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1. Brief

1.1 Instructing Solicitors

Solicitors
For the
Car Driver

1.2 Instructions

Investigate the circumstances of a road traffic collision and prepare a report

1.3 Location of the collision

XXXXXX bound carriageway of
XXXXXXXXXXXX
XXXXXXXXXX

1.4 Vehicles and persons involved

The following were involved in the collision

1.4.1 Vehicle One

Registration Number: Xxxxxxxxxx
  Make: Ford
  Model: Unknown
  Driver: Xxxxxxxxxx
  Passengers: Nil

1.4.2 Injured party (Pedestrian)

  Name: Xxxxxxxxxx
  Age: Xxxxxxxxx
  Address:

1.5 Witnesses

There are 4 independent witnesses

1.5.1 Xxxxx xxxxxxxx
1.5.2 Xxxxxxxx xxxx
1.5.3 Xxxx xxxx xxxx
1.5.4 Xxxxxx xxxx xxxx
2. Qualifications

- De Montfort University Certificate in forensic accident reconstruction
- Certificate of competency in analysis & reconstruction of motorcycle accidents
- Certificate of competency in analysis & reconstruction of pedestrian & pedal cycle accidents
- City Guild motor vehicles
- Class 1 HMF Army vehicle mechanic
- Certificate of Arts Certificate Professional Competency in Road Haulage National/International
- Police Tachograph level 2 (driver's hours and chart analysis)
- Police Tachograph level 3, (calibration)
- ECDL computer passport.
- Insurance fraud awareness trained and company IFIG SPOC
- Former Police authorised vehicle examiner.
- Former trainer on Police hand held speed detection devices
- Former Police advanced car driver
- Former Police motorcyclist
- Former holder of both Large Goods Vehicle and PSV Licence (Expired on age)
- I am a former Army vehicle mechanic having served 12 years with HMF. I was trained to carry out all aspect of repair, vehicle inspection and examinations to MOT standard.
3. Summary of the collision

3.1 Précis of circumstances

This is a report concerning a road traffic collision which occurred on the

4. Evidence

4.1 Evidence Supplied

I have been supplied with copy of statements from:

I have also been supplied with copies of plan drawings of the accident scene which include measurements and a number of photographs showing views various views of Broad Street.

4.2 Examination and comparison of witness evidence

4.2.1 Statement of

4.2.2 Statement of

4.2.3 Statement of

4.2.4 Statement of

4.2.5 Comparison of evidence

The witnesses agree the following points.

- The weather conditions at the time
- The fact that the pedestrian did not check the road was clear before crossing
- The location of the collision and who was involved
- How the pedestrian was thrown in front of the vehicle as a result of the impact
- How the pedestrian landed on the road in front of the vehicle
- The pedestrian injuries were to his head
- The approximate age of the pedestrian and the speed he was walking at a normal speed

The witnesses do not agree the following points.

- The speed of the vehicle none of the witness’s except the vehicle driver give a speed.
5. Scene visit

5.1 Introduction

I have not visited the scene of the collision.
The calculation and description of the scene have been done from the police report,
widess’s statements and photographs provided.

5.2 Description of

5.3 Description of the direction of travel of the.

5.4 General points

The road is subject to a 70 mph speed limit

The road surface appears to be in good condition

There is no pedestrian crossing in the area of the collision
6. Investigation and reconstruction

6.1

To calculate mu, the coefficient of friction of the tyre /road interface

There is no record of any skid tests being carried out by the police at the scene of this accident and I have not been given any data to establish the coefficient for friction for the road. At this point of time the coefficient of friction for the road is unknown.

So a range for mu is used which has been taken from recognized sources such Frecke and Bakers Tables in Traffic Accident Reconstruction Vol 2. These tables show a Range for mu of between 0.6 & 0.8. This range is given as the coefficient of friction for a road surface of hot rolled asphalt which is traveled. This is similar to the road surface to that at the accident scene. As this report is not a criminal report but a civil report an average of the two values of mu can be used.

The average of the two is a mu of 0.7

The coefficient of friction of the tyre road interface that will be used is 0.7. This figure will give results for calculations that are within 10% of the lower and upper ranges.

\[
\mu = 0.7 \\
u = ? \text{ ms}^{-1} \\
v = 0 \text{ ms}^{-1} \\
g = 9.81 \text{ ms}^{-2} \\
S = 11.8 \text{ m}
\]
To calculate the velocity of the vehicle at the point of impact

**Data**
The vehicle skidded for a distance of 11.8 metres from the point of impact as indicated by the scuff mark on the road to the point of rest.

The coefficient of friction for the road is unknown. So a range for $\mu$ is used taken from Frecke and Bakers Tables in Traffic Accident Reconstruction Vol 2. These tables show a range between 0.6 & 0.8 for a road surface of hot rolled asphalt which is traveled and this is similar to the road surface to that at the accident scene. As this report is not a criminal report but a civil report an average of the two values of $\mu$ can be used. The average of the two is a $\mu$ of 0.7

Equation:  
$$v^2 = u^2 + 2aS$$

Where the vehicle is slowing, $a$ may be replaced by $-\mu g$, to give.

$$v^2 = u^2 - 2\mu gS$$

Where final velocity is zero this gives

$$0 = u^2 - 2\mu gS$$

Transposing for $\mu$ gives.

$$u = \sqrt{2\mu gS}$$

Enter the known values.

$$u = \sqrt{2 \times 0.7 \times 9.81 \times 11.8}$$

$$u = 12.73 \text{ms}^{-1}$$

The velocity of the vehicle at the point of impact was 12.73 ms$^{-1}$ or when converted to mph by dividing by 0.447 as a conversion factor giving 28.48 mph, which rounded down gives a lower speed at impact was 28mph.
To calculate the velocity of the vehicle at the point of application

Data
The length of the longest skid was 12.5 metres. Again using the mu data from the Frecke & Baker Tables and taking the average of the figures given 0.6 and 0.8 which gives an average mu of 0.7.

Equation: \[ v^2 = u^2 + 2aS \]

Where the vehicle is slowing, \( a \) may be replaced by \(-\mu g\) to give.

\[ v^2 = u^2 - 2\mu gS \]

Where final velocity is zero, hence

\[ 0 = u^2 - 2\mu gS \]

Transposing for \( \mu \) gives.

\[ u = \sqrt{2\mu gS} \]

Enter the known values.

\[ u = \sqrt{2 \times 0.7 \times 9.81 \times 12.5} \]

\[ u = 13.10 \text{ ms}^{-1} \]

The velocity of the vehicle at the point of application was 13.10 ms\(^{-1}\) to convert to mph divide by conversion factor of 0.447 giving 29.31 mph. When this rounded down it gives a lower speed of 29mph.
To calculate the actual point of perception

The Highway Code gives an average reaction time of 0.68 for a driver. Using the range of reaction times for the driver between 0.5 and 1.5 second to give the widest range of results

Equation: $S = Vt$

Enter known values for 0.5s reaction time.

$S = 13.10 \times 0.5$

$S = 6.55 \text{ m}$

Enter the known values for 1.5s reaction time.

$S = 13.10 \times 1.5$

$S = 19.65 \text{ m}$

Assuming that the speed prior to lock up was constant, then the point of actual perception was between 6.55 and 19.65 metres prior to the point of application.

The length of pre-impact skidding was found to be the difference between 12.5 – 11.8m which equals 0.7 metres.

This can be added to the distance calculated above to find the point of actual perception. This was therefore between 7.25 and 20.35 metres prior to the point of impact
To calculate the point of possible perception

Data
Using data from research on road traffic (1975) and data from Hermes 1970 & Edwards 1989 in relation to pedestrian walking speeds for a male aged between 55-60 years old, this is the age of the pedestrian as given by witness’s who also stated he was walking. The average speed at walking pace is given as between 1.3 – 1.5ms⁻¹. This is not a criminal case and average of the two speeds will be used for the calculations, giving 1.4ms⁻¹.

The distance from the kerb to the point of impact was 6.2 metres.

STEP 1
To calculate the time the pedestrian took to reach the point of impact. From the plan it can be seen that the pedestrian did not walk in a straight line from the kerb to the point of impact, he in fact walked at an angle. Therefore we need to calculate the total distance walked by the pedestrian from where he stepped off the kerb to where he reached the point of impact. As we know the distance from the kerb to the point of impact is 6.2 metres and the distance in a straight line along the kerb from the point where the pedestrian stepped off the kerb to the point of impact which is 3metres. These two measurements and because we know the path taken by the pedestrian to reach the point of impact form a right angled triangle we can use Pythagoras to calculate the total distance walked.

Equation:  
\[ A = 3^2 + 6.2^2 \]
\[ A = 47.44 \]
\[ A = \sqrt{47.44} \]
\[ A = 6.89m \]

The total distance walked by the pedestrian to reach the point of impact is 6.89m.
STEP 2
To calculate the time the pedestrian took to reach the point of impact.

Equation: \( S = Vt \)

Transposed for \( t \): \( t = \frac{S}{V} \)

Enter known values to give
\( t = \frac{6.89}{1.4} \)
\( t = 4.92 \text{s} \)

Therefore the pedestrian took 4.92 seconds to reach the point of impact.

STEP 3
To calculate the time taken for the vehicle to skid to the point of impact.

Equation: \( v = u + at \)

Where the vehicle is slowing \( a \) may be replaced by \(-\mu g\) giving.
\( V = u - \mu gt \)

Transposing for \( t \) gives.
\( t = \frac{u - v}{\mu g} \)

Enter the known values.
\( t = \frac{13.10 - 12.73}{0.7 \times 9.81} \)
\( t = 0.5 \text{s} \)

The vehicle took 0.5 seconds to skid to the point of impact.
To calculate the point of possible perception (cont.)

Continued from the previous page

Time for the pedestrian to reach the point of impact  4.92s
Time for vehicle to skid to point of impact  0.05s
**Time remaining**  4.87 seconds

**STEP 4**
To calculate the position of the vehicle when the pedestrian left the kerb (The point of Possible Perception).

Equation: \[ S = Vt \]

Enter known values to give

\[ S = 13.10 \times 4.87 \]

\[ S = 63.80 \text{ m} \]

\[ V = 13.10 \text{ms}^{-1} \]
\[ t = 4.87s \]

The point of possible perception was therefore 63.80 metres prior to the point of Application. Since the impact occurred at 0.07 metres after the point of application, This point is 63.87 metres prior to the point of impact.
To calculate the point of no escape

Data
From the scene data we know that the vehicle took 12.5 metres to skid to a stop.

The point of no escape can be expressed as 12.5 metres from the point of impact plus the Distance traveled whilst reacting (As shown on page 6.4).

With the reaction time of 0.5 seconds the total distance is.

\[ S = 12.5 + 6.55 \]

\[ S = 19.05 \text{ metres} \]

With a reaction time of 1.5 seconds the total distance is.

\[ S = 12.5 + 19.65. \]

\[ S = 32.15 \text{ metres} \]

The point of no escape was therefore between 19.05 and 32.15 metres prior to the point of impact.
To calculate the position of the pedestrian when the driver reacted

STEP 1
Calculate the time for the vehicle to reach the point of impact from the point of actual perception.

Data
Time to skid to point of impact. 0.5 seconds (from page 6.5)
Reaction time 0.5 seconds: (from page 6.4)
or 1.5 seconds: (from page 6.4)

Therefore the total time to reach the point of impact is.

\[
0.5 + 0.5 = 1.0 \text{ seconds (driver 0.5 reaction time)}
\]

\[
0.5 + 1.5 = 2.0 \text{ seconds (driver 1.5 reaction time)}
\]

STEP 2
Calculating the distance that the pedestrian could cover in these times.

Data
Pedestrian speed 1.4 ms\(^{-1}\)

Equation \(S = Vt\)

Driver with a 0.5 second reaction time
Enter known values: \(S = 1.4 \times 1.0 = 1.4 \text{ m}\)

Driver with a 1.5 second reaction time
Enter known values: \(S = 1.4 \times 1.5 = 2.10 \text{ m}\)

The pedestrian was between 1.4 and 2.10 metres from the point of impact when the driver reacted. The point of impact was found from the scene data to be 6.89 metres from the kerb.

The pedestrian was therefore between 4.79 and 5.85 metres into the road when the Driver reacted.
7. Conclusions

1. The collision took place on the XXXXXXXXXXX XXXXXXXXXXXXX.

2. Witnesses suggest that the pedestrian who had apparently travelled from a nearby housing estate had simply walked out into the carriageway without looking for oncoming traffic. They again suggest that he crossed the nearside lane of the carriageway and then walked into the offside lane without looking and it was in the offside lane were the collision took place.

3. The speed of the vehicle at impact was in the region of 28mph (page6.2). The driver of the vehicle states that she was travelling between 30-35 mph on the approach to the accident. The calculated figure would tend to corroborate the driver version of vehicle speed. As vehicle speedometers do have a built in error of some 10% depending on speed.

4. It took the pedestrian from stepping off the kerb in the region of 4.92 seconds to reach the point of impact( page 6.5)

5. All the witness state that there was little or no traffic on the road and the weather was dry and clear with good visibility. The road is reasonably straight prior to the point of impact. The point on the road were the vehicle would have been when the driver should have seen the pedestrian step from the kerb was in the region of 63.87 metres prior to the point of impact (page 6.5).

6. The point of no escape is the point depending on reaction time of the driver were the collision would take place no matter what each party did. This has been calculated as in the region of 19.05 and 32.15 metres prior to the point of impact (page 6.6). From this we can conclude that the vehicle has traveled a distance along the road in the region of 31.72 – 44.82 metres before the driver has actually seen the pedestrian

7. It is clear that the if the driver of XXXXXX XXXXXXXX had seen the pedestrian when he first stepped off the driver’s nearside kerb and because of the pedestrian was walking at a normal pace but clearly not looking at oncoming traffic as stated by the witness’s, the driver would have had ample time to take the appropriate actions i.e., reducing vehicle speed, preparing to brake or moving her vehicle to the nearside lane as the pedestrian cleared this lane. If the vehicle driver had seen the pedestrian when he stepped from the kerb and there is nothing at the scene or in the witness statements to indicate otherwise this collision may not have taken place. It is also clear that the driver of the vehicle on seeing the pedestrian has assumed that he was going to stop to allow her vehicle to pass and has not taken any preventive action incase this scenario did not taken place. When the driver has realized that the pedestrian was in fact stepping out in front of her vehicle and because of the driver’s reaction times and distance available for the vehicle to stop an accident was unavoidable.
8. Appendix

8.1 Key to equations

**General symbols**

- $u$: Initial velocity
- $v$: Final Velocity
- $V$: Average speed
- $a$: Acceleration
- $g$: Acceleration due to gravity (usually taken as $9.81 \text{ ms}^{-2}$)
- $S$: Displacement
- $\mu$: Coefficient of kinetic (sliding) friction
- $t$: Time
- $m$: Mass
- $F$: Force
- $E$: Energy

**Circular measurements**

- $r$: Radius of a curve
- $M$: Mid-ordinate of a chord
- $C$: Length of a chord

8.2 SI Units

<table>
<thead>
<tr>
<th>Physical Quantity</th>
<th>Name</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>metre</td>
<td>m</td>
</tr>
<tr>
<td>Mass</td>
<td>kilogramme</td>
<td>kg</td>
</tr>
<tr>
<td>Time</td>
<td>second</td>
<td>s</td>
</tr>
<tr>
<td><strong>Derived Units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>newton</td>
<td>N (kgm$^{-1}$)</td>
</tr>
<tr>
<td>Rate of change of displacement</td>
<td>velocity</td>
<td>ms$^{-1}$</td>
</tr>
<tr>
<td>Rate of change of velocity</td>
<td>acceleration</td>
<td>ms$^{-2}$</td>
</tr>
<tr>
<td>Inertia</td>
<td>momentum</td>
<td>Kgms$^{-1}$</td>
</tr>
</tbody>
</table>

**Fundamental Constants**

<table>
<thead>
<tr>
<th>Physical Quantity</th>
<th>Name</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceleration of free fall</td>
<td>Acceleration due to gravity</td>
<td>g 9.81 ms$^{-2}$</td>
</tr>
</tbody>
</table>

8.3 Conversion factors

<table>
<thead>
<tr>
<th></th>
<th>To convert to second name multiply by the factor</th>
<th>To convert to first name divide by the factor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Velocity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles per hour into kilometres per hour</td>
<td>1.60934</td>
<td></td>
</tr>
<tr>
<td>Metres per second into kilometres per hour</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>Feet per second into metres per second</td>
<td>0.3048</td>
<td></td>
</tr>
<tr>
<td>Feet per minute into metres per second</td>
<td>0.00508</td>
<td></td>
</tr>
<tr>
<td>Miles per hour into metres per second</td>
<td>0.447</td>
<td></td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles into kilometres</td>
<td>1.60934</td>
<td></td>
</tr>
<tr>
<td>Yards into metres</td>
<td>0.9144</td>
<td></td>
</tr>
<tr>
<td>Feet into metres</td>
<td>0.3048</td>
<td></td>
</tr>
</tbody>
</table>
9. Photograph Schedule

This where the photographs of collision location would normally be