

CLASS HANDOUTS

CRASH ANALYSIS

Key to Collision Diagram Symbols

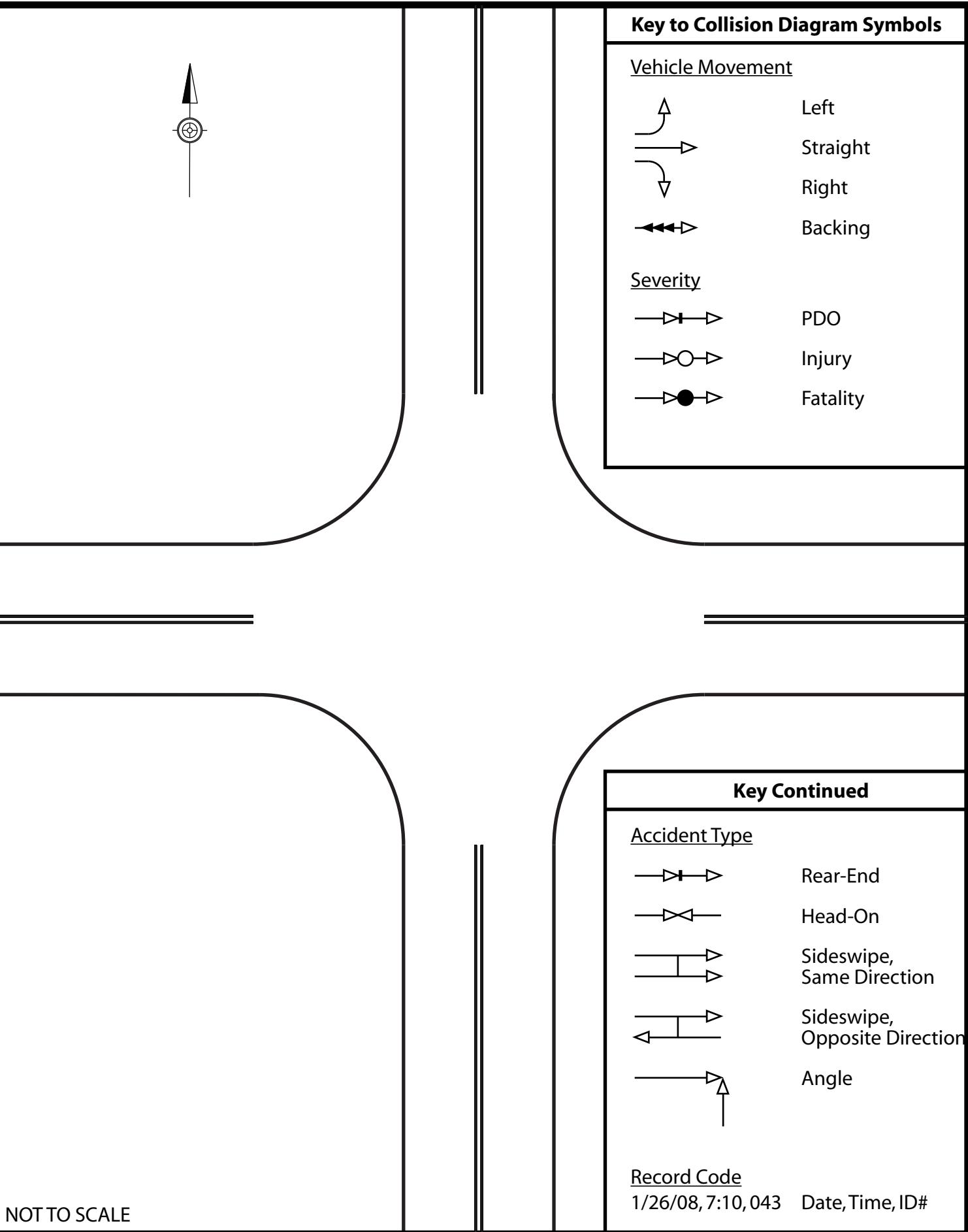


Vehicle Movement

- | | |
|-----|----------|
| ↗ | Left |
| → | Straight |
| ↘ | Right |
| ↔↔↔ | Backing |

Severity

- | | |
|-----|----------|
| →→→ | PDO |
| →○→ | Injury |
| →●→ | Fatality |



Key Continued

Accident Type

- | | |
|-----|----------------------------------|
| →→→ | Rear-End |
| →←→ | Head-On |
| ↔→→ | Sideswipe, Same Direction |
| ↔→→ | Sideswipe, Opposite Direction |
| →↑→ | Angle |

Record Code

1/26/08, 7:10, 043 Date, Time, ID#

NOT TO SCALE

SR 1234 AT JASPER LN/CAPTAINS WAY IN BROWN TWP IN REINBO CO LOG 0000-00


Sorted by County, Route, Segment, Offset

Date Range: 1/1/2003 to 12/31/2005

USER_ID/QUERY ID:

poremba/ 000000000000

Area of Interest: (In County 00 On State Route 1234(P) Between Segment 0000 Offset 0000

Interest: and Segment 0000 Offset 100)

| | CRN | CO | DATE | DAY | TIME | LIGHTING | ROAD SURF | WEATHER | FAT | INJ | PED | VEH | MAX SEVERITY | |
|---|----------------------------|----|------------|-----|-------|--|-----------|----------|-----|-----|-----|-----|-----------------|--------------|
| 1 | 0000000000 | 28 | 01/06/2005 | THR | 15:42 | DAYLIGHT | WET | RAIN/FOG | 0 | 0 | 0 | 1 | PROP DMG ONLY | |
| | | | | | | ENV RDWY FACTORS: NONE MIDB 1234 / 0000 / 0000 | | | | | | | HIT FIXED OBJ | |
| | | | | | | VEH: 1 AUTOMOBILE TRAVELING SOUTH IN RIGHT LANE AVOIDING VEH EVENTS: HIT TREE OR SHRUBBERY HIT BUILDING DVR ACTIONS: TOO FAST FOR CONDITIONS DRIVER INEXPERIENCED | | | | | | | | |
| 2 | 0000000000 | 28 | 01/22/2003 | WED | 15:33 | DAYLIGHT | DRY | CLEAR | 0 | 1 | 0 | 2 | MINOR INJURY | |
| | | | | | | ENV RDWY FACTORS: NONE 4WAY 1234 / 0000 / 0000 CAPTAINS WAY JASPER LN | | | | | | | ANGLE | |
| | | | | | | VEH: 1 AUTOMOBILE TRAVELING EAST IN RIGHT LANE TURNING RIGHT VEH EVENTS: STRUCK BY UNIT 02 DVR ACTIONS: RUNNING STOP SIGN VEH: 2 AUTOMOBILE TRAVELING SOUTH IN NOT APPLICABLE GOING STRAIGHT VEH EVENTS: HIT UNIT 01 DVR ACTIONS: NO CONTRIBUTING ACTION | | | | | | | | |
| 3 | 0000000000 | 28 | 07/13/2003 | SUN | 18:31 | DAYLIGHT | DRY | CLEAR | 0 | 3 | 0 | 2 | MODERATE INJURY | |
| | | | | | | ENV RDWY FACTORS: NONE 4WAY 1234 / 0000 / 0000 JASPER LN CAPTAINS WAY | | | | | | | ANGLE | |
| | | | | | | VEH: 1 AUTOMOBILE TRAVELING WEST IN RIGHT LANE GOING STRAIGHT VEH EVENTS: STRUCK BY UNIT 02 OVERTURN/ROLL OVER DVR ACTIONS: RUNNING STOP SIGN VEH: 2 AUTOMOBILE TRAVELING SOUTH IN RIGHT LANE GOING STRAIGHT VEH EVENTS: HIT UNIT 01 HIT EMBANKMENT DVR ACTIONS: NO CONTRIBUTING ACTION | | | | | | | | |
| 4 | 0000000000 | 28 | 09/23/2003 | TUE | 18:05 | DAYLIGHT | DRY | CLEAR | 0 | 2 | 0 | 2 | UNK SEVERITY | |
| | | | | | | ENV RDWY FACTORS: NONE 4WAY 1234 / 0000 / 0000 JASPER LN CAPTAINS WAY | | | | | | | ANGLE | |
| | | | | | | VEH: 1 AUTOMOBILE TRAVELING EAST IN RIGHT LANE TURNING LEFT VEH EVENTS: HIT UNIT 02 DVR ACTIONS: PROCEED W/O CLEARANCE VEH: 2 AUTOMOBILE TRAVELING SOUTH IN RIGHT LANE GOING STRAIGHT VEH EVENTS: HIT UNIT 01 DVR ACTIONS: NO CONTRIBUTING ACTION | | | | | | | | ALC TEST: 00 |
| 5 | 0000000000 | 28 | 11/14/2004 | SUN | 16:03 | DAYLIGHT | DRY | CLEAR | 0 | 5 | 0 | 2 | MINOR INJURY | |
| | | | | | | ENV RDWY FACTORS: NONE 4WAY 1234 / 0000 / 0000 CAPTAINS WAY JASPER LN | | | | | | | ANGLE | |
| | | | | | | VEH: 1 SMALL TRUCK TRAVELING WEST IN RIGHT LANE GOING STRAIGHT VEH EVENTS: STRUCK BY UNIT 02 HIT EMBANKMENT OVERTURN/ROLL OVER DVR ACTIONS: RUNNING STOP SIGN VEH: 2 AUTOMOBILE TRAVELING NORTH IN RIGHT LANE GOING STRAIGHT VEH EVENTS: HIT UNIT 01 HIT EMBANKMENT DVR ACTIONS: NO CONTRIBUTING ACTION | | | | | | | | ALC TEST: 00 |
| 6 | 0000000000 | 28 | 12/23/2004 | THR | 20:42 | DARK | DRY | CLEAR | 1 | 1 | 0 | 2 | FATAL | |
| | | | | | | ENV RDWY FACTORS: NONE 4WAY 1234 / 0000 / 0000 CAPTAINS WAY JASPER LN | | | | | | | ANGLE | |
| | | | | | | VEH: 1 AUTOMOBILE TRAVELING EAST IN RIGHT LANE GOING STRAIGHT VEH EVENTS: STRUCK BY UNIT 02 HIT OTHER FIXED OBJECT DVR ACTIONS: RUNNING STOP SIGN VEH: 2 VAN TRAVELING SOUTH IN RIGHT LANE GOING STRAIGHT VEH EVENTS: HIT UNIT 01 DVR ACTIONS: NO CONTRIBUTING ACTION | | | | | | | | ALC TEST: 00 |

IMPORTANT: This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. §3754 and 23 U.S.C. §409 and may not be disclosed or used in litigation without written permission from PennDOT.

Page 1 of 3

Print Date: 1/30/2007

SR 1234 AT JASPER LN/CAPTAINS WAY IN BROWN TWP IN REINBO CO LOG 0000-00


Sorted by County, Route, Segment, Offset

Date Range: 1/1/2003 to 12/31/2005

USER_ID/QUERY ID:

poremba/ 000000000000

Area of (In County 00 On State Route 1234(P) Between Segment 0000 Offset 0000

Interest: and Segment 0000 Offset 100)

| CRN | CO | DATE | DAY | TIME | LIGHTING | ROAD SURF | WEATHER | FAT | INJ | PED | VEH | MAX SEVERITY |
|---|-----------------------------------|------|------------|------|----------|-----------|---------|-------|-----|-----|-----|--------------|
| 7 | <u>0000000000</u> | 28 | 12/31/2004 | FRI | 14:20 | DAYLIGHT | DRY | CLEAR | 0 | 1 | 0 | 3 |
| ENV RDWY FACTORS: NONE 4WAY 1234 / 0000 / 0000 CAPTAINS WAY JASPER LN | | | | | | | | | | | | |
| VEH: 1 SMALL TRUCK TRAVELING EAST IN RIGHT LANE TURNING LEFT VEH EVENTS: STRUCK BY UNIT 02 DVR ACTIONS: PROCEED W/O CLEARANCE | | | | | | | | | | | | |
| VEH: 2 SMALL TRUCK TRAVELING NORTH IN RIGHT LANE GOING STRAIGHT VEH EVENTS: HIT UNIT 01 HIT UNIT 03 DVR ACTIONS: NO CONTRIBUTING ACTION | | | | | | | | | | | | |
| VEH: 3 SUV TRAVELING WEST IN RIGHT LANE STOPPED IN TRAFFIC LANE VEH EVENTS: STRUCK BY UNIT 02 DVR ACTIONS: NO CONTRIBUTING ACTION | | | | | | | | | | | | |
| 8 | <u>0000000000</u> | 28 | 08/26/2005 | FRI | 14:31 | DAYLIGHT | DRY | CLEAR | 0 | 0 | 0 | 2 |
| ENV RDWY FACTORS: NONE 4WAY 1234 / 0000 / 0000 JASPER LN CAPTAINS WAY | | | | | | | | | | | | |
| VEH: 1 AUTOMOBILE TRAVELING EAST IN ONCOMING TRAFFIC LANE TURNING LEFT VEH EVENTS: HIT UNIT 02 DVR ACTIONS: IMPROPER/CARELESS TURN | | | | | | | | | | | | |
| VEH: 2 SMALL TRUCK TRAVELING NORTH IN RIGHT LANE GOING STRAIGHT VEH EVENTS: HIT UNIT 01 DVR ACTIONS: NO CONTRIBUTING ACTION | | | | | | | | | | | | |

SR 1234 AT JASPER LN/CAPTAINS WAY IN BROWN TWP IN REINBO CO LOG 0000-00
Date Range: 1/1/2003 to 12/31/2005

Area of Interest: (In County 00 On State Route 1234(P) Between Segment 0000 Offset 0000

and Segment 0000 Offset 100)
USER ID/QUERY ID:

poremba/ [000000000000](#)

MONTH OF YEAR

| | JAN | JUL | AUG | SEP | NOV | DEC | |
|---------|-----|-----|-----|-----|-----|-----|------|
| CRASHES | 2 | 1 | 1 | 1 | 1 | 2 | 8 |
| PCT | 25% | 12% | 12% | 12% | 12% | 25% | 100% |

DAY OF WEEK

| | SUN | TUE | WED | THR | FRI | |
|---------|-----|-----|-----|-----|-----|------|
| CRASHES | 2 | 1 | 1 | 2 | 2 | 8 |
| PCT | 25% | 12% | 12% | 25% | 25% | 100% |

HOUR OF DAY

| | 14 | 15 | 16 | 18 | 20 | |
|---------|-----|-----|-----|-----|-----|------|
| CRASHES | 2 | 2 | 1 | 2 | 1 | 8 |
| PCT | 25% | 25% | 12% | 25% | 12% | 100% |

YEAR

| | CRASHES | PCT |
|--------------|----------|-------------|
| 2003 | 3 | 37% |
| 2004 | 3 | 37% |
| 2005 | 2 | 25% |
| TOTAL | 8 | 100% |

COLLISION TYPE

| | CRASHES | PCT |
|--------------|----------|-------------|
| ANGLE | 7 | 87% |
| HIT FIX OBJ | 1 | 12% |
| TOTAL | 8 | 100% |

CRASH SEVERITY LEVEL

| | CRASHES | PCT |
|--------------|----------|-------------|
| FATAL | 1 | 12% |
| MODERATE | 1 | 12% |
| MINOR | 3 | 37% |
| UNK SEVERITY | 1 | 12% |
| PDO | 2 | 25% |
| TOTAL | 8 | 100% |

SEVERITY COUNT

| | PERSONS |
|----------------|---------|
| FATALITIES | 1 |
| MAJOR | 0 |
| Moderate | 3 |
| MINOR | 5 |
| UNK SEVERITY | 5 |
| UNK IF INJURED | 0 |

DRIVER ACTIONS

| | ACTIONS | PCT |
|------------------------|-----------|-------------|
| NO CONTRIBUTING ACTION | 15 | 46% |
| RUNNING STOP SIGN | 8 | 25% |
| PROCEED W/O CLEARANCE | 5 | 15% |
| IMPROPER/CARELESS TURN | 2 | 6% |
| DRIVER INEXPERIENCED | 1 | 3% |
| TOO FAST FOR CONDITION | 1 | 3% |
| TOTAL | 32 | 100% |

VEHICLE TYPE

| | VEHICLES | PCT |
|--------------|-----------|-------------|
| AUTOMOBILE | 10 | 62% |
| SMALL TRUCK | 4 | 25% |
| SUV | 1 | 6% |
| VAN | 1 | 6% |
| TOTAL | 16 | 100% |

ROAD CONDITION

| | CRASHES | PCT |
|--------------|----------|-------------|
| DRY | 7 | 87% |
| WET | 1 | 12% |
| TOTAL | 8 | 100% |

ILLUMINATION

| | CRASHES | PCT |
|--------------|----------|-------------|
| DAYLIGHT | 7 | 87% |
| DARK | 1 | 12% |
| TOTAL | 8 | 100% |

WEATHER

| | CRASHES | PCT |
|--------------|----------|-------------|
| CLEAR | 7 | 87% |
| RAIN/FOG | 1 | 12% |
| TOTAL | 8 | 100% |

ENVIR/ROADWAY FACTORS

| | FACTORS | PCT |
|--------------|-----------|-------------|
| NONE | 11 | 100% |
| TOTAL | 11 | 100% |

Date Range: 1/1/2003 to 12/31/2005 *

Area of (In County 00 On State Route 1234(P) Between Segment 0000 Offset 0000

Interest: and Segment 0000 Offset 100)

CRASH SEVERITY LEVEL BY YEAR

| | 2003 CRASHES | 2004 CRASHES | 2005 CRASHES | ALL YEARS |
|-------------------------|-----------------|-----------------|-----------------|-----------|
| FATAL INJURY CRASH | 0 | 1 | 0 | 1 |
| MINOR INJURY CRASH | 1 | 2 | 0 | 3 |
| MODERATE INJURY CRASH | 1 | 0 | 0 | 1 |
| PROPERTY DMG ONLY CRASH | 0 | 0 | 2 | 2 |
| UNKNOWN SEVERITY CRASH | 1 | 0 | 0 | 1 |
| TOTAL | 3 | 3 | 2 | 8 |

CRASH DESCRIPTION TYPES BY YEAR

| | 2003 CRASHES | 2004 CRASHES | 2005 CRASHES | ALL YEARS |
|------------------|-----------------|-----------------|-----------------|-----------|
| ANGLE | 3 | 3 | 1 | 7 |
| HIT FIXED OBJECT | 0 | 0 | 1 | 1 |
| TOTAL | 3 | 3 | 2 | 8 |

PERSON INJURY SUMMARY BY YEAR

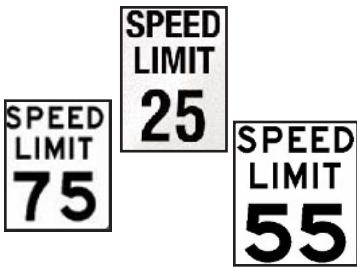
| | 2003 PERSONS | 2004 PERSONS | 2005 PERSONS | ALL YEARS |
|--------------------|-----------------|-----------------|-----------------|-----------|
| FATALITIES | 0 | 1 | 0 | 1 |
| MAJOR INJURIES | 0 | 0 | 0 | 0 |
| MODERATE INJURIES | 3 | 0 | 0 | 3 |
| MINOR INJURIES | 1 | 4 | 0 | 5 |
| UNKNOWN SEVERITY | 2 | 3 | 0 | 5 |
| UNKNOWN IF INJURED | 0 | 0 | 0 | 0 |

* PLEASE NOTE: Crash information for 2006 is incomplete at the time of this printing. As such, data for 2006 are not included in this report.

IMPORTANT: The information contained in this document is drawn from raw data and should not be interpreted as representing an engineering judgement or determination made by the Department of Transportation as to the type and severity of accidents noted herein.

Print Date: 2/1/2007:

SPOT SPEED STUDY



Speed Zoning Information

A Case of "Majority Rule" (Within the United States)

EXECUTIVE SUMMARY

What Realistic Speed Limits Do:

- Encourage compliance from the majority of drivers;
- Give a clear reminder of reasonable and prudent speeds;
- Provide an effective enforcement tool to the police;
- Minimize public antagonism toward police enforcement, which results from obviously unreasonable regulations; and
- Encourage drivers to travel at the speed where the risk of crash involvement is the lowest.

What Unrealistic Speed Limits Do:

- Discourage voluntary compliance;
- Create the perception of "speed traps;"
- Cause public antagonism toward the police;
- Create a bad image for a community in the eyes of tourists; and
- May increase the potential for crashes.

WHY SPEED LIMITS?

Generally, traffic laws that reflect the behavior of the majority of motorists are found to be successful, while laws that arbitrarily restrict the majority of motorists encourage violations, lack public support and usually fail to bring about desirable changes in driving behavior. This is especially true of speed zoning.

Speed zoning is based on several fundamental concepts deeply rooted within the American system of government and law:

- A. Driving behavior is an extension of social attitude and the majority of drivers respond in a safe and reasonable manner as demonstrated by consistently favorable driving records;
- B. The normally careful and competent actions of a reasonable person should be considered appropriate;
- C. Laws are established for the protection of the public and the regulation of unreasonable behavior on the part of individuals; and
- D. Laws cannot be effectively enforced without the consent and voluntary compliance of the public majority.

COMMON MISCONCEPTIONS

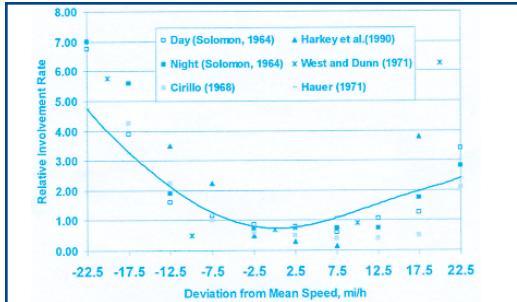
The public normally accepts the concepts noted above. However, when emotionally aroused in a specific instance, the same public will often reject these fundamentals and rely instead on more comfortable and widely-held misconceptions such as:

- A. Reducing the speed limit will slow the speed of traffic;
- B. Reducing speed limits will decrease the number of crashes and increase safety;
- C. Raising the posted speed limit will cause an increase in the speed of traffic;
- D. Any posted speed limit must be safer than an unposted speed limit; and
- E. Drivers will always go 5 mph over the posted speed limit.

INTENT OF SPEED ZONING

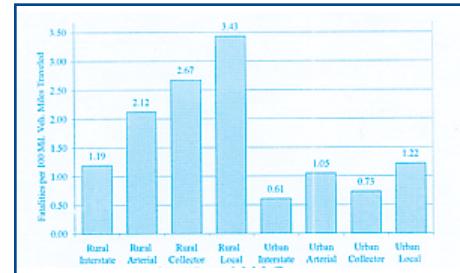
The most widely accepted method by state and local agencies is to set the limit at or below the speed at which 85 percent of the traffic is moving. The 85th percentile speed is how drivers "vote with their feet." Studies have shown crash rates are lowest at around the 85th percentile

speed. Drivers traveling significantly faster OR slower than this speed are at a greater risk for being in a crash. It is not high speeds alone that relate to crash risk; it is the variation of speed within the traffic stream.



Source: U.S. DOT PUBLICATION NO. FHWA-RD-98-154, 1998.

In fact, on a per mile driven basis, high speed roadways, like interstates, have a lower speeding related fatality rate than low speed roadway. Large variations in speed within the traffic stream create more conflicts and passing maneuvers.



Source: U.S. DOT Year 2000 Data.

HOW SPEED LIMITS ARE ESTABLISHED

According to a Federal Highway Administration study, all states and most local agencies use the 85th percentile speed of free flowing traffic as the basic factor in establishing speed limits.

Radar, laser and other methods are used to collect speed data from random vehicles on a given roadway. This speed is subject to revision based upon such factors as: crash experience, roadway geometrics, parking, pedestrians, curves, adjacent development and engineering judgment. This practice is in accordance with the MUTCD.

In the final analysis, it is the judgment of the traffic engineer that determines which, if any, of the factors in the speed study warrant an adjustment of the 85th percentile speeds. After all variables are considered and a speed limit is established, traffic should flow at a safe and efficient level.

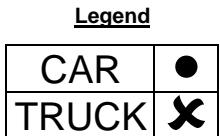
Members of the Committee:

| | |
|---------------------|-----------------------------|
| Rick Staigle, Chair | Robert Turner |
| Andrew O'Brien | Steve Taylor |
| Bruce Ward Jr. | Steven Jones Jr. |
| Dave Wong-Toi | Jim Hansen |
| David Clark | Kay Fitzpatrick |
| Dennis Morford | Dustin Qualls |
| Kent Collins | James Cheeks Jr., ITE Staff |

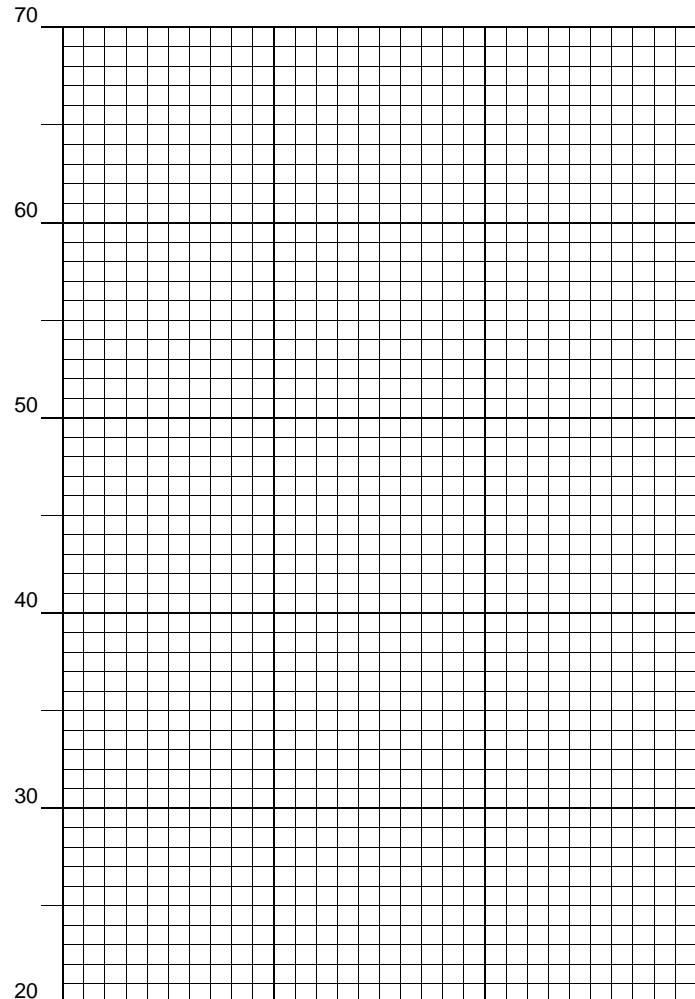
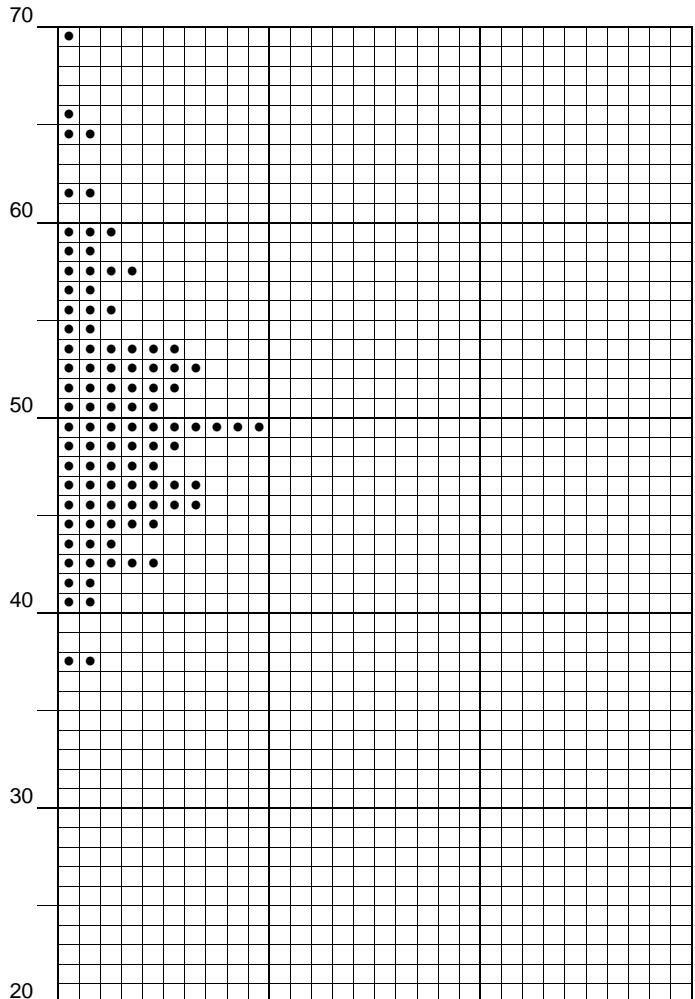
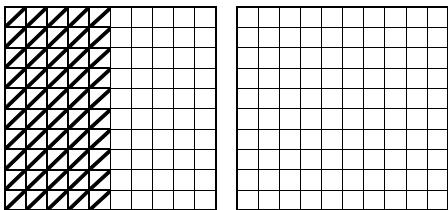


Speed Distribution Study

County Apple Date 1/1/2008
 SR 1234 Seg/Offs 01/1046
 Speed Limit 55 No. of Lanes 2
 Pavement Type Bituminous
 Roadway Width 20'
 Direction of Traffic Both
 Time Start 10:50 Time End 12:24
 Weather Sunny
 Conditions: Excellent Good Fair Poor
 Modal Speed 50
 Pace 45 MPH to 54 MPH
 % Vehicles Above Pace %
 % Vehicles Below Pace %
 % Vehicles in Pace %
 85TH Percentile Speed MPH
 Total Vehicles 100 OBSERVER CMZ



Running Total



County Date
 SR Seg/Offs
 Speed Limit No. of Lanes
 Pavement Type
 Roadway Width
 Direction of Traffic
 Time Start Time End
 Weather
 Conditions: Excellent Good Fair Poor
 Modal Speed
 Pace MPH to MPH
 % Vehicles Above Pace %
 % Vehicles Below Pace %
 % Vehicles in Pace %
 85TH Percentile Speed MPH
 Total Vehicles OBSERVER

**SAFE
RUNNING
SPEED**

**Smith Township,
Pitts County
Shark Road (T-234)
Safe Running Speed Study**

Study Performed: 1/1/2008

| Test Run Number | Speed (MPH) | | | | | | | |
|-------------------|------------------------------|--------------|----------------|--------------|-----------------------------|--------------|----------------|--------------|
| | Church Street to First Curve | | Through Curves | | Straight Stretch Up to Lake | | Lake to PA 543 | |
| | Direction #1 | Direction #2 | Direction #1 | Direction #2 | Direction #1 | Direction #2 | Direction #1 | Direction #2 |
| 1 | 34 | 32 | 22 | 26 | 38 | 40 | 37 | 40 |
| 2 | 32 | 33 | 23 | 25 | 40 | 42 | 35 | 39 |
| 3 | 27 | 30 | 20 | 25 | 34 | 40 | 34 | 37 |
| 4 | 30 | 30 | 20 | 25 | 36 | 38 | 34 | 35 |
| 5 | 29 | 30 | 22 | 25 | 34 | 38 | 34 | 36 |
| Average | 30.4 | 31.0 | 21.4 | 25.2 | 36.4 | 39.6 | 34.8 | 37.4 |
| Overall Average = | | 32.0 | | | | | | |

Notes:

Direction # 1 = Church Street to PA 543

Direction #2 = PA 543 to Church Street

Guidelines for Engineering and Traffic Studies

| | Study Elements | | | | | | | | | | | Study Elements | | | | | | | | | | | |
|----|---|-------------------|-----------------|----------------------------|--------------------------------------|-------------------|-------------------------------|------------------|------------------|-----------------|-------------------|--------------------|----------------------|-----------------------|-------------------|----------------|------------|---------------------|-----------------|-----------------|-----------------|--------------------|---|
| | Crash Analysis | Acceleration Lane | Alternate Route | Angle Parking Measurements | Arrival & Departure Hrs. of Students | Capacity Analysis | Gap Study for School Children | Geometric Review | Parallel Streets | Past Experience | Pavement Analysis | Pedestrian Volumes | Roadside Development | Roadside Obstructions | School Route Plan | Sight Distance | Speed Data | Structural Analysis | Traffic Signals | Traffic Volumes | Type of Highway | Intersection Delay | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | |
| 1 | Parking, Stopping or Standing Restriction | X | | | | X | | X | | | | | | | | X | | | | X | | | |
| 2 | Angle Parking | X | | X | | X | | X | | | X | | | | | X | X | | | X | | | |
| 3 | Speed Limits | X | | | | | | | | | | | | | | | X | X | | | | | |
| 4 | School Zone Speed Limits | | | X | | | | X | | | | X | | | X | | | | | | | | |
| 5 | Special Speeds on Bridges and Elevated Structures | X | | | | X | | | | | | | | | | | | X | | X | | | |
| 6 | Hazardous-grade Speed Limits | X | | | | | | X | | | | | | | X | X | | X | X | | | X | |
| 7 | One-way Streets | X | | | | X | | X | X | | | | | | | | | X | | | X | | |
| 8 | Through Highway | X | | | | | | X | | | | X | | | | | | X | X | | | X | |
| 9 | Stop or Yield Control at Intersections | X | X | | | | | X | | | | X | | | | | | X | X | | | X | |
| 10 | Multi-way Stop Control at Intersections | X | X | | | | | X | | | | X | | | | | | X | X | | | X | |
| 11 | Stop or Yield Control at locations other than Intersections | X | X | | | | | X | | | | | | | | | | X | X | | | X | |
| 12 | No-passing Zones | X | | | | X | | X | | | | | X | | | | | X | X | | | X | |
| 13 | Traffic-control Signals | X | | | | X | X | | | | | X | | | | | | X | | X | | X | X |
| 14 | Turn Restrictions | X | | | | X | | | | | | X | | | | | | X | X | | | X | |
| 15 | No-turn-on-red Restrictions | X | | | | | | X | | | | X | | | | | | X | X | X | X | X | X |
| 16 | Restrictions as to Weight or Size Based on Condition of Highway or Bridge | | | | | | | X | | X | X | | | | | | | X | X | | | X | |
| 17 | Restrictions as to Weight, Size, Kind or Class or Type of Load, Based on Traffic Conditions | X | | | | | | X | | | | | | | | | | | X | | | X | |
| 18 | Designations of Alternate Routes for Restricted Vehicles | X | X | | | | | | | | | X | | X | | | | | | X | | X | X |
| 19 | Removal of Traffic Hazards | X | | | | | | X | | | | | | | | | | | X | X | | | X |
| 20 | Special Events - Processions, Assemblages and Special Activities | X | | | | X | | | X | | | | | | | | | | | X | X | | |
| 21 | Engine Retarder Restriction | X | | | | | | X | | | | | | | | | | | X | X | | | X |
| 22 | Stop Except Right Turn | X | | | | X | | X | | | | | | | | | | X | | | X | | X |
| 23 | Hazardous Walking Route | X | | | X | | X | X | | | | X | | | X | | X | X | X | | | X | |

Guidelines for Miscellaneous Traffic Studies

| | Study Elements | | | | | | | | | | | | Study Elements | | | | | | | | | |
|----|-----------------------|-------------------|-----------------|----------------------------|--------------------------------------|-------------------|-------------------------------|------------------|------------------|-----------------|-------------------|--------------------|----------------------|-----------------------|-------------------|----------------|------------|---------------------|-----------------|-----------------|-----------------|--------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| | Crash Analysis | Acceleration Lane | Alternate Route | Angle Parking Measurements | Arrival & Departure Hrs. of Students | Capacity Analysis | Gap Study for School Children | Geometric Review | Parallel Streets | Past Experience | Pavement Analysis | Pedestrian Volumes | Roadside Development | Roadside Obstructions | School Route Plan | Sight Distance | Speed Data | Structural Analysis | Traffic Signals | Traffic Volumes | Type of Highway | Intersection Delay |
| 20 | Mid-block Crosswalks | X | | | | | X | | | | | | | | X | X | | | X | | | |
| 21 | Advance Warning Signs | X | | | | | X | | | | | | | | | X | | | | X | | |
| 22 | Ball-bank of Curves | X | | | | | X | | | | | | | | | X | | | | | | |
| 23 | Sight Distance | X | | | | | X | | | | | | | | | X | | | | X | | |
| 26 | School Bus Stop Ahead | X | | | | | X | | | | | | | | | X | X | | | | | |
| 29 | Mirrors | X | | | | | X | | | | | | | | | X | X | | | X | | |

Format for Traffic Engineering and Safety Studies:

County: SR:

Municipality: Type of Study:

- Study Cover Sheet
- TOPER 1 (10 day response letter)
- Letter, Memo, or Fax requesting a study
- Location Map
- Straight Line Diagram
- Field View Drawing
- Photographs
- Crashes
 - Crash Extracts
 - Crash Rate
 - Crash Plot
- Sight Distance Worksheets
- Speed Study
- Warrants
- Study Worksheet
- Traffic/Pedestrian Volume(s)
- STAMPP Identification Data (Roadway Information)
- Skid Test
- Curve Study
- Speed Permit

MULTI-WAY STOP EXAMPLE

Section 2B.07 Multi-Way Stop Applications

Support:

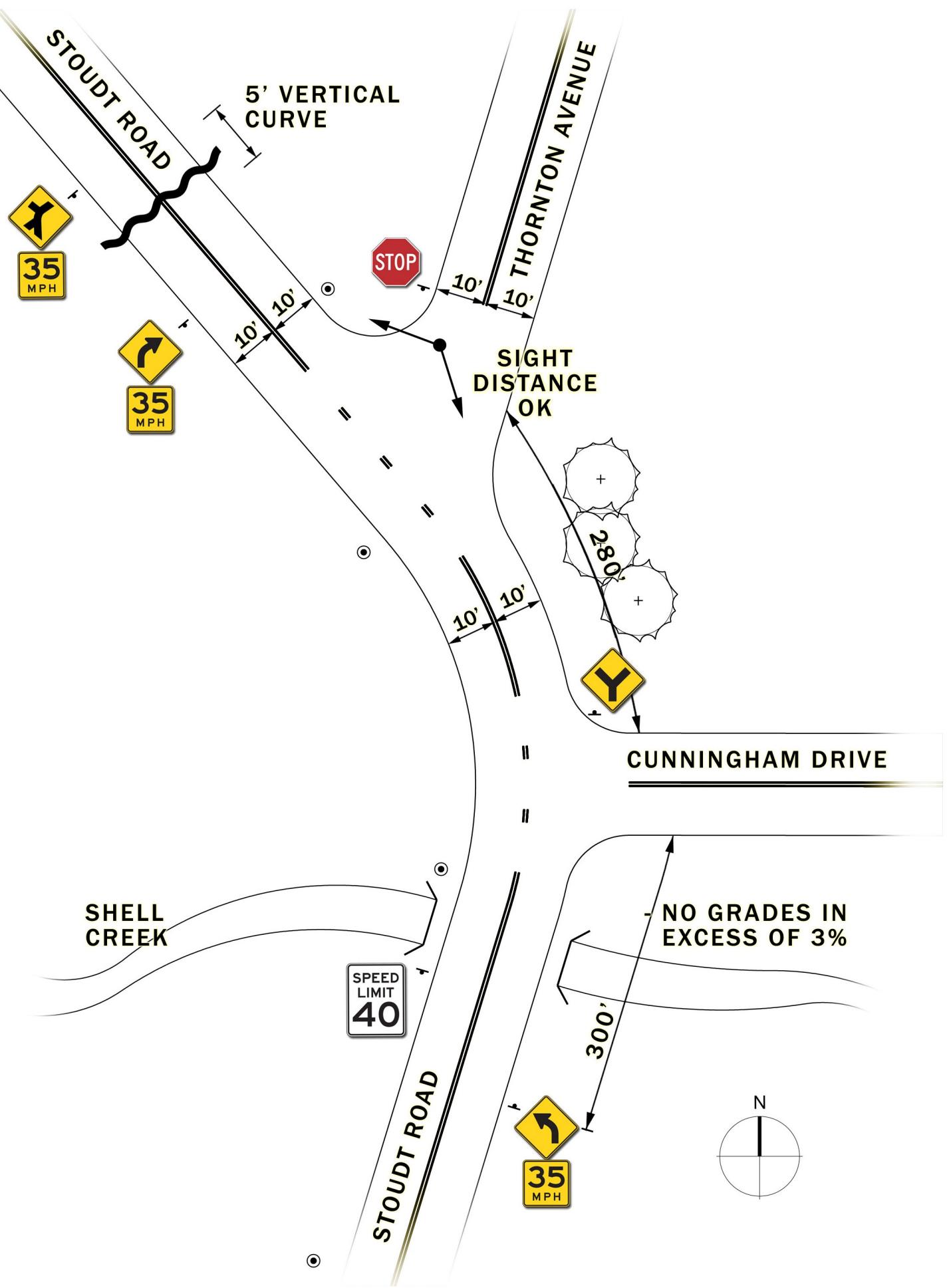
- 01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.
- 02 The restrictions on the use of STOP signs described in Section 2B.04 also apply to multi-way stop applications.

Guidance:

- 03 *The decision to install multi-way stop control should be based on an engineering study.*
- 04 *The following criteria should be considered in the engineering study for a multi-way STOP sign installation:*
 - A. *Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.*
 - B. *Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*
 - C. *Minimum volumes:*
 1. *The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
 2. *The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
 3. *If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*
 - D. *Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

Option:

- 05 Other criteria that may be considered in an engineering study include:
 - A. The need to control left-turn conflicts;
 - B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
 - C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and
 - D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

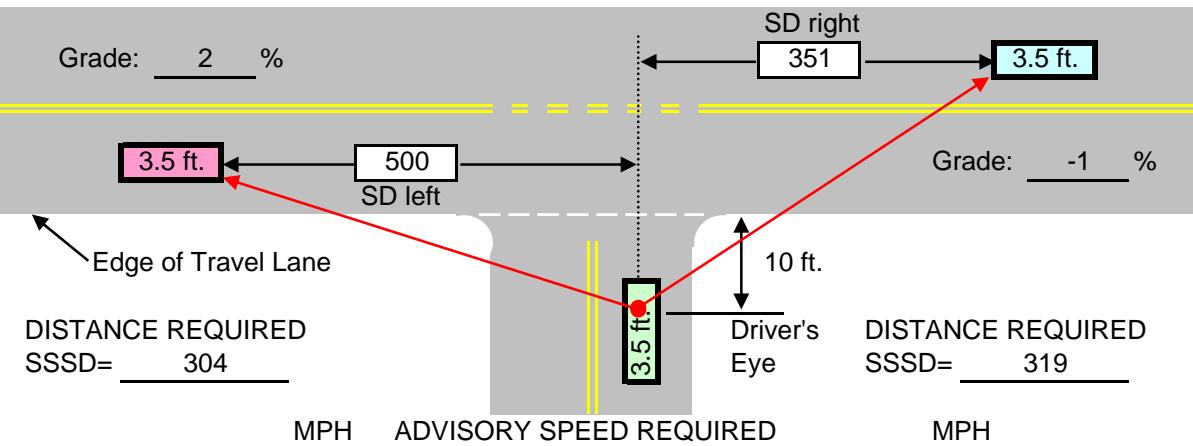


Formula Sight Distance Measurements

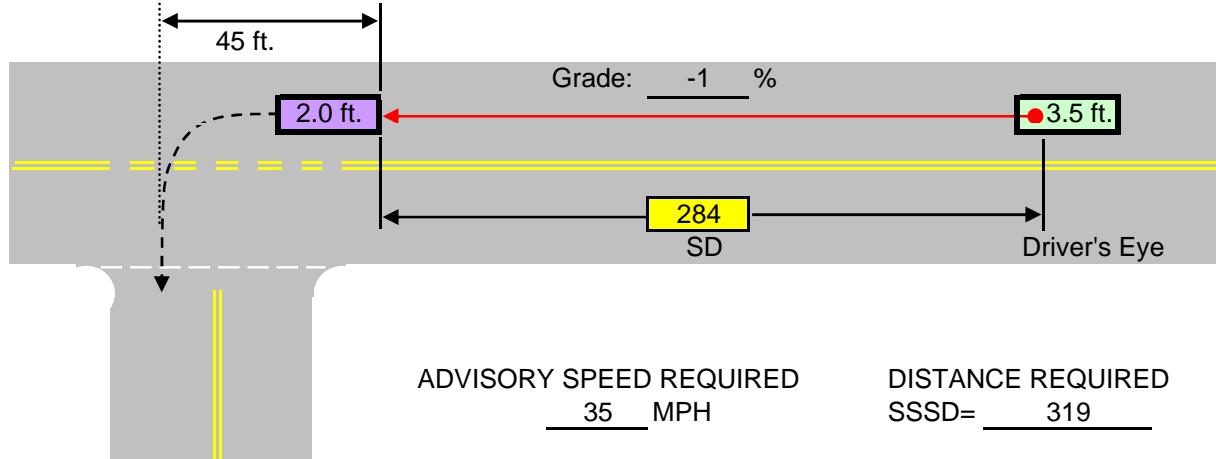
County: Adams SR: 2002 Segment: 80 Offset: 1446 Speed Limit: 40 MPH
 Measured By: Intersecting Road: Date: 8/12/2008

A

Source: Title 67 Pa. Code § 212 Appendix (Engineering and Traffic Study Elements)

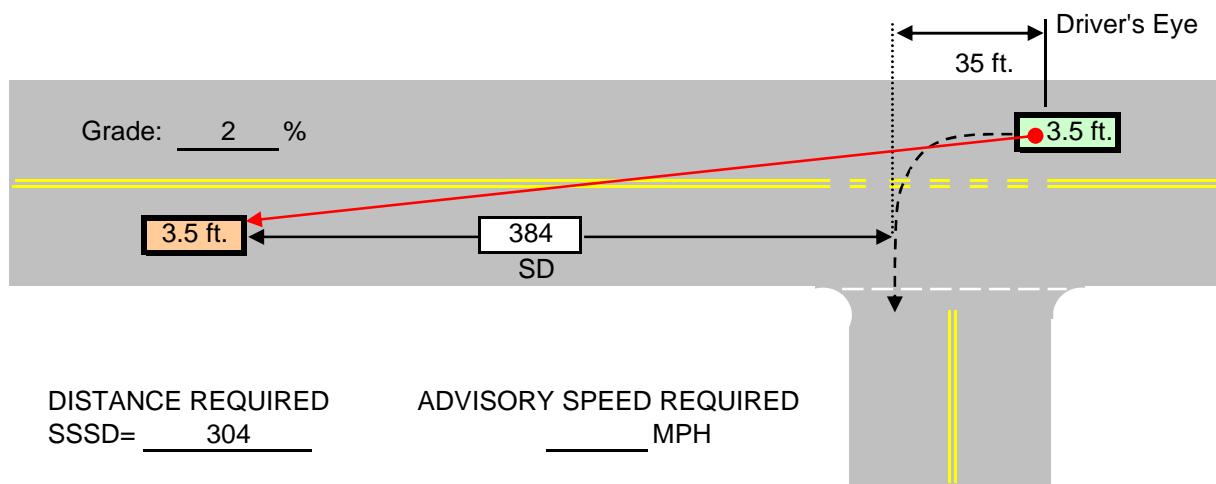


B



Source: AASHTO, Geometric Design of Highways and Streets, Chapter 3 (Elements of Design)

C



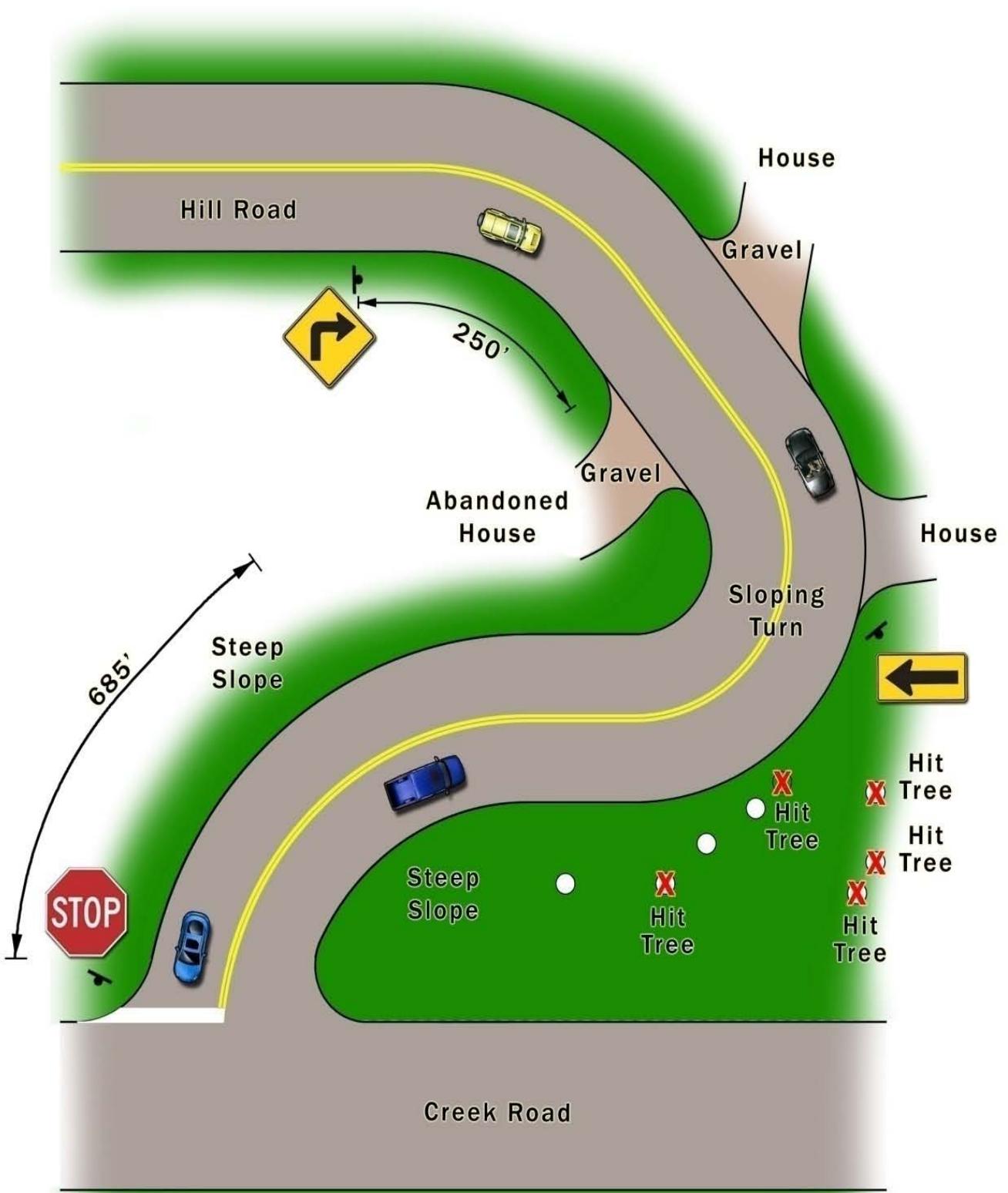
Source: Title 67 Pa. Code § 212 Appendix (Engineering and Traffic Study Elements)

SIGHT DISTANCE DEFICIENCIES ARE HIGHLIGHTED IN **YELLOW**

modified 12-05-06

| Time | Stoudt Rd (SB + NB) | Thorton Avenue (WB) | Meets Warrants? |
|-------|------------------------|------------------------|-----------------|
| 1:00 | 28 | 12 | |
| 2:00 | 28 | 11 | |
| 3:00 | 24 | 4 | |
| 4:00 | 16 | 8 | |
| 5:00 | 44 | 11 | |
| 6:00 | 180 | 42 | |
| 7:00 | 308 | 74 | |
| 8:00 | 544 | 164 | |
| 9:00 | 484 | 193 | |
| 10:00 | 340 | 127 | |
| 11:00 | 204 | 100 | |
| 12:00 | 270 | 137 | |
| 13:00 | 348 | 188 | |
| 14:00 | 232 | 113 | |
| 15:00 | 352 | 137 | |
| 16:00 | 314 | 156 | |
| 17:00 | 368 | 129 | |
| 18:00 | 316 | 114 | |
| 19:00 | 252 | 104 | |
| 20:00 | 164 | 105 | |
| 21:00 | 122 | 110 | |
| 22:00 | 130 | 88 | |

**SAFE
SPEED
ON
CURVES
EXAMPLE**



**CURVE SPEED STUDY
EXAMPLE**

Table 2C-5. Horizontal Alignment Sign Selection

| Type of Horizontal Alignment Sign | Difference Between Speed Limit and Advisory Speed | | | | |
|---|---|-------------|-------------|----------|----------------|
| | 5 mph | 10 mph | 15 mph | 20 mph | 25 mph or more |
| Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), and Combination Horizontal Alignment/Intersection (W10-1) (see Section 2C.07 to determine which sign to use) | Recommended | Required | Required | Required | Required |
| Advisory Speed Plaque (W13-1P) | Recommended | Required | Required | Required | Required |
| Chevrons (W1-8) and/or One Direction Large Arrow (W1-6) | Optional | Recommended | Required | Required | Required |
| Exit Speed (W13-2) and Ramp Speed (W13-3) on exit ramp | Optional | Optional | Recommended | Required | Required |

Note: Required means that the sign and/or plaque shall be used, recommended means that the sign and/or plaque should be used, and optional means that the sign and/or plaque may be used.

See Section 2C.06 for medianways with less than 1,000 ADT

**ADVANCED
WARNING
SIGN
PLACEMENT**

Table 2C-4. Guidelines for Advance Placement of Warning Signs

| Posted or 85th-Percentile Speed | Advance Placement Distance ¹ | | | | | | | | |
|---------------------------------|--|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | Condition A: Speed reduction and lane changing in heavy traffic ² | Condition B: Deceleration to the listed advisory speed (mph) for the condition | | | | | | | |
| | | 0 ³ | 10 ⁴ | 20 ⁴ | 30 ⁴ | 40 ⁴ | 50 ⁴ | 60 ⁴ | 70 ⁴ |
| 20 mph | 225 ft | 100 ft ⁶ | N/A ⁵ | — | — | — | — | — | — |
| 25 mph | 325 ft | 100 ft ⁶ | N/A ⁵ | N/A ⁵ | — | — | — | — | — |
| 30 mph | 460 ft | 100 ft ⁶ | N/A ⁵ | N/A ⁵ | — | — | — | — | — |
| 35 mph | 565 ft | 100 ft ⁶ | N/A ⁵ | N/A ⁵ | N/A ⁵ | — | — | — | — |
| 40 mph | 670 ft | 125 ft | 100 ft ⁶ | 100 ft ⁶ | N/A ⁵ | — | — | — | — |
| 45 mph | 775 ft | 175 ft | 125 ft | 100 ft ⁶ | 100 ft ⁶ | N/A ⁵ | — | — | — |
| 50 mph | 885 ft | 250 ft | 200 ft | 175 ft | 125 ft | 100 ft ⁶ | — | — | — |
| 55 mph | 990 ft | 325 ft | 275 ft | 225 ft | 200 ft | 125 ft | N/A ⁵ | — | — |
| 60 mph | 1,100 ft | 400 ft | 350 ft | 325 ft | 275 ft | 200 ft | 100 ft ⁶ | — | — |
| 65 mph | 1,200 ft | 475 ft | 450 ft | 400 ft | 350 ft | 275 ft | 200 ft | 100 ft ⁶ | — |
| 70 mph | 1,250 ft | 550 ft | 525 ft | 500 ft | 450 ft | 375 ft | 275 ft | 150 ft | — |
| 75 mph | 1,350 ft | 650 ft | 625 ft | 600 ft | 550 ft | 475 ft | 375 ft | 250 ft | 100 ft ⁶ |

¹ The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

² Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

³ Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second², minus the sign legibility distance of 180 feet.

⁴ Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second², minus the sign legibility distance of 250 feet.

⁵ No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

⁶ The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.

STOPPING, STANDING & PARKING PROBLEM SHEET

Given: For the graphic of a roadway network shown below:

LOS = B

Speed Limit = 35 mph

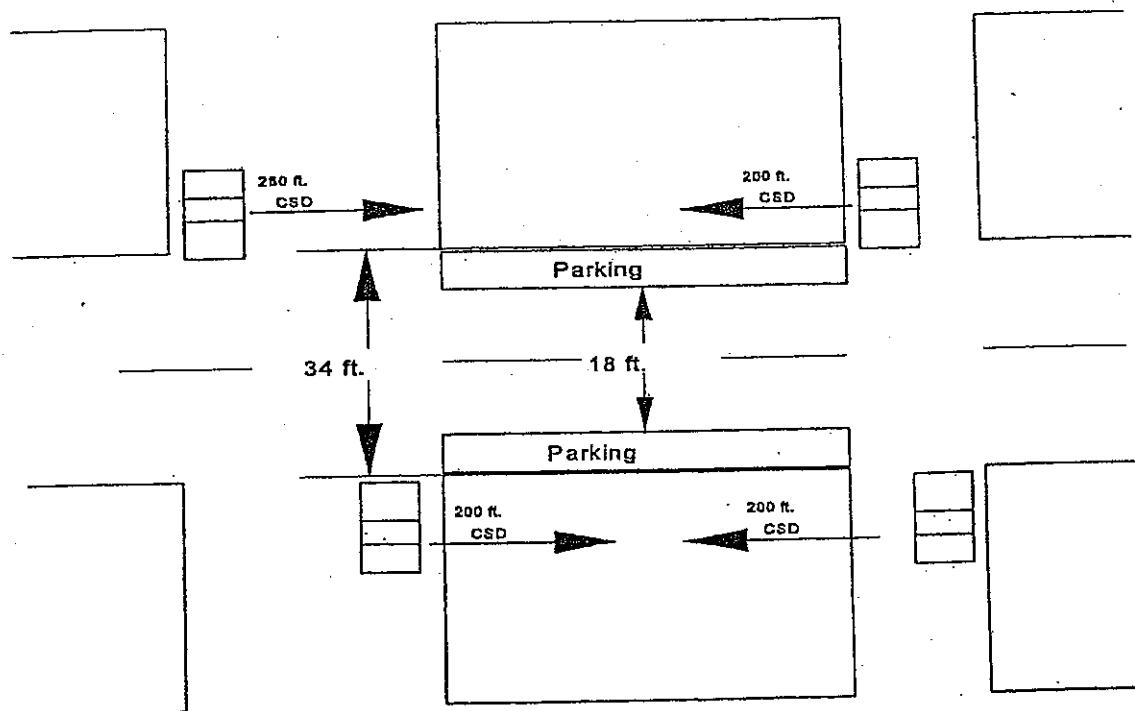
Sight Distance as indicated

Accident Data Attached

Parking Width = 8ft.

Problem: Determine whether or not parking should be restricted on Main Street.

Parking Restricted: Yes No



NO TURN ON RED PROBLEM SHEET

Given: A four way signalized intersection.

Speed limit:

Main Rd. = 45 mph.

2nd Rd. = 25 mph.

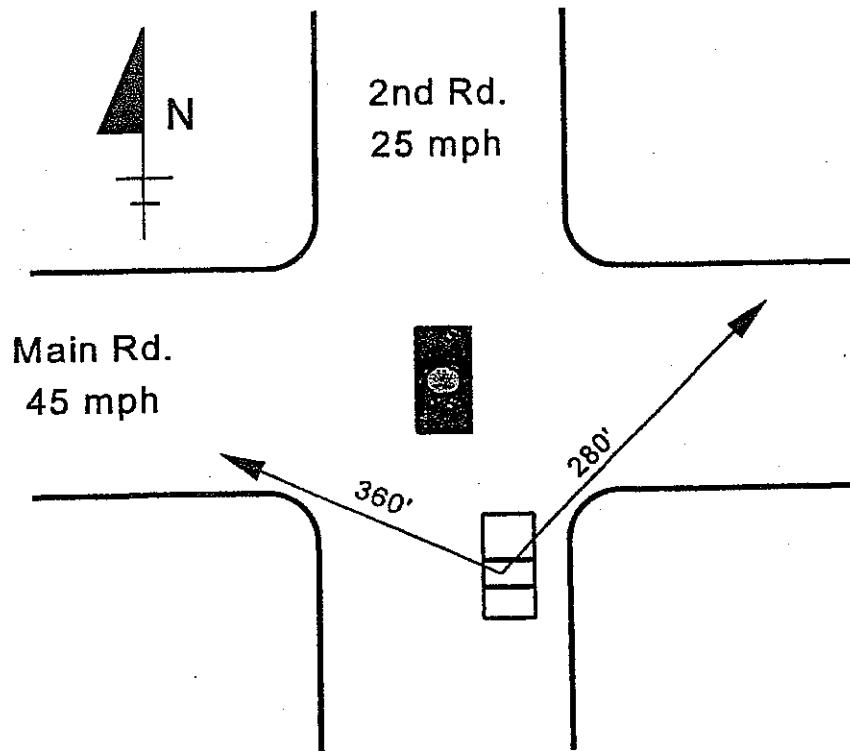
Sight distance:

To the East = 280 ft.

To the West = 360 ft.

Problem: For the signalized intersection below, and the given information, should Right Turn on Red be restricted?

Answer: Restrict Right Turn on Red: _____



Key to Collision Diagram Symbols

Vehicle Movement

- ↑ Left
- Straight
- ↓ Right
- ↔ Backing

Severity

- PDO
- Injury
- Fatality

Jasper
Lane

Captains
Way

PDO

S.R.793

NOT TO SCALE

Key Continued

Accident Type

- Rear-End
- ↔ Head-On
- ↔ Sideswipe,
Same Direction
- ↔ Sideswipe,
Opposite Direction
- Angle

Record Code

1/26/08, 7:10, 043 Date, Time, ID#