

TRAFFIC ACCIDENT INVESTIGATION

Objective:

Explorers should be able to investigate a traffic accident, obtain witness and victim information, determine the cause and fault of an accident and properly fill out the state ST-3 Accident Report form. Explorers should be able to properly clear the scene of an accident calling upon the necessary resources such as EMS, wreckers, firemen or repair crews.

Foreword:

Traffic accidents are extremely confusing events. How they occur, who or what caused them, and why they occurred are facts that police must determine. Every peace officer must know the fundamentals of traffic accident investigation and know how to prepare traffic accident reports. Traffic accidents, resulting in personal injury, fatality, and property damage in the amount of \$1,000 or greater require an on scene investigation. The State of Texas mandates all peace officers will use the ST-3 state accident form for reporting traffic accidents to the Texas Department of Public Safety. If additional instruction/information is needed, contact the Bureau of Statistical Records, Texas Department of Public Safety.

Initial Steps.

Prompt arrival at the scene of an accident is essential. Safety, however, should be emphasized at all times. While in route, the officer should maintain contact with the Dispatcher. They should also be on the lookout for any suspicious or damaged vehicles fleeing the general area.

Arrival at the Scene.

The following steps should be taken upon arrival at the scene of the accident. While enroute to the scene, the officer should obtain as much preliminary information as possible concerning the accident. Such information includes:

- Location
- Time of notification
- Who notified the officer and how
- Weather and visibility conditions
- General information as to seriousness of the accident--injuries, hit and run, amount of traffic congestion, etc.
- Whether or not additional support is proceeding to the scene, such as wrecker, ambulance, or additional Police patrols
- By obtaining such information prior to arrival at the scene, the investigators may more quickly and efficiently respond to the needs of the situation.

Location of the Patrol Vehicle.

The police vehicle should be positioned so as not to cause further traffic congestion or accidents. If necessary, it may, however, be used as a roadblock. At night it should be parked so the headlights illuminate the entire scene. At all times the emergency lights should be on to warn approaching motorists of the hazard.

Care for injured and protect the scene.

The investigators should determine the extent of injuries, if any, to accident victims; render first aid; and request medical assistance, if necessary. Severely injured persons should not be moved, except to preserve their safety. The position of all victims should be noted for report purposes and, if on the road, the positions

outlined in chalk or road paint. A doctor/coroner or justice of the peace makes final determination of death. After caring for the injured, the scene should be secured to protect property and preserve evidence. Personal property of accident victims must be protected. In case of accidents involving fatalities or felonies, Explorers should request appropriate specialized accident investigators.

Establish Traffic Control.

Traffic control is essential at the accident scene to prevent further accidents or injury. Rerouting vehicles around the accident scene is the most common procedure used. Spectators or unnecessary personnel should be cleared from the accident area.

Request Additional Support

Additional support personnel should be requested, if necessary, such as power line repair; road repair; water pipe repair; portable lighting, signal personnel (for telephone repair or photography), medical personnel (for ambulance, special medical equipment), and civilian police personnel within their jurisdiction.

Essential Elements of an Investigation.

The ST-3 state accident form when completed, contains the essential investigative elements who, what, when, where, why, and how the accident happened. It may be used alone, or supported by scaled diagrams, photographs and/or statements. This form is one of the special tools needed to clearly explain what happened at the accident scene.

Securing Facts at Scene.

After completing the initial steps and securing the scene of the accident, the investigator obtains and records facts needed to complete their reports to arrive at logical and objective conclusions. The main thrust of the investigation is to determine whether or not there was a violation of the law; and if so, to prove each element of the offense. Explorers should issue a traffic ticket when appropriate.

Moving Vehicle And Marking Wheels

The decision to move a vehicle from its final position must often be made by the police patrol arriving at the scene. When this is done, the positions of the wheels should be marked on the ground so they can be relocated for investigative purposes.

Under the following conditions, a vehicle must be moved immediately:

- When an injured person is trapped in the wreckage and cannot be treated there.
- When a person is trapped in wreckage near burning material, or an area of potential fire hazard.
- When a vehicle position is an immediate hazard to oncoming traffic and adequate traffic control cannot be established.

Identify and Preserve Fragile Evidence

Any fragile evidence that can be damaged, altered, destroyed or removed from the scene by any willful or negligent act must be identified and secured. Prior to removal, its position should be noted, sketched, photographed and/or marked in chalk. Examples of such evidence are puddles of gasoline, oil, blood or pieces of broken glass. The position of turn signal levers should be checked; although this is not a positive indicator of whether a turn signal was in use it can be helpful. Alcoholic beverage containers inside a vehicle should also be secured. Evidence should be tagged, marked, and secured in accordance with proper evidence gathering procedures prior to its removal from the scene.

Take Statements

Questioning and taking statements of witnesses and victims should be done at the scene. If this is not possible, statements should be taken as soon as possible at the hospital, police station or homes of those involved. Names, number and contact address of witnesses should be noted on the ST-3 accident report. All parties should be separated when questioning them, but in a safe location like on the sidewalk, not in the roadway. Make sure the parties exchange names and phone numbers before leaving the accident scene.

Recording Observations

After gaining all the information possible from all persons involved in the accident, the investigator begins to examine the physical condition of the scene, and to record his observations.

Vehicle Final Rest Position

The examination should start where the vehicle came to final rest. Debris or broken parts from vehicles, with other indications, will help locate the key event and indicate the paths of the vehicles involved. Marks or traces such as skid or scrape marks help the investigator locate pertinent points accurately. All marks, puddles, bits of metal and contents of vehicles must be located and their positions measured and recorded. Skidmarks are very important since they show position and direction of travel, evasive action or unlawful behavior. Note especially things that would help locate the point of first contact, such as changes in skidmarks, chips in pavement and damage to roadside objects.

Path of Vehicles

The investigator should next retrace the paths of the vehicles involved. Note visibility, condition of signs and signals, road surface condition, traffic volume, angles of view and possible distractions.

Vehicle Search and Inspection

A careful inspection of vehicle equipment and contents is necessary. Items affecting vehicle control should be particularly checked, such as tires, brakes, lights, steering, signals and safety equipment. For example, it is important to know whether a tire blew out as a result of the accident, or whether a tire blowout was a possible contributing factor of the accident. This fact can be determined by analyzing skid and scuff marks. Contents of the vehicle may also give important information concerning the identity, residence, occupation, destination and position of vehicle occupants.

Sketches

Depending on the type and severity of an accident, sketches are made, which may range from a simple sketch on the ST-3 accident form, to detailed scaled drawings on separate sheets.

Sketches serve four purposes:

- Help explain the accident.
- Help the investigator reveal facts.
- Locate any given point at the scene.
- Serve as the basis for accurate scale drawings.

Field sketches are made at the scene and are used to support the officer's original notes. The following information must be placed on sketches and scaled drawings:

- Time of the accident (date and hour).
- Names of roads. If on a rural highway, show the distance to the nearest identifiable landmark.
- Direction of North.

- Report or case number.
- References to photographs taken.

Steps in Preparing a Sketch

1. The investigator first draws the roadway, shoulder and other areas of the scene that are pertinent to the investigation. This includes any physical characteristics which may constitute contributing factors to the cause of the accident, or which will be used as base points.

2. Base points are then drawn on the sketch. These are those points used in making measurements by triangulation. They are permanent objects such as telephone poles, mileage markers, road sign posts, etc. If permanent objects are not available, base points can be established by driving wooden stakes into the dirt at the edge of the roadway or driving nails into the asphalt. Measurements are made from the place where the base point meets the ground. If large circular objects, such as telephone poles are used, the exact reference point should be marked with a nail or paint.

3. The next portion of the sketch shows the final position of the vehicle, occupants and objects involved in the accident. All damage to the vehicle and other property is also indicated on the sketch. This information should also be entered in the narrative portion of the report.

4. The sketch is completed by including information on vehicle marks and debris at the scene. Vehicle marks include skid and scuff marks, scratches, scrapes and gouges of the pavement and yaw marks. These marks will be used in determining speeds of the vehicles involved. Debris is useful in determining the point of first contact. An outline of the areas in which debris has come to rest is included in the sketch. Debris is usually spread in an elongated pattern in the direction of travel. Points where debris concentration is greatest are also indicated. Notes should be made if there appears to be two or more separate debris areas.

5. After entering identifying information on the sketch, the final step is to recheck the sketch at the scene. The investigator should retravel the paths of the accident vehicles at their level of vision height to determine visibility and any obstructions. The sketch must have an understandable legend.

Measurements

Accurate measurements are necessary to relocate and relate exact points in an accident scene. There are two methods of making measurements--triangulation and coordinate.

Triangulation Method

Triangulation is the best method to use on unpaved roads without clean-cut edges or on sharp curves and irregular intersections. The steps in this method are as follows:

1. Determine two fixed base points, such as telephone poles, edges of buildings, etc.
2. Measure from both base points to each object such as the accident vehicle.
3. Write measurements as 126 for 12 feet, 6 inches. The normal symbols for feet (') and inches (") are not used to avoid misreading or confusion. (Meters are listed in tenths, such as 10.6m).
4. Fixed base points should be widely spaced to provide wide angles in measuring. Narrow angles increase the probability of error.
5. Show measurements to the wheel positions on one side of the vehicle or to the front and rear of vehicle if undamaged. Also show measurements to large debris and to victims not in the vehicle(s) involved.
6. Measure skidmarks from where the road surface first shows any marks of tires grabbing.

Coordinate Method

This method is best-used in roadways with well-defined edges and when measurements are to be made within 25 feet (7 to 8 meters) of the roadway edge.

The edge of the roadway forms one coordinate. The distance to the object, measured at a right angle to the first coordinate is the other.

A point along the roadway edge is selected as the zero or reference point. Its exact location must be recorded. Measurements are taken from the zero point. Measurements are recorded by compass direction. Measurements may be recorded on the sketch in chart form, thus keeping the sketch from becoming overly cluttered.

Photography

Photographs are used to supplement an accident investigation and the written report concerning the accident. When used in court testimony, they help indicate and explain the chain of events. Photographs, however, never take the place of an investigation or a report.

The investigator should take as many pictures as necessary to properly depict the accident. They should represent what is actually seen by the investigator, thus scale, angles of view, color and light should be as nearly like what, is seen as possible. Photographs must be taken as follows (minimum):

- **Establishing Photograph**--This picture should show the scene, the approaches to the scene, and a fixed object in the background to establish the scene.
- **360-Degree Photographs**--These pictures should show all four sides of the accident scene, that is, looking north, south, east and west.
- **Damage Photographs**--Close-up pictures of damage to all vehicles and items struck by vehicles involved, to include contact and induced damage.

Skidmarks and debris

Any persons, materials or marks not included in the original scene should not be included in the photographs. This includes police, wrecker personnel, bystanders, chalk marks, measuring devices, etc.

The locations from which photographs are taken should be recorded on an overlay to the diagram. They should be numbered in sequence, and a brief description of the picture scene placed on the reverse. For example, "Photo #6 Accident Scene, Facing South." To avoid confusion with other photographs, the first exposure of a roll or series should include a data card that includes the time, date, location and investigator's initials. (Note: The same scene should then be photographed without the data card.)

Nighttime Photography--At night, it is more difficult to establish the scene and to see details and distance relationships in photographs. If it is impossible to have permanently fixed objects in the scene to establish the photograph a data board should be used. Greater detail can be achieved by adjusting the f-stop of the camera to allow more light to enter (smaller f-stop). If available, an extension flash attachment will better reveal depth at night. If no flash is available, several photographs taken successively, closer to the object, should be taken. Investigators should go back and photograph the complete area during daylight.

Photographs in Court

To be admissible in court, the investigator taking and using photographs should follow these four steps:

1. **Authentication**--Photographic evidence will be authenticated in court by the officer who takes the pictures. A summary describing the incident should be annotated and attached to the negative film packet or recorded on the reverse side of the hard copies soon after the photographs are taken. This will assist in authentication.

2. *Marking*--Each roll of film or film pack must be marked with the name of the individual who took the photographs, date, time and location of the incident, type of incident, a control number, and the sequence in which the film was used. If it is desirable to point out a specific area of a photograph, an acetate overlay should be used. Never mark directly on the print.
3. *Relevancy*--All pictures must be clear, sharp and free of distortion. They must be relevant to the investigation. Photographs support the testimony. They must not be inflammatory or provide for shock value; particularly photographs of injuries. Photographs of bodies in relation to the vehicles' position are not, however, considered inflammatory if relevant to support a point of testimony.
4. *Supportive Only*--Photographs alone do not substantiate facts--they must be supported by testimony. The investigator or photographer must be able to testify that the photos reflect a true representation of the scene.

Inspection of Vehicles

After sketching, measuring and photographing the accident scene, the investigator should begin his inspection of the vehicle(s) condition and damage. The purpose is to obtain supporting information concerning statements of witnesses and his own conclusions, when made.

Vehicle condition is a term used to describe any physical characteristic of the vehicle, existing prior to the accident. Some unsafe aspect may be determined to have been an intermediate or early cause of the accident, such as a bald tire.

Vehicle damage is the resulting physical characteristics of the vehicle(s) caused by the accident. Damage is classified as either contact or induced.

Contact damage is that which occurs as a direct result of contact with or by an object. It can occur in more than one location on the vehicle.

Induced damage is that caused to vehicle parts that did not come in contact with the object struck, but resulted from the shock of the collision.

Vehicle body condition

Check locations of damage. The amount of buckling or breaking can indicate the force of the accident. Check for alteration to the frame, body, or suspension, which could have affected the driver's vision or vehicle reaction.

Tires and rims condition--Check to see if the tires are fully inflated, have good tread, or show signs of a blowout. Check for tread scrape marks, sidewall scrapes or cuts, which can indicate how well the vehicle held up to braking and sideways skidding. Check rims for fresh scrapes, cuts or scratches. They may indicate that a blowout occurred prior to the accident.

Light conditions--Check all lights for operation and position of knobs and levers used to control lights. These checks are often necessary to verify statements. Note also any lights burning when you arrived at the scene. Check for obstructions to lights such as dirt film. If lights are to be checked by the US Army Criminal Investigation Laboratory, the entire light structure should be sent. If the light switch is on but not operating, perhaps due to the accident, the lab can determine whether or not the filament is intact or broken and whether the break is new or old.

Glass condition--The condition of the glass in an accident vehicle can determine whether it may have caused poor visibility and may indicate the manner in which injuries were caused. Check to see if glass is cracked or broken. If cracks are clouded or discolored, the cracks existed prior to the accident. Note obstruction on the glass such as dirt or frost. For side windows note position, up or down, if relevant. Operation of side and rearview mirrors should also be noted.

Interior vehicle equipment--Various items of equipment inside the vehicle should be checked for proper operation by a qualified mechanic if necessary. Additionally, the position of equipment may indicate actions or intended actions of drivers. These include the turn signal lever, pedal operation, horn, seat belts, sun visors, ignition switch, accessory switch (especially defroster in cold weather) and gear shift lever. The speedometer may give some indication of speed.

Miscellaneous equipment--Check any material inside the vehicle which may have contributed to the accident. This might include alcoholic containers, drugs, toys, etc. In doing this, remember that for other than plain view items, further search of the vehicle will require the owner's or driver's permission or a search warrant. If safety inspection stickers are present, check their validity.

Checks of vehicle damage compared to scratches/gouges on the roadway or other damage to roadway objects may show vehicle position and direction of travel after the key event. The age of all damage should be determined to relate it to the specific accident. All accident damage and vehicle conditions should be photographed, if relevant to the specific investigation.

Actions After Gaining Facts

Clear the Scene

Vehicles are removed safely from the scene under Police supervision. Civilian vehicles normally are removed by commercial wrecker if they are not drivable. In this case, the wrecker operator's name, firm, time of departure, and new location of the vehicle should be recorded on the ST-3 accident report, especially if further inspection of the vehicle may be necessary.

Roads should be cleared of debris by the wrecker drivers. Fire fighters should assist when fire hazards, such as large pools of spilled gasoline are present.

Additional Searches

Prior to leaving the scene the investigator should recheck the accident location for any additional marks, debris, victims, etc. If an accident occurs at night, the scene should be searched during daylight also. The reverse of this is also true. Retracing the driver's approach to the scene on the following day at the same time can reveal additional unanticipated evidence.

Completing Investigation

Traffic accident investigations must provide accurate explanations of the facts. In addition to the ST-3 accident report, the accident investigation may include additional diagrams, statements and photographs, the investigator should prepare a statement. This statement should clearly distinguish between fact and opinion--although opinions are a necessary part of the investigation. The statement should discuss how the accident occurred, identify causes, and list factors that may constitute hazardous driving conditions. All conclusions and recommendations must be supported by fact.

Special Considerations

Alcohol

Use of alcohol by drivers is a factor in over half of all fatal traffic accidents. The investigator may suspect a participant in an accident was under the influence of an intoxicant or drug during the course of the investigation. Should such a suspicion exist, the investigator must follow through to the extent allowed by law, to determine whether or not these suspicions are justified. This will be in the form of chemical tests, or tests of the suspect's blood, breath or urine, to determine alcoholic content. In addition to testing the suspect, inspection and search of the vehicle may be used to gather additional information. Approved methods include:

Plain view search of vehicle for intoxicants.

- Detection of odors of intoxicants or other unusual odors.
- Observation of individual's actions.
- Search of the vehicle with permission of driver.
- Search with a search warrant, based on probable cause.

Medical

Medical statements may be required to reflect expert opinions as to whether medical reasons contributed to an accident. The investigator must obtain medical information for the following:

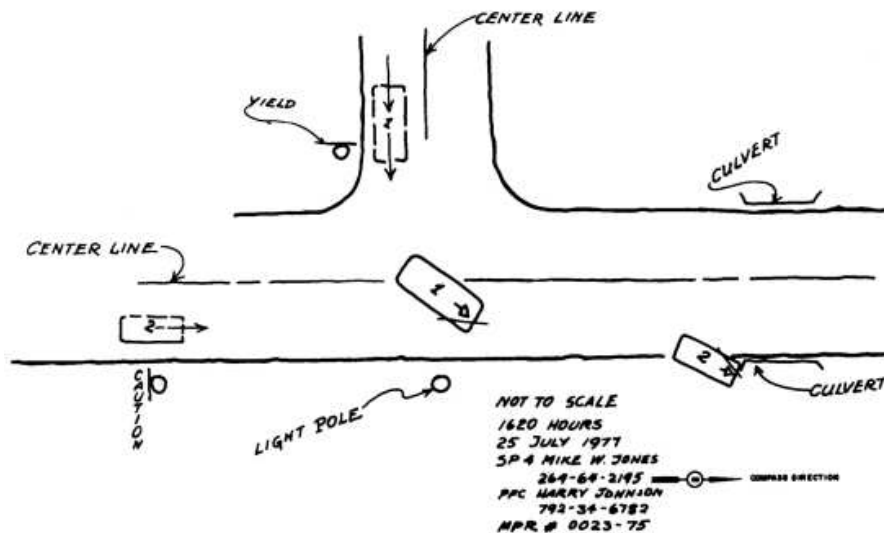
Personal injuries--Determine the extent of injuries received by all involved in an accident and any injuries that existed prior to the accident.

Fatal injuries--In case of deaths, obtain estimated time and cause of death.

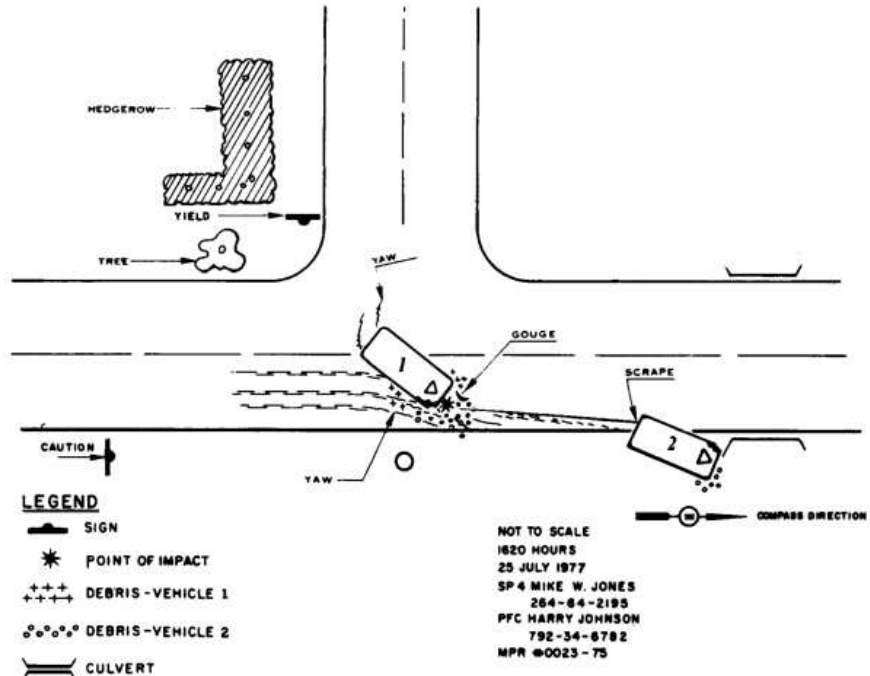
Tests--Obtain any information concerning the results of alcohol, drugs or medicine used.

The accident investigator should recommend to all persons involved in serious accidents that they see a physician immediately.

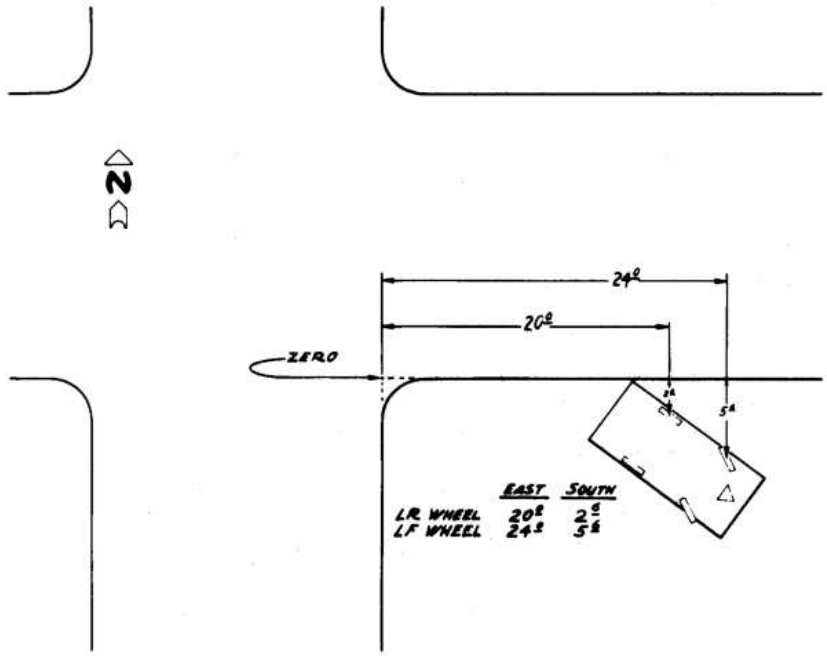
Examples of sketches:



Field Sketch Showing Final Rest Position of Vehicles



Completed Sketch



Locating a Vehicle With Coordinate Method

How to Determine the Coefficient of Friction

Example Problem: You have made a test skid in a vehicle travelling 30 mph. The skidmark measurements are as follows:

Left Front = 60 feet
Right Front = 62 feet

Left Rear = 57 feet
Right Rear = 59 feet.

Step 1 Add the lengths together.
 $60 + 62 + 57 + 59 = 238$

Step 2 Divide by 4 to find the average skidding distance.
 $238 \text{ divided by } 4 = 59.5$

Step 3 Square the speed.
 $30 \times 30 = 900$

Step 4 Divide 900 by 59.5 (distance or d).
 $900 \text{ divided by } 59.5 = 15.13$

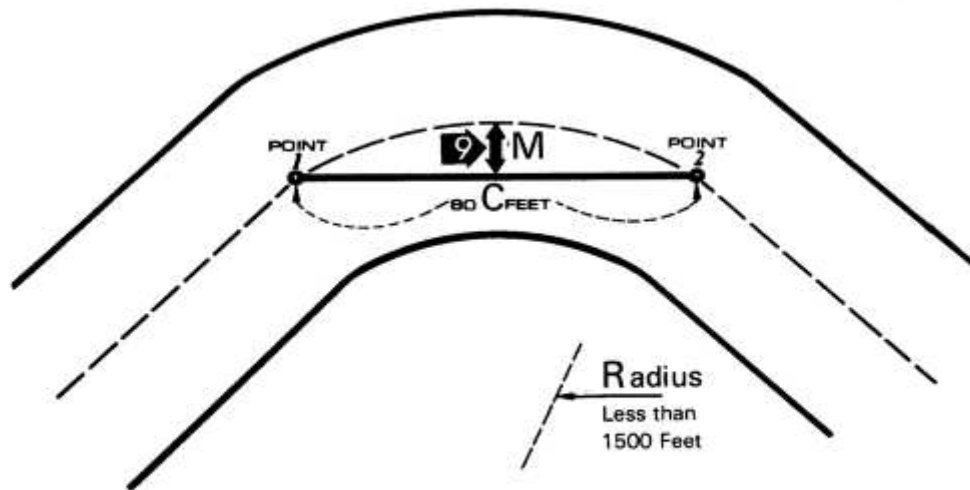
Step 5 Multiply this by 0.033 (a constant).
 $15.13 \times 0.033 = .4992 \text{ or } .50$



**FRONT
SKID MARK**



**REAR
SKID MARK**



$$R = \frac{C^2}{8M} + \frac{M}{2}$$

$$R = \frac{80 \times 80}{8 \times 9} + \frac{9}{2}$$

$$R = \frac{6400}{72} + \frac{9}{2}$$

$$R = 88.88 + 4.5$$

$$R = 93.38$$

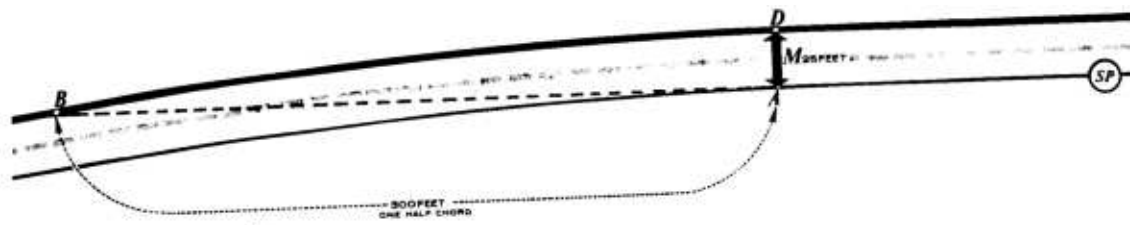
$$R = 93^{5*}$$

Legend

- M Middle Ordinate
- 9 Length of M (9 Feet)
- C Chord

93^{5*} = 93 Feet 5 Inches

Measuring Radius of a Sharp Curve



$$R = \frac{C^2}{8M} + \frac{M}{2}$$

$$M = 25$$

$$C = 2 \times 300 = 600$$

$$R = \frac{600 \times 600}{8 \times 25} + \frac{25}{2} = \frac{360000}{200} + \frac{25}{2} = 1800 + 12.5 = 1812.5$$

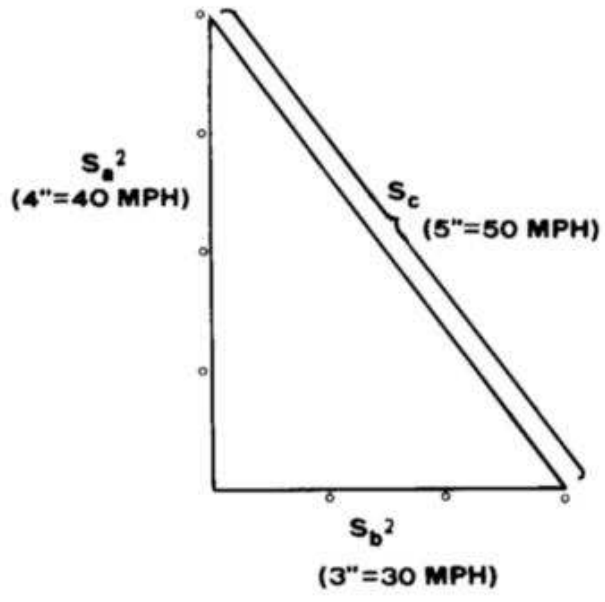
$$R = 1812.5 = 1812 \frac{1}{2} = 1812 \text{ FEET } 6 \text{ INCHES}$$

RADIUS
GREATER THAN
1800 FEET

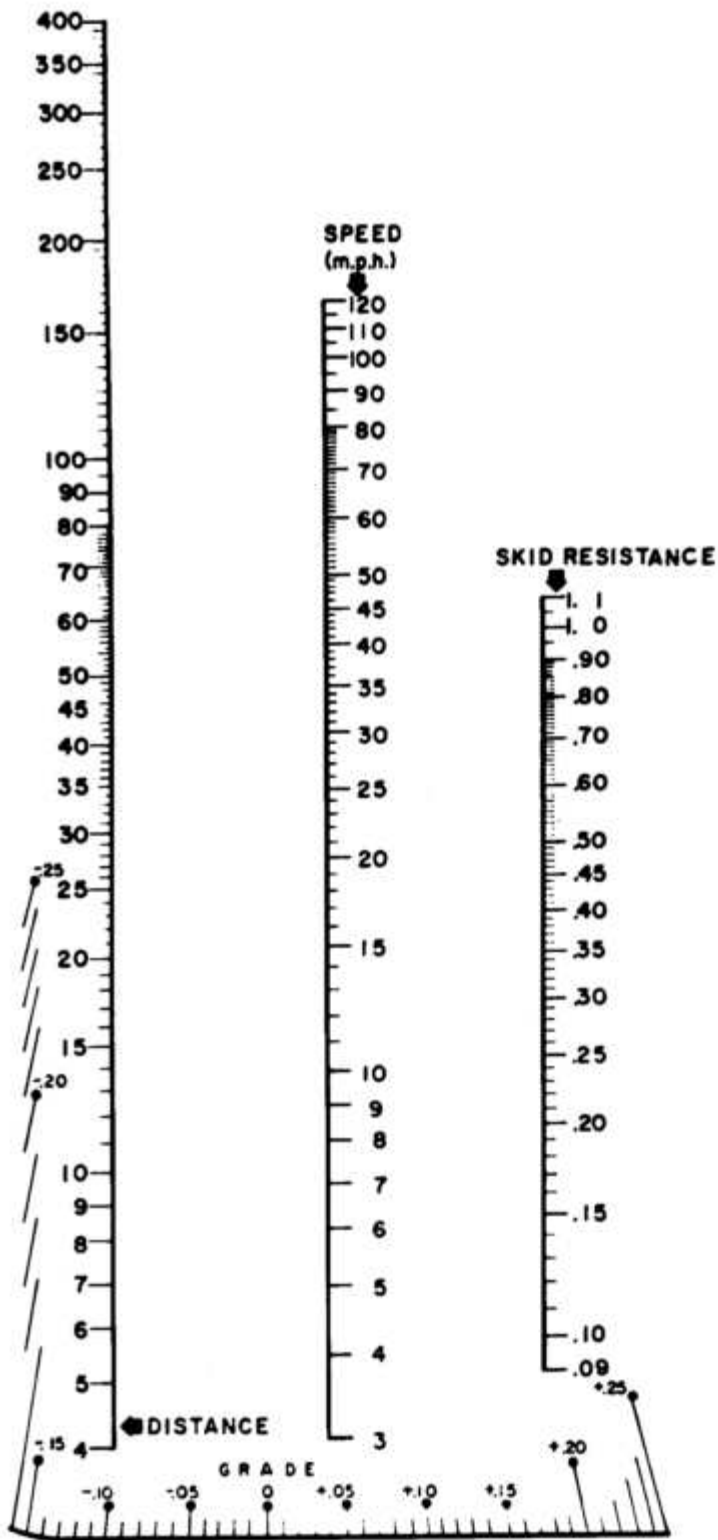
LEGEND

- A** THE BEGINNING OF THE CURVE
- B** EXTENSION OF SIGHTING LINE INTERSECTING OUTER EDGE OF ROADWAY
- A-D** WIDTH OF ROAD AT **A**
- SP** SIGHTING POINT ON THE STRAIGHT EDGE OF ROAD
- C** CHORD

Measuring Radius of a Long Sweeping Curve



Calculating Combined Speed With a Pythagorean Triangle



Speed Nomograph

TI TRAFFIC INSTITUTE
 NORTHWESTERN UNIVERSITY
 405 Church St. Evanston, Illinois 60204

Reproduced with Permission

