LOTAMB Skid Training 2012

The London Skid Project: Overview

Mark Stephenson
marks@wdm.co.uk

W.D.M. Limited
North View, Staple Hill, Bristol BS16 4NX
Telephone: 0117 956 7233 Web: www.wdm.co.uk

Session outline

- Background
- Overview
- Project history
- Key elements of project
- Implementation

The London skid project

- Aim came from Highway Management working group in 2007
- Desire to achieve consistent approach across London
- Promoting safer road surfaces
- Surveys through Roads 2000 for many years
- Need to understand and use data intelligently
- WDM commissioned in 2008 to assist

The London Skid Project

Three Stages

- **Stage 1**
  Establish common standards across capital and set up digital network
- **Stage 2**
  Policy documentation and dissemination
- **Stage 3**
  Ongoing reviews and improvements through continued LOTAMB funding

Stage 1 - Outline

- Establish common standards across capital and set up digital network
  - Site Category review
  - Accident Rate versus Skid Resistance Study
  - Investigatory Level review

Stage 2 - Outline

- Policy Set up and Dissemination
  - Guidance Document and Draft Policy (documentation issues in Autumn 2009)
  - Development of Prioritised Site Listings (a.k.a. Deficiency Listings)
  - Training held in March/ April 2009 (approx 100 delegates)
  - Project launch at ROAD2000 in November 2009
  - Reports on LOTAG website

Stage 3 - Outline

- Continued LOTAMB Funding
  - 2010,2011 and 2012 deficiency listings
  - Development of Pan-London Approach
  - Training
  - Investigation Handbook
  - Review of use and effectiveness of HFS

Stage 3 - Outline

- Borough Reviews
  - Review of practice in boroughs (3 completed)
  - Better understanding of deficiency listing
  - Cooperation of accident/safety teams
  - Clarity on roles
  - Drilling into Deficiency Listings
  - Records

Stage 3 - Outline

- New Standard
  - HD28 likely to be updated
  - An assessment of London Policy/Guidance v new standard
  - Draft reviewed
  - In general, if borough follows guidance will be consistent with revised standard
  - Some operational changes

Stage 3 - Outline

- Other Roads
  - Development of a framework approach for the remaining network
  - Three potential strategies
    1. Application of material policy
    2. Monitoring regime on part of network
    3. Reactive regime
  - In addition recommendation of proactive inspection regime for HFS surfaces.

Anu Prematilaka
anup@wdm.co.uk

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Stage 1

- First objective was to understand the available data and how to use it
- Found limited site category work: they needed to be correctly positioned – very important
- Investigatory Levels to be established by understanding level of risk
- Standards needed to be common for road users across the capital - Borough principal roads
- TfL network – site categories and IL's were already established

Site Categories

- Road network characteristics are diverse
- Various types of sites have different exposure to accident risk, hence skid resistance requirements are different
- Need for site categories

Busy locations …
Quiet locations …

Multiple events …
Rare events …

Sometimes you see the road well ahead …
Sometimes you don't …

Complex layouts

Complex layouts

The need for a skid policy

- Highway authorities cannot 'gold plate' everything
- Therefore, need to identify and treat areas that save the most accidents with the least expenditure
- Increasing need for a paper trail: very valuable in case of public prosecutions

Some Definitions

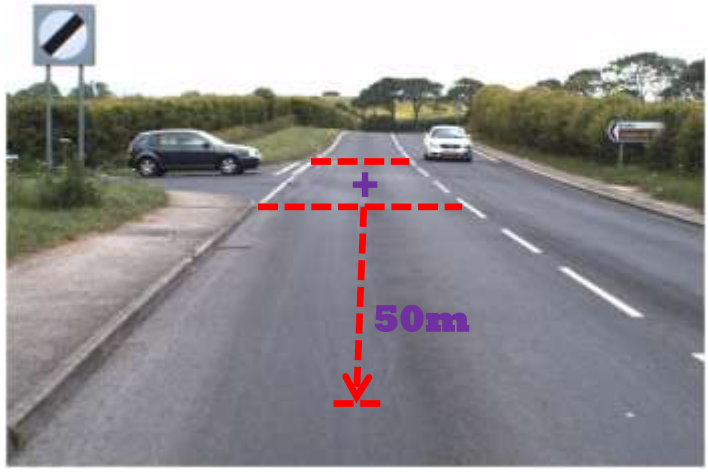
Site Categories are road section types that have similar broad features of the road type and geometry

An **Investigatory Level** is assigned to each Site Category based on the level of accident risk; they can be adjusted at individual sites based on a risk assessment

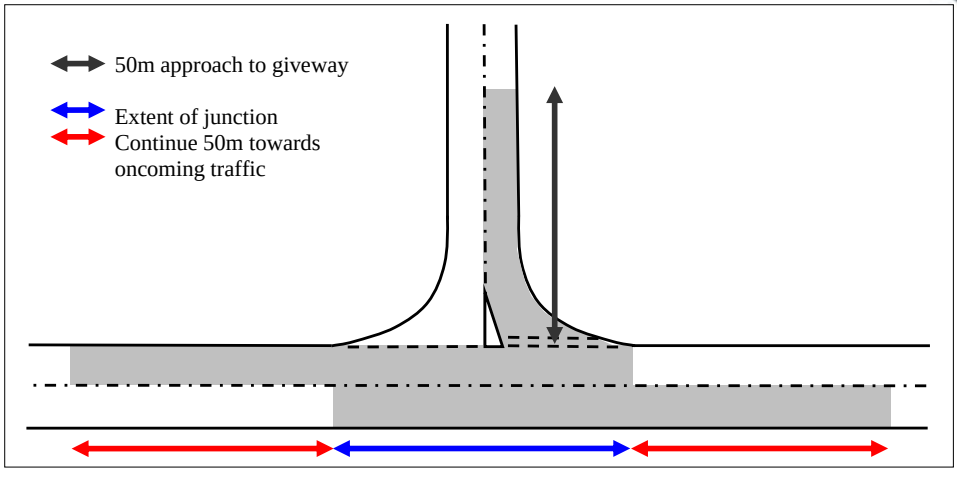
Single Carriageway Non Event

Dual Carriageway Non Event

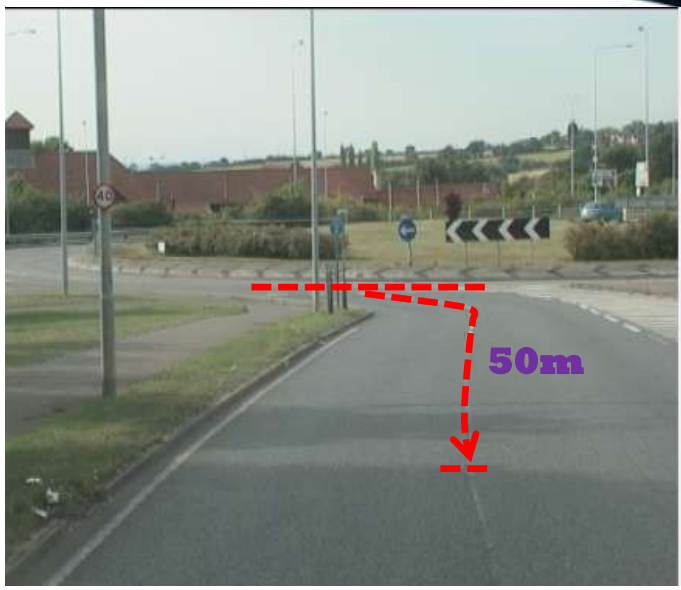
Approach to Junctions



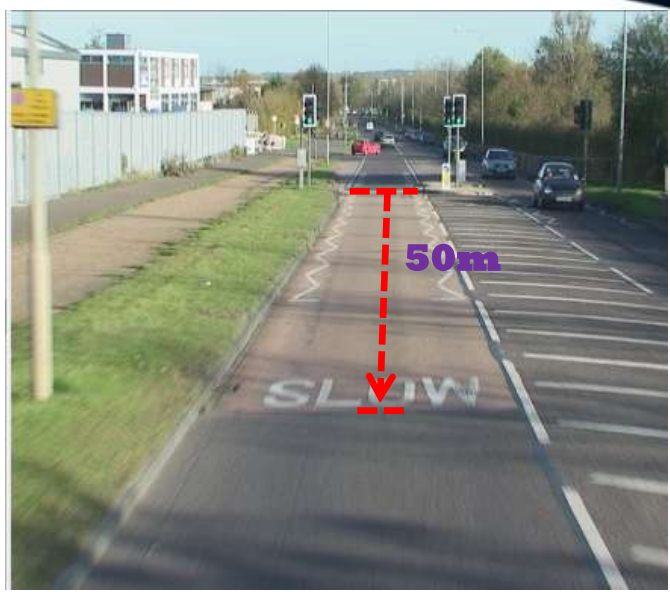
Approach to Junctions



Approach to Roundabouts



Approach to Crossings Etc



Roundabouts

Gradients 5-10%

Minimum 50m length

<u>Dual CW</u>
Only downhill gradients considered

Gradients >10%

Minimum 50m length

Dual CW
Only downhill gradients considered

Single C/W Bends

Three bands of bends

<100m (all speeds)
100m-250m (all speeds)
250m-500m (>40mph)

Dual C/W Bends

Three bands of bends

<100m (all speeds)
100m-250m (all speeds)
250m-500m (>40mph)

Borough Site Categories

- Updated in 2008 using SCANNER videos and OS MasterMaps
- Site categories are provided with SCRIM survey data to LBHF every year
- Need to identify changes/improvements to network
- PMS needs to be kept up to date

Setting Investigatory Levels (ILs)

To assess the nature of the site and assign appropriate level of skid resistance (the IL), at or below which a more detailed site investigation must be undertaken

The same IL is assigned to all sites in the site category by default, but detailed investigation can revise IL's on a site by site basis

Accident v SCRIM Study

- To establish appropriate IL's for London boroughs
- Used accident data and its relationship with recorded skid resistance – a risk assessment
- Accidents fitted to road sections in the network and linked to SCRIM survey data
- Accident rates calculated and plotted

Accident Rate Formula

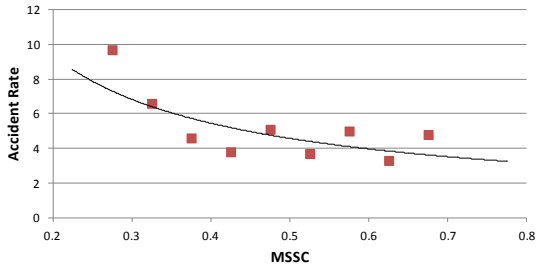
$$Accident\ \ Rate = \frac{A/n}{365 \times AADF \times l} \times 100{,}000{,}000$$

A = *Number of wet accidents during the analysis period*
n = *Number of years in analysis period*
l = *Length of site in km*
AADF = *Average Annual Daily Flow*

Unit of Accident Rate is acc/100M.Veh.km

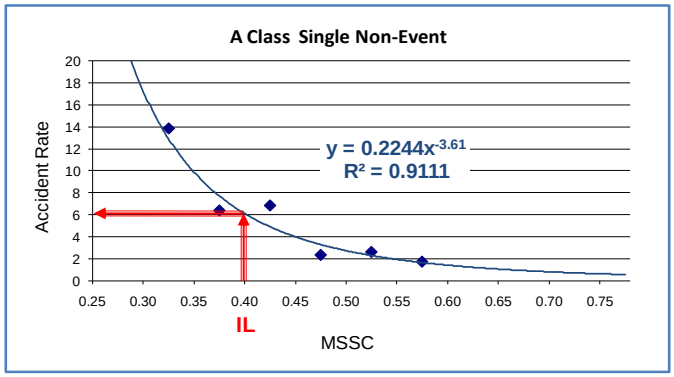
Accident Rate and SCRIM Plots

Scrim Site Category	Wet Acc	m	MSSC Band	Wet Acc Rate
Single Non-Event	0	1363	0.225	0.0
Single Non-Event	13	11511	0.275	9.7
Single Non-Event	54	74621	0.325	6.6
Single Non-Event	89	175376	0.375	4.6
Single Non-Event	65	157060	0.425	3.8
Single Non-Event	63	115846	0.475	5.1
Single Non-Event	24	61513	0.525	3.7
Single Non-Event	15	28693	0.575	5.0
Single Non-Event	4	11332	0.625	3.3
Single Non-Event	2	4057	0.675	4.8
Single Non-Event	0	1238	0.725	0.0
Single Non-Event	1	696	0.775	12.5

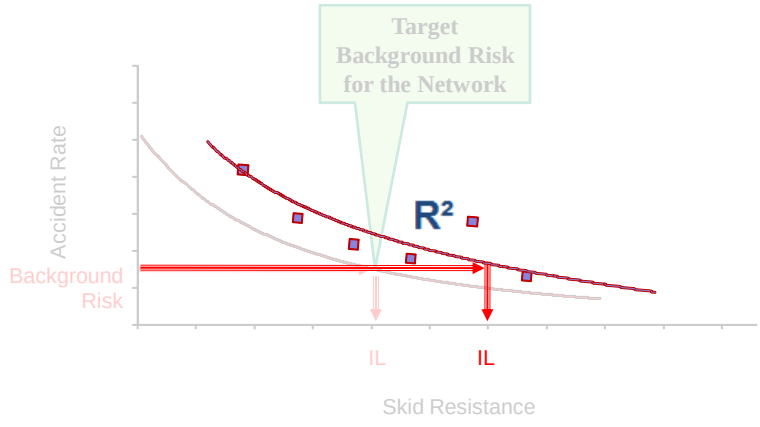


Determining Background Risk

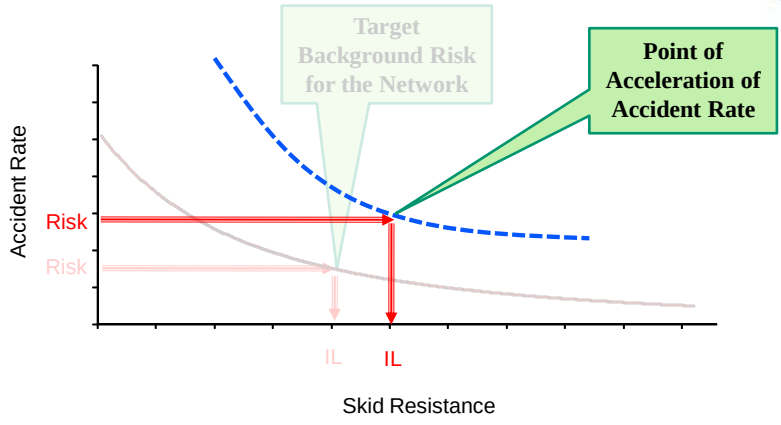
- Usually determined from the Site Category with the 'lowest' accident rate
- Class A - 'Dual Carriageway Non-Event' or 'Single Carriageway Non-Event'
- Engineering Judgement



Methods of Setting IL's
Equalising Risk

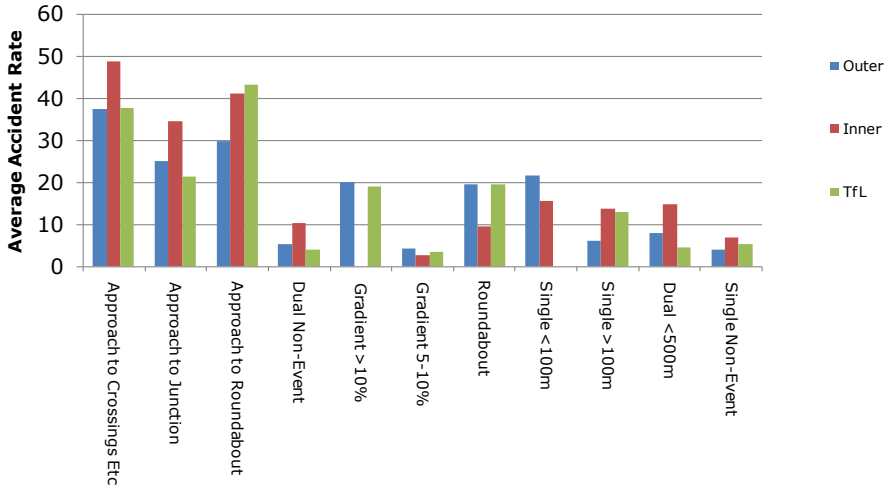


Methods of Setting IL's
Point of Acceleration



London: Site Risk Rating

High Accident Rates in all 'approaches' categories



Stage 2: Documentation

Site category and definition		Investigatory level at 50km/h							
		0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65
A	Motorway class	Not Applicable							
B	Dual carriageway non-event			I					
C	Single carriageway non-event			I					
QL	Approaches to and across minor and major junctions,				I				
QM	Approaches to roundabouts					I			
K	Approaches to pedestrian crossings and other high risk situations						I		
R	Roundabout				I				
G1	Gradient 5-10% longer than 50m				I				
G2	Gradient >=10% longer than 50m					I			
S1	Bend radius ≥250m and <500m – dual carriageway. Speed limit>40mph				I				
D100	Bend radius <100m dual carriageway. All speeds					I			
D250	Bend radius ≥100m and <250m dual carriageway. All speeds.				I				
S2	Bend radius ≥250m and <500m – Single carriageway. Speed limit>40mph				I				
S100	Bend radius <100m – single carriageway. All speeds.					I			
S250	Bend radius ≥100m < 250m single carriageway All speeds.				I				

Adopted IL's

- Different IL's for low/med/high risk sites
- Differentiation on bends by radius
- Approaches to Roundabouts
- IL = 0.55 for approaches to crossings

Stage 2: Documentation

- Policy Document
- Guidance Document
  ....more on Policy/Guidance in Session 3
- Ongoing Annual Deficiency Listings
  ....more on Deficiency Listings in Session 4

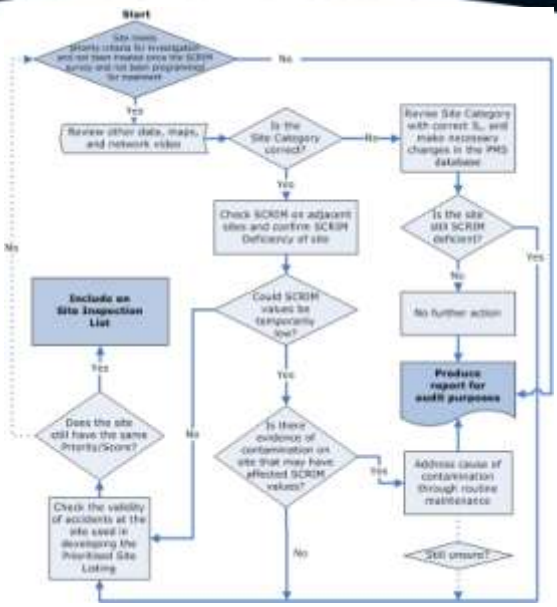
Stage 3: Investigation Handbook

- Follows Deficiency Listing
- Draft provided to project Board in 2012
- A 'how to investigate' guide
- Practical techniques
- Understanding accidents
- Investigation forms

Tasks to be undertaken

Guidelines and tools to help undertake these tasks

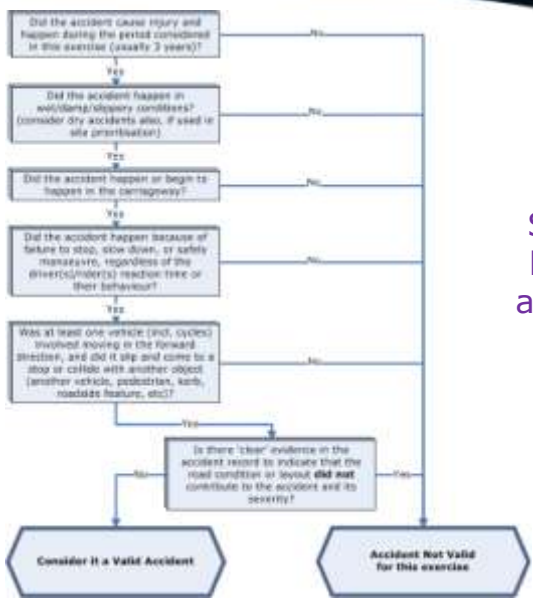
Initial Investigation Flowchart



Desktop validation of preliminary deficiency listing

Select sites that need a secondary field inspection

Accident Validation Checklist



Some accidents can be clearly identified as not related to skid resistance

Guidelines on Treatment Selection

Factors to consider in treatment selection

Stage 3: Review of the use and performance of HFS surfaces

- Large proportion of highly ranked sites on the Deficiency Listings are Approach to Crossings with an IL of 0.55
- Often need specialist material (HFS)
- An IL of 0.55 is relatively difficult/expensive to maintain

Stage 3: Review of the use and performance of HFS surfaces

So, study aimed to ....

- Find if there is a basis to alter the standard length of HFS
- Find evidence in literature whether HFS is failing prematurely
- Investigate alternative materials to provide acceptable skid resistance levels

Vehicle Stopping Distance Calculation

$SSD = vt + v^2/2d$

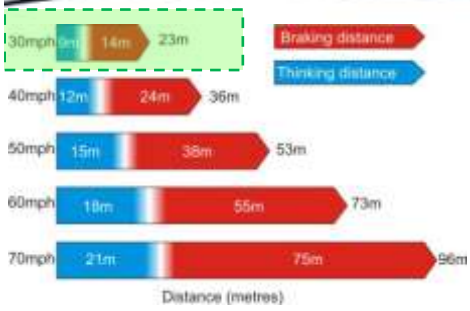
where:

v = speed (m/s)

t = driver perception–reaction time (seconds)

d = deceleration (m/s^2)

Vehicle Stopping Distance



Highway Code
(emergency braking)

Speed	Kilometres per hour	16	20	24	25	30	32	40	45	48	50	60
	Miles per hour	10	12	15	16	19	20	25	28	30	31	37
SSD (metres)		9	12	15	16	20	22	31	36	40	43	56
SSD adjusted for bonnet length. See 7.6.4		11	14	17	18	23	25	33	39	43	45	59
		Additional features will be needed to achieve low speeds										

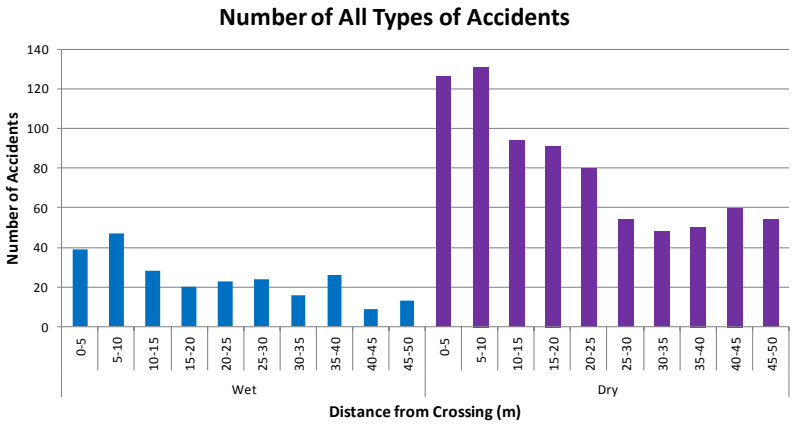
Manual for Streets
(design guide)

Comparison of Codes/Guides

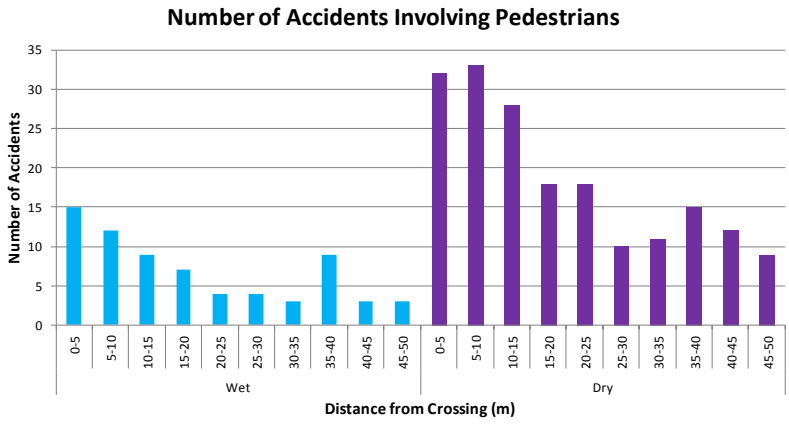
Speed Environment	Stopping Distance / Stopping Sight Distance		
	Highway Code *t=0.667s d=0.667g*	**DMRB** *t=2s d=0.25g*	**Manual for Streets** *t=1.5s d=0.45g*
v = 30mph	23m	63m	40m
v = 40mph	36m	101m	63m
v = 50mph	53m	147m	90m

- 50m approach seems to be more on the conservative side
- However, not wise to design for emergency braking scenario
- Range of variables and contributory factors determine the individual stopping manoeuvres
- A significant amount of accidents tend to occur within 50m of a crossing

Accidents at or near crossings
All accidents

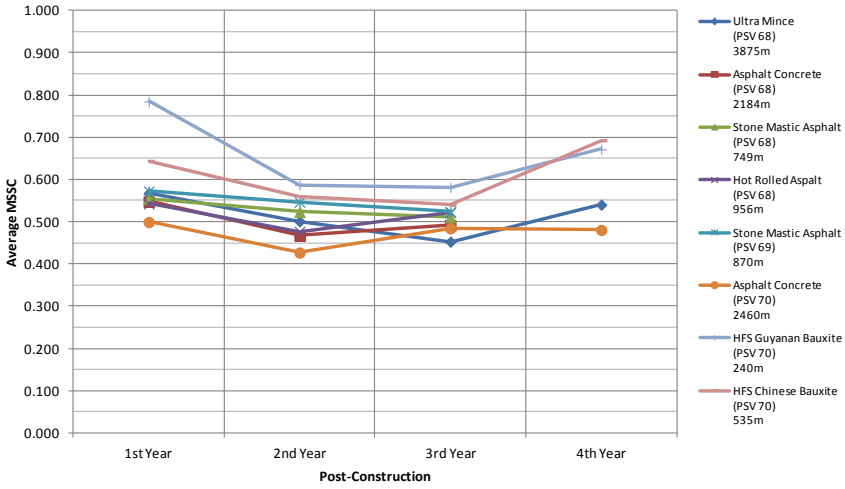


Accidents at or near crossings
Involving pedestrians



Performance of High PSV and HFS

Average skid resistance in the first four years



Performance of High PSV and HFS

Surface Type	Total Length of Data (m)	Length Above 0.50 (%)	Length Above 0.55 (%)
ULM Ultra Mince (PSV 68)	2550	86%	69%
Asphalt Concrete (PSV 68)	1160	79%	46%
Stone Mastic Asphalt (PSV 68)	670	79%	48%
Hot Rolled Asphalt (PSV 68)	960	84%	52%
Stone Mastic Asphalt (PSV 69)	720	61%	50%
Asphalt Concrete (PSV 70)	2460	52%	3%
HFS Guyanan Bauxite (PSV 70)	240	100%	100%
HFS Chinese Bauxite (PSV 70)	540	81%	72%

- Need more data on more sites to make strong conclusions
- Typical service lives of HFS are 4-8 years: RTSA/ADEPT

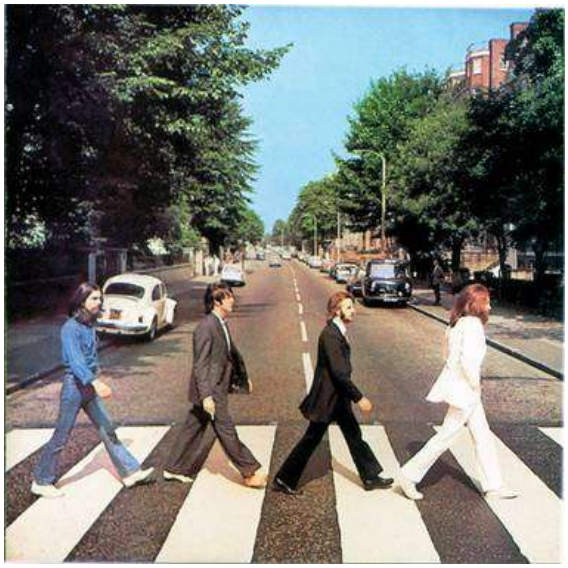
HFS Study

- Stopping distance depends on speed, reaction time, and deceleration
- Surface treatments (i.e. HFS) can only influence deceleration rate
- Surface friction is significantly reduced in wet conditions, hence affects the deceleration rate
- Driver speeds and reaction times vary greatly that will affect the stopping distances
- Equal risk of accidents within 20m of the crossing
- The provision of the standard 50m approach to crossing seems appropriate. It includes a factor of safety.
- A departure from 50m may be possible - Need to assess risk on a site-by-site basis by considering a number of factors

Departure from policy/practice on 50m HFS length

Things to consider...

- the type of crossing, including standard of control equipment
- the approach speeds (peak and off-peak speeds)
- road alignment
- accident patterns
- visibility of crossing for approaching traffic
- visibility of approaching traffic for crossing users
- patterns of use of crossing
- any route management strategies in place or proposed



Vulnerable Road Users !!!