

Forensic Investigation on Motor Vehicle Collision in India

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Abstract:

This paper will indicate the basic of forensic investigation on motor vehicle collision in India, This paper reviews various investigation related to road accidents occurring in India. The analysis of road accidents reveals that drivers fault is the single most important factor responsible for accidents, fatalities and injuries. However, road fatalities are increasing and still cases of under reporting, lack of proper road safety regulation, improper investigation procedures, increasing vehicle usages, and higher urbanization have made the matters quite worse in India.

Keywords —Objective, When Do You Conduct An Investigation, The Six Step Process, Accident Reconstruction, Sample Incident/ Accident Analysis Team Kit, Sketching Techniques, Forms of Energy That Describe The Direct Cause of Injury, Accident Types.

I. INTRODUCTION

The three primary tasks of the accident investigator is to gather useful information, analyze the facts surrounding the accident, and write the accident report. The intent of this poster is to help you gain the basic skills necessary to conduct an effective accident investigation at workplace.

- Management is able to control, to some degree, the factors that produce 98 % of all workplace accidents.

II. OBJECTIVE

- Hazardous conditions account for 3 % of all workplace accidents.
- Unsafe/inappropriate behaviors account for 95 % of all workplace accidents.
- Uncontrollable acts account for 2 % of all workplace accidents

III. WHEN DO YOU CONDUCT AN INVESTIGATION

All incidents, whether a near miss or an actual injury-related event, should be investigated. Near miss reporting and investigation allow you to identify and control hazards before they cause a more serious incident. Accident/incident investigations are a tool for uncovering hazards that either were missed earlier or have managed to slip out of the controls planned for them. It is useful only when done with the aim of discovering every contributing factor to the accident/incident to "foolproof" the condition and/or activity and prevent future occurrences. In other words, your objective is to identify root causes, not to primarily set blame.

IV. THE SIX-STEP PROCESS (FIG 1.1)

STEP 1: Secure the accident scene: Your primary goal in this step is to gather information accident that can give critical clues into the causes associated with the accident. To do that you must first secure the accident scene.

STEP 2: Collect facts about what happened: In this step, you will use various tools and techniques to collect pertinent facts about the accident to determine the:

- Direct cause of injury.
- Hazardous conditions and unsafe employee/management behaviors (surface causes) that produced the accident.
- System weaknesses (root causes) that produced the surface causes for the accident.

STEP 3: Develop the sequence of events: In this step, we take the information gathered in step 2 to determine the events prior to, during, and after the accident. Once the events are clearly understood, we can then continue to examine each event for hazardous conditions and/or unsafe behaviors. Accident “investigations” to place blame may not place adequate emphasis on this step. But, developing the sequence of events is critical in the accident “analysis” process to fix the system.

STEP 4: Determine the causes: The occurrence of an injury invariably results from a completed sequence of factors, the last one of these being the accident itself. The accident in turn is invariably caused or permitted directly by the unsafe act of a person and/or a mechanical or physical hazard, behind every accident there are many contributing factors, causes, and sub causes. These factors combine in a random fashion causing accidents. We must find the fundamental root causes and remove them to prevent a recurrence.

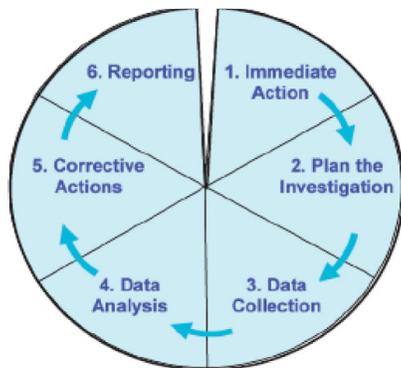
STEP 5: Recommend improvements: The Hierarchy of Controls

- Engineering Controls. Eliminate/reduce hazards through equipment redesign, replacement, substitution, etc.
- Management Controls. Eliminate/reduce exposure to hazards by controlling employee behaviors. Two primary strategies:
 - o Design of safety rules and safe work practices such as using personal protective equipment (PPE) and procedures. These control strategies work as long as employees comply with the controls.
 - o Scheduling strategies that include reducing the frequency or duration of a particular task, more frequent breaks, reducing the number of employees, etc.
- Interim Measures. These include strategies that are used as a temporary fix while permanent controls are being developed.

STEP 6: Write a report: The primary reason accident investigations fail to help eliminate similar accidents is that some report forms unfortunately address only correcting surface causes. Root causes are often ignored. Let's take a look at one format for ensuring an effective report.

The report is an open document until all actions are complete

When the accident investigator completes the report, he or she will give it to someone who must do something with it. That's the job of the decision-maker. For accident investigation to be effective, management must consider the findings and develop an action plan for taking corrective action and making system improvements. Finally, periodic evaluation of the quality of accident investigation and report is critical to maintaining an effective program.



(Fig 1.1)

V. ACCIDENT RECONSTRUCTION

Accident reconstruction is the process of using physics and mathematics to determine the speeds of the vehicles and their relative positions at all times during the accident sequence.

Investigators look at a variety of issues to determine this, including:

- The pre and post impact direction of travel
- The length of pre-impact skid marks
- The post impact distances moved
- Friction levels for the various surfaces the vehicles traveled on
- Point of impact, impact angles, and the weights of the vehicles.

As an example, let us assume that there is a two vehicle crash involving one vehicle that was traveling south and another car that was traveling west.

When these vehicles collide, we can assume they will move in a southwesterly direction because that's a combination of the momentum from both of the cars.

If the accident investigator knows how much each vehicle weighs, how far each vehicle moved south, and how far each vehicle moved west, he or she can then use that information to determine how fast the vehicles were traveling when they collided.

This collision speed can then be combined with the vehicles pre-collision speed gathered from skid

marks to determine the driver's relative pre braking speeds.

Example on accident reconstruction of motorcycle going wrong way on divided Suburban Street impacts car. (Fig 1.2)



(Fig 1.2)

VI. SAMPLE INCIDENT/ACCIDENT ANALYSIS TEAM KIT

Essential: Camera, film, flash, Tape measure - preferably 100 foot, Clipboard and writing pad, Graph paper, Straight-edge ruler. Can be used as a scale reference in Photos, Pens, pencils, Accident investigation forms, Flashlight.

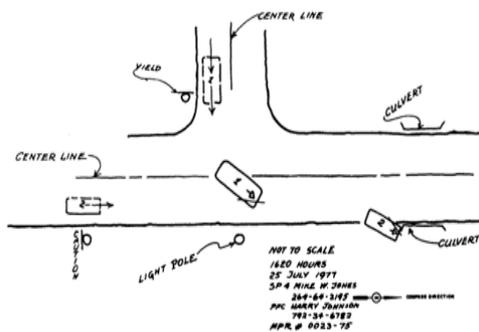
- Helpful : Accident investigator's checklist, Magnifying Glass, Sturdy gloves, High visibility plastic tapes to mark off area, First aid kit, Cassette recorder and spare cassette tapes, Identification tags, Scotch tape, Masking tape, Specimen containers, Compass, Ten 4-inch spikes, Hammer, Paint stick (yellow/black), Chalk (yellow/white), Protractor, Video camera with tape, Investigator's template. (Fig 1.3)



(Fig 1.3)

VII. SKETCHING TECHNIQUES

- Make sketches large; preferably 8" x 10".
- Makes sketches clear. Include information pertinent to the investigation. (Fig 1.4)
- Include measurements.
- Print legibly. All printing should be on the same plane.
- Indicate directions, i.e. N, E, S, and W.
- Always tie measurements to a permanent point, e.g. telephone pole, building. Use sketches when interviewing people. You can mark where they were standing. Also, it can be used to pinpoint where photos were taken



Field Sketch Showing Final Rest Position of Vehicle

(Fig 1.4)

VIII. FORMS OF ENERGY THAT DESCRIBE THE DIRECT CAUSE OF INJURY

- **MECHANICAL ENERGY** - Components that cut, crush, bend, shear, pinch, wrap, pull, and puncture as a result of rotating, transverse, or reciprocating motion.
- **ELECTRICAL ENERGY** - Low voltage electrical hazards (below 440 volts) and high voltage electrical hazards (above 440 volts).
- **CHEMICAL ENERGY** - Corrosive, toxic, flammable, or reactive (involving a release of energy ranging from not violent to explosive and capable of detonation). Toxics include poisonous plants, dangerous animals, biting insects and disease carrying bacteria, etc.
- **KINETIC (IMPACT) ENERGY** - Collision of objects in relative motion to each other including impact of a moving object against a stationary object, falling objects, flying objects, and flying particles.
- **POTENTIAL (STORED) ENERGY** - Sudden unexpected movement due to gravity, pressure, tension, or compression.
- **THERMAL ENERGY** - Extreme or excessive heat, extreme cold, sources of flame ignition, flame propagation, and heat related explosions.
- **ACOUSTIC ENERGY** - Excessive noise and vibration.
- **RADIANT ENERGY** - Relatively short wavelength energy forms within the electromagnetic spectrum including the potentially harmful characteristics of radar,

infra-red, visible, microwave, ultra-violet, x-ray, and ionizing radiation.

- **ATMOSPHERIC/GEOLOGICAL/OCEANOGRAPHIC ENERGY** - atmospheric weather circumstances such as wind and storm conditions, geological structure characteristics such as underground pressure or the instability of the earth's surface, and oceanographic currents, wave action, etc.

IX. ACCIDENT TYPES

- **STRUCK-BY** - A person is forcefully struck by an object. The force of contact is provided by the object. Example - a pedestrian is struck by a moving vehicle
- **STRUCK-AGAINST** - A person forcefully strikes an object. The person provides the force. Example -- a person strikes a leg on a protruding beam.
- **CONTACT-BY** - Contact by a substance or material that by its very nature is harmful and causes injury. Example - a person is contacted by steam escaping from a pipe.
- **CONTACT-WITH** - A person comes in contact with a harmful material. The person initiates the contact. Example –A Person touches the hot surface of a boiler.
- **CAUGHT-ON-** A person or part of his/her clothing or equipment is caught on an object that is either moving or stationary. This may cause the person to lose his/her balance and fall, be pulled into a machine, or suffer some other harm. Example - a person snags a sleeve on the end of a hand rail.
- **CAUGHT-IN-** A person or part of him/her is trapped, stuck, or otherwise caught in an

opening or enclosure. Example – a person foot is caught in a hole in the floor.

- **CAUGHT-BETWEEN** - A person is crushed, pinched or otherwise caught between either a moving object or stationary object or between two moving objects. Example -- a person's finger is caught between a door and its casing.
- **FALL TO SURFACE** - A person slips or trips and falls to the surface he/she is standing or walking on. Example – a person trips on debris in the walkway and falls.
- **FALL-TO-BELOW** - A person slips or trips and falls to a surface level below the one he/she was walking or standing on. Example - a person trips on a stairway and falls to the floor below.
- **EXERTION** - Someone over exerts or strains him or herself while doing a job. Examples - a person lifts a heavy object repeatedly flexes the wrist to move materials, and; a person twists the torso to place materials on a table. Interaction with objects, materials, etc., is involved.
- **BODILY REACTION** - Caused solely from stress imposed by free movement of the body or assumption of a strained or Unnatural body position. A leading source of injury. Example - a person bends or twists to reach a valve and strains back.
- **EXPOSURE** - Over a period of time, someone is exposed to harmful conditions. Example - A person is exposed to level of noise in excess of 90 dba for 8 hours.

X. CONCLUSION

From this paper we come to know the basic of forensic investigation on motor vehicle collision in India. It also give an explanation on six step procedure, accident reconstruction, sketching

techniques, forms of energy describing the cause of injury, accidental types and information about the basic kit required for investigation. The depth and complexity of the investigation will vary with the circumstances and seriousness of the accident. The Forensic investigator responsible for operations involved in an accident should ensure that an investigation is conducted and that when appropriate, corrective actions are taken. Incidents that involve no injury or property damage should be investigated to determine the hazards that should be corrected. The same principles apply to a quick inquiry of a minor incident and to the more formal investigation of a serious event.

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