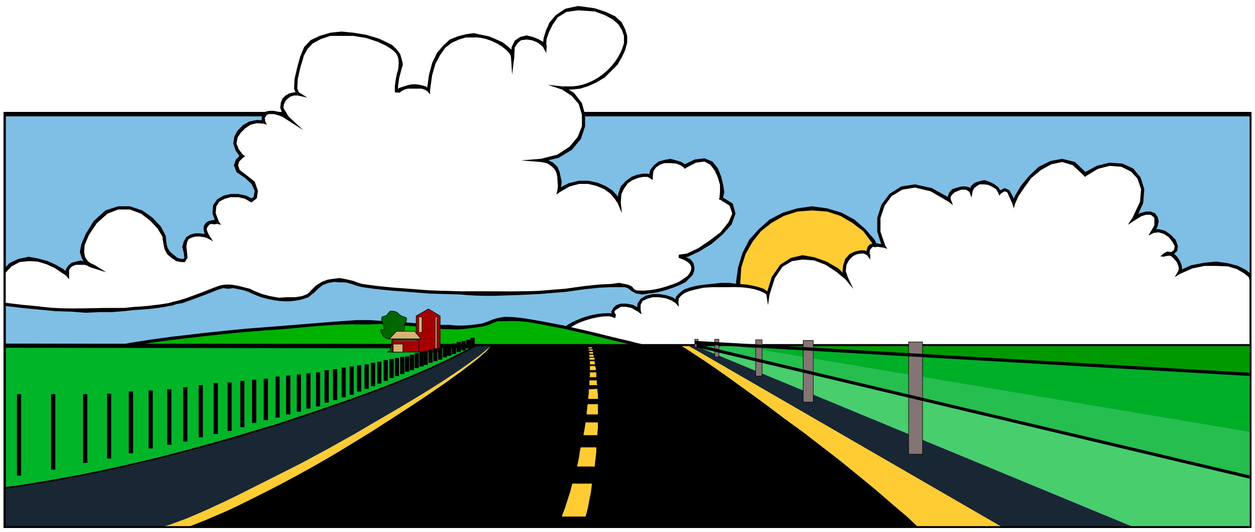
I.D.O.T. / DISTRICT 2



ACCESS GUIDELINES

FOR DEVELOPMENTS

ALONG STATE HIGHWAYS

S\OPS\Word\ppoint

1. **An initial coordination meeting between the Department and the developer/consultant is suggested to discuss the permit process, access locations, construction requirements, and any other general questions each party may have**.

   A. Reasonable access is defined as access to a "public" or "private" road. Township and county roads, city streets or alleys meet the definition of a "public" road. This does not necessarily guarantee direct access to a State Highway. Reasonable access is site specific. This means that the type of access is solely dependent on the type of business or use the entrance is being provided for at a specific location and will vary from site to site.

   B. The planned access shall be compatible with the access management plan for the roadway corridor.

   C. Access locations shall be determined prior to site development and construction.

   D. Land subdivided into two or more parts, any of which are less than five acres, shall be required to comply with Illinois compiled statues (765ILCS 205) Plat Act.

2. **Submit permit requested for development and all subsequent coordination and correspondence to the Permits Engineer in the Bureau of Operations, which should include the following:**

   A. Preliminary Plan with Traffic Projects

      1. A detailed site plan will be required for all access permits. The site plan guidelines are included.

      2. An initial determination will be made on whether an Intersection Design Study (IDS) is needed based on future traffic projections.

      3. Traffic generations should be submitted for the construction year, ten-year and twenty-year design period, and should contain average daily traffic (ADT) and design hourly volume (DHV) for AM/PM peak. The data needed must include the criteria and calculations used for said projections.

      4. The width, number, and location of all proposed entrances will be evaluated by site specific conditions and will be determined by applying current IDOT policies as in the <u>BDE/Design Manual</u>, the <u>Access to State Highways</u> guide and the <u>Reference Guide for Entrance Certification.</u>

   B. Drainage and calculations should be submitted to the Permits Engineer as soon as they are available.

      1 Plans and calculations showing the existing conditions and the existing ten-year and 100-year run-offs to the State route drainage system.

2. Plans and calculations showing the proposed conditions. Detention must be provided to ensure no increase in ten-year and 100-year peak run-off to the State drainage system. Methods stated in the IDOT Drainage Manual are acceptable.
.
3. Any detention facility shown on the plans must be located a minimum of ten foot (10') plus 1.5 times its depth from the State right-of-way.

3. IDS APPROVAL PROCESS

A. IDS must be twenty-year design utilizing twenty-year projections approved by the District. A ten-year design will be acceptable if the District determines that a twenty-year design is not appropriate.

B. Capacity analyses should normally be done for both AM and PM DHV's for the design period.

C. Only capacity software approved by IDOT should be used the most recent version of HMC.

D. The Developer/Consultant should work with the District to complete the IDS according to Chapter 14 of the BDE Manual. The Department will approve the final IDS.

E. Any Consultant doing work for a Developer should have a copy of the Department Bureau of Design and Environmental Manual (BDE Manual).

F. This approval process will take a minimum of six months.

4. **Permi**t

A. Upon approval of the IDS, the developer's consultant is responsible for preparation of construction plans for all improvements on State of right-of-way.

B. Three copies of the construction plans are to be submitted to the Department for review.

C. The construction plans will be reviewed by the District Bureau of Operations and the District of Bureau of Program Development for compliance with current standards.

   1. Developer will be required to resurface project limits if old pavement markings would leave an unsafe intersection for the traveling public.

   2. Developer shall install signals immediately if warranted within the five years of construction or through an escrow account if not warranted until beyond five years.

D. Upon approval of the construction plans, drainage plans, and the right-of-way documents, the Department will issue the permit/agreement for the work. A five-year surety bond is required; dollar amount is dependent upon the magnitude of the project.

5. Prepare and Submit Right of Way Documents for Permit Approval.

1. Any additional right-of-way areas shall be transferred to IDOT via warranty deed and shown on the proposed subdivision plat as State of Illinois property.

2. Deed description shall be approved by IDOT before placing on IDOT approved documents. (Consult with Charles Cordell, Land Acquisition Chief of Plats and Plans, at 815/284-5370, regarding required documents.)

3. After approval of deed description, a title policy shall be issued in the name of the State of Illinois.

4. Deed description, plat, title policy, and other required documents shall be forwarded to the Attorney General's office for approval.

5. Following approval, the warranty deed will be recorded and a recorded copy forwarded to the IDOT office.

6. After the warranty deed is recorded, the final subdivision plat can be recorded.

SITE PLAN GUIDELINES

SUBMITTAL OF SITE PLAN SHOULD CONTAIN THE FOLLOWING INFORMATION:

1. Scale = 1” = 20’ for single developments such as service stations, convenience stores, auto garages, fast food restaurants, etc. If a development will not fit on a 24” X 36” plan sheet, then a 1” = 50’ should be used for major developments such as shopping malls, truck stops, large supermarkets, etc.

2. Show north arrow.

3. Label scale.

4. Show existing roadway elements and topography of both sides of roadway fronting the site, for example, existing entrances, curb and gutter, sidewalk, existing flush or raised channelization, and auxiliary lanes on the State highway.

5. Lettering shall be of sufficient size to be completely legible and not become blurred when reproductions are made - follow IDOT CADD.

6. A profile of the proposed entrances should be submitted with the layout of the site. Also, a profile of the State route or side roads should be submitted if the grades are not relatively flat, less than or equal to 1% (≤ 1%), from Ch. 14 of BDE Manual, and vertical curves exist that could block site distance.

7. The existing posted speed of the route or routes fronting the site should be indicated.

8. Intersection Site Distance layout should be submitted if grades are not relatively flat. Horizontal sight should be shown on a plan view and vertical site lines should be shown on a profile. All distances and elevations are to be labeled (see Figure 36-6A/Page 6).

9. Existing and proposed, if required, right-of-way should be shown.

10. All items are to be dimensioned, example lane widths, parking dimensions, gas pump locations, driveway width and flares or radius, etc.

11. Drawings are to be engineering quality, either drawn on CADD or with proper drafting equipment. **Free hand sketches will not be accepted**.

12. Drainage details should be shown on a separate sheet.

13. Cross sections may be required along with dedication of right- of-way if auxiliary lanes are needed.

NOTE: Other items may also be required based upon site-specific details.

36-6 INTERSECTION SIGHT DISTANCE

36-6.01 General

At each intersection the potential exists for vehicles to conflict with each other when entering, exiting, or crossing the intersection. The designer should provide sufficient sight distance for a driver to perceive these potential conflicts and to perform the necessary actions needed to negotiate the intersection safely. The additional costs and impacts to achieve this sight distance are often justified based on the safety and operational considerations.

Because all intersections on State highways are either stop controlled or signalized, no guidelines are provided for no control or yield-controlled intersections. For these types of intersections, the designer is referred to NCHRP Report 383, *Intersection Sight Distance* for guidance and/or the 2004 AASHTO *Policy on the Geometric Design of Highways and Streets*.

36-6.02 Design Procedures

The Department uses gap acceptance as the conceptual basis for its intersection sight distance (ISD) criteria. The ISD criteria used by the Department is intended to find a balance between an acceptable level of safety and what can be provided at an intersection on a practical basis. This ISD methodology ensures than an intersection operates smoothly without forcing a vehicle on the major road to stop. As the crossroad vehicle makes the turn and accelerates, field studies have indicated that mainline vehicles reduce their speed to approximately 70% of the mainline design speed to compensate for the entering vehicle.

The intersection sight distance is obtained by providing clear sight triangles both to the right and left as shown in Figure 36-6.A. The lengths of legs of these sight triangles are determined as follows:

1. Minor Road. The length of leg along the minor road is based on two parts. The first is the location of the driver's eye on the minor road. This is typically assumed to be 14.4 ft (4.4 m) from the edge of the major road traveled way. The second part is based on the distance to the center of the vehicle on the major road. For right-turning vehicles, this is assumed to be the center of the closest travel lane from the left. For left-turning vehicles, this is assumed to be the center of the closest travel lane for vehicles approaching from the right.

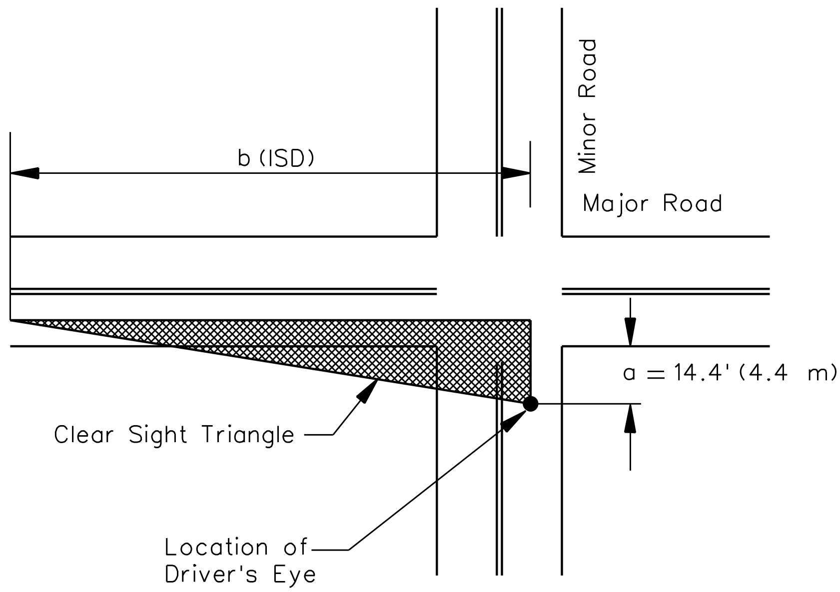
2. Major Road. The length of the sight triangle or ISD along the major road is determined using the following equation:

$$b = ISD = 1.467\, V_{major}\ t_c$$ (US Customary) Equation 36-6.1

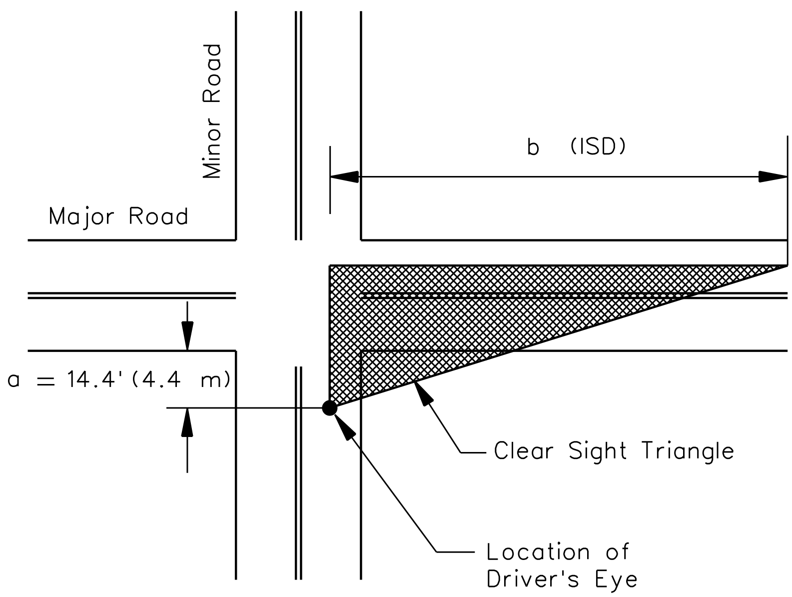
$$b = ISD = 0.278\, V_{major}\ t_c$$ (Metric) Equation 36-6.1

where:

b = length of sight triangle along the major road or ISD, ft (m)
ISD = Intersection Sight Distance, ft (m)
V_{major} = design speed of major road, mph (km/h)
t_c = critical gap for entering or crossing the major road, sec



CLEAR SIGHT TRIANGLE FOR VIEWING
TRAFFIC APPROACHING FROM LEFT



CLEAR SIGHT TRIANGLE FOR VIEWING
TRAFFIC APPROACHING FROM RIGHT

CLEAR SIGHT TRIANGLES FOR STOP-CONTROLLED INTERSECTIONS

Figure 36-6.A

The critical gap time (t_c) varies according to the design vehicle, the grade on the minor road approach, the number of lanes on the major roadway, the type of operation, and the intersection skew.

Within this clear sight triangle, if practical, remove or lower any object that would obstruct the driver's view. These objects may include buildings, parked or turning vehicles, trees, hedges, tall crops, unmowed grass, fences, retaining walls, and the actual ground line. In addition, where an interchange ramp or crossroad intersects the major road near a bridge on a crest vertical curve, items such as bridge parapets, piers, abutments, guardrail, or the crest vertical curve itself may restrict the clear sight triangle. Figure 36-6.B illustrates, in both the plan view and profile view, the application of the clear sight triangles at an interchange ramp. This figure also applies to any crossroad intersection.

The height of eye for passenger cars is assumed to be 3.5 ft (1080 mm) above the surface of the minor road. The height of object for an approaching vehicle on the major road is also assumed to be 3.5 ft (1080 mm). An object height of 3.5 ft (1080 mm) assumes that a sufficient portion (9 in (225 mm)) of an oncoming passenger car must be seen to identify it as an object of concern by the minor road driver. Using the 3.5 ft (1080 mm) height for both vehicles assumes that each driver can see and recognize the other vehicle. If there are a sufficient number of trucks on the minor road or ramp to warrant their consideration, use Figure 36-6.C to determine the appropriate eye height for the minor road vehicle.

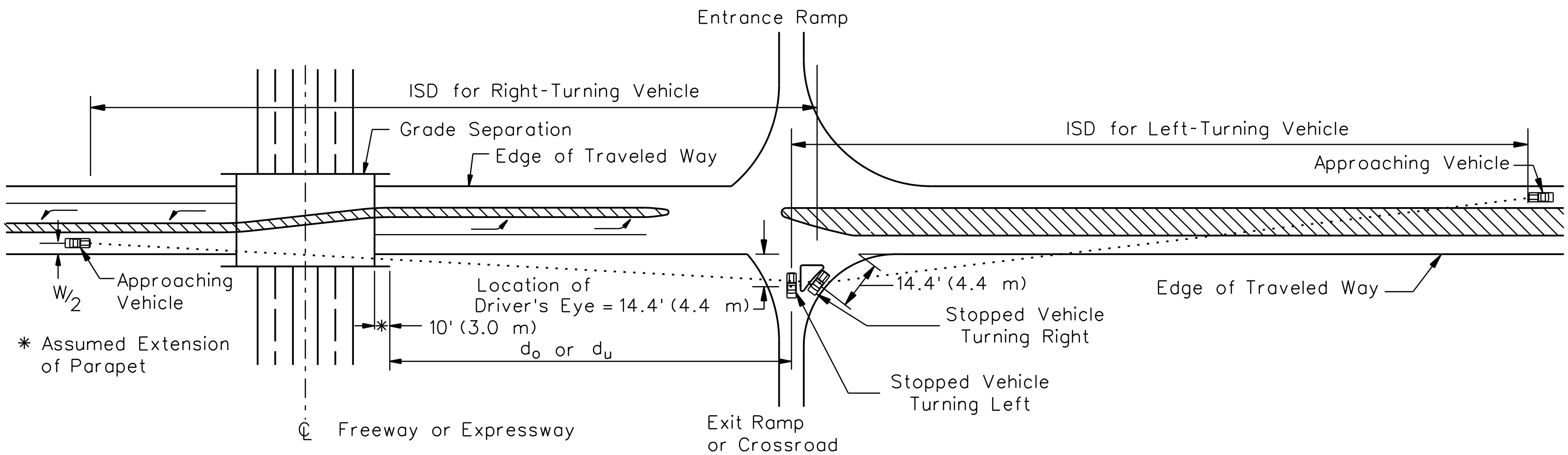
36-6.03 <u>Stop-Controlled Intersections</u>

Where traffic on the minor road or an exit ramp of an intersection is controlled by stop signs, the driver of the vehicle on the minor road must have adequate sight distance for a safe departure from the stopped position. This assumes that the approaching vehicle comes into view just as the stopped vehicle begins it departure. The following sections discuss the application of the Department's ISD methodology at stop-controlled intersections.

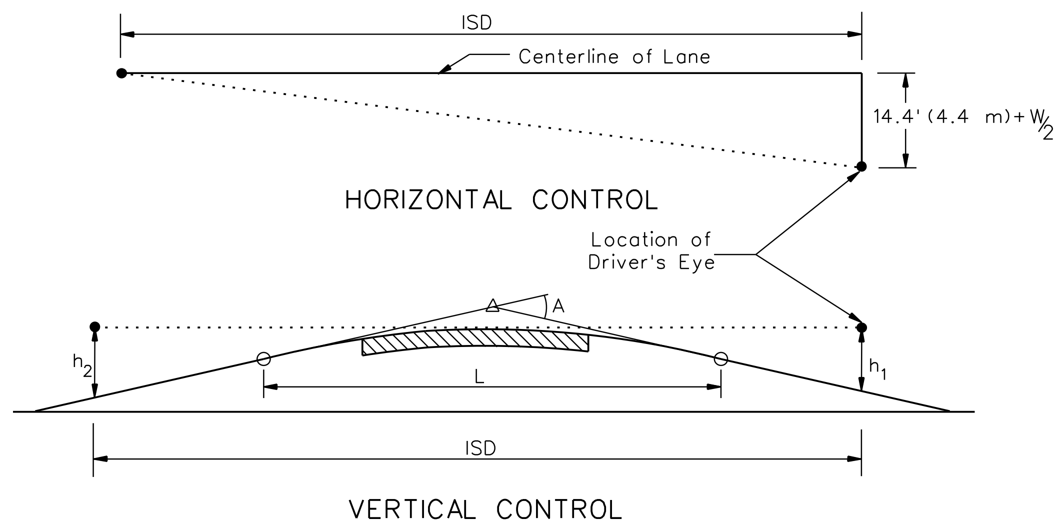
36-6.03(a) Turns Onto Major Roadway

To determine the intersection sight distance for vehicles turning left or right onto the major road, the designer should use Equation 36-6.1 and the gap times (t_c) presented in Figure 36-6.D. Figure 36-6.D also presents adjustments to the gap times for multilane facilities and steep grades on the minor road approach. These adjustments are further discussed below. Figure 36-6.E provides the ISD values for typical design vehicles on two-lane, level facilities. The designer should also consider the following:

1. <u>Turning Maneuver</u>. There is only a minimal difference in the base gap acceptance times between the left- and right-turning drivers. Consequently, only one gap time is provided for both the left- and right-turning vehicle onto the major road. See Figure 36-6.B.



ISD – intersection sight distance, ft (m)
d – minimum distance needed from back of parapet extension or side of structure to vehicle position, ft (m)
do – when minor road is over
du – when minor road is under
A – maximum algebraic difference of grades (%)
L – Length of crest vertical curve, ft (m)
W – width of lane, ft (m)
h_1 – height of eye, see Figure 36-6.C
h_2 – height of obstacle = 3.5 ft (1080mm) (passenger car assumed)



INTERSECTION SIGHT DISTANCE CONTROLS

Figure 36-6.B

20-Year ADT of Tractor/ Semitrailers on Exit Ramp or Crossroad	**Approaching Vehicle on Mainline**[2]	**Stopped Design Vehicle on Crossroad**[1]
ADT $\leq$ 40	Passenger Car h_2 = 3.5 ft (h_2 = 1080 mm)	Passenger Car h_2 = 3.5 ft (h_1 = 1080 mm)
40 < ADT $\leq$ 100	Passenger Car h_2 = 3.5 ft (h_2 = 1080 mm)	Single Unit (SU) or Bus h_1 = 6 ft (h_1 = 1.8 m)
ADT > 100	Passenger Car h_2 = 3.5 ft (h_2 = 1080 mm)	Tractor/Semitrailers (MU) h_1 = 8 ft (h_1 = 2.5 m)

Notes:

1. *h_1 - Assumed height of eye for stopped motorist.*
2. *h_2 - Assumes 9 in (225 mm) of top of approaching vehicle can readily be seen by stopped motorist.*
3. *Where a mainline crest vertical curve lies close to an intersection of a crossroad or ramp, it may be necessary to increase the length of the vertical curve (designed for either existing or proposed stopping sight distance) or to reduce the grades in order to obtain the proper ISD in the vertical plane.*

DESIGN VEHICLES USED TO DETERMINE AVAILABLE ISD ALONG A CROSSROAD

Figure 36-6.C

Design Vehicle	Gap Acceptance Time (t_c) (sec)
Passenger Car	7.5
Single-Unit Truck	9.5
Tractor/Semitrailer	11.5

Note: Times are for turns onto a two-lane highway without a median and may require adjustments to the base time gaps.

Adjustments:

1. *<u>Multilane Highways</u>. The following will apply:*

   - *For left turns onto two-way multilane highways without a median, add 0.5 seconds for passenger cars or 0.7 seconds for trucks for each additional lane from the left, in excess of one, to be crossed by the turning vehicle. See discussion in Section 36-6.03(a) for additional guidance.*

   - *For right turns, no adjustment is necessary.*

2. *<u>Minor Road Approach Grades</u>. If the approach grade on the minor road exceeds +3%, the following will apply:*

   - *For right turns, multiply 0.1 seconds times the actual percent grade on the minor road approach and add this number to the base time gap.*

   - *For left turns, multiple 0.2 seconds times the actual percent grade on the minor approach and add this number to the base time gap.*

3. *<u>Major Road Approach Grade</u>. Major road grade does not affect calculations.*

GAP ACCEPTANCE TIMES
(Left and Right Turns From Minor Road)

Figure 36-6.D

Design Speed (V_{major})	ISD		
	Passenger Cars	Single-Unit Trucks	Tractor/Semitrailers
US Customary			
20 mph	225 ft	280 ft	340 ft
25 mph	280 ft	350 ft	425 ft
30 mph	335 ft	420 ft	510 ft
35 mph	390 ft	490 ft	595 ft
40 mph	445 ft	560 ft	675 ft
45 mph	500 ft	630 ft	760 ft
50 mph	555 ft	700 ft	845 ft
55 mph	610 ft	770 ft	930 ft
60 mph	665 ft	840 ft	1015 ft
65 mph	720 ft	910 ft	1100 ft
70 mph	775 ft	980 ft	1185 ft
Metric			
30 km/h	63 m	80 m	96 m
40 km/h	84 m	106 m	128 m
50 km/h	105 m	132 m	160 m
60 km/h	126 m	159 m	192 m
70 km/h	146 m	185 m	224 m
80 km/h	167 m	212 m	256 m
90 km/h	188 m	238 m	288 m
100 km/h	209 m	264 m	320 m
110 km/h	230 m	291 m	352 m

Notes:

1. *These ISD values assume turns onto a two-lane facility without a median.*
2. *These ISD values assume a minor road approach grade $\leq$ +3%.*

INTERSECTION SIGHT DISTANCES FOR TWO-LANE HIGHWAY
(Left and Right Turns From Minor Road)

Figure 36-6.E

2. Multilane Facilities. For multilane facilities, the gap acceptance times presented in Figure 36-6.D may need to be adjusted to account for the additional distance required by the turning vehicle to cross the additional lanes or median. The following will apply:

   a. Left-Turns. For left turns onto multilane highways without a median, add 0.5 seconds for passenger cars or 0.7 seconds for trucks for each additional lane from the left, in excess of one, to be crossed by the turning vehicle. Assume that the left-turning driver will enter the left most travel lane on the far side of the major road.

   b. Right Turns. Because the turning vehicle is assumed to be turning into the nearest right through lane, no adjustments to the gap times are required. This is the same for either two-lane or multilane facilities.

   c. Medians. Depending on the median width, it also may be necessary to add additional time to the base gap time; see Item 3.

3. Left Turns Through Medians.

   a. Narrow Medians. For a facility that does not have a median wide enough to store a stopped design vehicle, divide the median width by 12 ft (3.6 m) to get the corresponding number of lanes and then use the criteria in Item 2a above to determine the additional time factor.

   b. Wide Medians. For a facility that does have a median wide enough to store a stopped design vehicle, the designer should evaluate the sight distance needed in two separate steps:

      - First, with the design vehicle stopped on the side road, use the gap acceptance times for a vehicle turning right or use Figure 36-6.E directly to determine the applicable ISD. Under some circumstances, it also may be necessary to check the straight through crossing maneuver to determine if it is the critical movement. Straight through crossing criteria are discussed in Section 36-6.03(b).

      - Second, with the design vehicle stopped in the median, assume a two-lane roadway design and use the gap acceptance times for a vehicle turning left or use Figure 36-6.E directly to determine the applicable ISD.

   Section 36-6.07 provides an example of school bus crossing a wide median.

4. Approach Grades. If the approach grade on the minor road exceeds 3%, see the criteria in Figure 36-6.D.

5. Trucks. At some intersections (e.g., near truck stops, interchange ramps, grain elevators), the designer may want to use the truck as the design vehicle for determining the ISD. The gap acceptance times (t_c) for single-unit and tractor/semitrailer trucks are provided in Figure 36-6.D. Calculated ISD values for two-lane roadways are presented

in Figure 36-6.E. The height of eye for these vehicles is discussed in Section 36-6.02 as shown in Figure 36-6.C.

36-6.03(b) Vehicle Crossing Mainline

In the majority of cases, the intersection sight distance for a crossing maneuver is less than that required for a left- or right-turning vehicle. However, in the following situations, the straight through crossing sight distance may be the more critical movement:

- where left and/or right turns are not permitted from a particular approach and the crossing maneuver is the only legal or expected movement (e.g., indirect left turns);
- where the design vehicle must cross more than four travel lanes or, with medians, the equivalent distance; or
- where a substantial volume of heavy vehicles cross the highway and there are steep grades on the minor road approaches.

Use Equation 36-6.1 and the gap acceptance times (t_c) and adjustment factors in Figure 36-6.F to determine the ISD for crossing maneuvers. Where narrow medians are present which cannot store the design vehicle, include the median width in the overall width to determine the applicable gap time. Divide this overall width by 12 ft (3.6 m) to determine the corresponding number of lanes for the crossing maneuver. Add 0.5 seconds for passenger cars or 0.7 seconds for trucks for each additional lane, in excess of two, to be crossed by the design vehicle.

Design Vehicle	**Gap Acceptance Time (t_c) (sec)**
Passenger Car	6.5
Single-Unit Truck	8.5
Tractor/Semitrailer	10.5

Note: Times are for crossing a two-lane highway without a median.

Adjustments:

1. *Multilane Highway. Where the design vehicle is crossing a major road with more than two lanes and/or where there is a narrow median which cannot store the design vehicle, add 0.5 seconds for passenger cars or 0.7 seconds for trucks for each additional lane in excess of two. See the discussion in Section 36-6.03(b) for additional guidance.*

2. *Approach Grade. If the approach grade on the minor road exceeds +3%, multiply 0.1 seconds times the actual percent grade of the minor road approach, and add this number to the base time gap.*

GAP ACCEPTANCE TIMES
(Vehicle Crossing Mainline)

Figure 36-6.F

36-6.03(c) Four-Way Stop

At intersections with all-way stop control, provide enough sight distance so that the first stopped vehicle on each approach is visible to all the other approaches. The ISD criteria for left- or right-turning vehicles as discussed in Section 36-6.03(a) are not applicable in this situation. Often intersections are converted to all-way stop control to address limited sight distance at the intersection. Therefore, providing additional sight distance at the intersection is unnecessary.

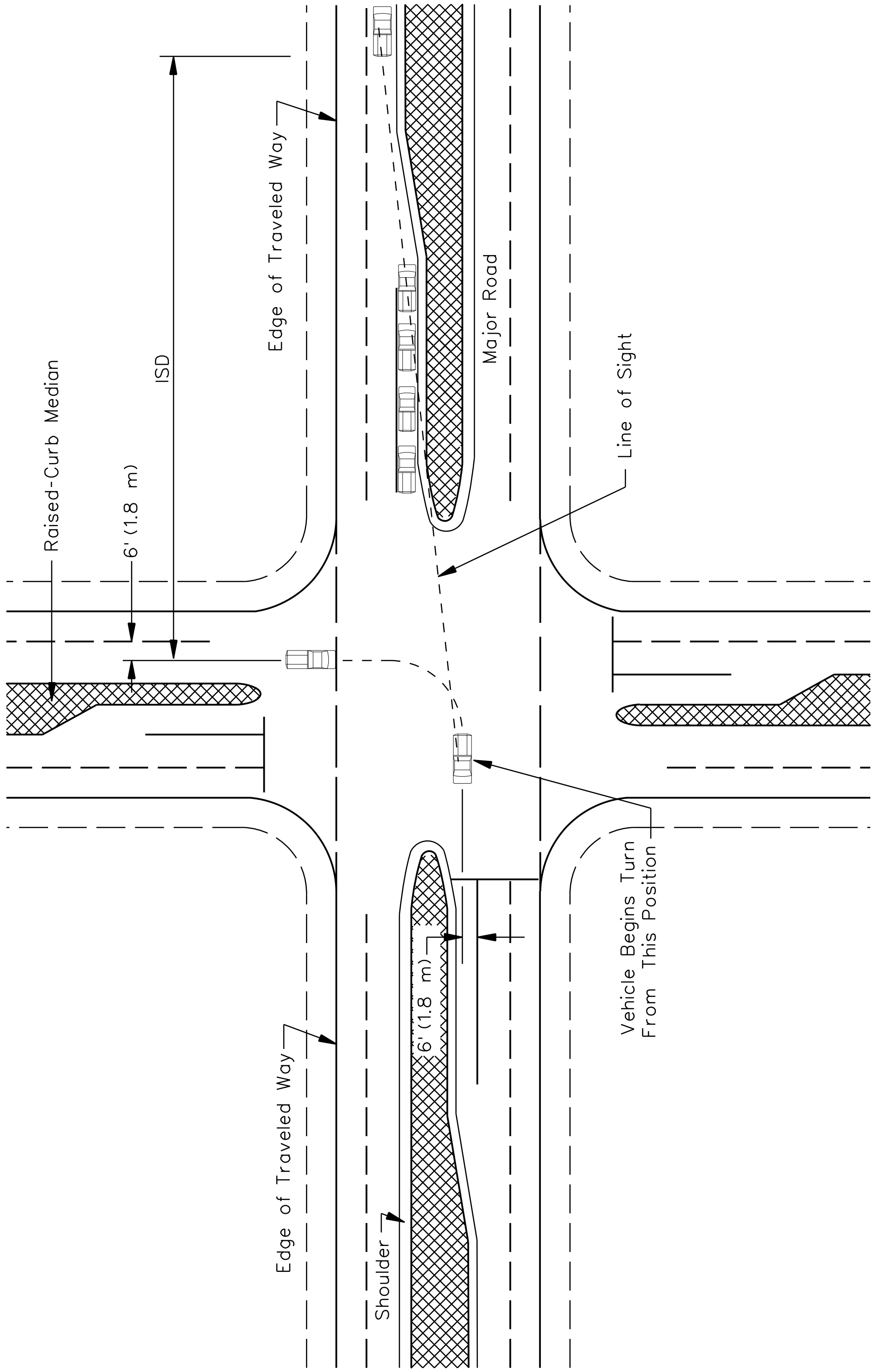
36-6.04 Signal-Controlled Intersections

At signalized intersections, provide sufficient sight distance so that the first vehicle on each approach is visible to all other approaches. Traffic signals are often used at high-volume intersections to address accidents related to restricted sight distances. Therefore, the ISD criteria for left- or right-turning vehicles as discussed in Section 36-6.03(a) is typically not applicable at signalized intersections. However, where right-turn-on-red is allowed, check to see that the ISD as presented in Section 36-6.03(a) for a stop-controlled right-turning vehicle is available to the left. If it is not, this may warrant restricting the right-turn-on-red movement. In addition, if the traffic signal is placed on two-way flash operation (i.e., flashing amber on the major-road approaches and flashing red on the minor-road approaches) under off-peak or nighttime conditions, provide the ISD criteria as discussed in Section 36-6.03(a) for a stop-controlled intersection.

36-6.05 Left Turns From the Major Road

At all intersections, regardless of the type of traffic control, the designer should consider the sight distance needs for a stopped vehicle turning left from the major road. This situation is illustrated in Figure 36-6.G. The driver will need to see straight ahead for a sufficient distance to turn left and clear the opposing travel lanes before an approaching vehicle reaches the intersection. In general, if the major highway has been designed to meet the stopping sight distance criteria, intersection sight distance only will be a concern where the major road is on a horizontal curve, where there is a median, or where there are opposing vehicles making left turns at an intersection. Sight distance for opposing left turns may be increased by offsetting the left-turn lanes; see Section 36-3.03(c).

Use Equation 36-6.1 and the gap acceptance times (t_c) from Figure 36-6.H to determine the applicable intersection sight distances for the left-turning vehicle. Where the left-turning vehicle must cross more than one opposing lane, add 0.5 seconds for passenger cars or 0.7 seconds for trucks for each additional lane in excess of one. Where medians are present and the left-turn lanes are not offset, the designer will need to consider the median width in the same manner as discussed in Section 36-6.03. Figure 36-6.I provides the ISD values for typical design vehicles and two common left-turning situations on a facility without a median.



Note: See Section 36-6.05 for discussion and application

INTERSECTIONS SIGHT DISTANCE CONTROLS)
(Left Turns from the Major Road)

Figure 36-6.G

Design Vehicle	Gap Acceptance Time (t_c) (sec)
Passenger Car	5.5
Single-Unit Truck	6.5
Tractor/Semitrailer	7.5

Adjustments: Where left-turning vehicles cross more than one opposing lane, add 0.5 seconds for passenger cars or 0.7 seconds for trucks for each additional lane in excess of one. See Section 36-6.05 for additional guidance on median widths.

GAP ACCEPTANCE TIMES
(Left Turns From Major Road)

Figure 36-6.H

36-6.06 Effect of Skew

Where is it is impractical to realign an intersection which is greater than 30° from perpendicular, adjust the gap acceptance times presented in the above sections to account for the additional travel time required for a vehicle to make a turn or cross a facility. At oblique-angled intersections, determine the actual path length for a turning or crossing vehicle by dividing the total distance of the lanes and/or median to be crossed by the sine of the intersection angle. If the actual path length exceeds the total width of the lanes to be crossed by 12 ft (3.6 m) or more, apply the applicable adjustment factors; see Figure 36-6.J.

36-6.07 Examples of ISD Applications

The following three examples illustrate the application of the ISD criteria:

Example 36-6.07(1)

Given: Minor road intersects a four-lane highway with a TWLTL.
Minor road is stop controlled and intersects major road at 90°.
Design speed of the major highway is 45 mph.
All travel lane widths are 12 ft.
The TWLTL width is 12 ft.
Grade on minor road is 1%.
Trucks are not a concern.

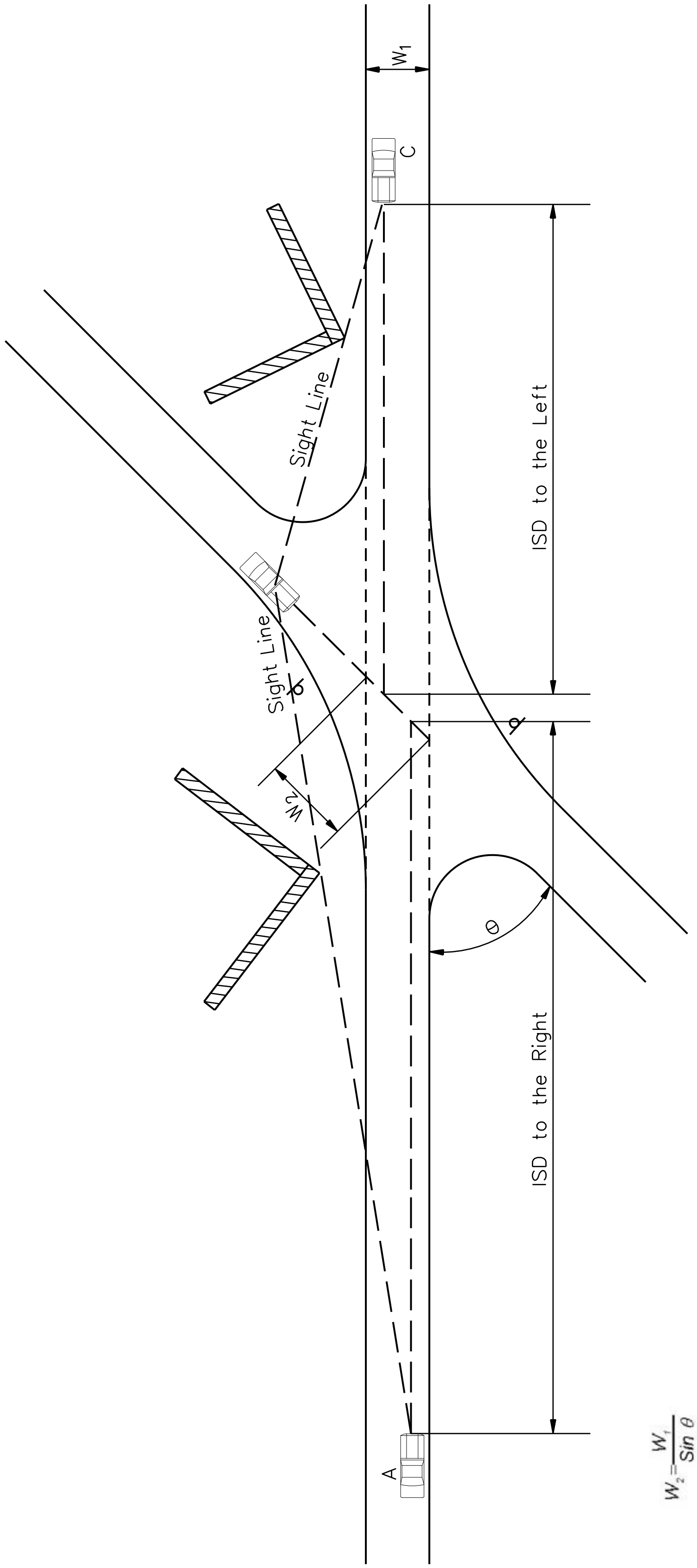
Problem: Determine the intersection sight distance needed to the left and right of the minor road. See Figure 36-6.B.

Design Speed (V_{major})	ISD					
	Passenger Cars		Single-Unit Trucks		Tractor/Semitrailers	
	Crossing 1 lane	Crossing 2 lanes	Crossing 1 lane	Crossing 2 lanes	Crossing 1 lane	Crossing 2 lanes
US Customary						
20 mph	165 ft	180 ft	195 ft	210 ft	225 ft	240 ft
25 mph	205 ft	225 ft	240 ft	260 ft	280 ft	295 ft
30 mph	245 ft	265 ft	290 ft	310 ft	335 ft	355 ft
35 mph	285 ft	310 ft	335 ft	365 ft	390 ft	415 ft
40 mph	325 ft	355 ft	385 ft	415 ft	445 ft	475 ft
45 mph	365 ft	400 ft	430 ft	465 ft	500 ft	530 ft
50 mph	405 ft	445 ft	480 ft	515 ft	555 ft	590 ft
55 mph	445 ft	490 ft	525 ft	570 ft	610 ft	650 ft
60 mph	490 ft	530 ft	575 ft	620 ft	665 ft	710 ft
65 mph	530 ft	575 ft	625 ft	670 ft	720 ft	765 ft
70 mph	570 ft	620 ft	670 ft	720 ft	775 ft	825 ft
Metric						
30 km/h	50 m	50 m	55 m	59 m	63 m	67 m
40 km/h	65 m	67 m	73 m	78 m	84 m	89 m
50 km/h	77 m	84 m	91 m	98 m	105 m	112 m
60 km/h	92 m	100 m	109 m	117 m	125 m	134 m
70 km/h	107 m	117 m	127 m	137 m	146 m	156 m
80 km/h	123 m	134 m	145 m	156 m	167 m	178 m
90 km/h	138 m	150 m	163 m	175 m	188 m	200 m
100 km/h	153 m	167 m	181 m	195 m	209 m	223 m
110 km/h	169 m	184 m	199 m	214 m	230 m	245 m

Note: Assumes no median on major road.

INTERSECTION SIGHT DISTANCES
(Left Turns From Major Road)

Figure 36-6.I



$$W_2 = \frac{W_1}{\sin \theta}$$

Where: W_1 = Major road traveled way width, ft (m)
W_2 = Adjusted width for skew, ft (m)
θ = Intersection angle

SIGHT DISTANCE AT SKEWED INTERSECTIONS

Figure 36-6.J

Solution:

1. For the passenger car turning right, the ISD to the left can be determined directly from Figure 36-6.E, because the right-turning motorist is assumed to turn into the near lane. For the 45 mph design speed, the ISD to the left is 500 ft.

2. For the passenger car turning left, the ISD to the right must reflect the additional time required to cross the additional lanes and TWLTL; see in Section 36-6.03(a). The following will apply:

   a. First, determine the extra width required by the one additional travel lane and the TWLTL and divide this number by 12 ft:

$$\frac{(12 + 12)}{12} = 2 \text{ lanes}$$

   b. Next, multiply the number of lanes by 0.5 seconds to determine the additional time required:

(2 lanes)(0.5 sec/lane) = 1.0 second

   c. Add the additional time to the basic gap time of 7.5 seconds and insert this value into Equation 36-6.1:

ISD = (1.467)(45)(7.5 + 1.0) = 561 ft

   Provide an ISD of 561 ft to the right for the left-turning vehicle.

3. Check the passenger vehicle crossing the mainline, as discussed in Section 36-6.03(b). The following will apply:

   a. First determine the extra width required by the two additional travel lanes and the TWLTL and divide this number by 12 ft:

$$\frac{(12 + 12 + 12)}{12} = 3.0 \text{ lanes}$$

   b. Next, multiply the number of lanes by 0.5 seconds to determine the additional time required:

(3.0 lanes)(0.5 sec/lane) = 1.5 seconds

   c. Add the additional time to the basic gap time of 6.5 seconds and insert this value into Equation 36-6.1:

ISD = (1.467)(45)(6.5 + 1.5) = 530 ft

The 530 ft for the crossing maneuver is less than the 561 ft required for the left-turning vehicle and, therefore, is not the critical maneuver.

4. Prepare a scaled drawing in the horizontal and vertical planes and graphically check to determine if the applicable ISD is available.

Example 36-6.07(2)

Given: Minor road intersects a four-lane divided highway.
Minor road is stop controlled and intersects major road at 90°.
Design speed of the major highway is 60 mph.
All travel lane widths are 12 ft.
The median width is 50 ft.
Grade on minor road is +2%.
The design vehicle is a 64-passenger school bus that is 35.8 ft long.

Problem: Determine the intersection sight distance needed to the left and right of the minor road. See Figure 36-6.B.

Solution:

1. For a school bus, assume a SU design vehicle for gap acceptance times.

2. For the school bus turning right, the ISD to the left can be determined directly from Figure 36-6.E. For the 60 mph design speed, the ISD to the left is 840 ft.

3. Determine if the straight through crossing maneuver is critical; see Section 36-6.03(b). No adjustments are required to the base time of 8.5 seconds. Therefore, use Equation 36-6.1 directly:

$$ISD = (1.467)(60)(8.5) = 750 \text{ ft}$$

The crossing maneuver ISD is less than the right-turning maneuver and, therefore, is not critical.

4. For the school bus turning left, it can be assumed the school bus can safely stop in the median (i.e., 50 ft minus 35.8 ft). The ISD to the right can be determined directly from Figure 36-6.E. For the 60 mph design speed, the ISD to the right for the left turn is 840 ft. The crossing maneuver will not be critical.

5. Prepare a scaled drawing in the horizontal and vertical planes and graphically check to determine if the applicable ISD is available.

Example 36-6.07(3)

Given: Minor road intersects a four-lane divided highway.
Minor road is stop controlled and intersects major road at 90°.
Design speed of the major highway is 50 mph.
All travel lane widths are 12 ft.
Existing median width is 48 ft.
Traffic signals are likely within 10 years.
Current mainline ADT is 1600 and left-turn volumes exceed 60 vph.
Trucks are not a concern.

Problem: Determine the intersection design and sight distance for a vehicle turning left from the major road.

Solution:

1. From Section 36-3.03(c), the recommended left-turn lane design is a tapered offset left-turn lane.

2. Because the offset left-turn lane design places vehicles near the median edge of the opposing lanes, no adjustment is necessary for the median width in computing the gap acceptance time.

3. For the left-turning vehicle, the ISD can be determined directly from Figure 36-6.I. For the 50 mph design speed and crossing two lanes, the required ISD is 480 ft.

4. Prepare a scaled drawing in the horizontal and vertical planes and graphically check to determine if the applicable ISD is available.

36-7 DRIVEWAYS AND MAJOR ENTRANCES

For guidelines on design criteria for driveways and major entrances, see the IDOT *Policy on Permits for Access Driveways to State Highways* (92 *Illinois Administrative Code* 550).

36-8 INTERSECTION DESIGN NEAR RAILROADS

These design guidelines apply to all State highway improvement projects where the route is adjacent and parallel to a railroad. Where an at-grade railroad crossing is within 200 ft (60 m) of an intersection, the design should address efforts to keep vehicles from stopping or storing on the tracks. This applies to either signal- or stop-controlled intersections. The following factors should be identified and considered during the planning stages:

1. Clear Storage Distance. Consider alternative designs that provide a minimum distance of 75 ft (23 m) between the proposed intersection stop bar and a point 6 ft (1.8 m) from the closest rail.

2. Space for Vehicular Escape. On the far side of any railroad crossing, consider providing an escape area for vehicles (e.g., shoulder with curb and gutter behind the shoulder, flush medians, flush-corner islands, right-turn acceleration lanes, improved corner radii).

3. Conflicting Commercial Access. Left-turn vehicular movements that may inhibit the clearance of queued traffic on the approaches to railroad tracks should be discouraged. If entrances on the street approach exist, consider using design features that would eliminate the problems (e.g., left-turn lane, raised-curb median).

4. Pre-Signal Traffic Signals. Pre-signals should be installed at a grade crossing where the distance between the stop bar and the nearest rail is 56 ft (17.1 m) or less. If the crossing is on a State highway, or if a high percentage of multi-unit vehicles cross the tracks, then pre-signals should be installed where the distance between the stop bar and the nearest rail is 81 ft (24.7 m) or less. If pre-signals are required on the near side of the tracks, a raised-curb median may be necessary adjacent to the tracks to provide for proper placement of signals.

5. Restricted Intersection Capacity. During periods of frequent railroad preemption of traffic signals, consider the effects of reduced traffic flow, lack of progression on the street paralleling the tracks, and traffic backups. Available computer programs should be used to analyze different capacity and operational scenarios and to recommend any countermeasures.

6. Sight Restrictions. Review and analyze sight distance triangles along railroad tracks and eliminate any restrictions. Guidance on this analysis can be found in AASHTO, *A Policy on Geometric Design of Highways and Streets*. Notify the ICC of any obstructions on railroad right-of-way.

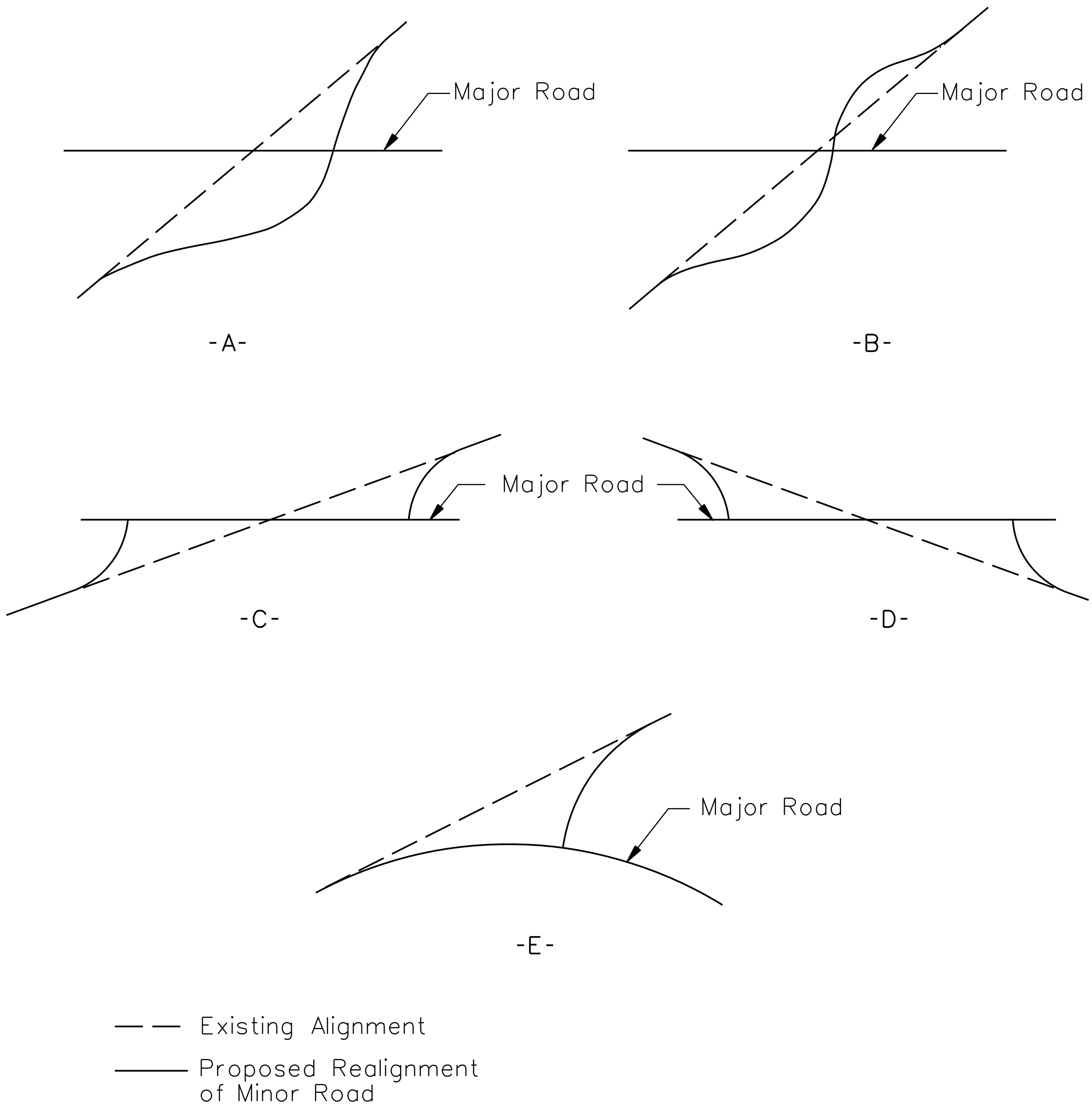
7. Protected Left-Turn Storage. On the street that parallels the tracks, analyze the storage length needed for left-turns into the side street and across the tracks during preemption of the traffic signals. Without the proper storage length available, this could cause backups into the through lanes.

8. Right-Turn Lanes. On the street which runs parallel to the railroad and where an actuated NO RIGHT TURN SIGN is proposed in conjunction with railroad preemption, a

right-turn lane should be considered for the right-turn movement across the tracks. The auxiliary lane provides a refuge for right-turning vehicles during railroad preemption and eliminates the problem of traffic temporarily blocking the through lanes.

9. Side Street Left-Turn Lane Capacity. On streets that cross railroad tracks, provide sufficient left-turn storage lengths that will avoid the problem of left turns spilling out onto through lanes and blocking the through lanes.

10. Other. See the Bureau of Operations *Policies and Procedures Manual* and memorandum for additional information.



Notes:

1. *Where there are high volumes of left turns from the major road, avoid using the offset intersection alignment illustrated in "C."*

2. *Revised alignments "C" and "D" are not desirable in agricultural areas with large numbers of farm vehicles crossing the major road.*

REALIGNMENT OF INTERSECTIONS

Figure 36-1.D