	305	323.4	325
45	360	363.8	365
50	425	404.3	405
55	495	444.7	445
60	570	485.1	490
65	645	525.5	530
70	730	566.0	570
75	820	606.4	610
80	910	646.8	650

Metric			
Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance Passenger Cars Calculated (m)	Intersection Sight Distance Passenger Cars Design (m)
20	20	30.6	35
30	35	45.9	50
40	50	61.2	65
50	65	76.5	80
60	85	91.7	95
70	105	107.0	110
80	130	122.3	125
90	160	137.6	140
100	185	152.9	155
110	220	168.2	170
120	250	183.5	185
130	285	198.8	200

Note: Intersection sight distance shown is for a passenger car making a left turn from an undivided roadway. For other conditions and design vehicles, the time gap should be adjusted and the sight distance recalculated.

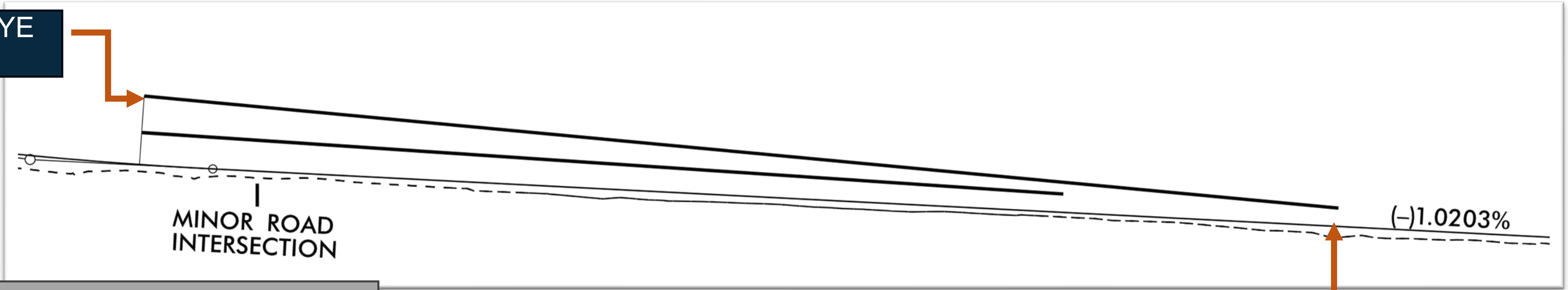
CASE F: LEFT TURN FROM MAJOR ROAD (UNSIGNALIZED)

SIGHT DISTANCE (WB-62) = 660 FEET



SIGHT DISTANCE (PC) = 480 FEET

TRUCK DRIVER EYE HEIGHT

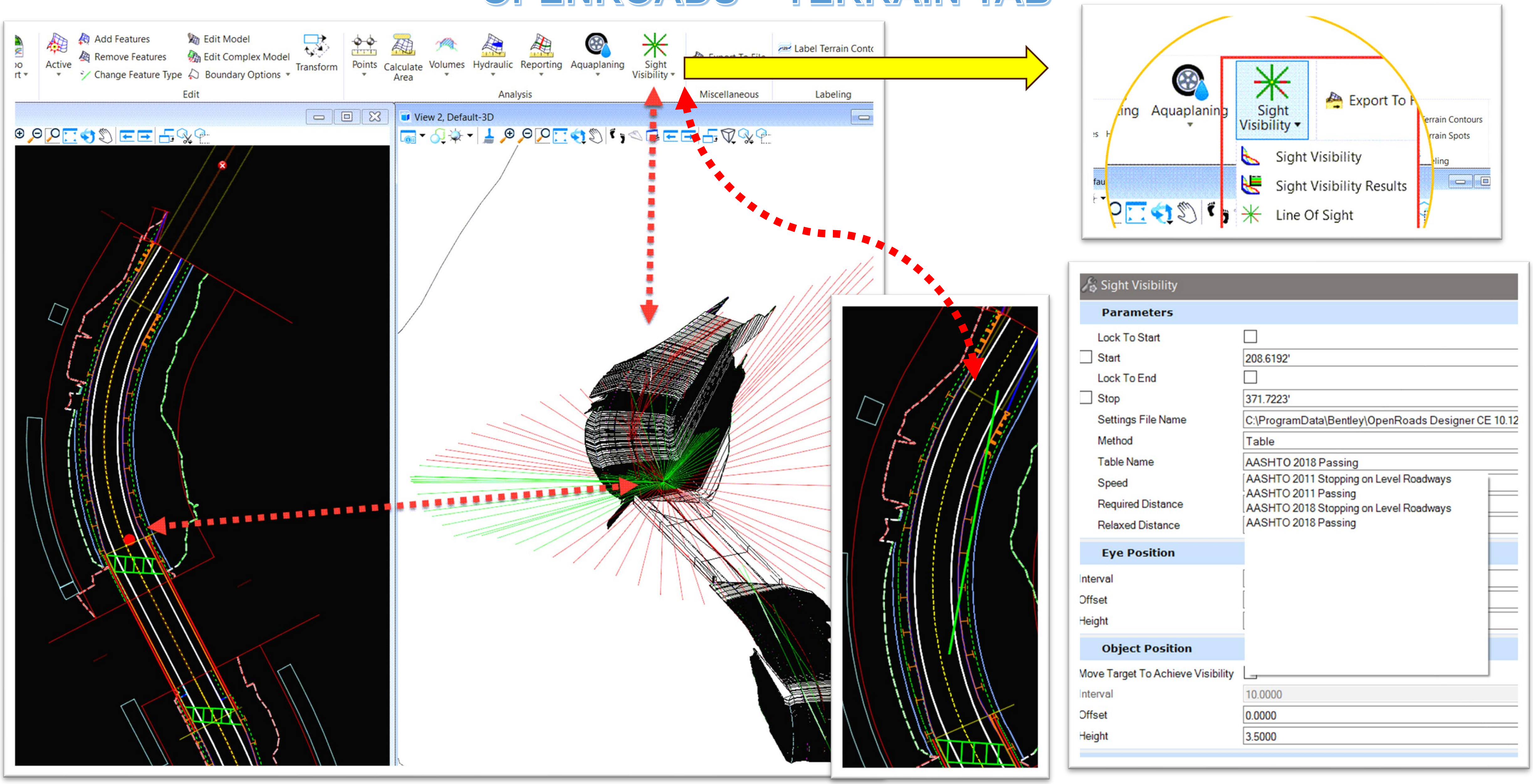


OBJECT HEIGHT 3.5 FEET

Leg_{major} = 1.47 x V_{major} x t_g

- V_{major} = 50 mph
- Combination Truck base t_g = 7.5 sec
- 2 lanes to cross
- CALCULATED ISD = 654.15 feet
- **DESIGN ISD = 660 feet**

OPENROADS – TERRAIN TAB



Sight Visibility Results - Section: SSD1

☑ Achieved ☑ Relaxed ☑ Not Achieved ☐ Show Selected

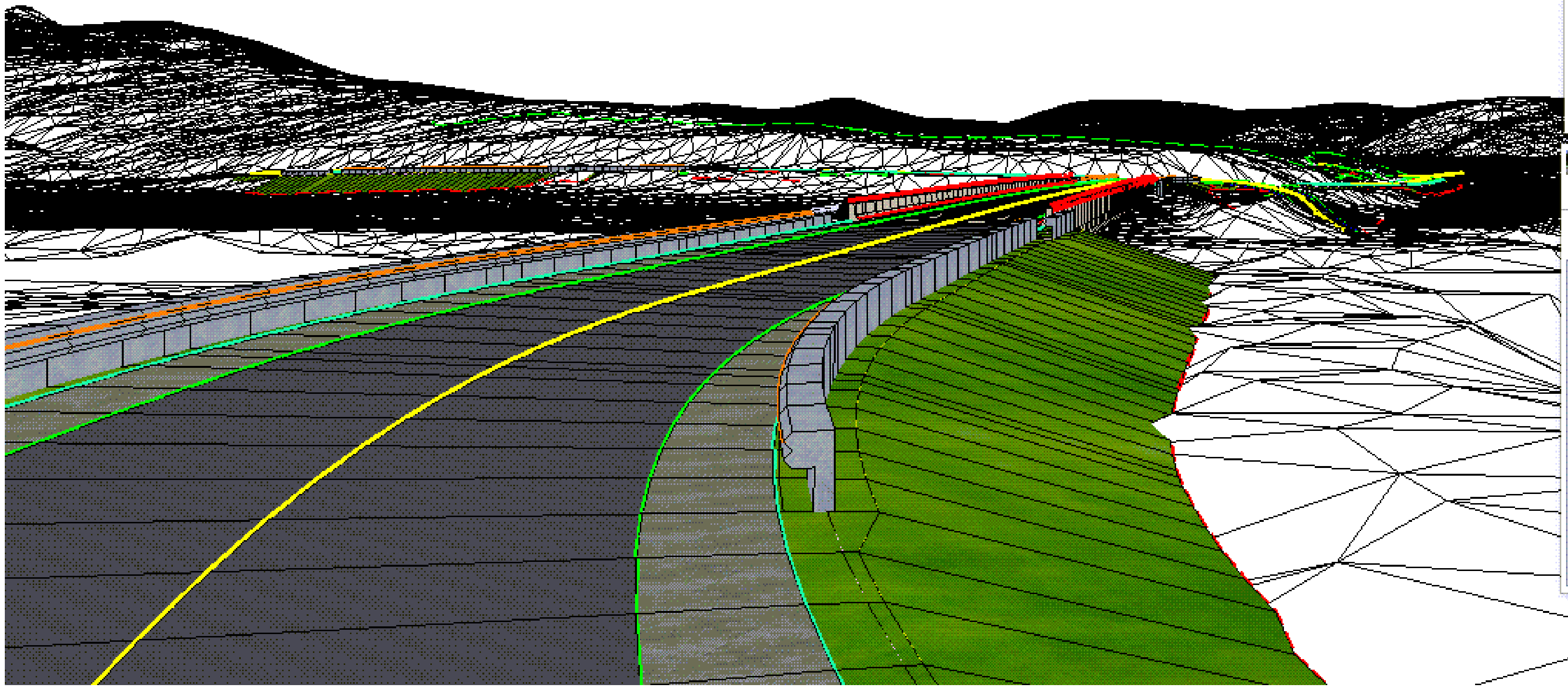
Eye Position	Object Position	Eye Level	Actual Level	Object Level	Design Speed	Instantaneous Grade	Average Grade	Sight Distance Required	Sight Distance Relaxed	Sight Distance Achieved	Sight Distance Along Sight Line Achieved	Sight Line Status
0+00.00	9+10.00	2928.945	2963.739	2963.739	80.000	0.0000%	0.0000%	910.000	910.000	910.000	910.000	Achieved
0+50.00	9+60.00	2930.940	2965.645	2965.645	80.000	0.0000%	0.0000%	910.000	910.000	910.000	910.000	Achieved
1+00.00	10+10.00	2932.928	2967.643	2967.643	80.000	0.0000%	0.0000%	910.000	910.000	910.000	910.000	Achieved
1+50.00	10+60.00	2934.853	2969.579	2969.579	80.000	0.0000%	0.0000%	910.000	910.000	910.000	910.000	Achieved
2+00.00	11+10.00	2936.812	2971.582	2971.582	80.000	0.0000%	0.0000%	910.000	910.000	910.000	910.000	Achieved
[illegible]	[illegible]	2938.803	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Achieved
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	80.000	[illegible]	[illegible]	910.000	[illegible]	[illegible]	910.000	[illegible]
7+00.00	16+10.00	2956.958	2986.892	2986.892	80.000	0.0000%	0.0000%	910.000	910.000	910.000	910.000	Achieved
7+50.00	16+50.00	2959.018	2987.777	2987.777	80.000	0.0000%	0.0000%	910.000	910.000	900.000	900.000	Not Achieved
8+00.00	16+70.00	2961.011	2988.167	2988.167	80.000	0.0000%	0.0000%	910.000	910.000	870.000	870.000	Not Achieved
8+50.00	16+90.00	2962.982	2988.540	2988.540	80.000	0.0000%	0.0000%	910.000	910.000	840.000	840.000	Not Achieved
9+00.00	17+10.00	2964.866	2988.888	2988.888	80.000	0.0000%	0.0000%	910.000	910.000	810.000	810.000	Not Achieved
9+50.00	17+30.00	2966.746	2989.218	2989.218	80.000	0.0000%	0.0000%	910.000	910.000	780.000	780.000	Not Achieved
10+00.00	17+60.00	2968.745	2989.658	2989.658	80.000	0.0000%	0.0000%	910.000	910.000	760.000	760.000	Not Achieved
10+50.00	18+00.00	2970.684	2990.239	2990.239	80.000	0.0000%	0.0000%	910.000	910.000	750.000	750.000	Not Achieved
11+00.00	18+50.00	2972.690	2990.877	2990.877	80.000	0.0000%	0.0000%	910.000	910.000	750.000	750.000	Not Achieved

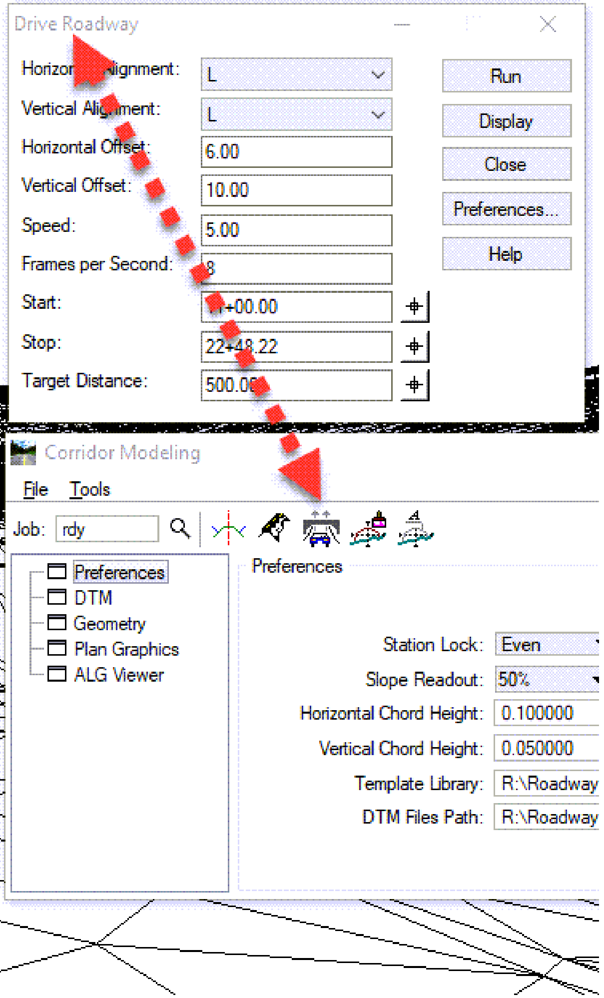
ORD TOOL AVAILABLE :

- REQUIRES AN XML SETTING FILE.
  - C:\ProgramData\Bentley\OpenRoads Designer CE 10.12\
    - Configuration\Organization-Civil_Civil Default Standards - Imperial\Sight Visibility\Sight Visibility Tables and Equations Imperial.xml
- THE SETTING FILE WILL BE INCORPORATED INTO NCDOT WORKSPACE SOON.

SS2 DRIVE THRU OPTION TO VISUALLY CHECK SIGHT VISIBILITY

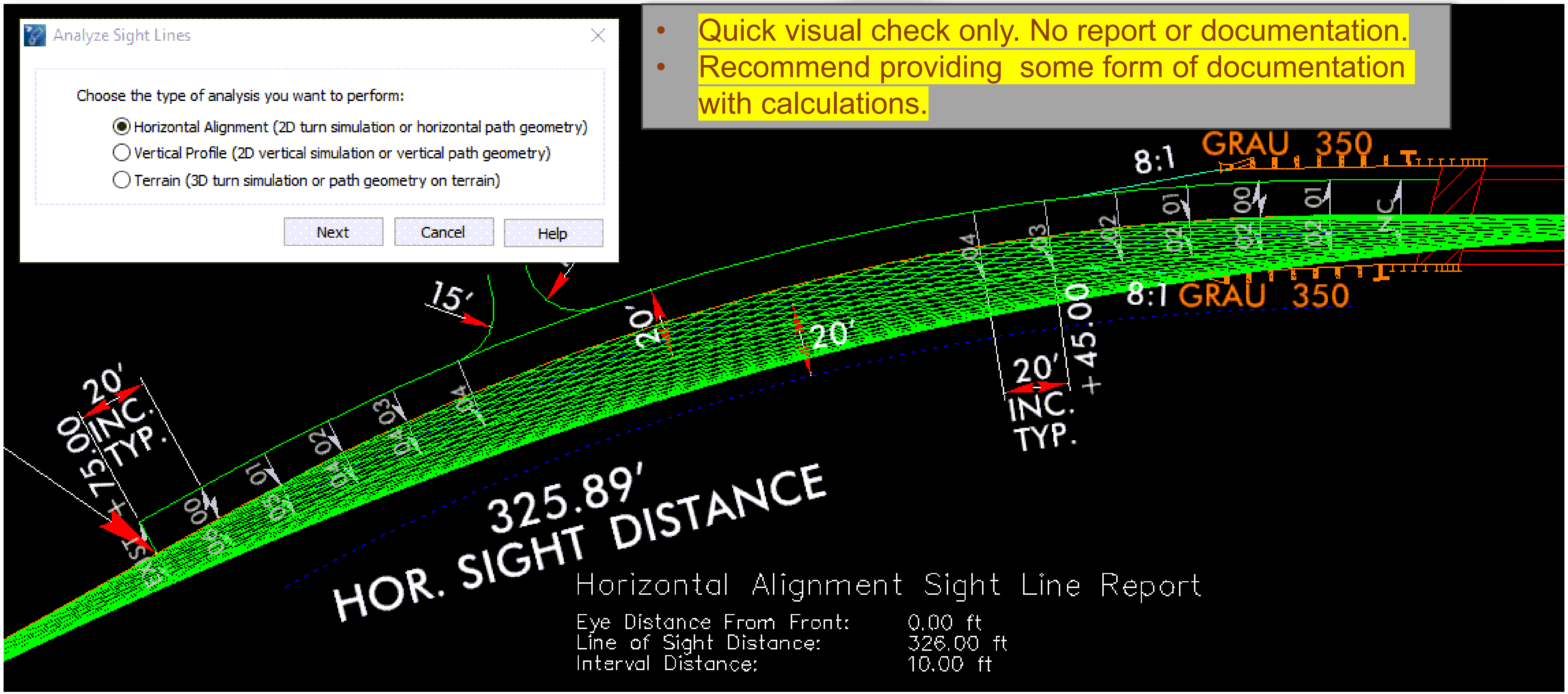
- Quick **visual** check only. No report or documentation.
- Recommend providing some form of documentation with calculations.

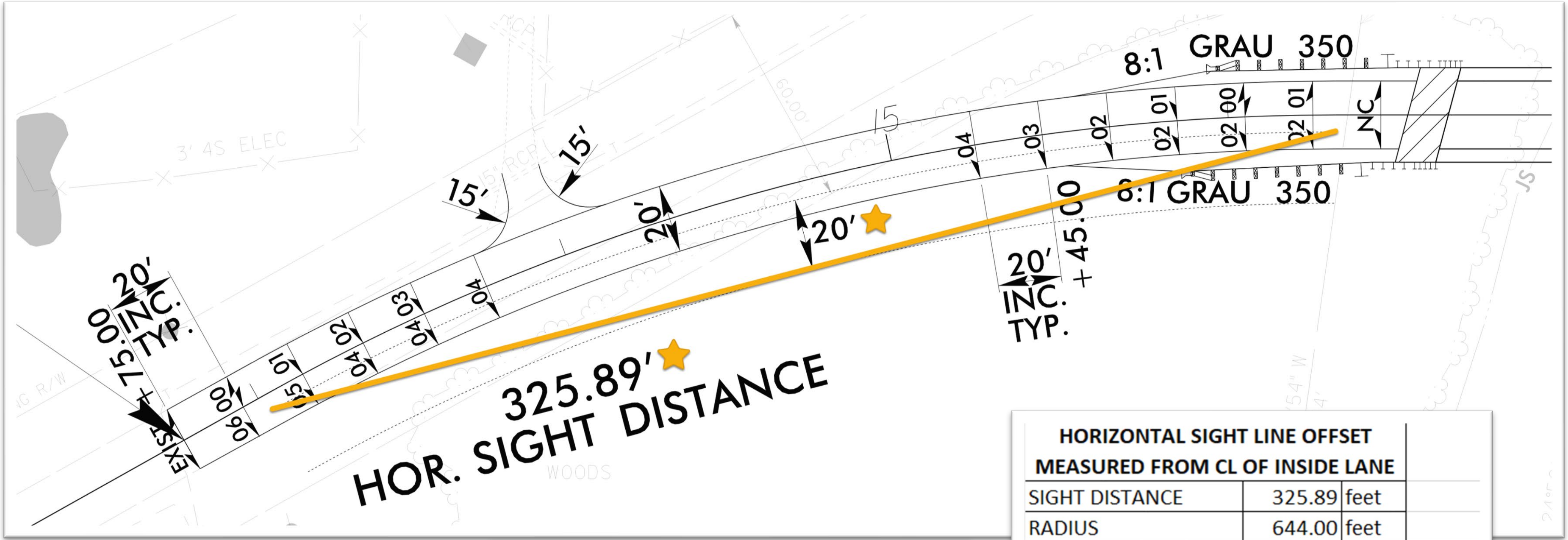




AUTOTURN SIGHT LINE VISUAL CHECK TOOL

- Quick visual check only. No report or documentation.
- Recommend providing some form of documentation with calculations.





HORIZONTAL SIGHT LINE OFFSET MEASURED FROM CL OF INSIDE LANE		
SIGHT DISTANCE	325.89	feet
RADIUS	644.00	feet
M (HOR OFFSET)	**20.51**	**feet**

SIGHT DISTANCE FROM CL OF INSIDE LANE		
RADIUS	644	feet
M (HOR OFFSET)	20.5	feet
SIGHT DISTANCE	**325.83**	**feet**

MANUAL CHECK

$$HSO = R\left[1 - \cos\left(\frac{28.65S}{R}\right)\right]$$

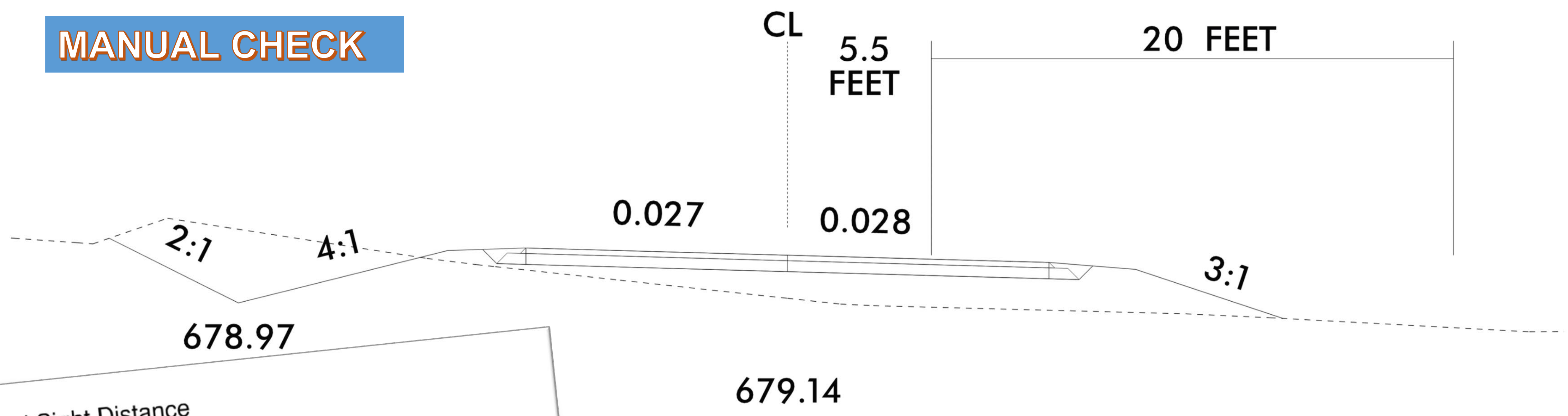
where:

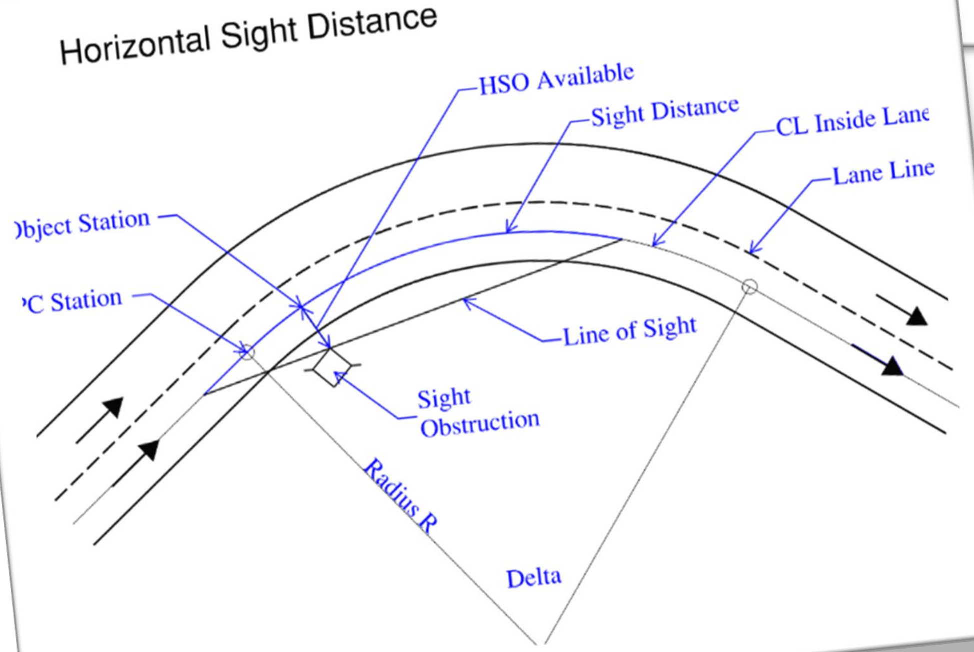
HSO = Horizontal sight line offset, ft

S = Sight distance, ft

R = Radius of curve, ft

MANUAL CHECK





U.S. Customary

$$HSO = R\left[1-\cos\left(\frac{28.65S}{R}\right)\right]$$

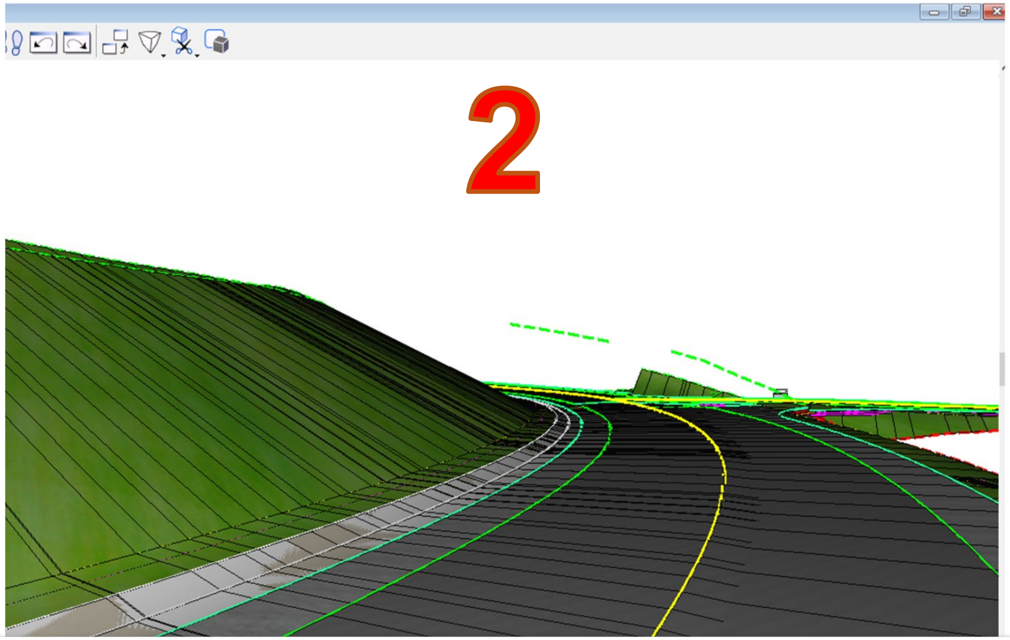
where:

HSO = Horizontal sight line offset, ft

S = Sight distance, ft

R = Radius of curve, ft

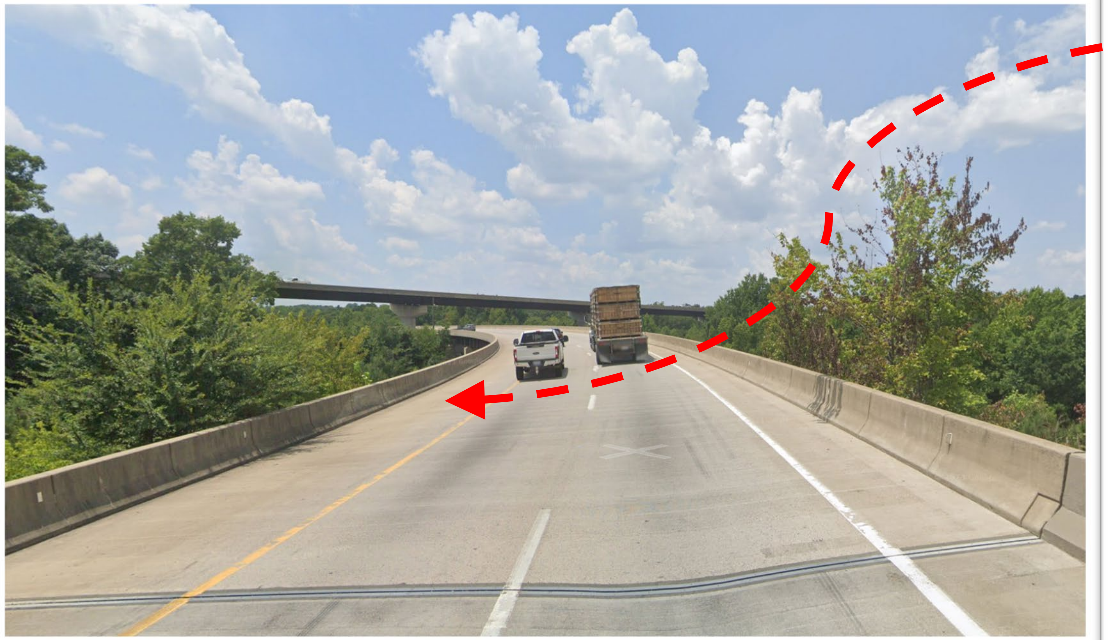

1

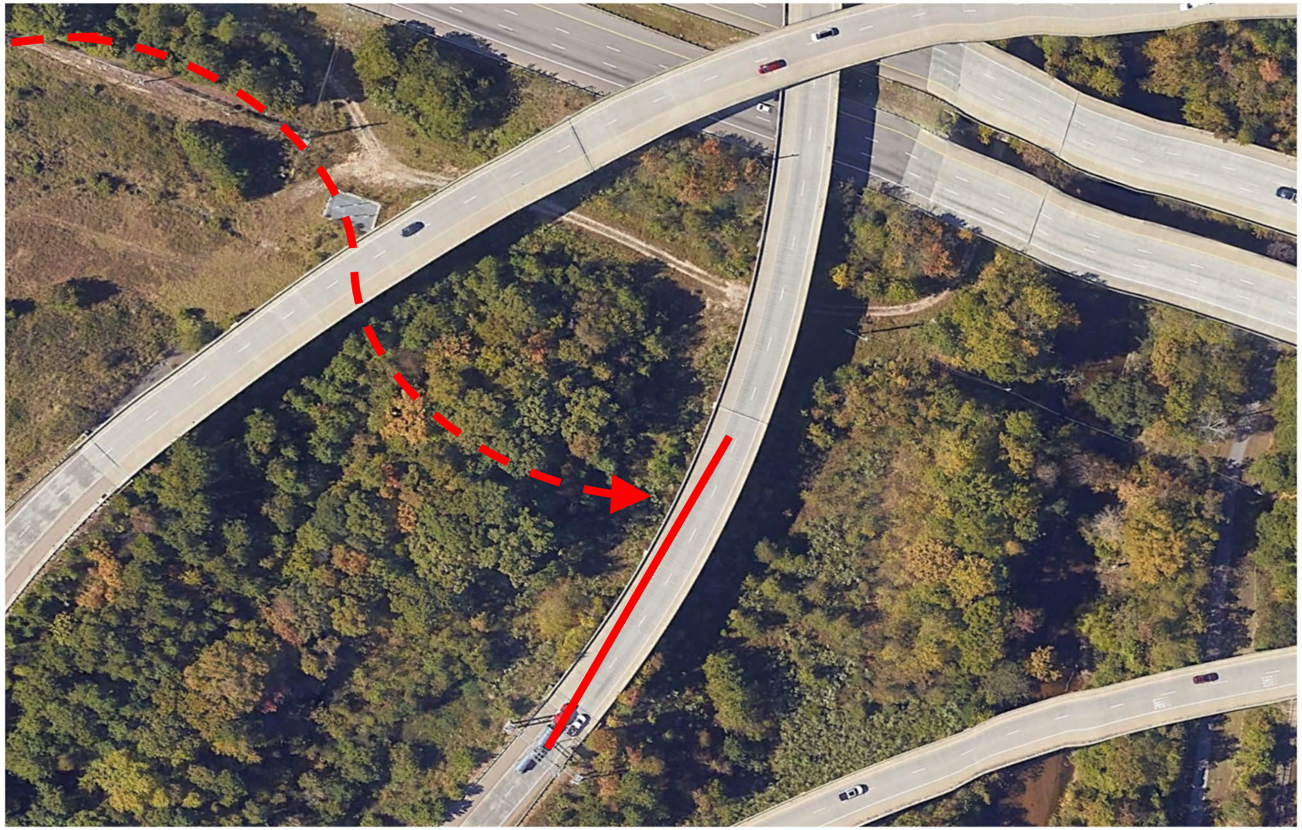

2


3


4
Click to view information about this Street View contributor.
Google Ear

HORIZONTAL SIGHT DISTANCE ON FLYOVERS





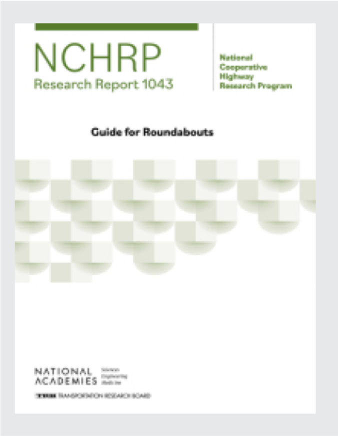
ON DIRECTIONAL INTERCHANGE RAMPS IT IS ACCEPTABLE TO SWITCH THE WIDENED OFFSET TO THE INSIDE OF THE CURVE WHEN NEEDED FOR HORIZONTAL SIGHT DISTANCE.

REFER TO GB CHAPTER 10 FOR ADDITIONAL INFORMATION.

ncdot.gov

CASE G: Roundabouts:

This PDF is available at http://nap.nationalacademies.org/27069



Guide for Roundabouts (2023)

BUY THIS BOOK

FIND RELATED TITLES

DETAILS

426 pages | 8.5 x 11 | PDF
ISBN 978-0-309-69840-5 | DOI 10.17226/27069

CONTRIBUTORS

Kittelson & Associates, Inc., Sunrise Transportation Strategies, LLC, Texas A&M Transportation Institute, Kimley-Horn and Associates, Inc., and Accessible Design for the Blind, LLC; National Cooperative Highway Research Program; Transportation Research Board; National Academies of Sciences, Engineering, and Medicine

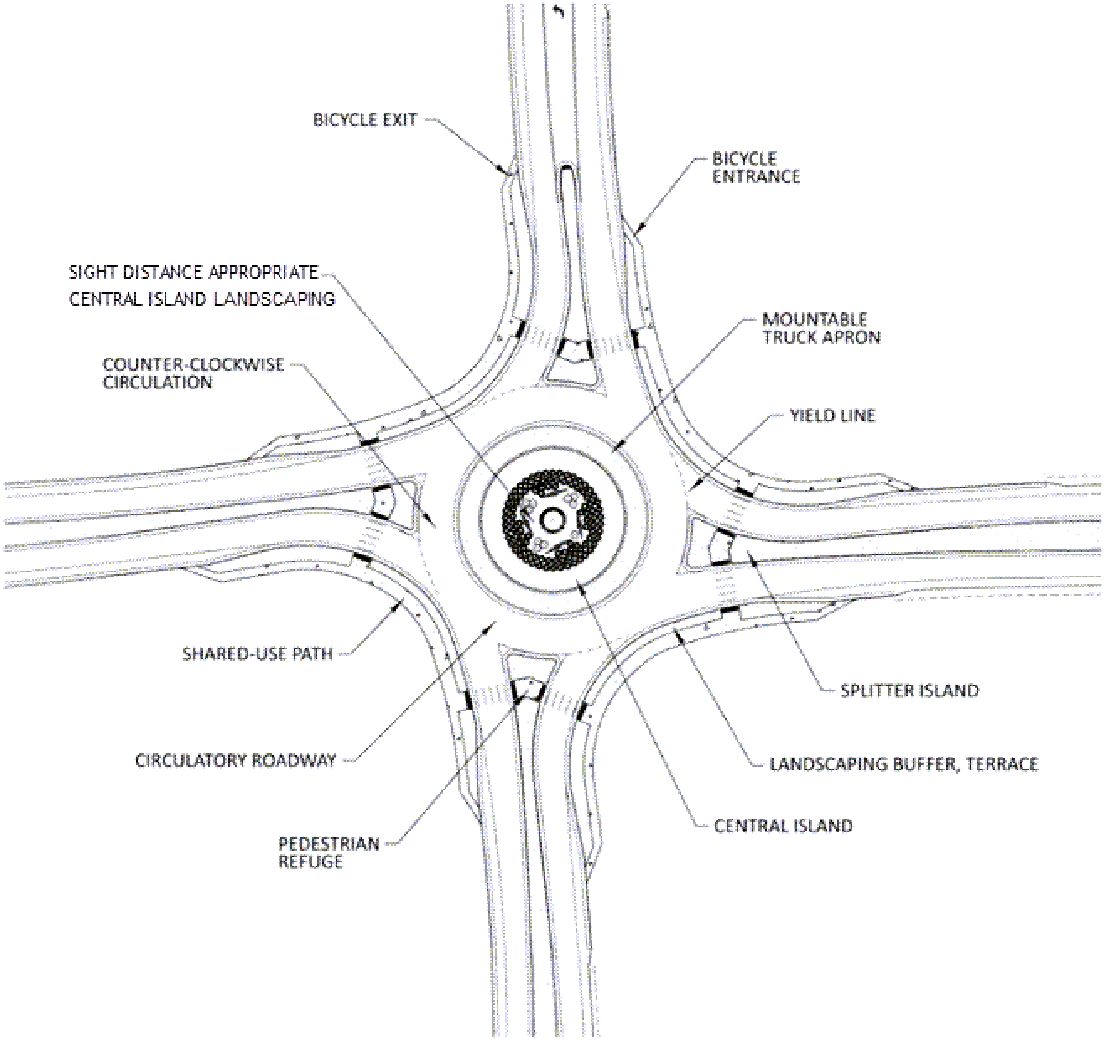
SUGGESTED CITATION

National Academies of Sciences, Engineering, and Medicine. 2023. *Guide for Roundabouts*. Washington, DC: The National Academies Press. https://doi.org/10.17226/27069.

CASE G: Roundabouts:

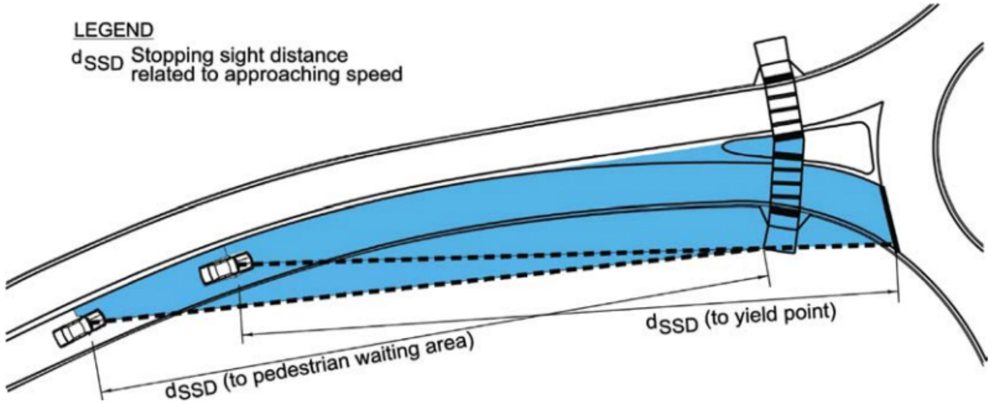
Typical Single Lane Roundabout

- Common roundabout sight distance concerns:
  - Entry visibility
  - Central island visibility
  - Pedestrian crossings
  - Landscaping and Signage
  - Vertical Grade Changes



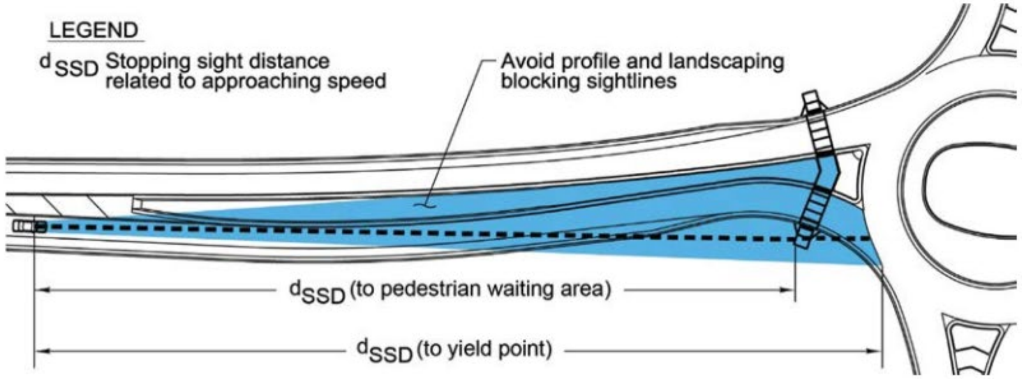
CASE G: Roundabouts: Stopping Sight Distance

Exhibit 9.12. Stopping sight distance to the pedestrian crossing and entrance line on the approach.



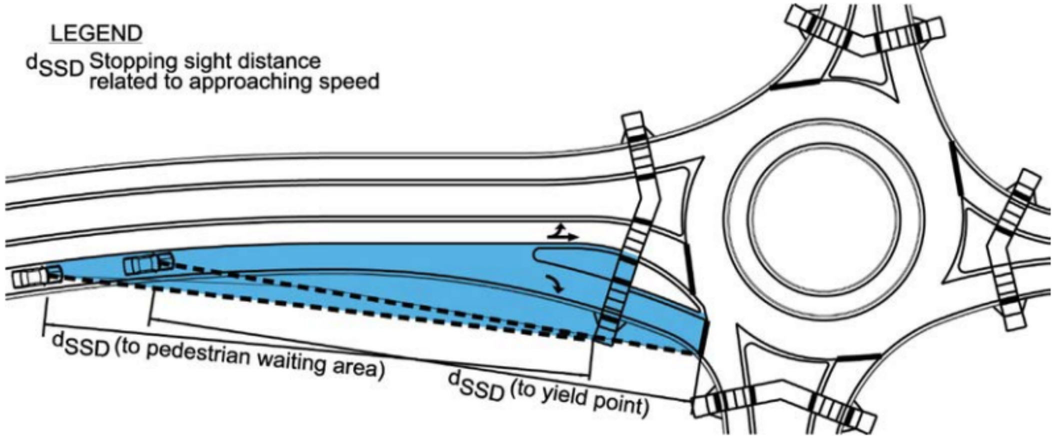
SOURCE: Adapted from Georgia Department of Transportation (*3*).

Exhibit 9.14. Stopping sight distance for approach curvature.



SOURCE: Adapted from Georgia Department of Transportation (*3*).

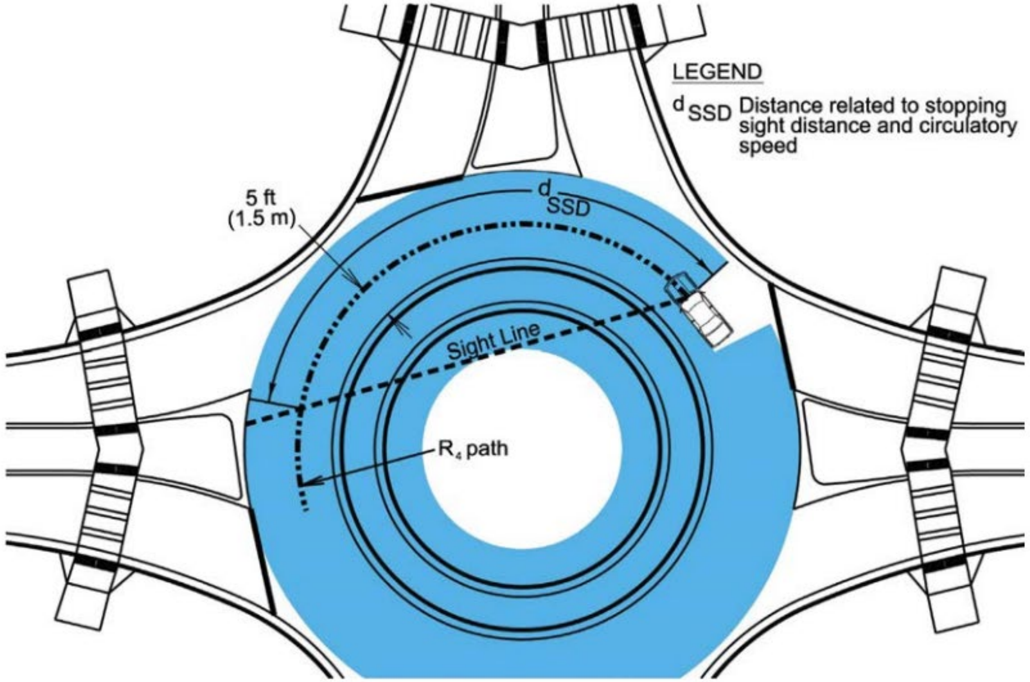
Exhibit 9.13. Stopping sight distance for a right-turn bypass lane.



SOURCE: Adapted from Georgia Department of Transportation (*3*).

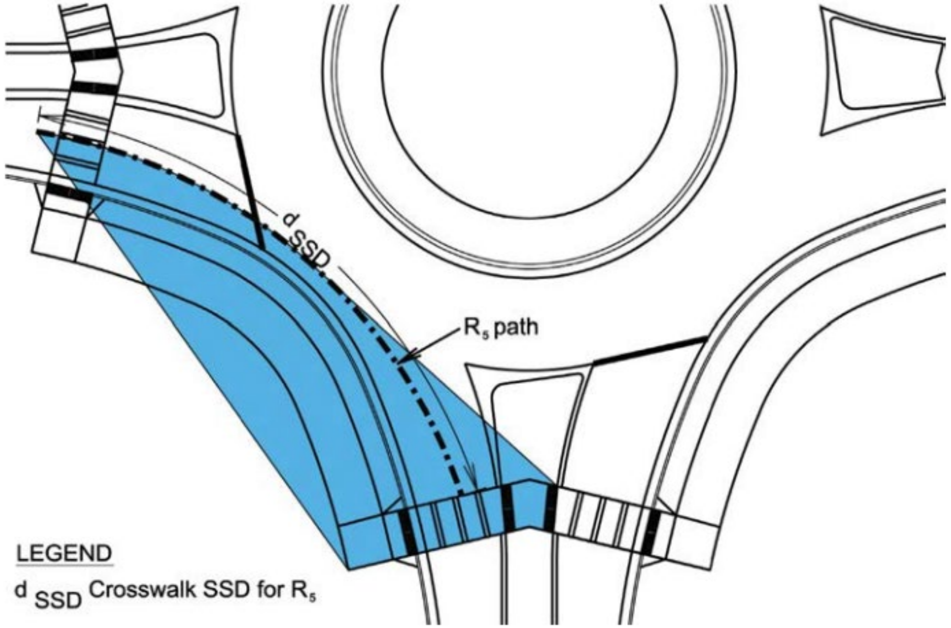
CASE G: Roundabouts: Stopping Sight Distance

Exhibit 9.15. Stopping sight distance on circulatory roadway.



SOURCE: Adapted from Georgia Department of Transportation (3).

Exhibit 9.16. Stopping sight distance to crosswalk on exit.



SOURCE: Adapted from Georgia Department of Transportation (3).

CASE G: Roundabouts: Intersection Sight Distance

US Customary

Equation 9.11

$$b_1 = 1.47V_{ent}\, t_g$$

Equation 9.12

$$b_2 = 1.47V_{circ}\, t_g$$

where

b_1 = length of entering branch of sight triangle (ft);

b_2 = length of circulating branch of sight triangle (ft);

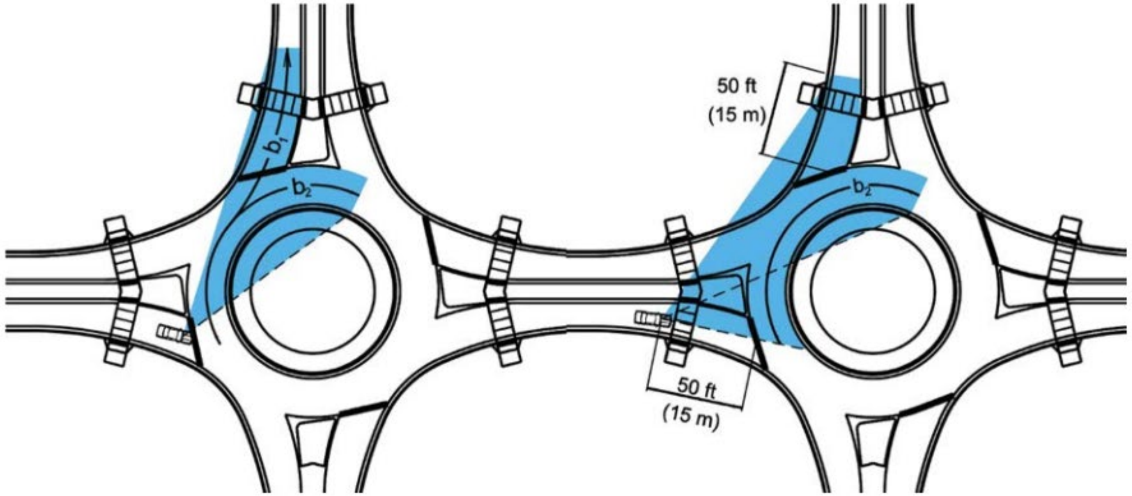
V_{ent} = speed of vehicles from upstream entry for the conflicting through movement, assumed to be average of V_1 and V_2 (mph);

V_{circ} = speed of circulating vehicles, assumed to be V_4 (mph); and

t_g = design headway (s, assumed to be 5.0 s).

- Use Equation 9.11 through 9.12 to obtain the distance for the two branches b_1 and b_2. b_1 and b_2 can then be used to calculate sight triangles

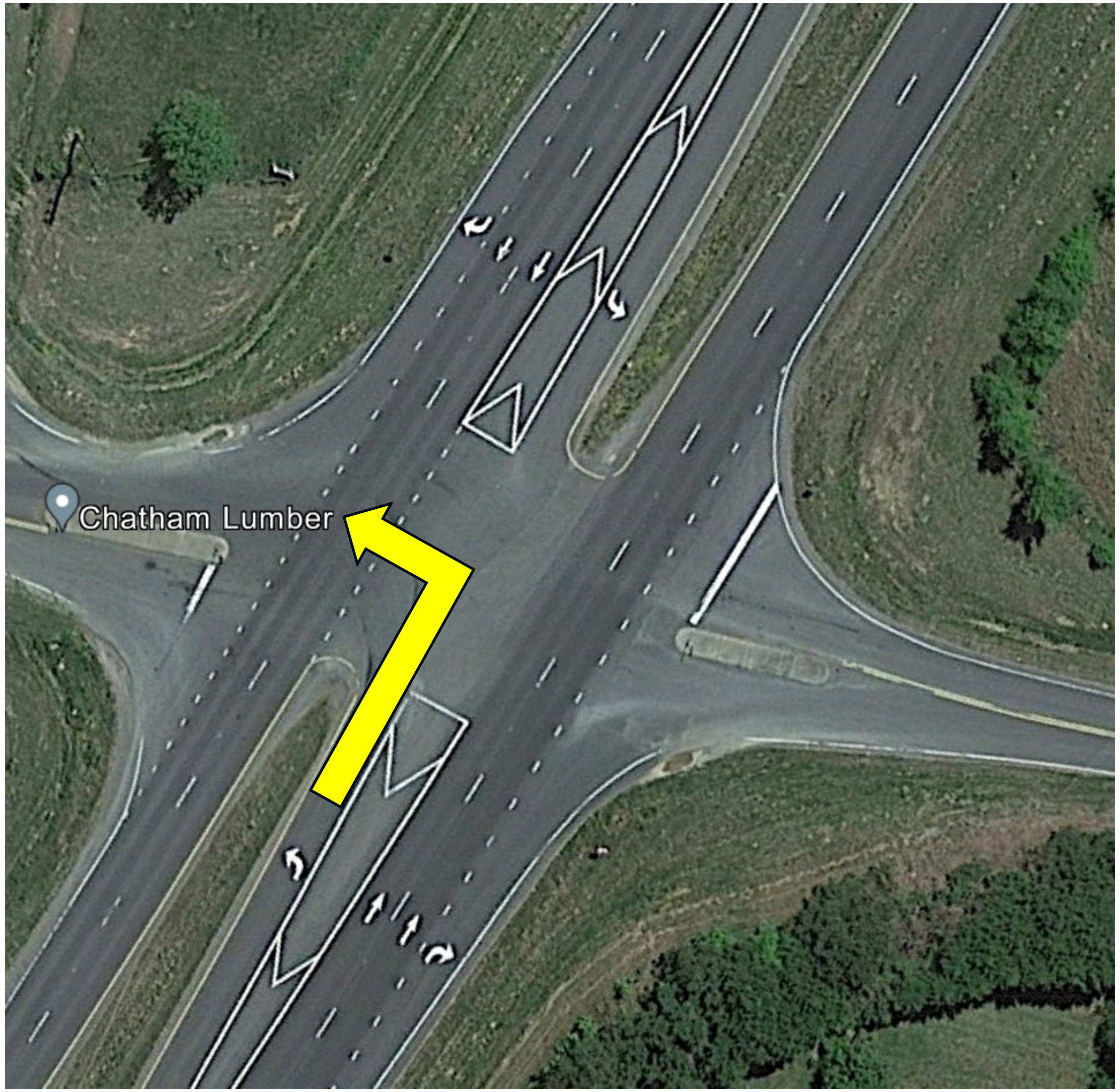
Exhibit 9.17. Intersection sight distance.



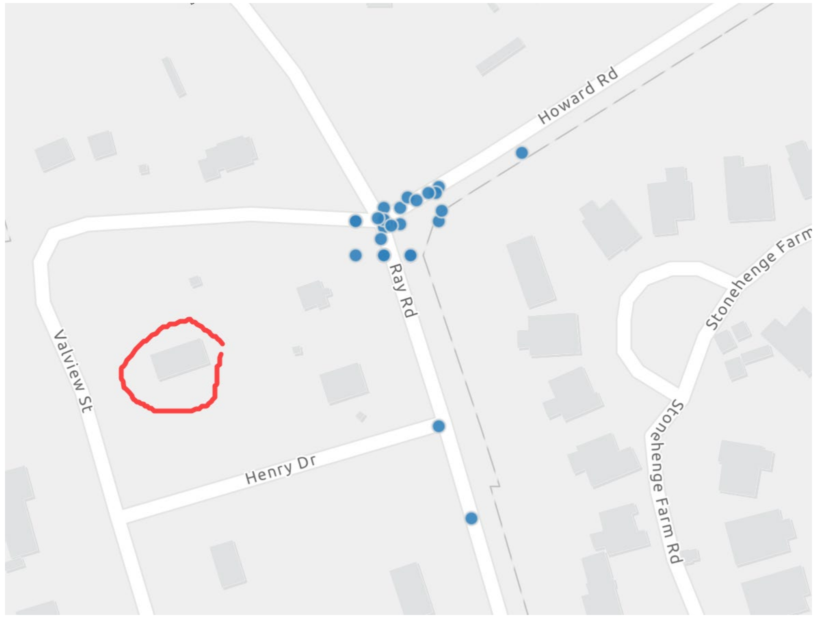
SOURCE: Adapted from Georgia Department of Transportation (3).

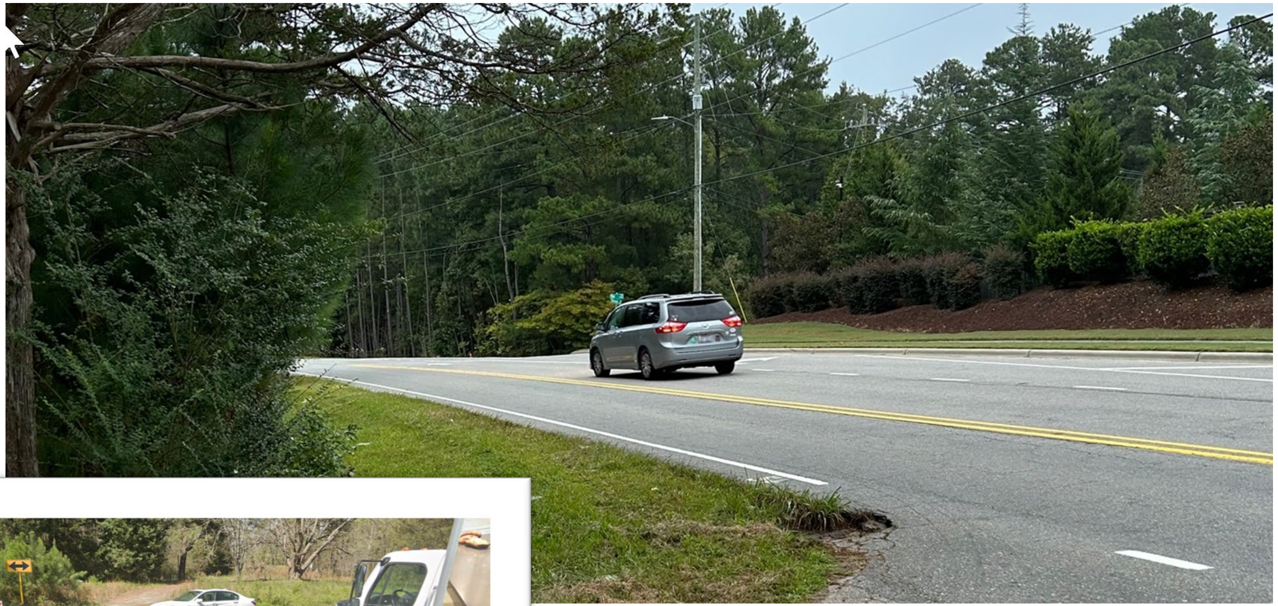
Offset Left Turn Lanes

- Offset left lane design helps to provide more sight distance
- Drivers have a clearer view of oncoming traffic
- Traffic can be better assessed reducing risk of collisions
- Allows drivers to have improved visibility of crosswalks and other pedestrian facilities



Example site:
Henry Drive next to Howard Road in Raleigh
(Valview leg was never built)
Howard Stop Sign with two lanes





Check with City of Raleigh and this intersection has been submitted for spot safety funding for signal but has not ranked high enough yet.

More Examples:

Four Way Stop – Recommend edging out slowly here.


STOP
Google
Image capture: Apr 2022


© 2021 Google
Google


Dancing Davis Creations
Bare Glo Studio

Neighborhood stop sign obstructed. Need to do some trimming. Tell someone.


Jun 2022
See more dates
SR 5943 Jackpine Dr 100
STOP
Jordan Rd


© 2022 Google
Google


40

If you see an issue, say something to a government agency.

City of Raleigh Website: https://raleighnc.gov/transportation/services/neighborhood-traffic-management

Multiway Stop Control Evaluations

The Neighborhood Traffic Management Program can look at any intersection throughout the City of Raleigh to see if the addition of a multiway stop will increase intersection safety. Multiway stops take the form of three-way or four-way stops.

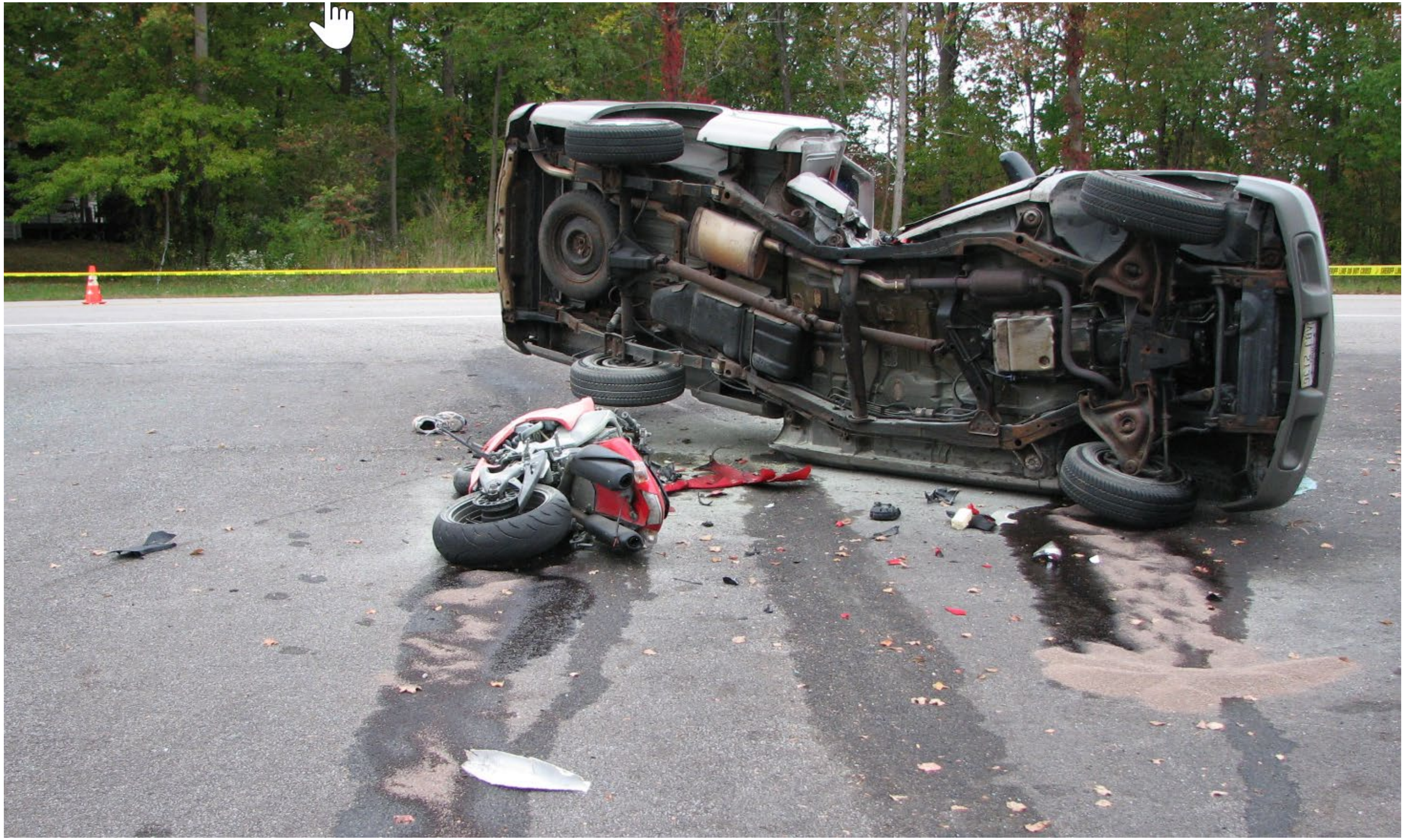
When performing our evaluation, staff will look at nationally recognized safety criteria to help determine if an intersection is appropriate for a multiway stop. The criteria we look at include:

1. Volumes of traffic (cars, bikes, and pedestrians) entering the intersection on each approach;
2. The number of crashes that have occurred within the last year at the intersection; and,
3. The sight distance for each approach at the intersection

After we review the information gathered from the criteria above, we will make our recommendation. If it is determined that adding stop signs will increase intersection safety, staff will present to City Council. Once approved, the signs will be put in place within seven days.

SIGHT DISTANCE MATTERS

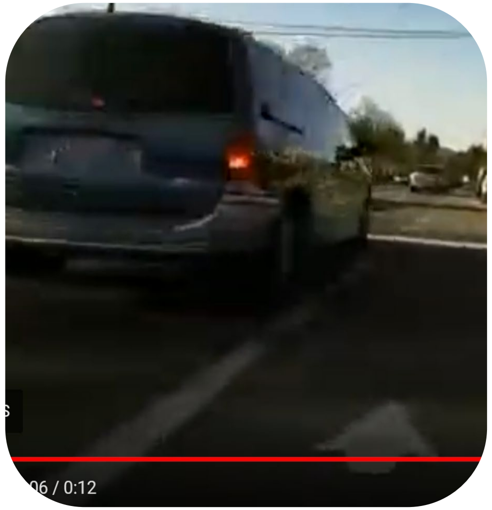
SIGHT DISTANCE MATTERS

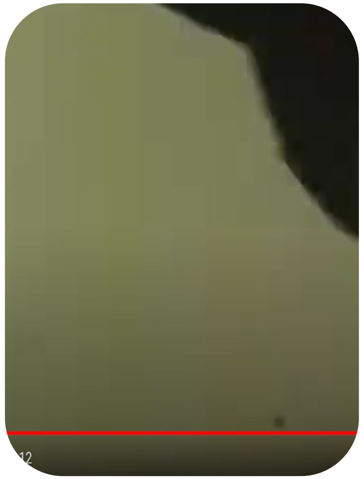


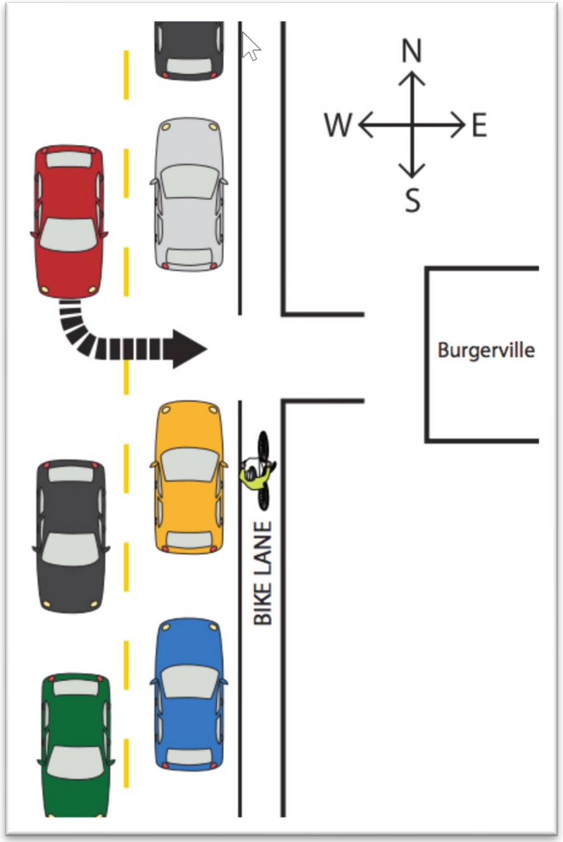
One additional Item While I have your attention:

Courtesy Gap Crashes!

3 SECONDS







Do Not Wave Across

The easy way to prevent this is to not "wave across" anyone who wants to pull out and cross lanes of traffic to go the other direction. The drivers wanting to pull out may not be happy with you, but they will be more upset if you wave them into an accident. Only allow cars to pull out if they want to pull into the lane you are in and go the direction you are going. Also, remember this if you are waiting to get into traffic from a lot. "Let's be careful out there."

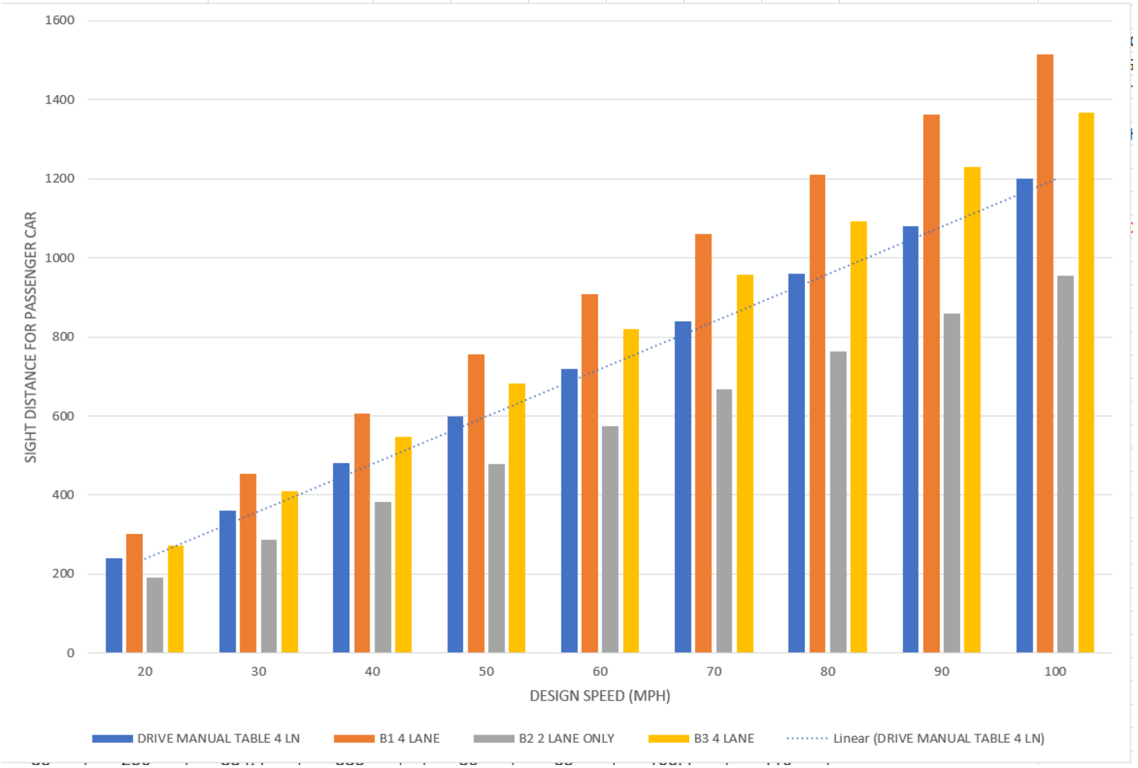
- Evaluate sight distance for safety while making design decisions.
- Mitigation impacts are costly when a project is built with inadequate sight distance.
- Use the Greenbook to compute minimum sight distance requirements.
- Utilize the software tools for a visual check.
- Document sight distance by calculations.

Think About Safety – Put yourself into the Design

QUESTIONS?


END
ROAD WORK
I've seen these protest signs for years. I don't think they are working.

SIGHT DISTANCE (ft) PER 10 MPH OF ARTERIAL DESIGN SPEED FOR APPROPRIATE ARTERIAL WIDTH OF CROSSING			
Design Vehicle Crossing the Arterial	**Two Lanes**	**Four Lanes**	**Six Lanes**
Passenger Vehicle	100	120	130
Single Unit Truck	130	150	170
WB-50 Tractor Trailer	170	200	210



Question: On Page 27, the driveway manual says that there should be adequate vertical and horizontal sight distance, but does not explicitly say if ISD or SSD is the appropriate distance. I assume ISD is the correct type of sight distance to design for based on the intention of ISD for access points and the table provided on Page 29 (though it is for crossing vehicles only). Should ISD (typically Case B with stop-controlled access) be used for driveways and only based on the dimensions from the page 29 table or also including the criteria in the Green Book for left and right turning vehicles?

Recommended Resources:

- NCDOT Policy on Street and Driveway Access to North Carolina Highways (2003)
- AASHTO Greenbook 2018