



ASIA-PACIFIC
ROAD SAFETY
OBSERVATORY



ROAD TRAFFIC ACCIDENT DATA COLLECTION AND ANALYSIS WORKSHOP COUNTRY: TAJIKISTAN

TA-6763 REG: Accelerating Innovation in Transport

Presented by

David Shelton, Senior Transport Specialist (Road Safety), Asian Development Bank

Ravishankar Rajaraman, Road Crash Data Specialist, JP Research India Pvt. Ltd.

13 – 14 March 2023



ASIA-PACIFIC
ROAD SAFETY
OBSERVATORY



PART 2&3: ON-SITE ROAD TRAFFIC ACCIDENT INVESTIGATION BEST PRACTICES

Are eye-witness statements reliable? What are the 5 phases of a crash?

How is on-site road accident investigation conducted?

Minimum road traffic accident data collection checklist

WHAT HAPPENED IN THIS ACCIDENT?



Courtesy: Kolkata Traffic Police

SAME ACCIDENT, DIFFERENT VIEW POINT



Courtesy: Kolkata Traffic Police

WHAT DID YOU SEE?

- For whom was the traffic signal initially red? Motorcyclist or car driver?
- What part of the motorcycle contacted the car?
- Was the motorcyclist wearing a helmet?
- What was the source of the motorcyclist's injury on the left hand?

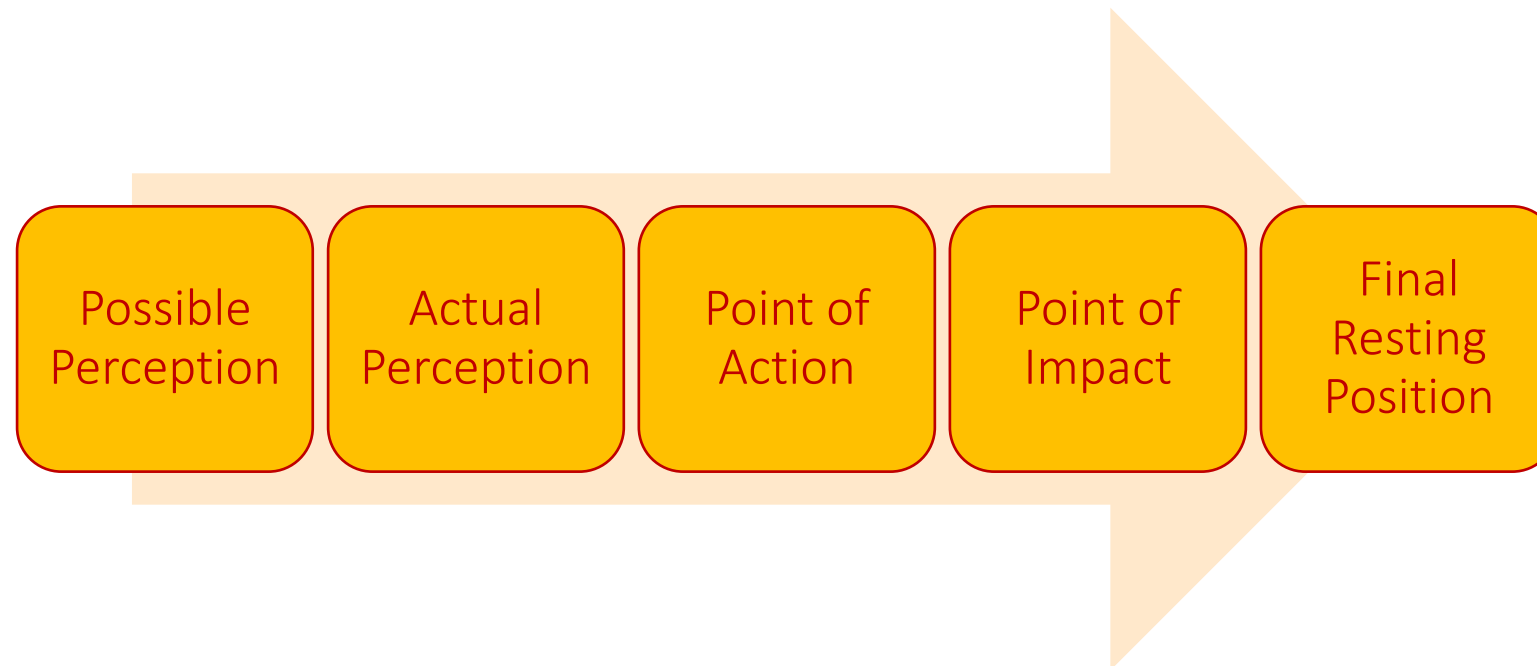
CHECK YOUR OBSERVATION SKILLS

- Traffic signal was red for Motorcyclist.
- The motorcyclist and other vehicles started to move before the signal turned green.
- The motorcyclist and the car driver cannot see each other due to the bus obstructing vision.
- The front of motorcycle impacted the right side of the car.
- Post impact motorcyclist fell on road.
- The motorcyclist's left palm came under the right front wheel of the bus.

The testimony of eyewitnesses is not reliable.

Therefore, there is a need to study traffic accidents in detail.

5 PHASES OF A ROAD ACCIDENT



PHASE 1: POSSIBLE PERCEPTION

- Driver identifies the situation which may or may not turn into a potential hazard.



Signal is "Green" for car.



Signal is "Red" for motorcyclist.

PHASE 2: ACTUAL PERCEPTION

- Driver identifies the situation as a potential hazard and he/she will initiate the reaction.



Actual perception happened when Motorcyclist crossed the bus and noticed the car coming from its left side.

PHASE 3: POINT OF ACTION

- Driver's action to avoid the conflict with the other road user/object



Motorcyclist braked to avoid the impact with the car. Car driver did not perform any avoidance maneuver.

PHASE 4: POINT OF IMPACT

- Position of vehicle/pedestrians at the time of impact is called Point of Impact (POI).



First Point of Impact



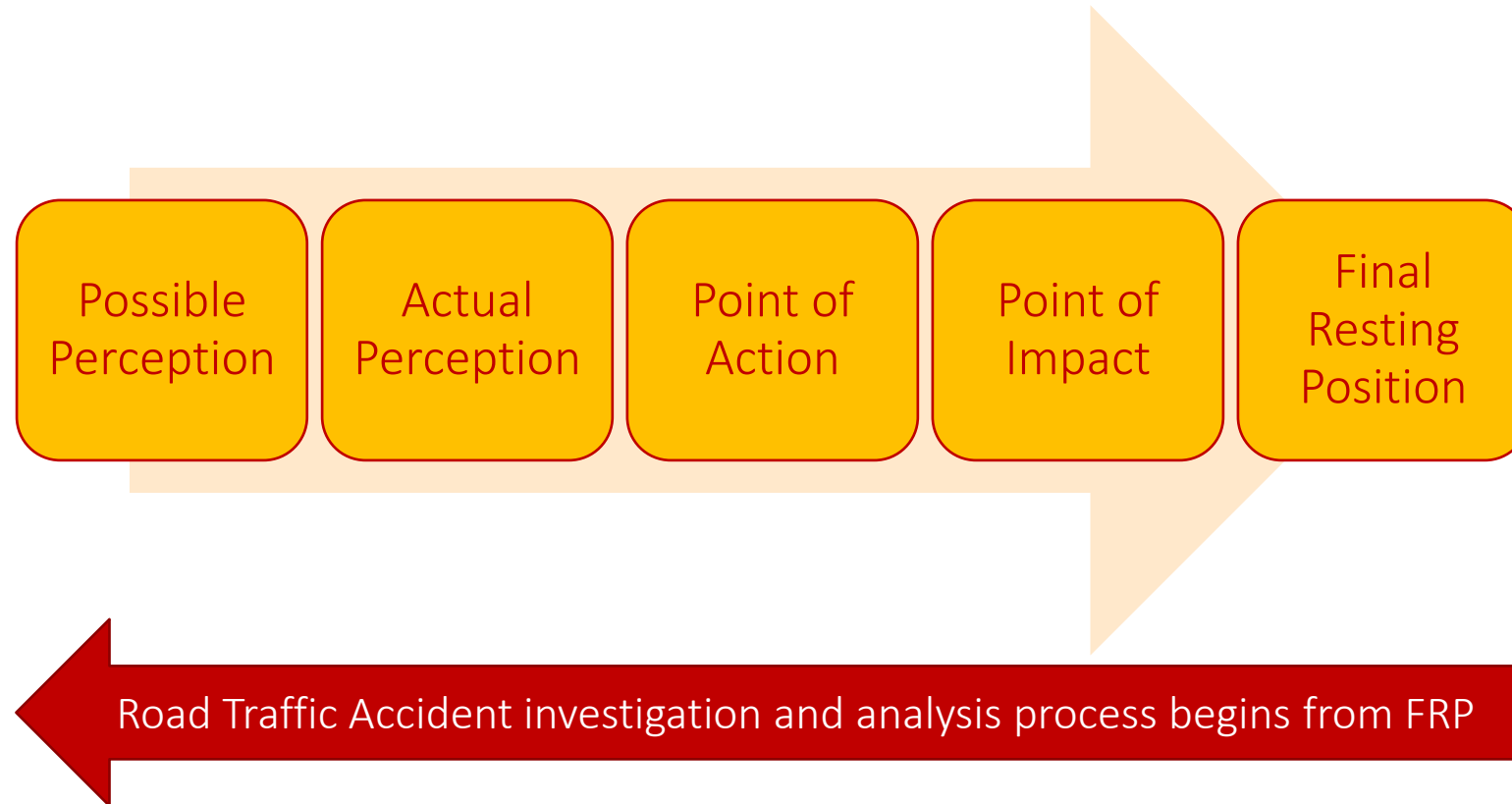
Second Point of Impact

PHASE 5: FINAL RESTING POSITION

- The location where the vehicle(s) come to rest after the Road Traffic Accident.



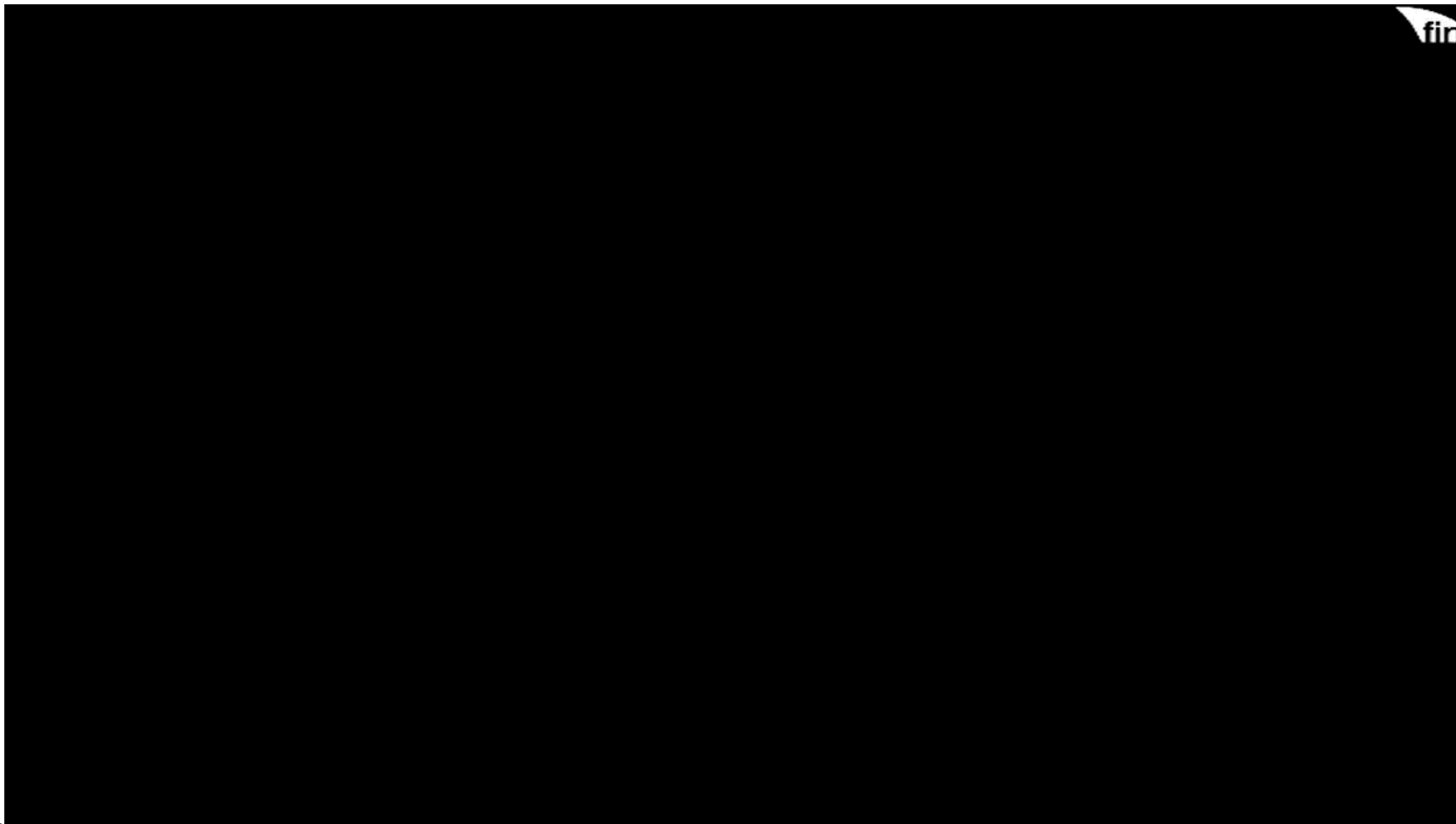
5 PHASES OF A ROAD ACCIDENT



ACCIDENT INVESTIGATION & RECONSTRUCTION

CREATIVE VISUALIZATION

Source: https://www.youtube.com/watch?v=XUXJ6ky69ki&ab_channel=RouteSafety



ROAD TRAFFIC ACCIDENT PHASES



Point of Actual Perception

Point of Action

Point of Impact

Final Resting Position

Image Source: https://www.youtube.com/watch?v=XUXI6ky69kl&ab_channel=RouteSafety

CRASH SCENE EXAMINATION

CRASH SCENE EXAMINATION

- Interpreting tire marks
- Scratch and Gouge marks
- Determination of vehicle positions:
 - Final Resting Positions.
 - Point Of Impact
 - Trajectories
- Marking crash scene evidence

BRAKE MARKS

A moving vehicle leaves a brake mark on the road when:

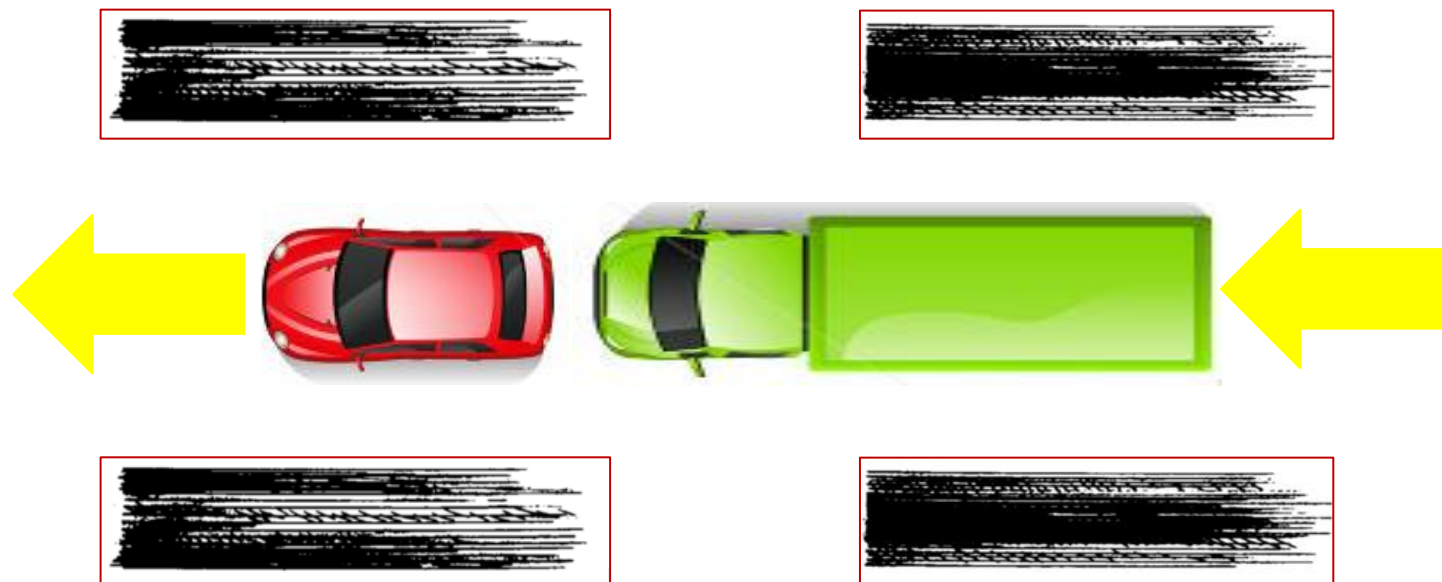
- the tire stops rotating and slides on the road.
- the vehicle speed and tire circumferential speed does not match.



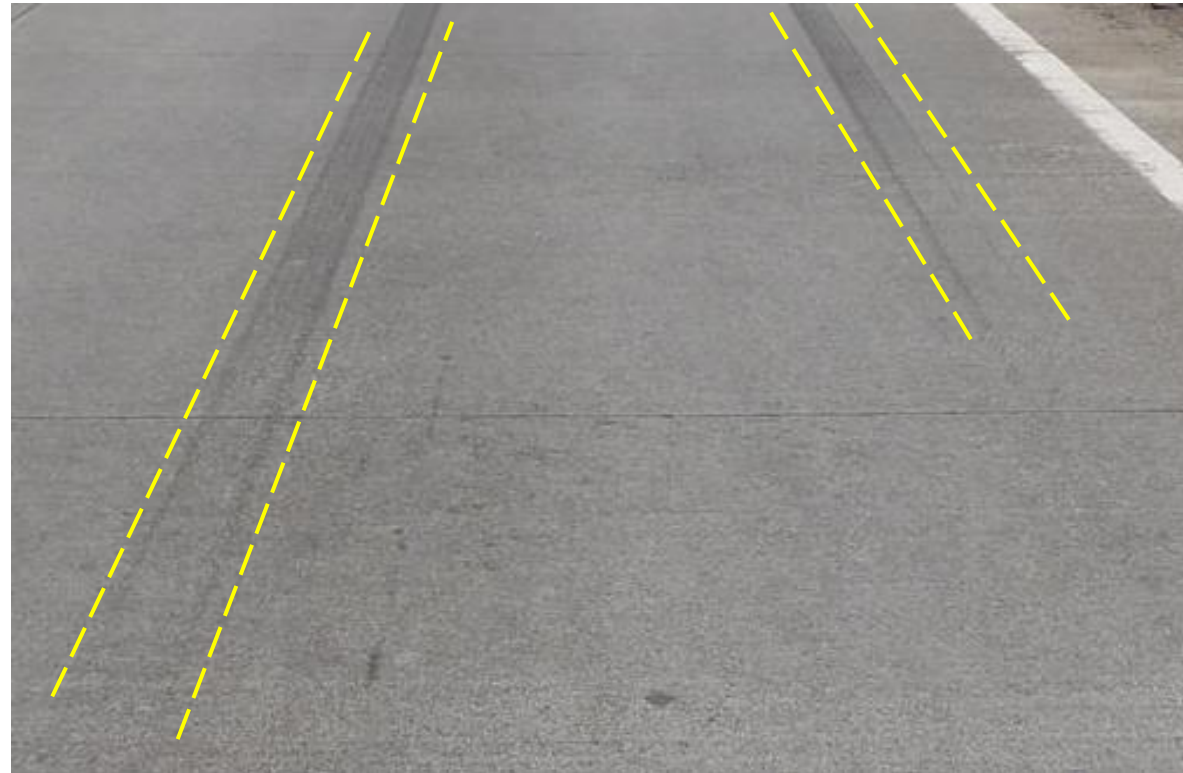
BRAKE MARKS: FRONT / REAR TIRE

Front Tire Brake Mark

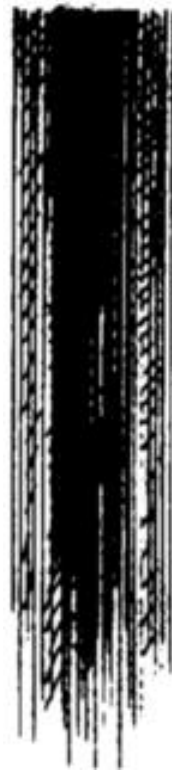
Rear Tire Brake Mark



BRAKE MARKS: FRONT TYRE



BRAKE MARKS: REAR TYRE



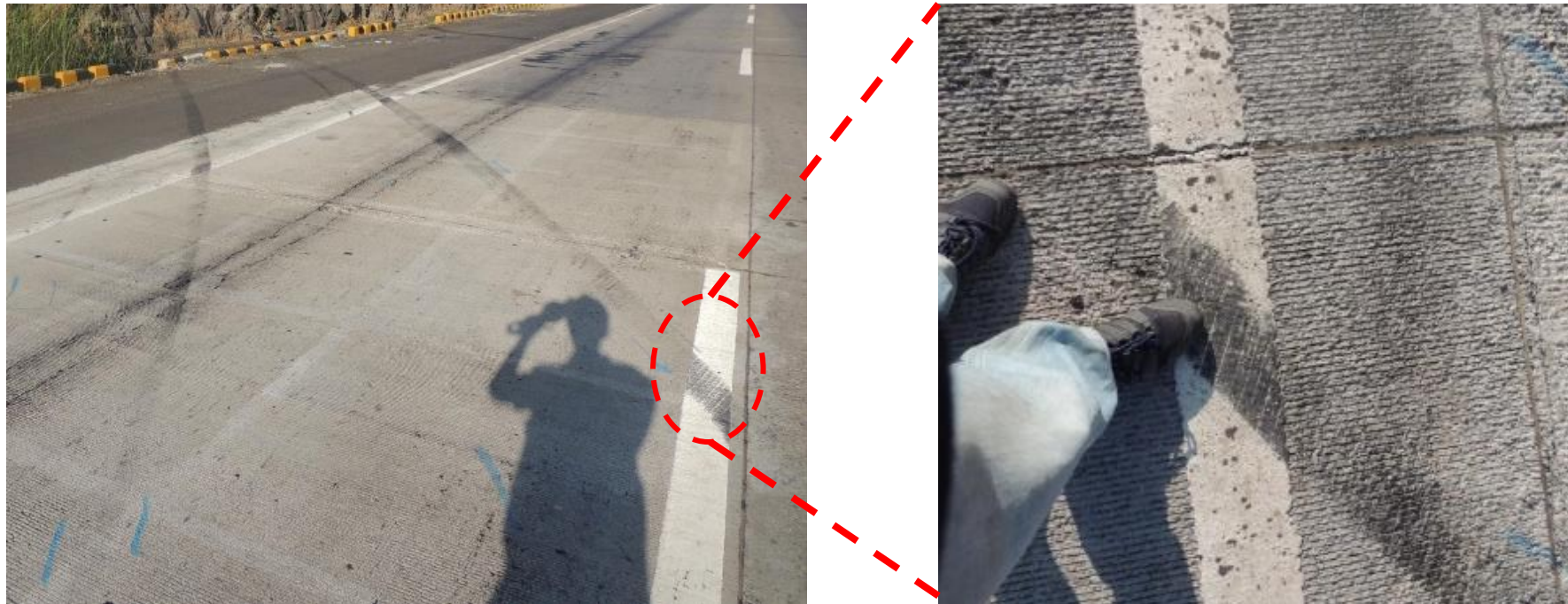
YAW MARKS

- When heading angle and velocity angle of a vehicle are different, then the vehicle starts to rotate either clockwise or anticlockwise direction. This rotation is called “Yaw”.



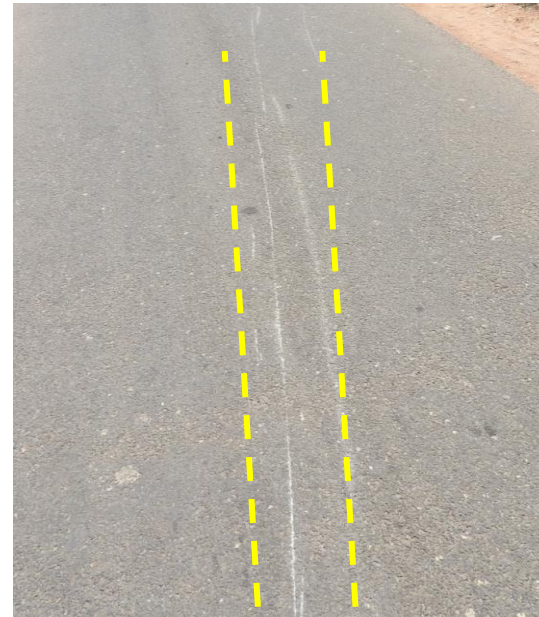
YAW MARKS

- During such lateral motion, the tire leaves curved skid mark with striations called “Yaw marks”. Marks from all the tires of a vehicle can be observed.



SCRATCH MARKS

- They are typically a result of sliding contact between road and vehicle / vehicle parts.



GOUGE MARKS

- They are typically a result of an impact between road and vehicle/vehicle components.



DETERMINATION OF VEHICLE POSITIONS

FINAL RESTING POSITION

- The positions of vehicles/pedestrians after a collision, when it is at rest or stationary.
- The FRP of accident involved vehicles can be determined from the following.
 - End of brake mark
 - Fluid/oil
 - End of scratch marks
 - Biological traces – Blood pool/tissues

END OF BRAKE MARK



FLUID/OIL POOL



END OF SCRATCH MARKS



BIOLOGICAL TRACES – BLOOD POOL/TISSUES



POINT OF IMPACT (POI)

- The position of vehicles/pedestrians at the time of impact.
- The evidence to identify POI are:
 - Deflection (kink) in tire brake marks
 - Scratch/Gouge marks on the road
 - Fluid splash – oils, coolant, water, etc.
 - Object impacts

BRAKE MARK DEFLECTION (KINK)



START OF SCRATCH MARK



DEBRIS / FLUID SPLASH



OBJECT IMPACTS



MARKING CRASH SCENE EVIDENCE

MARKING TOOLS

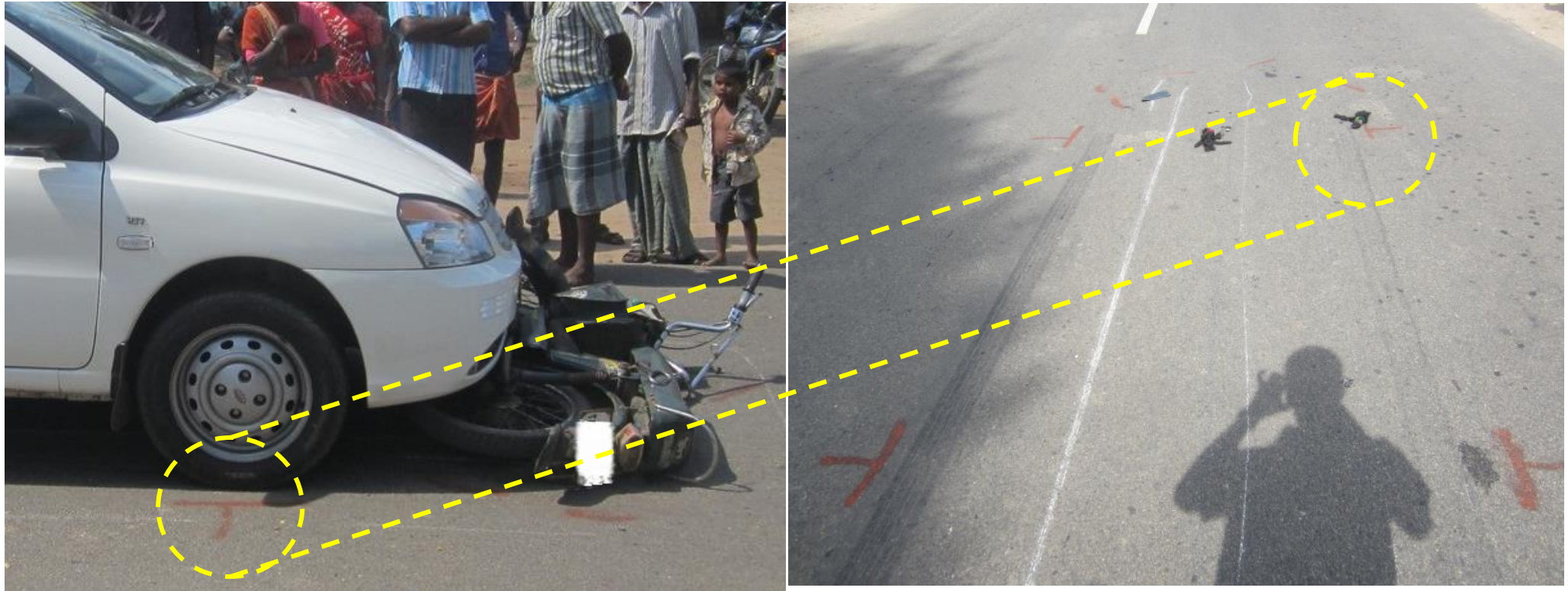


Spray Paint (2 colours)

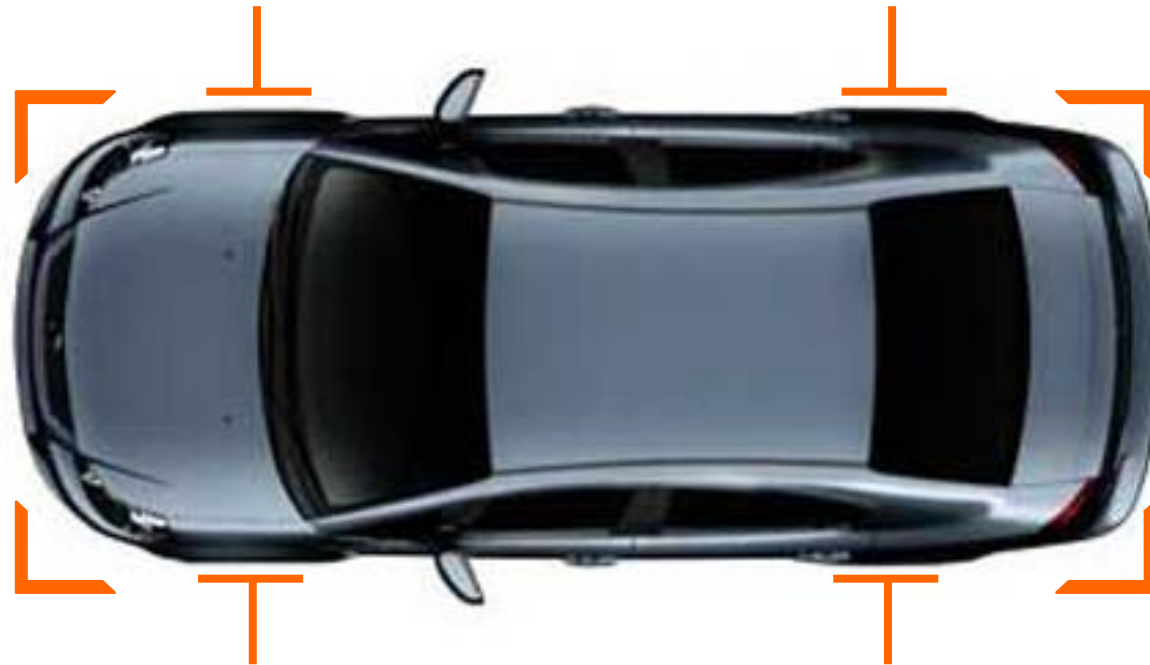


Chalk (As a Backup)

FRP OF VEHICLE: TYRES - "T-MARK"



FRP OF VEHICLES: VEHICLE CORNERS – “L-MARK”



START/END OF TYRE MARKS: “U-MARK”



VEHICLE TRAJECTORY – CONTINUOUS DASHED LINES



FLUID POOLS – “O-MARK”

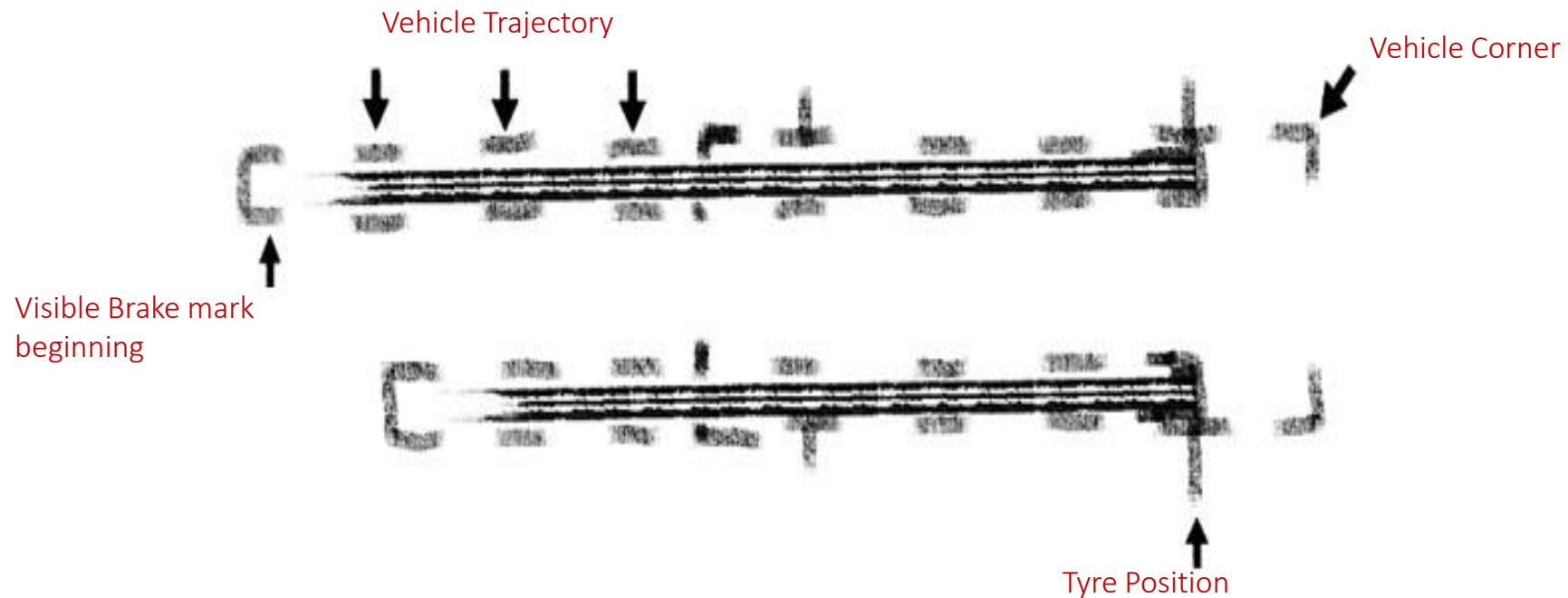


Blood pool



Oil pool

SCENE MARKING SUMMARY

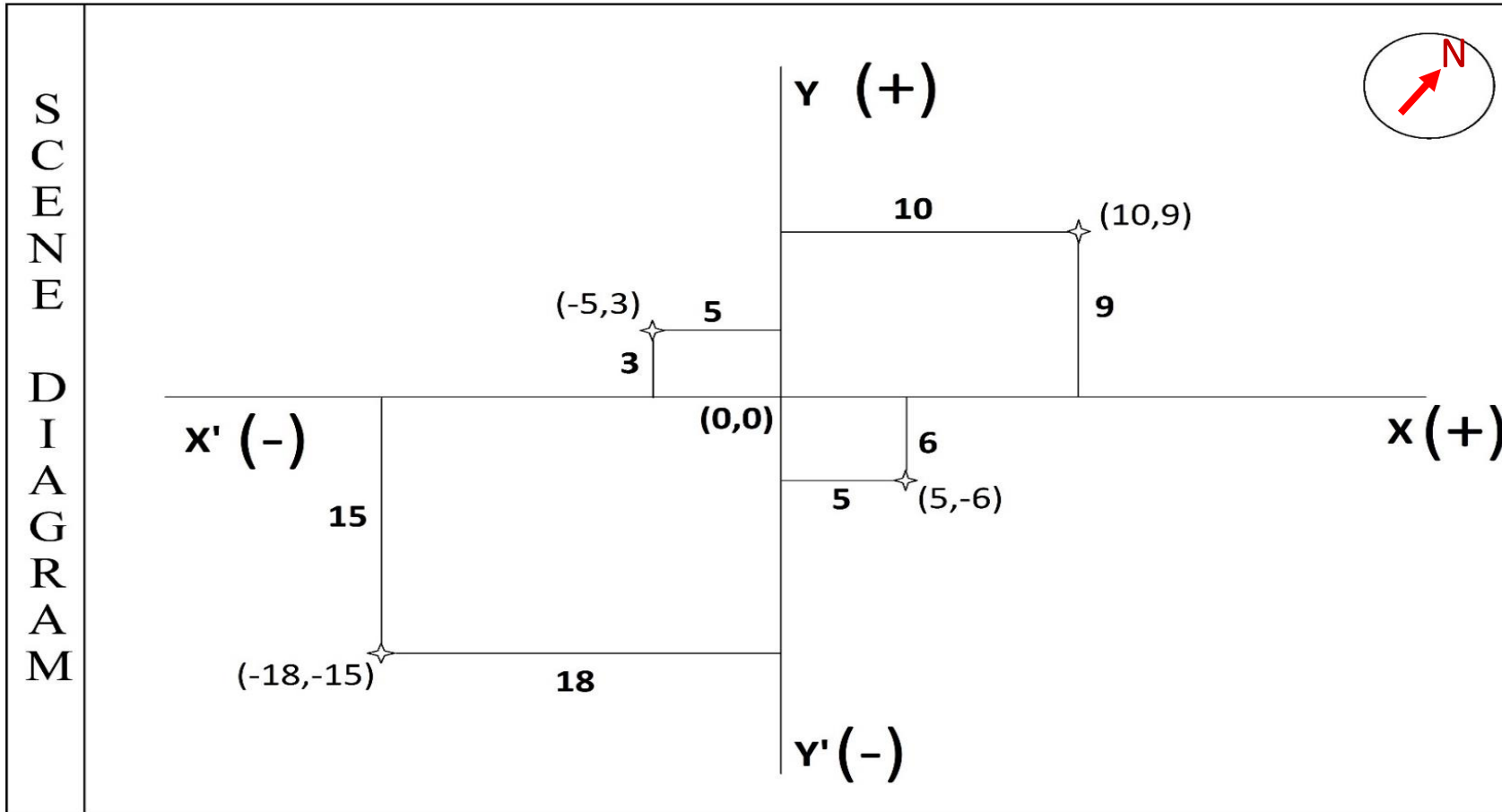


SCENE MARKING SUMMARY



CRASH SCENE MEASUREMENTS

TRAFFIC POLICE CRASH DATA COLLECTION FORM Division: _____ # _____



Page 2

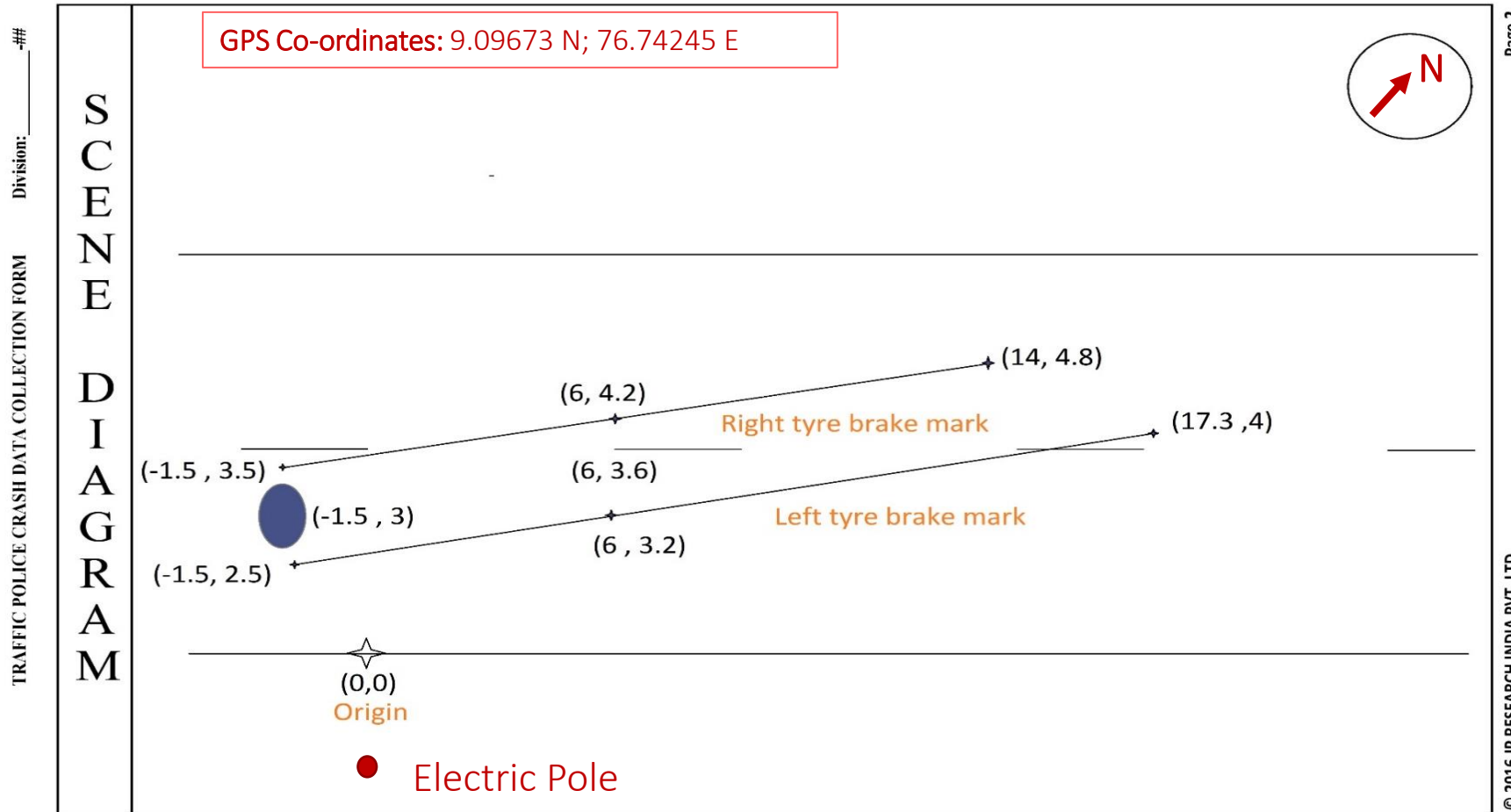
© 2016 JP RESEARCH INDIA PVT. LTD.



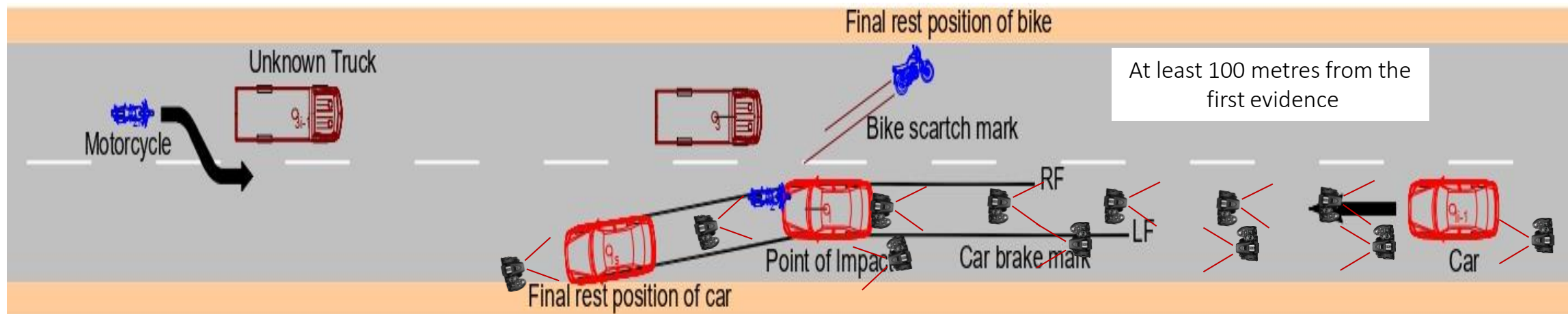
HOW TO TAKE MEASUREMENTS?



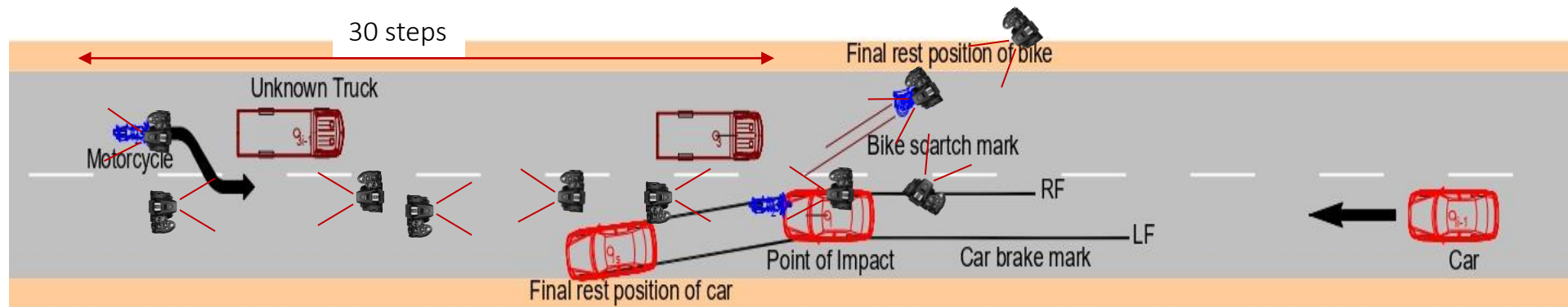
ACCIDENT SCENE DIAGRAM



CRASH SCENE PHOTOGRAPHY SEQUENCE



CRASH SCENE PHOTOGRAPHY SEQUENCE



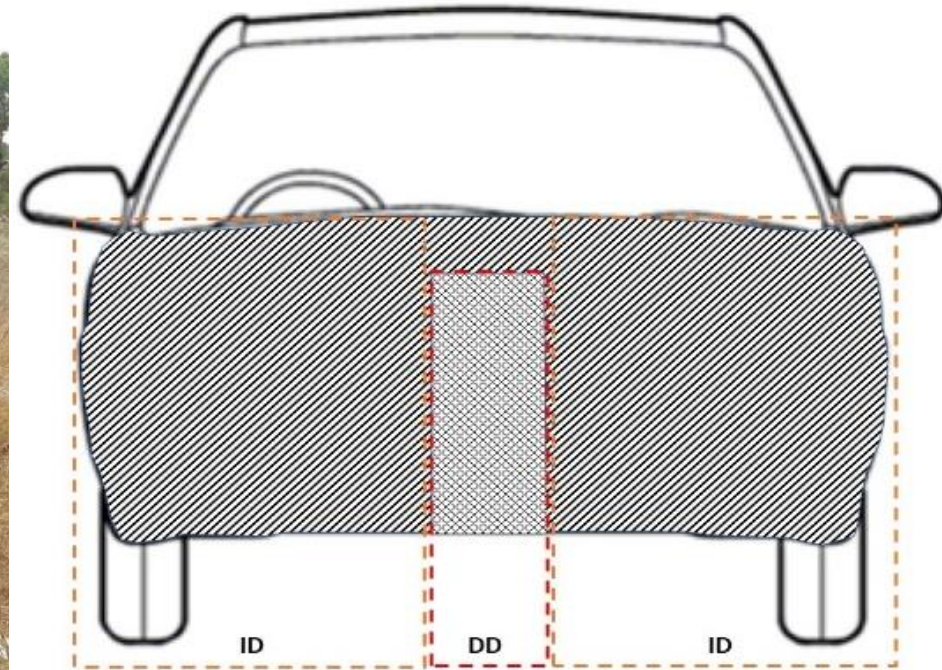
SCENE EXAMINATION CHECKLIST

MINIMUM REQUIREMENTS

- Identify and mark the Final Resting Position (FRP)
- Identify and mark the Point Of Impact (POI)
- Identify and mark the vehicle trajectory
- GPS Coordinates at Point of Impact
- Measurement of evidence
 - Length of brake mark
 - Length of scratch mark
 - To scale scene diagram
- Scene Photography
 - For each road user type
 - Photos from Final Resting Position to approximate Point of Perception
 - Photos from approximate Point of Perception to Final Resting Position

CRASH VEHICLE EXAMINATION

DIRECT/INDIRECT DAMAGE



TYPES OF DAMAGE

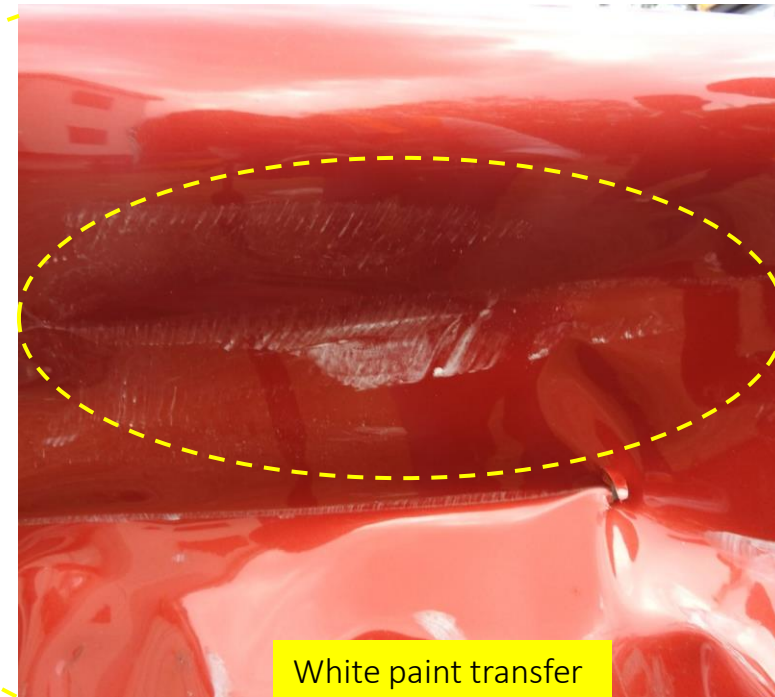
Direct Damage (DD): All damage sustained in the vehicle physically touching or in contact with the striking/struck, object/vehicle.

Indirect Damage (ID): All damage sustained beyond the limits of the contact area due to transmission of impact forces is called Indirect Damage.

DIRECT DAMAGE IDENTIFICATION

- Paint transfers
- Scratch marks
- Scuff marks
- Kinks/ Dents
- Object evidences

PAINT TRANSFER



SCRATCH MARKS



SCUFF MARKS



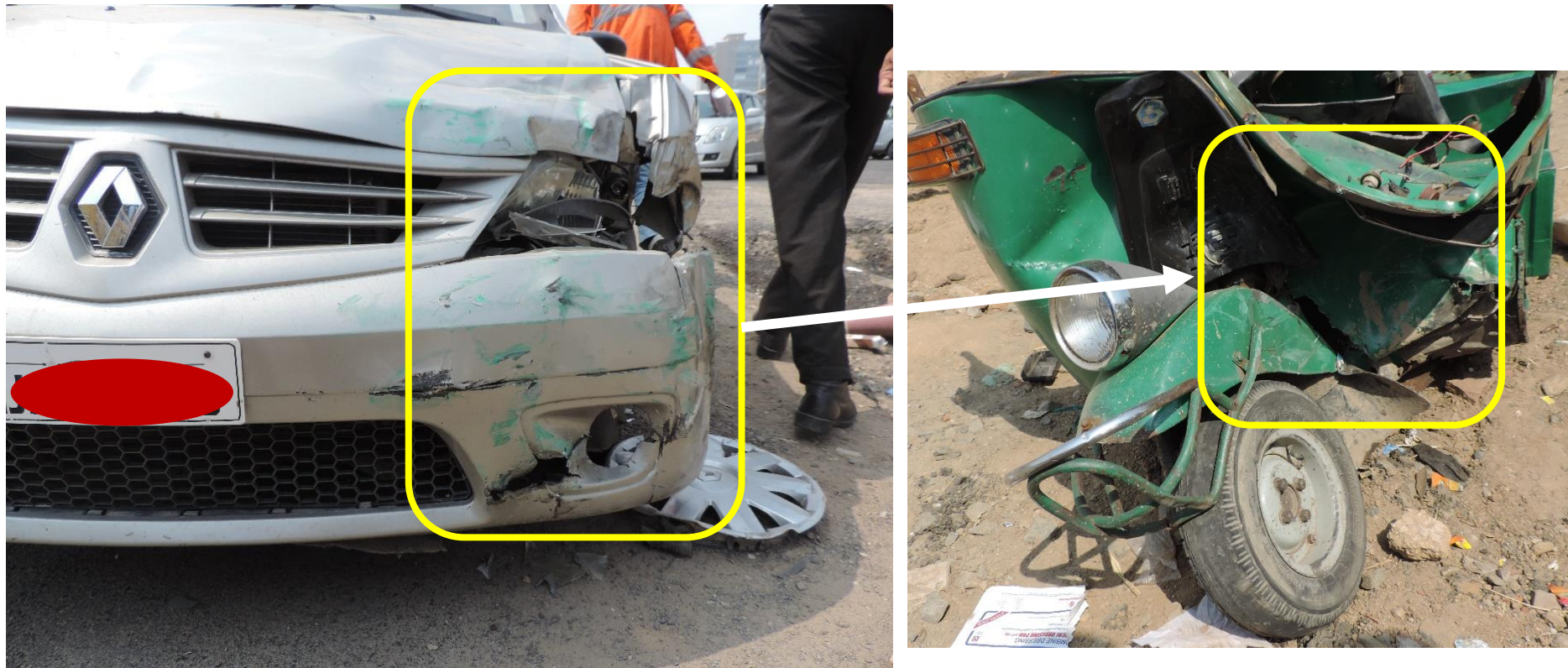
KINKS/BENDS



OBJECT IMPACTS



DIRECT DAMAGE CORRELATION



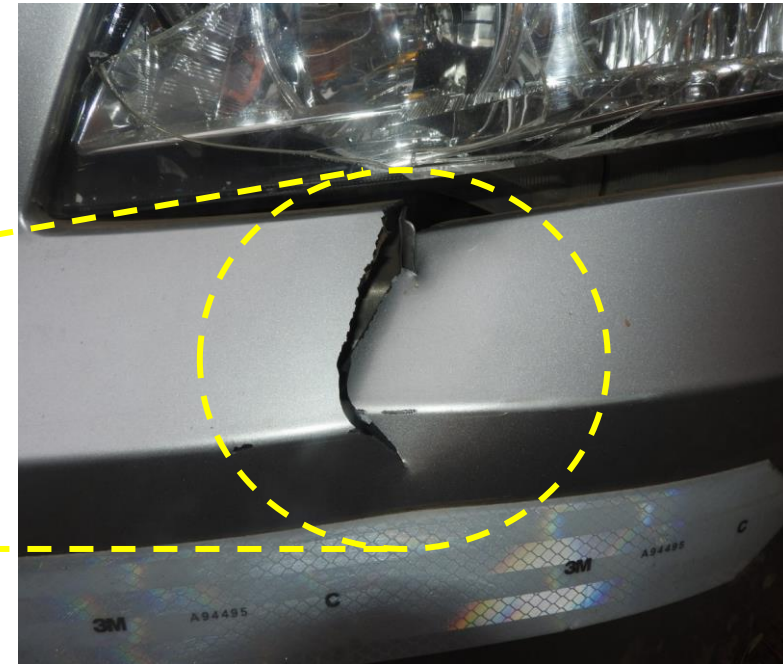
DIRECT DAMAGE CORRELATION



PEDESTRIAN CONTACT EVIDENCES

- Pedestrian contact evidences on cars and M2Ws
 - Broken components
 - Bents/Dents
 - Windshield crack
 - Hair sample/tissues
 - Fabric transfer

BROKEN COMPONENTS



BENTS/DENTS



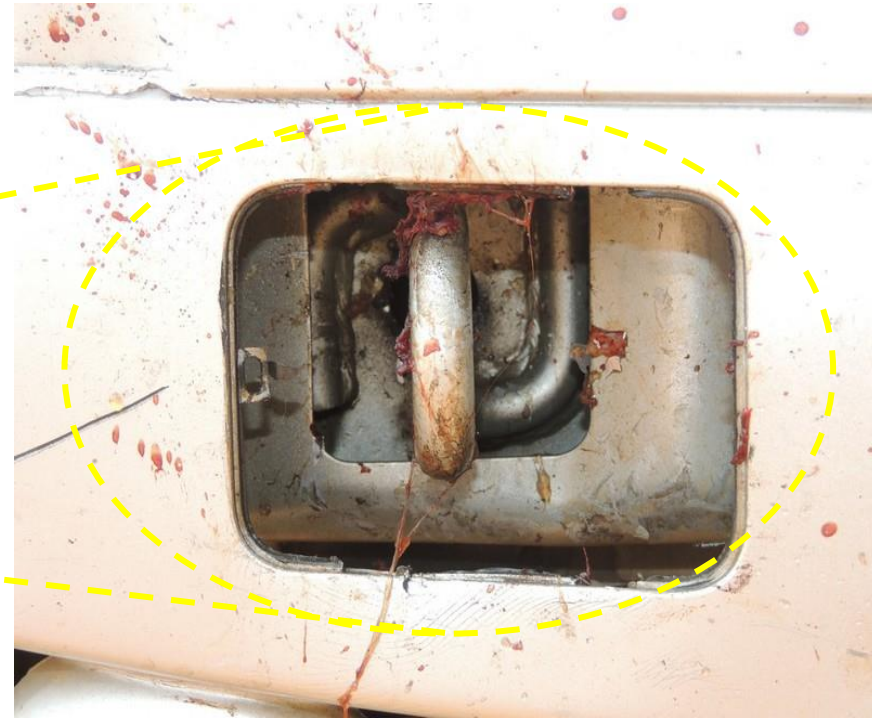
WINDSHIELD CRACK/DAMAGE



HAIR SAMPLE



BLOOD/TISSUES



CRASH VEHICLE PHOTOGRAPHY

CRASH VEHICLE PHOTOGRAPHY

- Essential pictures required for an accident involved vehicles are exterior 8-angle pictures.
- Picture at every 45 degree of a vehicle in a clockwise direction starting from the front end of the vehicle.



EXAMPLE: CAR 8-ANGLE PICTURES



EXAMPLE: 2-WHEELER 8-ANGLE PICTURES

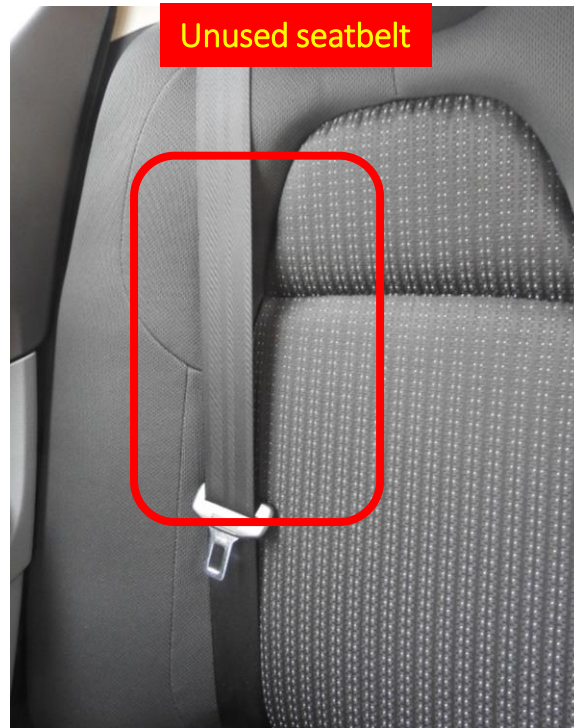


DETERMINATION OF SAFETY SYSTEM USE

SEATBELT INSPECTION PLASTIC MELT ON BUCKLE TONGUE



SEATBELT INSPECTION BELT WEBBING STRETCH MARKS



VEHICLE EXAMINATION CHECKLIST

MINIMUM REQUIREMENTS

- 8-Angle Photos of the Car
- 8-Angle Photos of the 2-Wheeler
- Damage Photos and contact evidence
 - Ground contact for 2-wheelers
- Safety system use – Helmet / Seatbelt

SUMMARY

- 5 Phases of a Collision
- Scene Examination
 - Reading tyre marks – Brake (Front/Rear Tyre) , Yaw
 - Metal – Scratch marks, Gouge marks
 - Determination of Final Resting Position and Point Of Impact
 - Scene and Vehicle Photography
- Vehicle Examination
 - Direct and Indirect Damage
 - Pedestrian Collision
 - Safety System Use – Seatbelt and Helmet



ASIA-PACIFIC
ROAD SAFETY
OBSERVATORY



PART 2&3: ON-SITE ROAD TRAFFIC ACCIDENT INVESTIGATION BEST PRACTICES

For any queries or feedback, please contact:

dshelton@adb.org

ravishankar@jpri.in