



Setting standards in forensic science

What's on the Highway? Frequency of Occurrence of Paint Chips Amongst Debris Collected from Road Surfaces

LGC Forensics

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2009

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UK 'Hit and Run' statistics in 2006



Government Office Region	Fatal	Serious	Slight	Total
North East	6	80	714	800
North West	26	263	2,825	3,114
Yorkshire and the Humber	16	176	1,749	1,941
East Midlands	12	142	1,193	1,347
West Midlands	17	183	2,178	2,378
East of England	12	168	1,571	1,751
South East	14	202	2,226	2,442
London	28	424	3,370	3,822
South West	11	98	1,484	1,593
Wales	3	64	850	917
Scotland	7	117	777	901
Great Britain	152	1,917	18,937	21,006

Reported personal injury road accidents involving at least one hit and run driver/rider, by road type¹



		FSA *	Slight	Total
All roads	Motorways	41	517	558
	A roads	787	7,320	8,107
	B roads	239	2,104	2,343
	Other roads	1,002	8,996	9,998
	Total	2,069	18,937	21,006

* Fatal
Or serious
incident

¹ <http://www.dft.gov.uk/excel/173025/221412/221549/227755/285672/Article5HitRuntables.xls>

- **Motorway (Freeway)**
 - Similar to freeways, high-speed roads
 - Not examined in this study
- **Primary A-road (Arterials)**
 - A main recommended route, either single or dual carriageway (*expressways*)
 - Not examined in this study
- **Non-primary A-road (collectors)**
 - Often exists where the route is important but there is a nearby primary route (A or motorway) which duplicates this road's function.
- **B Road (local roads)**
 - Regional in nature and used to connect areas of lesser importance
- **Unclassified (local roads)**
 - Unclassified roads are local roads with no defined destination. Local destinations may be signed along them



Forensic viewpoint: In the case of a vehicle colliding with a pedestrian or a cyclist

- Notoriously difficult to investigate
- The victim and the involved vehicle(s) are often in contact for an extremely short period of time
- Injury to the victim, however severe, does not always cause immediate bleeding and often no body fluids are detected on the vehicle
- Trace evidence such as hair caught on broken glass, or fibre transfer to vehicle parts, rely on the relevant vehicle being located before damage can be repaired and evidence lost
- Without witnesses, the vehicle colour and type may not be known and hence the finding of the perpetrator may not be possible

Finding car paint chips on a victim's clothing

- How common are car paint chips on the clothing of a person taken at random?
- How common are car paint chips on the road?
- How easily are random car paint chips on the road transferred to clothing?
- In order to make the assessment; if car paint chips are found on the victim's clothing, how significant is this finding?

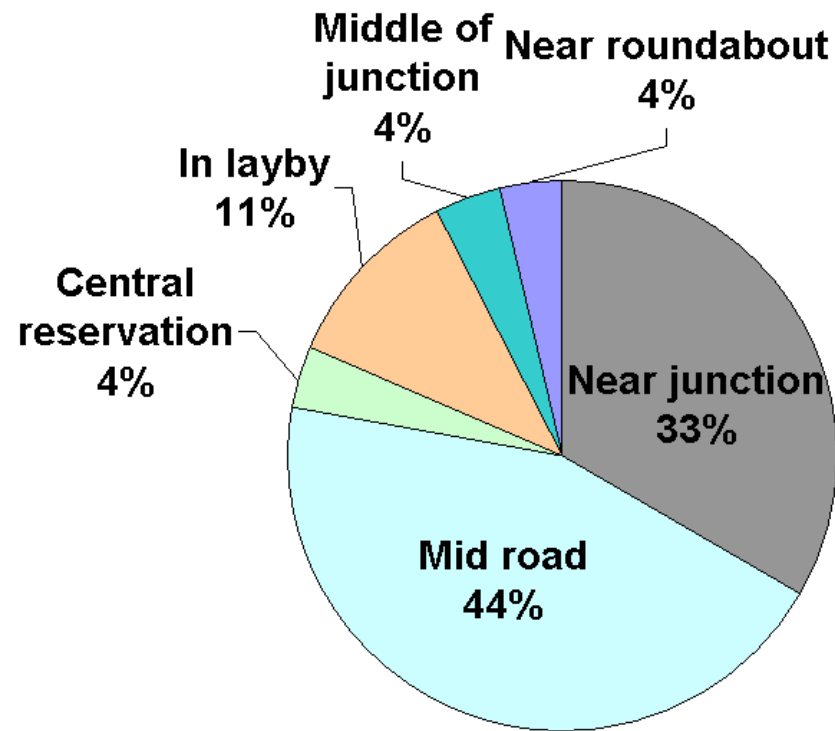
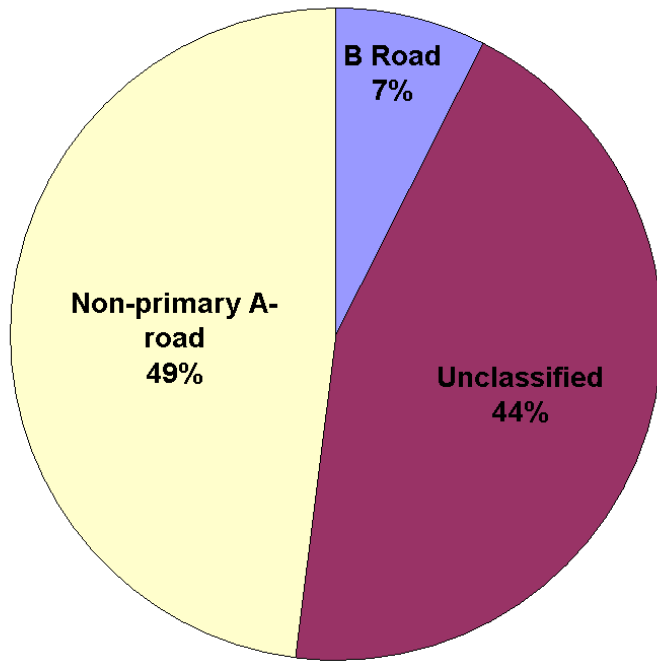
Collection Technique

- Dustpan and Brush
- Debris collected from an area A3 size
- Debris tipped to plastic bag
- Filtered to separate debris >1mm for ease of searching
- Transferred to Petri dish for examination



- 27 separate samples taken from different locations over the course of a 3 month period
 - All samples taken near curb, to maximise sample collection away from the road camber
 - Sampling done when road surface and debris was completely dry
 - Magnification x25 using low powered microscope

Sampled Areas



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Results

Weight of sample		Proportion of samples collected
1-4g	9 samples	0.34
5-20g	3 samples	0.11
21-30g	6 samples	0.22
31-50g	4 samples	0.15
51-80g	3 samples	0.11
81-134g	2 samples	0.07

Of which, the average % of the sample being over 1mm in size was 70%

Apart from paint?



- 1 Fragment of glitter found in one sample
- **All** samples contained old glass
- 19/27 (70%) of samples contained glass with a freshly broken appearance
- 1/27 (3.7%) sample had a fragment of glass with a mirrored background
- 3/27 (11%) contained fragments of plastic
- 24/27 (89%) of samples contained **microscopic glass balls**

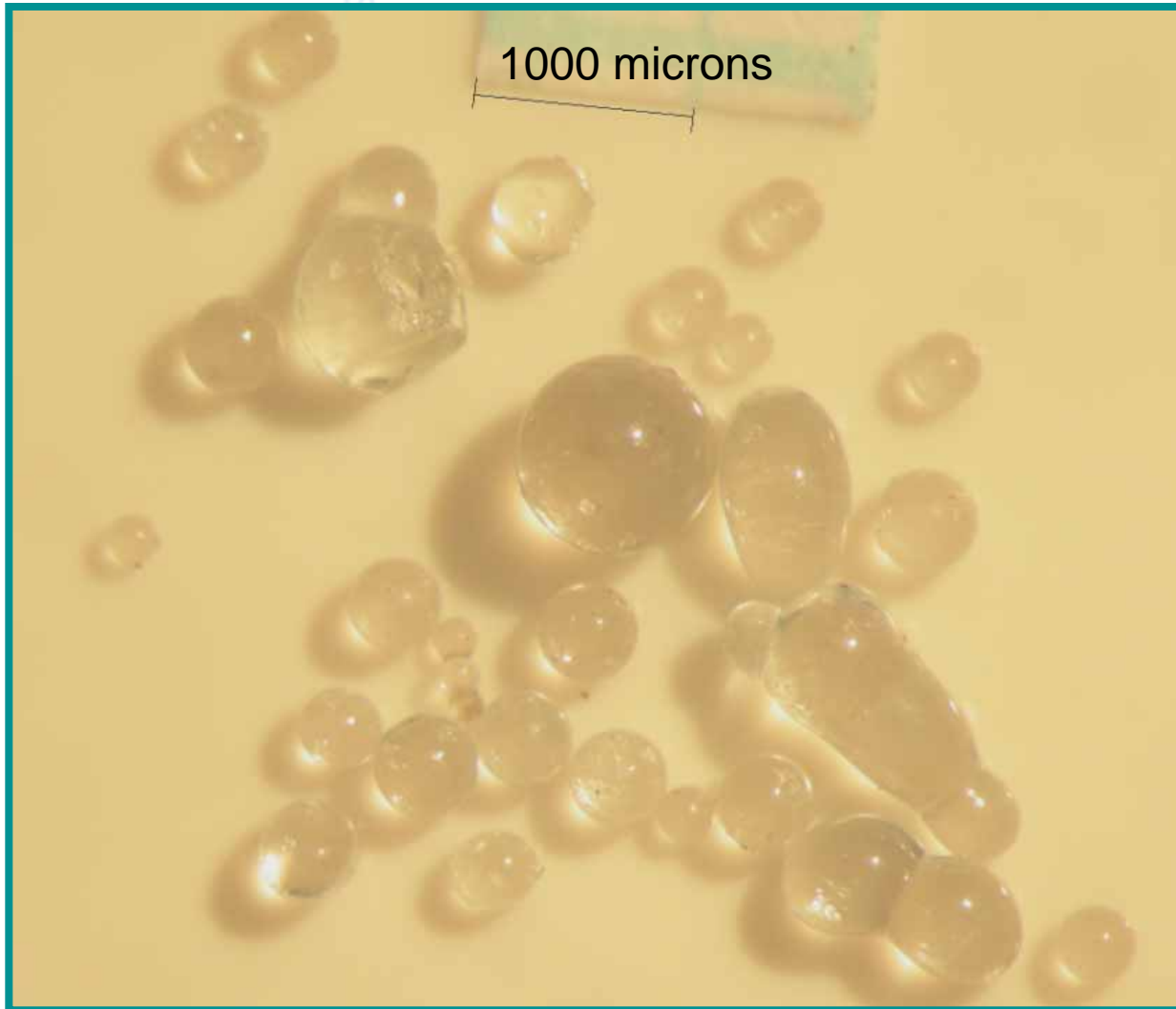
Glass balls

- Small glass beads used extensively as a reflective addition in road marking paint
- From the manufacturer's information²:



Standard diameter (um)	Contain (%)
> 850	0--5
600--850	5--20
300--600	30--75
180--300	10--30
<180	0--15

² http://tjlianda.en.alibaba.com/product/50044024-50006941/Glass_Beads_for_Road_Marking.html



- A small proportion of glass beads found in a single sample

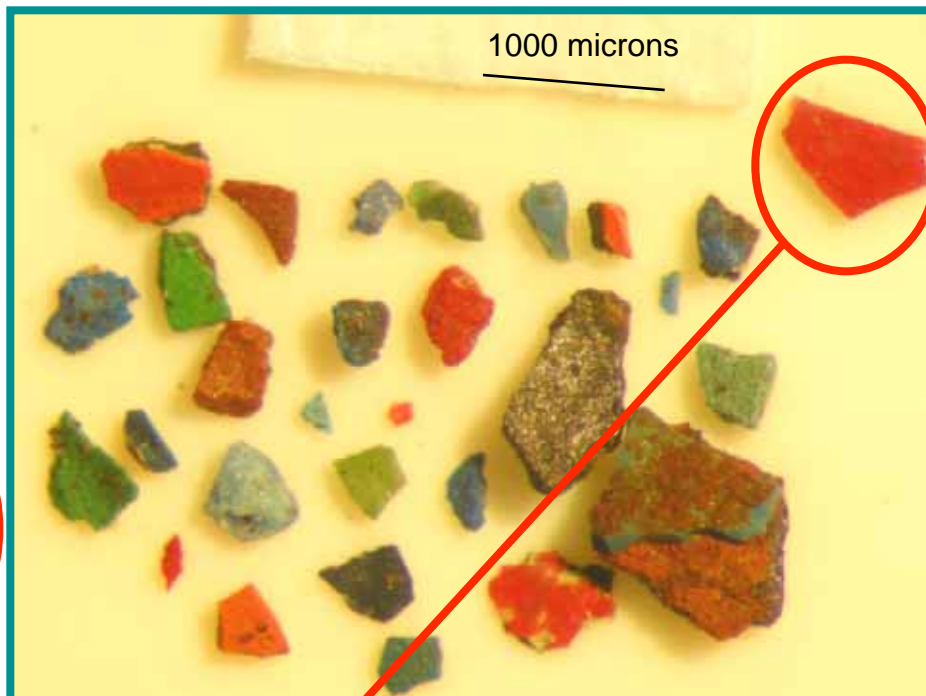
Paint?

- **Paint chips found in 20/27 (74%) of samples**
- Paint chip sizes ranged from 100 -2200 microns
- In total, 191 paint chips were counted over all samples
 - Giving a total of 113 different populations
 - with 41 paint chips containing more than 2 paint layers (21%)
- Of these, only **3** were car paint chips
 - Found in 2 samples
 - 2 car paint chips were from the same sample and looked the same colour
 - **Giving a total ‘chance’ of finding car paint chips in 2/27 (7%) in the samples taken**

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Sample number 25

Sample number 17



Car paint chips

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Random paint chips found (both samples found on unclassified roads)



Grey undercoat
Red
Red
Clearcoat
Red
Clearcoat



Grey undercoat
Blue metallic
Clearcoat

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How common are car paint chips on the clothing of a person taken at random? ³

- 100 garments shaken for debris on the surface
- Debris examined x25 magnification
- All paint chips counted and recorded
- 95/100 garments showed the presence of paint chips
- Total number of paint chips recorded was 1,253
 - These could be divided into 1,008 different populations
 - Of these, 9% contained 2 layers and 1% contained 3+ layers
- **None** of the recovered paint chips were automotive

³ Miss. R. Hewetson, MSc Thesis, 'Paint database', University of Strathclyde 2006

So, if debris is found on a victim in the road, what does it mean?

- Uncertainties **must** be considered
 - How regional are the findings?
 - How easily does particulates such as paint chips on the road transfer to clothing?
 - How often are roads swept?
 - How soon after the last rain cleaned the road surface?
 - How much activity has the victim undertaken (i.e. persistence)?
 - Was paint/other debris already present?
 - etc

Conclusions

- Using the statistics presented here, some assumptions can now be made
 - There is an extremely high chance (in this investigation, 100%) that old glass is present on the road
 - There is a very high chance (+89%) that glass beads are on the road surface
 - There is a high chance (+70%) that glass fragments with a freshly broken appearance are on the road
 - There is a high chance (+74%) that paint chips are present on the road
 - **But, of these, only a 7% chance that car paint chips are present on the road surface**
 - Plus, the finding of car paint chips on a person's clothing at random is very unlikely (in this investigation, 0/ 1,253 paint chips were car paint)

Acknowledgements



- Rachel Hewetson
 - for her MSc project which investigated the occurrence of paint chips on 100 garments taken at random
- LGC Forensics
 - For support
- Dr. Tina Lovelock
- Pam Hamer
 - Both for invaluable advice and help

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