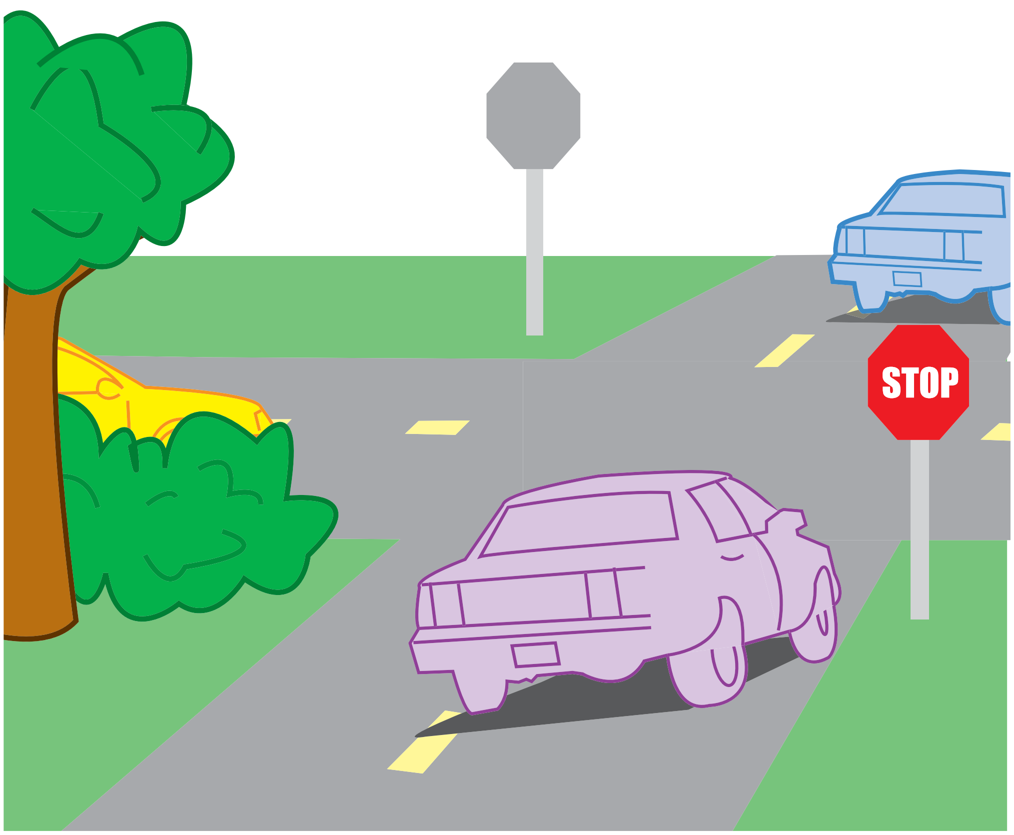
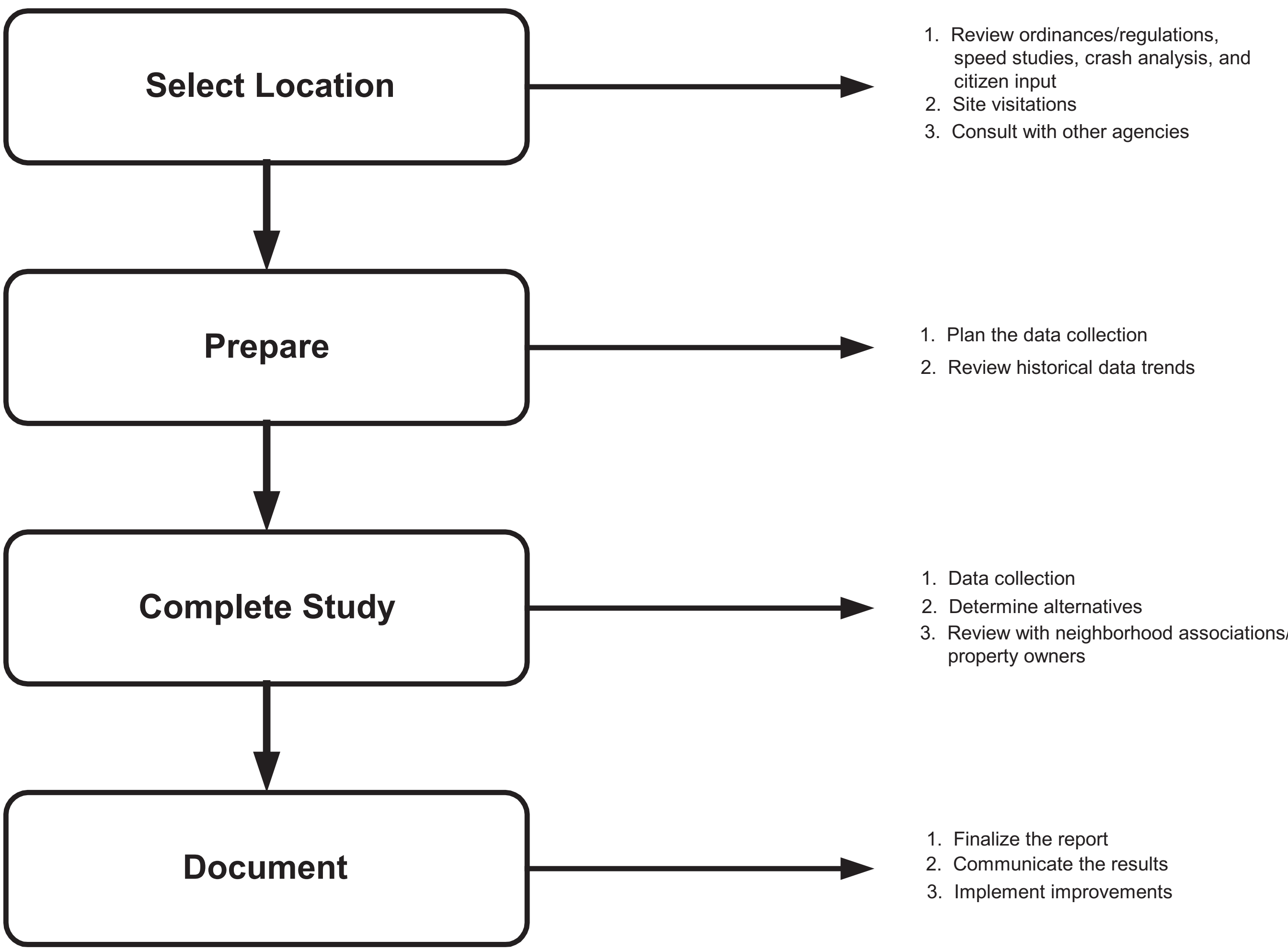
4
Sight Distance



Sight Distance



INTRODUCTION

Sight distance is the length of roadway visible to a driver. The three types of sight distance common in roadway design are intersection sight distance, stopping sight distance, and passing sight distance. This handbook will not discuss passing sight distance because it primarily occurs in rural settings and this handbook generally addresses urban areas. (Information on passing sight distance can be found in Chapter 3 of the AASHTO *Green Book* and in the CTRE *Iowa Traffic Control Devices and Pavement Markings* manual.)

INTERSECTION SIGHT DISTANCE

The driver of a vehicle approaching or departing from an intersection should have an unobstructed view of the intersection, including any traffic control devices, and sufficient lengths along the intersecting highway to permit the driver to anticipate and avoid potential collisions (Maze and Plazak 2000). These unobstructed views form triangular areas known as sight triangles.

A typical intersection is divided into areas between each leg known as quadrants. There may be three quadrants, such as for a "T" intersection, or four, such as for a four-legged intersection. Sight triangles are the specified areas along an intersection's approach legs and across the included corners (see Figures 4.1 and 4.2 for an illustration). These areas should be clear of obstructions that might block a driver's view of conflicting vehicles or pedestrians. The two types of sight triangles are approach sight triangles and departure sight triangles (AASHTO, *Green Book*, 2001).

Approach Sight Triangles

Approach sight triangles provide the driver of a vehicle approaching an intersection an unobstructed view of any conflicting vehicles or pedestrians. These triangular areas should be large enough that drivers can see approaching vehicles and pedestrians in sufficient time to slow or stop and avoid a crash. Approach sight triangles are illustrated in Figure 4.1.

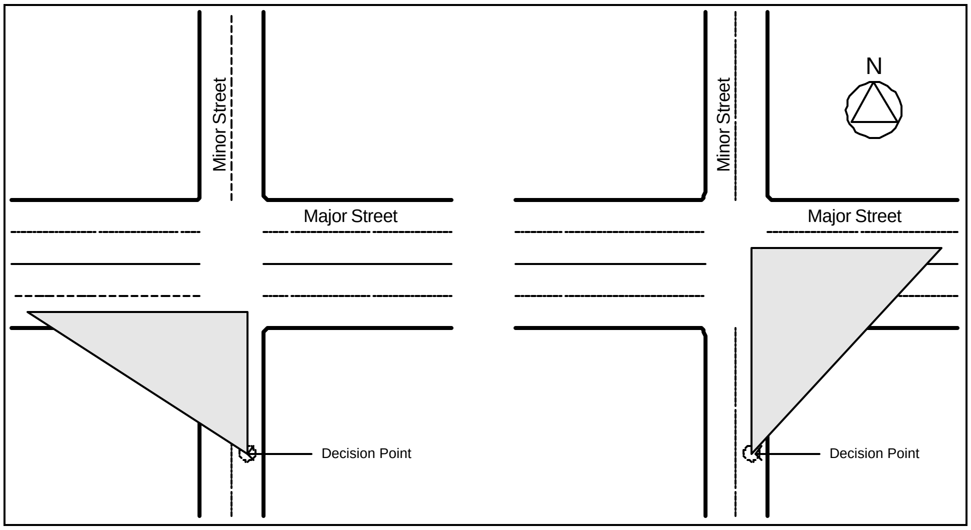


Figure 4.1. Approach Sight Triangles

Departure Sight Triangles

Departure sight triangles provide adequate sight distance for a stopped driver on a minor roadway to depart from the intersection and enter or cross the major roadway. These sight triangles should be provided in each quadrant of a controlled intersection. Departure sight triangles are illustrated in Figure 4.2.

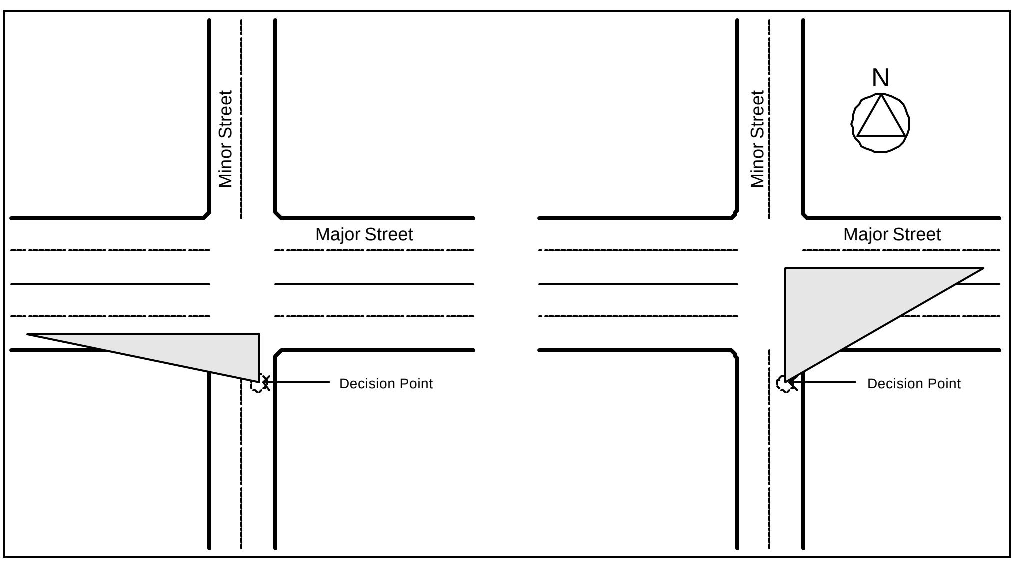


Figure 4.2. Departure Sight Triangles

Obstructions within Sight Triangles

To determine whether an object is a sight obstruction, consider both the horizontal and vertical alignment of both roadways, as well as the height and position of the object (AASHTO, *Green Book*). For passenger vehicles, it is assumed that the driver's eye height is 3.5 feet and the height of an approaching vehicle is 4.25 feet above the roadway surface, as illustrated in Figure 4.3. At the decision point, as shown in Figure 4.3, the driver's eye height is used for measurement.

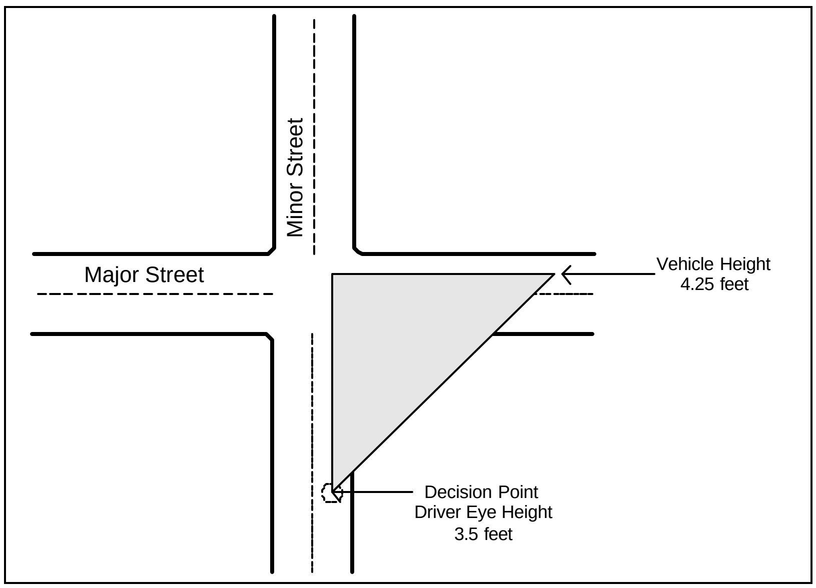


Figure 4.3. Heights Pertaining to Sight Triangles

Any object within the sight triangle that would obstruct the driver's view of an approaching vehicle (4.25 feet in height) should be removed or modified or appropriate traffic control devices should be installed as per the *Manual on Uniform Traffic Control Devices*. Obstructions within sight triangles could be buildings, vehicles, hedges, trees, bushes, tall crops, walls, fences, etc. Figure 4.4 shows a clear sight triangle and an obstructed sight triangle.

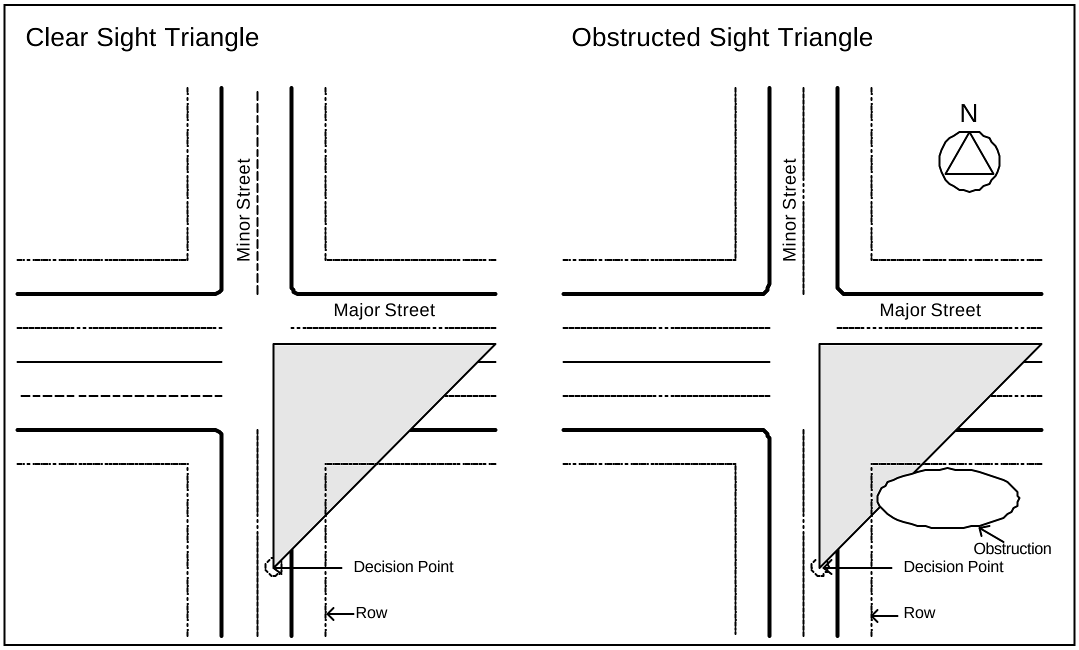


Figure 4.4. Clear versus Obstructed Sight Triangles

SIGHT DISTANCE STUDY METHODS

Different types of traffic control require different sight distances. For example, intersections with no control require adequate distance for the approaching vehicle to identify any conflicts in or approaching the intersection before entering. An approach sight triangle is used for this analysis. However, intersections with stop or yield control require drivers to stop or yield at the intersection, check for approaching vehicles in the intersection, and then depart. A departure sight triangle is used for this analysis.

Sight Distance Study Preparation Checklist

When preparing for an intersection sight distance study, use the checklist in Table 4.1. The checklist may be modified or expanded as necessary.

Table 4.1. Sight Distance Study Preparation Checklist

Step	Ö When Complete	Notes
Obtain target and sighting rods		
Obtain measuring wheel		
Obtain hardhat and safety vest		
Obtain sight distance diagram form		
Select time and day		
Determine availability of observers		
Contact corresponding jurisdiction(s)		
Other:		

If an agency does not possess the equipment necessary to complete a sight distance study, it may be obtained from the Iowa DOT, another jurisdiction, or a responsible consulting firm. A blank sight distance diagram form is located in Appendix C. Information on contracting for a sight distance study, including a project work order example, is provided near the end of this chapter.

UNCONTROLLED INTERSECTIONS

For uncontrolled intersections, the drivers of both approaching vehicles should be able to see conflicting vehicles in adequate time to stop or slow to avoid a crash. The required sight distance for safe operation at an uncontrolled intersection is directly related to the vehicle speeds and the distances traveled during perception, reaction, and braking time. Table 4.2 lists the minimum recommended sight distances for specific design speeds. For example, if a vehicle is traveling 20 mph, a sight distance of 90 feet is the minimum recommended stopping sight distance.

Table 4.2. Minimum Recommended Sight Distances

Vehicle Speed (mph)	Stopping Sight Distance (feet)
15	70
20	90
25	115
30	140
35	165
40	195
45	220
50	245
55	285

Note: Distances are from the 2001 AASHTO *Green Book* and 2001 AASHTO *Little Green Book*. Distances may change in future versions.

Key Steps to a Sight Distance Study at an Uncontrolled Intersection

A sight distance study at an uncontrolled intersection includes four key steps:

1. Determine the minimum recommended sight distance.
2. Obtain or construct sighting and target rods.
3. Measure current sight distances and record observations.
4. Perform sight distance analysis.

Determine the Minimum Recommended Stopping Sight Distance

Determine the minimum sight distance for the posted or operating speed at the intersecting roadway (see Table 4.2).

Obtain or Construct Sighting and Target Rods

Sighting and target rods are illustrated in Figure 4.5. The target rod can be constructed out of 2-inch by 0.75-inch wood. The target rod should be 4.25 feet tall to represent the vehicle height and be painted fluorescent orange on both the top portion and bottom 2 feet of the rod. The bottom 2-foot portion represents the object height for measuring stopping sight distance. (This will be further explained later in the stopping sight distance section.) The sighting rod should be 3.5 feet tall to represent the driver's eye height. The sighting rod can be constructed out of the same type of wood but should be painted flat black. The sighting rod and target rod are used in measuring sight distance.

Figure 4.5. Sighting Rod (left) and Target Rod (right)

Measure Current Sight Distances and Record Observations

Sight distance measurements should be gathered for all legs of the uncontrolled intersection. Traffic approaching from both the left and right should be considered for measurements. On the sight distance intersection diagram (a blank diagram form is provided in Appendix C), the observer records the date and time, posted or operating speed, site location, and weather conditions. The measuring process is represented in Figure 4.6 and described below.

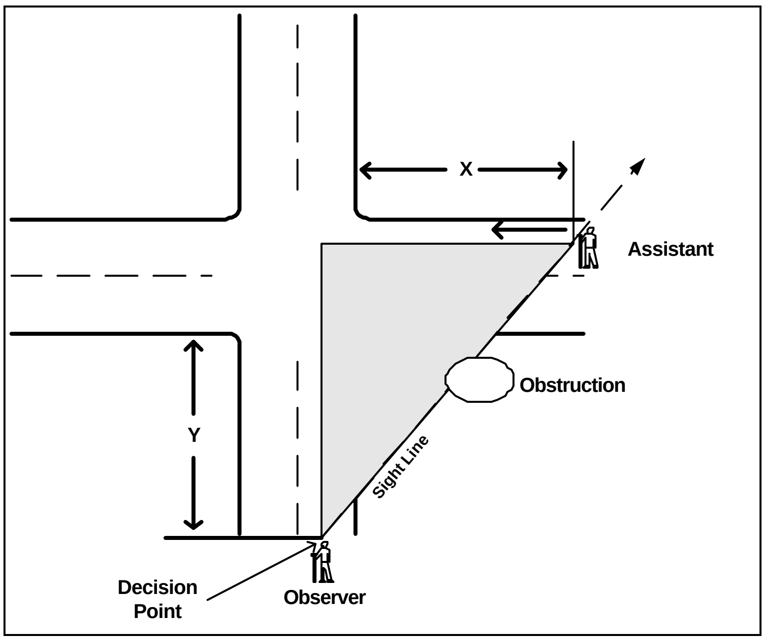


Figure 4.6. Sight Distance Measurement at Uncontrolled Intersection

The observer holds the sighting rod, and the assistant holds the target rod. They position themselves on two intersecting approaches at the appropriate stopping sight distances taken from Table 4.2. These are the X and Y dimensions. The observer represents the approaching vehicle and is located at the decision point. The observer uses the 3.5-foot sighting rod, which represents the driver's eye height. The assistant represents the intersecting vehicle. The assistant uses the 4.25-foot target rod, which represents the height of the approaching vehicle. The observer sights from the top of the sighting rod to the target rod.

If the target rod is visible, the approach sight triangle for the intersection is appropriate. If the top of the target rod is not visible, the assistant holding the target rod should walk toward the intersection along the centerline of the intersecting lane until the observer can see the target rod. When the target rod is visible, the position should be marked and the distance to the intersection should be measured along the centerline of the roadway. This is the X dimension.

Perform Sight Distance Analysis

The analysis of intersection sight distance consists of comparing the recommended sight distance to the measured sight distance. The measured sight distance should be equal to or greater than the recommended stopping sight distance. If the measured sight distance is less than the recommended sight distance, some mitigation may be required. Some mitigation measures are as follows:

- Remove/modify obstruction.
- Reduce speeds.
- Install traffic control devices (if warranted by the MUTCD).

Example Sight Distance Study at an Uncontrolled Intersection

The city of Cottonwood Glen noticed an increase of crashes at the intersection of 6th Street and Phoenix Avenue. The city suspected that the crash problem may be related to sight distance. The problem seemed to be centered around vehicles traveling northbound at the intersection. Cottonwood Glen decided to conduct a sight distance study at the intersection to see whether that was a contributing factor.

The intersection of 6th Street and Phoenix Avenue has no traffic control. The posted speed limit for both of the roadways is 25 mph. Cottonwood Glen referred to Table 4.2 for the recommended sight distance for this situation: 115 feet for both roadways. Cottonwood Glen conducted the study on a Tuesday at 2:00 p.m. under clear weather conditions. The study was conducted early afternoon to avoid heavy traffic volumes. City staff measured the sight distance for the eastbound and westbound approaches.

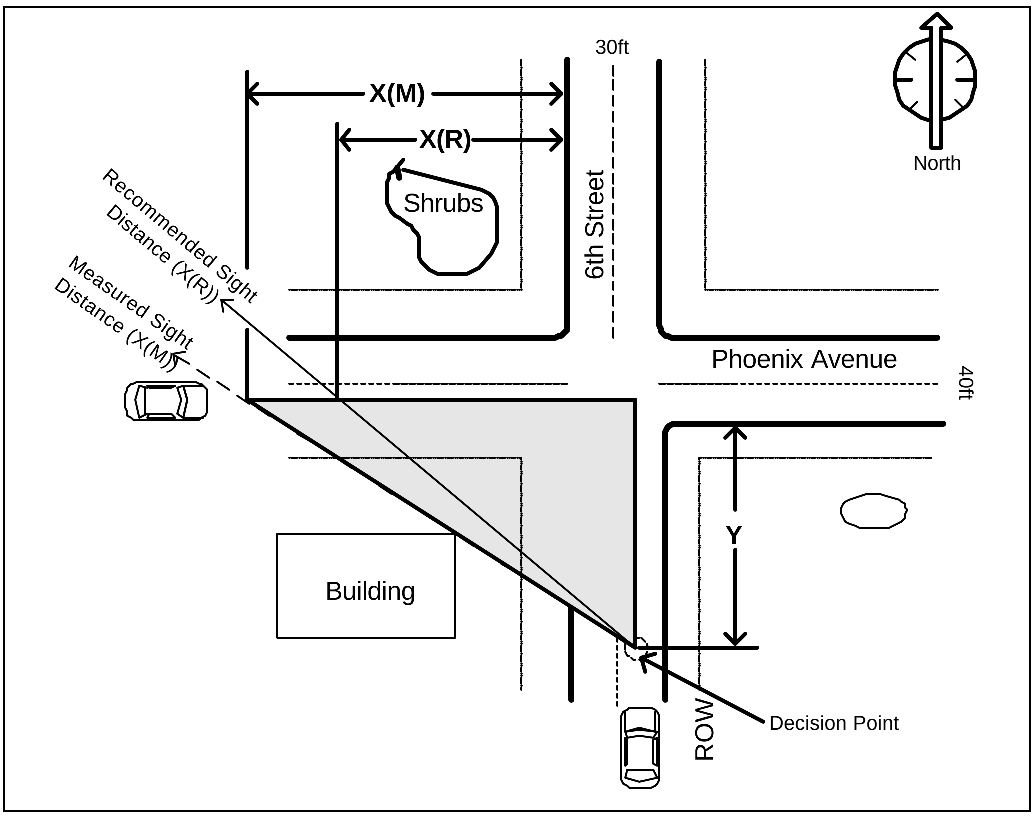
Figure 4.7 shows that the measured sight distance on the west approach is 140 feet. The recommended stopping sight distance for this approach is 115 feet. This tells us that the measured sight distance satisfies the minimum recommended. No sight distance related improvements need to be considered on the west approach.

Figure 4.8 shows that the measured sight distance on the east approach is 100 feet. The recommended stopping sight distance for this approach is 115 feet. This tells us that the measured sight distance does not satisfy the minimum recommended. The stopping sight distance diagram shows that there is an obstruction limiting the sight distance, located outside of the right-of-way. In this situation, the property owner should be contacted for cooperation in eliminating, modifying, or moving the obstruction. If they are unwilling to cooperate, other mitigation measures should be considered.

Date	MM/DD/YY
Time of Day	1400
Posted Speed Limit or 85% for Major Roadway ($X(R)$)	25 mph
Posted Speed Limit or 85% for Minor Roadway (Y)	25 mph
Traffic Controls Present	No Control
Intersection Maneuver	N.A.
Weather	Clear
Horizontal Curve	N
Vertical Curve	N

Major Roadway Width	40 feet
No. of Lanes	2
Minor Roadway Width	30 feet
No. of Lanes	2

Y Stopping Distance	115 feet
$X(R)$ Recommended	115 feet
$X(M)$ Measured	140 feet



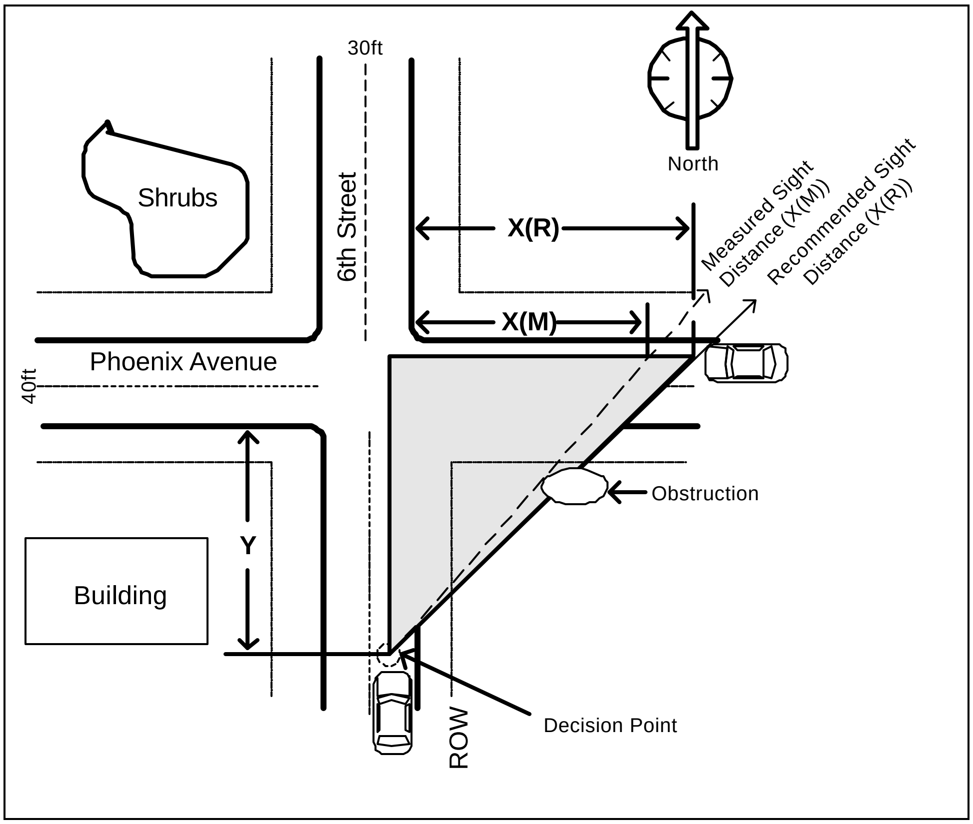
Conclusion: $X(M) > X(R)$. The measured sight distance was 140 feet, which is more than the recommended sight distance of 115 feet. Sight distance on the west approach is adequate.

Figure 4.7. 6th Street and Phoenix Avenue, West Approach

Date	MM/DD/YY
Time of Day	1400
Posted Speed Limit or 85% for Major Roadway (*X*(*R*))	25 mph
Posted Speed Limit or 85% for Minor Roadway (*Y*)	25 mph
Traffic Controls Present	No Control
Intersection Maneuver	N.A.
Weather	Clear
Horizontal Curve	N
Vertical Curve	N

Major Roadway Width	40 feet
No. of Lanes	2
Minor Roadway Width	30 feet
No. of Lanes	2

Y Stopping Distance	115 feet
X(*R*) Recommended	115 feet
X(*M*) Measured	100 feet



Conclusion: *X*(*M*) < *X*(*R*). The measured sight distance was 100 feet, which is less than the recommended sight distance of 115 feet. There is an obstruction limiting sight distance and it is outside of the right-of-way.

Figure 4.8. 6th Street and Phoenix Avenue, East Approach

INTERSECTIONS WITH STOP SIGN CONTROL

Vehicles stopped at an at-grade intersection must have sufficient sight distance to permit a safe departure. At intersections with stop sign or yield control, close attention should be given to departure sight triangles.

Vehicle Maneuvers at Intersections with Stop Sign Control

Three maneuvers can be completed for vehicles stopped at an intersection: crossing maneuver, left-turn maneuver, and right-turn maneuver. See Figure 4.9.

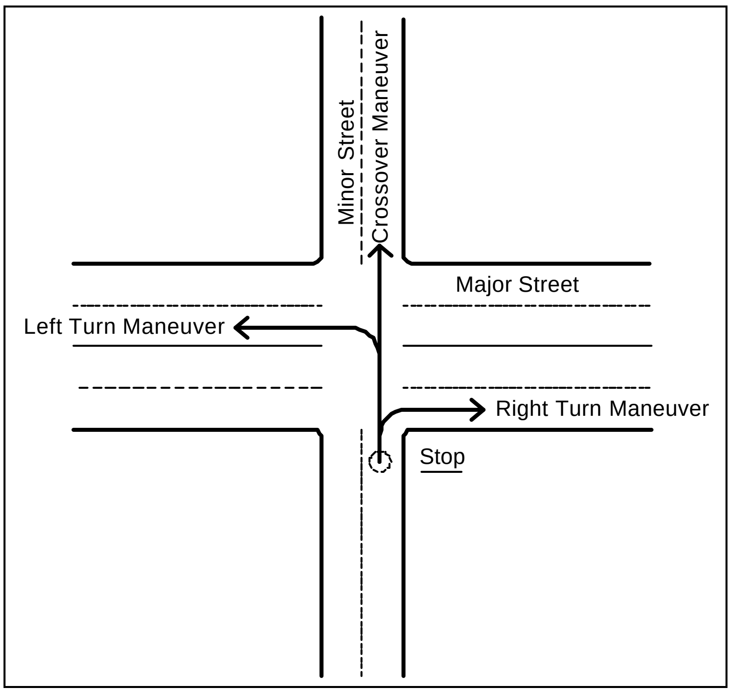


Figure 4.9. Three Maneuvers at an Intersection with Stop Sign Control

Crossing Maneuver from the Minor Roadway

When a driver is completing a crossing maneuver, there must be sufficient sight distance in both directions available to cross the intersecting roadway and avoid approaching traffic. The sight distance required for this maneuver is based on the distance approaching vehicles will travel on the major road during the time period it takes a stopped vehicle to clear the intersection. Table 4.3 lists the recommended sight distances for this maneuver based on design speeds.

Turning Left from the Minor Roadway

The left-turn maneuver requires first clearing the traffic on the left, then entering the traffic stream on the right. The required sight distance for this maneuver is affected by the amount of time it takes the stopped vehicle to turn left clearing traffic and reach average running speed without affecting the speed of the approaching vehicle. Table 4.3 lists the recommended sight distances for this maneuver based on design speeds.

Turning Right from the Minor Roadway

The right turn maneuver must have sufficient sight distance to permit entrance onto the intersecting roadway and then accelerate to the posted speed limit without being overtaken by approaching vehicles. Table 4.3 lists the minimum recommended sight distances for this maneuver based on design speeds.

Table 4.3. Minimum Recommended Sight Distances Based on Vehicle Maneuver

Vehicle Speed (mph)	Stopping Sight Distance for Left-Turn Maneuver (feet)	Stopping Sight Distance for Crossover and Right-Turn Maneuvers (feet)
15	170	145
20	225	195
25	280	240
30	335	290
35	390	335
40	445	385
45	500	430
50	555	480
55	610	530

Note: Distances are from the 2001 AASTHO *Green Book* and are for two-lane roadways. Distances may change in future versions.

Key Steps to a Sight Distance Study at an Intersection with Stop Control

A sight distance study at an intersection with stop control includes four key steps:

1. Determine the minimum recommended sight distance.
2. Obtain or construct sighting and target rods.
3. Measure current sight distances and record observations.
4. Perform sight distance analysis.

Determine the Minimum Recommended Sight Distances

Determine the minimum sight distance for each maneuver and speed (see Table 4.3).

Obtain or Construct Sighting and Target Rods

Sighting and target rods are illustrated in Figure 4.5. The target rod can be constructed from 2-inch by 0.75-inch wood. The target rod should be 4.25 feet tall to represent the vehicle height and be painted fluorescent orange on both the top portion and bottom 2 feet of the rod. The bottom 2-foot portion represents the object height for measuring stopping sight distance. The sighting rod should be 3.5 feet tall to represent the driver's eye height. The sighting rod can be constructed from the same type of wood but should be painted flat black. The sighting rod and target rod are used in measuring sight distance.

Measure Current Sight Distances and Record Observations

On the sight distance intersection diagram (a blank diagram form is provided in Appendix C), the observer records the date and time, posted or operating speed site location, and weather conditions.

The observer with the sighting rod stands at the center of the approaching lane and 10 feet back from the stop bar or aligned with the stop sign. The observer's eyes should be at the top of the sighting rod.

The assistant walks away from the observer along the intersecting roadway toward approaching traffic. The assistant should stop periodically and place the target rod on the pavement for sighting by the observer. This process should continue until the top of the target rod can no longer be seen. The point where the target rod disappears is the maximum sight distance along that leg and should be recorded from the observer's sight.

Perform Sight Distance Analysis

The analysis of intersection sight distance consists of comparing the recommended sight distance to the measured available sight distance. The comparison of the actual distances should be performed with consideration to the greater of the 85th percentile of speed or the posted speed limit. If the measured sight distance is less than the recommended sight distance some mitigation may be required. Some mitigation measures are as follows:

- Remove/modify obstruction.
- Reduce speed.
- Install traffic control devices (if warranted by the MUTCD).

Example Sight Distance Study at an Intersection with Stop Sign Control

The city of Cottonwood Glen was changing the speed limit on one of their arterial streets from 25 to 30 mph. This change required the city to conduct an intersection sight distance study. The only intersection in question was the T-intersection of Ross Road and 13th Street. The east approach for both left- and right-turn maneuvers need to be studied. The city obtained recommended sight distances from Table 4.3: 335 feet for a right-turn maneuver and 290 feet for a left-turn maneuver.

The study was conducted on a Wednesday at 2:00 pm at the intersection of Ross Road and 13th Street. Because of the need for adequate sight distance for both left- and right-turn maneuvers, two separate sight distance measurements were made.

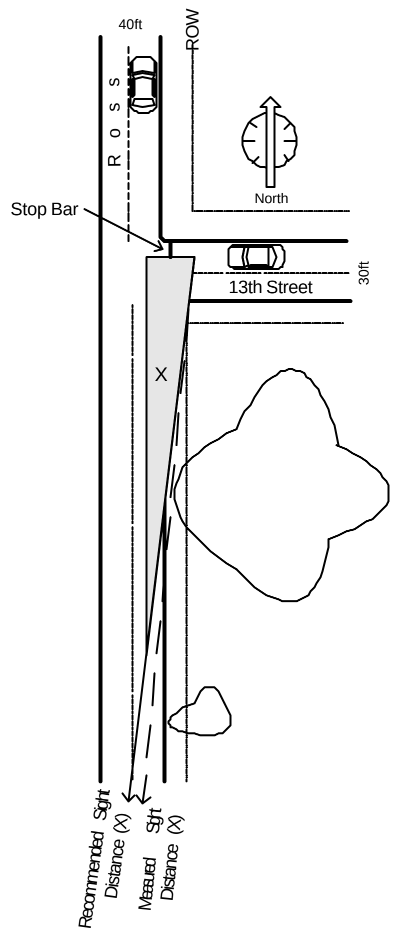
Figure 4.10 shows the measurement that was conducted for the right-turn maneuver. The measured sight distance for this maneuver is 350 feet. The minimum recommended sight distance is 335 feet for 30 mph. This shows that there is adequate sight distance for a right-turn maneuver from the side road, 13th Street.

Figure 4.11 shows the measurement that was conducted for a left-turn maneuver. The measured sight distance for this maneuver is 300 feet. The minimum recommended sight distance is 290 for 30 mph. This shows that there is adequate sight distance for a left-turn maneuver.

Date	MM/DD/YY
Time of Day	1400
Posted Speed Limit or 85% for Major Roadway (*X*(*R*))	30 mph
Traffic Controls Present	Stop
Intersection Maneuver	Right Turn
Weather	Clear
Horizontal Curve	N
Vertical Curve	N

Major Roadway Width	40 feet
No. of Lanes	2
Minor Roadway Width	30 feet
No. of Lanes	2

Y Stopping Distance	N.A.
X(*R*) Recommended	290 feet
X(*M*) Measured	300 feet



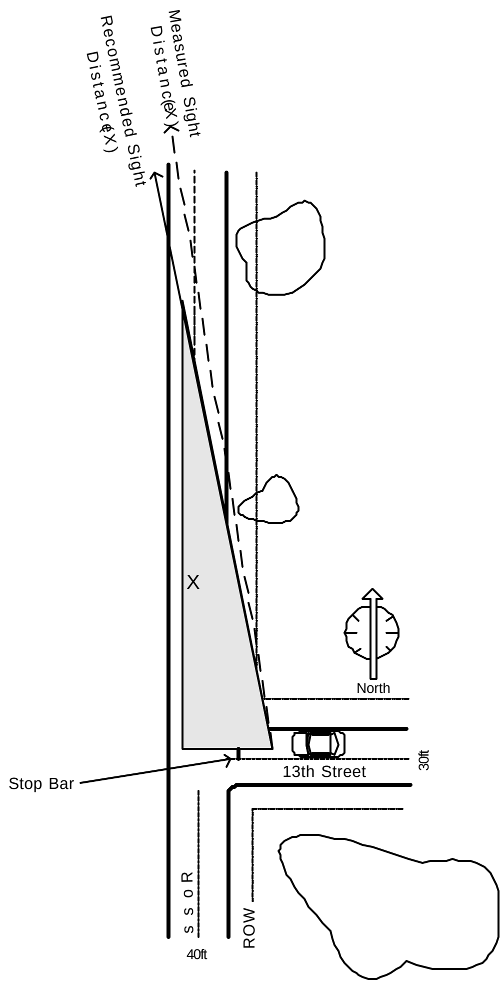
Conclusion: *X*(*M*) > *X*(*R*). The measured sight distance was 300 feet, which is more than the recommended sight distance of 290 feet. Sight distance for a right-turn maneuver is adequate.

Figure 4.10. Ross Road and 13th Street, Right-Turn Maneuver

Date	MM/DD/YY
Time of Day	1400
Posted Speed Limit or 85% for Major Roadway (*X*(*R*))	30 mph
Traffic Controls Present	Stop
Intersection Maneuver	Left Turn
Weather	Clear
Horizontal Curve	N
Vertical Curve	N

Major Roadway Width	40 feet
No. of Lanes	2
Minor Roadway Width	30 feet
No. of Lanes	2

Y Stopping Distance	N.A.
X(*R*) Recommended	335 feet
X(*M*) Measured	350 feet



Conclusion: *X*(*M*) > *X*(*R*). The measured sight distance was 350 feet, which is more than the recommended sight distance of 335 feet. Sight distance for a left-turn maneuver is adequate.

Figure 4.11. Ross Road and 13th Street, Left-Turn Maneuver

STOPPING SIGHT DISTANCE

To allow drivers to perceive, react, and safely stop, a minimum stopping sight distance must be available. Stopping sight distance is defined as the sum of two distances (AASHTO, *Green Book*):

1. R*eaction distance*—the distance traveled by the vehicle from the instant the driver sees an object necessitating a stop to the instant the brakes are applied; plus

2. *Braking distance*—the distance traveled by the vehicle from the instant brake application begins to the instant when the vehicle has come to complete stop.

The reaction distance is based on the reaction time of the driver and the speed of the vehicle. The braking distance is dependent upon the vehicle speed and the coefficient of friction between the tires and roadway.

Table 4.4 lists minimum recommended stopping sight distances based on design speed and the sum of reaction distance and braking distance. At 25 mph, for example, 91.9 feet are needed for reaction distance and 60 feet are needed for braking distance. When these numbers are added, the total distance is 151.9 feet. For performance purposes this figure has been rounded up to 155 feet.

Table 4.4. Minimum Required Stopping Sight Distances

Vehicle Speed (mph)	**Reaction Distance (feet)**	**Braking Distance (feet)**	**Summed Distance (feet)**	**Stopping Sight Distance (feet)**
15	55.1	21.6	76.7	80
20	73.5	38.4	111.9	115
25	91.9	60.0	151.9	155
30	110.3	86.0	196.7	200
35	128.6	117.6	246.2	250
40	147.0	153.6	300.6	305
45	165.4	194.4	359.8	360
50	183.8	240.0	423.8	425
55	202.1	290.3	492.4	495

Note: Distances are from the 2001 AASHTO *Green Book* and are for dry conditions. Distances may change in future versions.

For stopping distance calculations, the height of the driver's eye is 3.5 feet above the roadway and the object height is 2 feet above the roadway surface, as illustrated in Figure 4.12. The 2-foot object height represents an object that the driver of an approaching vehicle would want to avoid. One element to consider for stopping sight distance is vertical curvature of the roadway. On straight roadway sections, the obstruction that blocks the driver's vision of the roadway ahead is the vertical curvature of the road surface. As the vertical curvature increases, stopping sight distance also increases.

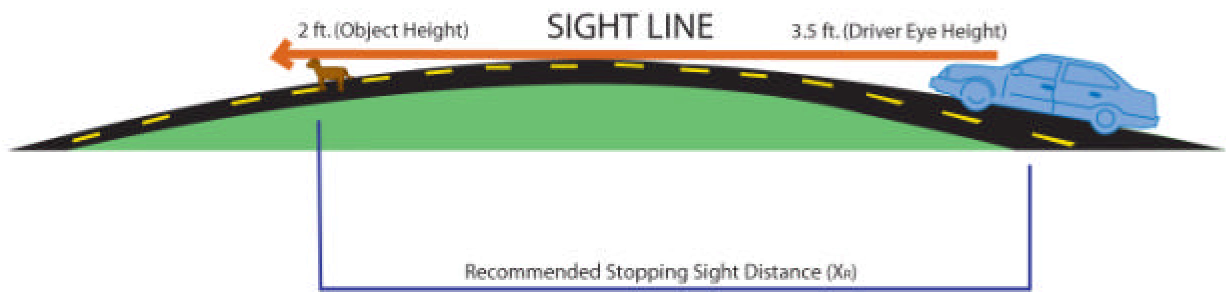


Figure 4.12. Heights Pertaining to Stopping Sight Distance

Key Steps to a Stopping Sight Distance Study

A stopping sight distance study includes four key steps:

1. Determine the minimum recommended stopping sight distance.
2. Obtain or construct sighting and target rods.
3. Measure current sight distances and record observations.
4. Perform sight distance analysis.

Determine the Minimum Recommended Stopping Sight Distance

Determine the minimum stopping sight distance for the posted speed limit (see Table 4.4).

Obtain or Construct Sighting and Target Rods

The target rod can be constructed from 2-inch by 0.75-inch wood. The target rod is 4.25 feet tall to represent the vehicle height and be painted fluorescent orange on both the top portion and bottom 2 feet of the rod. The bottom 2-foot portion of the target rod is the height for conducting stopping sight distance. The 2-foot height is representative of an object that involves risk to drivers and can be recognized in time to stop before reaching it (AASHTO, *Green Book*).

The sighting rod is 3.5 feet tall to represent the driver's eye height. The sighting rod can be constructed from the same type of wood but should be painted flat black.

Measure Current Sight Distances and Record Observations

On the sight distance diagram (a blank diagram form is provided in Appendix C), the observer records the date and time, posted or operating speed, site location, and weather conditions.

Standing at a pre-determined location along the road, the observer should sight from the top of the sighting road while the assistant moves away in the direction of travel. The assistant stops when the bottom 2-foot portion of the target rod is no longer visible. This is the distance at which a 2-foot tall object can no longer be seen by an approaching driver. The distance from the disappearing point to the observer is measured and recorded.

Perform Sight Distance Analysis

The analysis of stopping sight distance consists of comparing the recommended sight distance to the measured sight distance. The measured stopping sight distance should be greater than the recommended stopping distance. On a horizontal curved roadway, a sight obstruction may be due to the curve or to physical features outside of the roadway. On a straight roadway, the sight obstruction will be due to the vertical curvature of the roadway alone.

Example Stopping Sight Distance Study

The city of Cottonwood Glen may be undergoing new development near an established housing district, currently including multiple families and many with children. The proposed development is a new city park and is proposed to be directly across the roadway from the housing area. There is no established traffic control and no crosswalks in the area. At public meetings, parents have voiced concern about the safety of their children crossing the roadway to the park. This roadway does have a vertical curve, which may affect the stopping sight distance.

The city of Cottonwood Glen conducted the study on a Thursday at 10:00 a.m. on Washington Avenue. The posted speed limit on this roadway is 25 mph. The recommended stopping sight distance from Table 4.4 is 155 feet.

The results of the study show that the measured stopping sight distance was 245 feet (see Figures 4.13 and 4.14). There is adequate stopping sight distance at the study location. However, if the stopping sight distance would not have been adequate, the following actions could have been considered:

- Install traffic control device(s).
- Establish no-passing zones.
- Conduct public awareness efforts.
- Install a barrier between the park and street to prohibit mid-block crossings.
- Provide input into the developmental planning of the park.

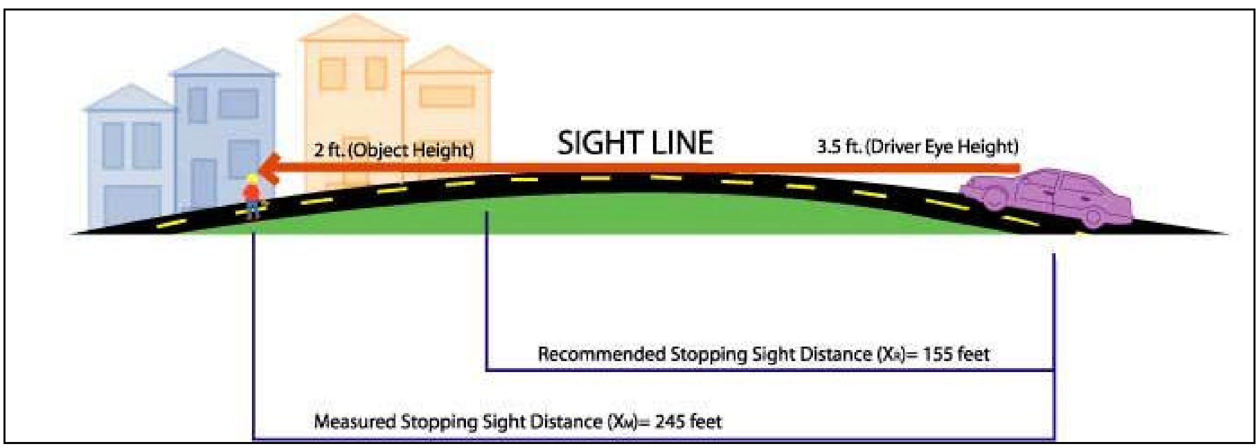
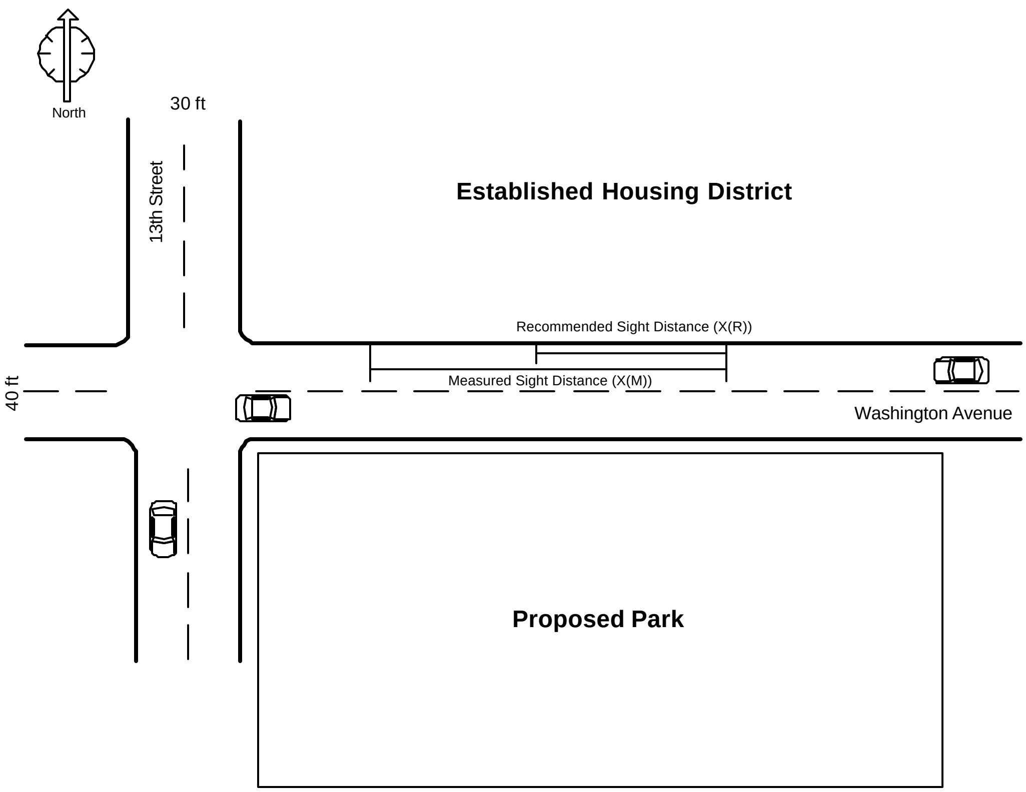


Figure 4.13. Washington Avenue and 13th Street Stopping Sight Distance

Date	MM/DD/YY
Time of Day	1000
Speed (Posted or 85%)	25 mph
Traffic Controls Present	No Control
Intersection Maneuver	N.A.
Weather	Clear
Horizontal Curve	N
Vertical Curve	Y

Major Roadway Width	40 feet
No. of Lanes	2
Minor Roadway Width	N.A.
No. of Lanes	N.A.

Y Stopping Distance	N.A.
X(*R*) Recommended	155 feet
X(*M*) Measured	245 feet



Conclusion: $X(M) > X(R)$. The measured sight distance is 245 feet, which is more than the recommended sight distance of 155 feet. Sight distance for this section of roadway is adequate.

Figure 4.14. Washington Avenue and 13th Street Sight Distance Diagram

CONTRACTING FOR A SIGHT DISTANCE STUDY

Information Gathering

Before a jurisdiction contacts an engineering consulting firm to perform a sight distance study, a variety of information may need to be collected. The following is a list of possible information that an engineering consulting firm may request:

- issue at hand
- existing traffic control devices
- conditions map/existing photographs, etc.
- right-of-way information
- roadway geometry
- roadway classifications
- crash history
- posted speed limits in and around study area
- preliminary speed studies
- citizen input
- location map
- appropriate contact persons
- any other relevant information

The following project work order may assist local government is contracting to an engineering firm. The example project work order contains information from the stopping sight distance example (a blank form is provided in Appendix E).

Project Work Order: Sight Distance Study

Referenced Agreement

This work order is part of an agreement between Mattson and Associates and the city of Cottonwood Glen for municipal engineering services.

Project Location Description

This work involves conducting a stopping sight distance study around the location of Washington Avenue and 13th Street. A map depicting the location is attached.

Obligation of the City/County

The city shall provide the following items to the consultant: existing traffic control, volumes, right-of-way information, roadway geometry, posted speed limits, crash history and a list of important contacts.

Scope of Consultant Services

This work includes obtaining and evaluating sight distance measurements on the east side of the proposed driveway for the apartment complex.

Schedule

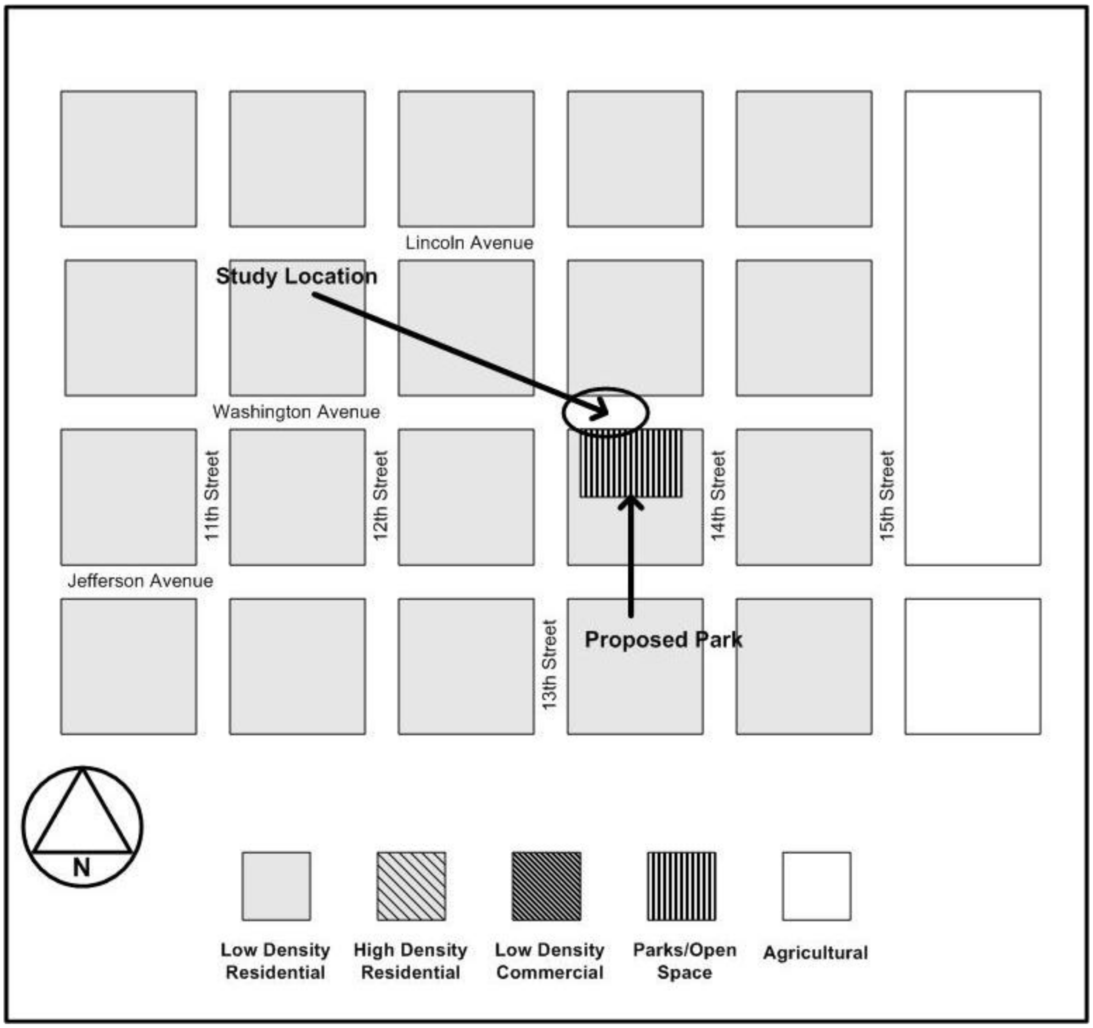
Field meeting date:	______________________
Estimated date of preliminary deliverable:	______________________
Estimated date of final deliverable:	______________________

Compensation

Labor cost	$
Direct expenses	$
Subcontractor cost	$______________________
Overhead	$______________________
Maximum payable	$

Authorization

City of Cottonwood Glen	Mattson and Associates
City/County	Contractor
______________________	______________________
City/County Administrator	Project Manager's Name/Title
______________________	______________________
Signature	Signature
______________________	______________________
Date	Date


Lincoln Avenue
Study Location
Washington Avenue
11th Street
12th Street
14th Street
15th Street
Jefferson Avenue
13th Street
Proposed Park
N
Low Density Residential
High Density Residential
Low Density Commercial
Parks/Open Space
Agricultural

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CTRE. 2001. *Iowa Traffic Control Devices and Pavement Markings: A Manual for Cities and Counties*. Ames, Iowa: Center for Transportation Research and Education, Iowa State University.

Maze, T., and D. Plazak. 2000. *Access Management Handbook: Balancing the Demands on Our Roadways.* Ames, Iowa: Center for Transportation Research and Education, Iowa State University.