Cosmetic or Crucial?

'Cosmetic or Crucial? – The case for good signing and lining' has been jointly produced between the Road Safety Markings Association and the Association for Road Traffic Safety and Management. The publication clearly illustrates the relationship between road marking, signage schemes and accident reduction and identifies and highlights the importance of the visual requirements of drivers.

Cosmetic or Crucial?
The case for good signing and lining
A technical guide

Summary

The ARTSM and RSMA believe that:

- Signs and lines are the most important visual clues a driver has to alert him to hazards and to give him directions to his destination
- Analysis of available data shows that good signing and lining practice reduces accidents and can save lives and resources.
- Compared with other highways activities, signing and lining are relatively inexpensive.
- With good planning, for a small amount of highways budget, a highways engineer can make a real difference to the apparatus and safety on his roads.

Recommendations

The ARTSM and RSMA recommend that:

- Each responsible local authority develops a pro-active policy to promote increased road safety through the use of signing and lining. This policy should encompass the replacement of old signs, maintenance of existing signs, and maintenance or replacement of old road markings.
- Adequate resources are made available specifically for signs and road markings to optimise the benefits attained.

The Role of Signs and Road Markings

Signs and road markings are the most visible parts of the highway structure. A sign's function is to alert drivers to hazards, or to inform him of directions at intervals along his route. Road

markings provide a continuous visual signal to the driver of his position on the highway, an indication of hazards, and may also give the driver instructions.

Without any signing or lining the road system would be chaotic with frequent accidents. With well thought out visual instructions roads are safer, and the highway engineer is able to help route the flow of traffic.

Signing and lining are very important in road safety designs, not only for traffic calming measures, but also as reminders of speed limits and warnings of potential hazards. The institute of Civil Engineers in their report on safety, place emphasis on road safety audit and engineering measures such as signing to reduce accidents[1].

Poor route signing can lead to frustrating delays for a driver as it increases his chances of getting lost. This time wasted in London alone is estimated to cost £35 million a year[2].

Good design of the signing along popular routes can help eases traffic congestion and direct traffic away from built-up urban areas, or traffic calmed areas.

Where these instructions are poorly maintained the quality of the message received is diluted. Poor signing and lining means the driver has to work harder to remain at the same level of safety.

The Driver

The driver needs a safe road network which clearly signposts his destination. He has a limited time to see, interpret and act upon information presented to him as he is travelling down a road. The clearer the message is, the more time he has to act upon it, or discard its information.

A young driver with good eyesight in well-lit conditions usually has plenty of time to interpret and act on road signals. However, as a driver gets older his eyesight deteriorates, as does his reaction time. There may also be other distractions in the car such as young children or the car may have a dirty windscreen, or in the case of night driving, poorly adjusted headlights. These all add to drivers' reaction time. In addition he may be driving in unfavourable conditions such as darkness or with a wet road surface, which may need more of his attention.

The older driver in particular is of growing concern to many in authority. There are currently about 10 million driving licence holders in the UK over the age of 55. By 2001 the number will have risen to 12 million, and by 2025 there are likely to be 17 million drivers older than 55[3]. These drivers will also face an increase in the level of traffic on the roads at the same time as their mental and physical capabilities are declining.

The Department of Transport has stated that older drivers may need more time to read and absorb the information on road signs and to take appropriate action[4]. The AA too, states that the proper maintenance of signs and markings is of importance to all drivers, especially the older driver[5].

In a recent independent survey it was found that drivers taking part in a study thought that road signs in the UK could be improved. Many of the drivers taking part in the study felt that it was a common experience for signs to be dull, poorly lit, badly positioned, too small and in short supply[6].

The United States has carried out research which shows that in times of poor visibility for example in rain or fog well maintained road markings that provide visual clues to a safe lane position are even more important to older drivers than traffic signs[3].

It is generally acknowledged that what is good for the older driver, benefits the whole driving population.

Road Safety and Accident Reduction

It can be shown that the use of signing and lining can reduce traffic accidents. The following studies use only signing and/or road marking as safety improving measures. Overall they represent 310 sites. All accidents involve personal injury with the cost benefit based on all injuries being slight. If accidents saved were serious or fatal the cost benefit would be much greater.

Transport Research Laboratory – Molasses (Appendix 1)

Number of sites	15
Before treatment accidents	429
After treatment accidents	304
Av. Time each site monitored before	3 years
Av. Time each site monitored after	3 years
Reduction in number of accidents	125
Total cost (all sites)	£92,819
Amount spent per accident saved	£742
Total cost of accidents saved	£1,436,875

Lancashire County Council (Appendix 2)

Number of sites	16
Before treatment accidents	155
After treatment accidents	83
Time monitored before accidents	576 months (Av. Per site = 3 years)
Time monitored after accidents	471 months (Av. Per site = 2.5 years)
Actual number of accidents saved in after timescale	72
Projected number of accidents after treatment over 3 years per site	107
Projected number of accidents saved over 3 years per site	48
Total cost (all sites) Amount spent per accident saved	£35,093 £731.10
Total cost benefit of accidents saved	£556,320

Northern Ireland – Department of the Environment (Appendix 3)

Number of sites	20
Before treatment accidents	225
After treatment accidents	146
Time monitored before accidents	3 years

Time monitored after accidents	3 years
Number of accidents saved	79
Accidents saved per year	26.3
Total cost (all sites)	£242,737
Amount spent per accident saved	£3072.62
Total cost benefit of accidents saved	£304,817 per year

Nottinghamshire County Council (Appendix 4)

Number of sites	229
Before treatment accidents per annum	288
After treatment accidents per annum	159
Accidents saved per year	129
Scheme costings	All small schemes (< £10,000)
Total cost benefit of accidents saved	£1,495,110 per year

Kent County Council (Appendix 5)

Number of sites	23
Before treatment accidents	167
After treatment accidents	89
Time monitored before accidents	3 years
Time monitored after accidents	3 years
Number of accidents saved	78
Accidents saved per year	26
Total cost benefit of accidents saved	£633,880 (Kent figures)

Individual Site Studies:

Hereford and Worcester County Council
A449 Worcester to Ledbury Road at the junction with Abbey Road, Malvern

A Give Way junction, the minor road is positioned on the inside of a left-hand bend and it approaches the junction at an oblique angle. Existing signing to Diagram 512 was replaced with signing to diagram 512.2 and an additional sign placed on the offside of the road for improved visibility. All existing road markings through the junction were renewed to amplify the junction.
Before accidents (personal injury): 8
After accidents (personal injury): 0
Cost of work: £280
Estimated cost benefit: £92,720

A38 (T) Worcester to Birmingham Road at the junction with Hurst Lane, Fernhill Heath

This junction is a conventional Give Way, which prior to treatment was approached on the side road by 100mm wide hazard line markings only. These lines being laid along the centre of the carriageway met the main road at a slightly oblique angle, forcing motorists to look back over their left shoulder when exiting to the right. Road marking to Diagram 1040 was laid on the approach to indicate a squarer line to motorists.
Before accidents (personal injury): 7

After accidents (personal injury):	0
Cost of work	£565
Estimated cost benefit	£81,130

Plymouth, Crownhill Road, Devon County Council

Situation: Dual Carriageway narrowed to single carriageway using thermoplastic white lining material.

Previous problem:	a high accident record occasionally involving high speeds
Accident record:	Before 82 in 3 years After 27 in 2 years
No accidents saved:	41.5 (estimate for 3 year figs)
Speeds:	Before 45mph, after 41 mph
Cost of work:	£12 600
Estimated cost benefit:	£480,985

C660/C668 Westley Crossroads, Suffolk County Council

Situation:	Staggered crossroads, accidents mainly failure to give way at junction.
Treatment:	Road markings: centre line; Give Way lines, Triangles and Slow Signs: junction warning sign and advance Give Way signs
Date implemented:	6/90 to 9/90
Accidents before:	6 Accidents after: 2 (3 year figures)
Cost:	£1000
Estimated cost benefit:	£46,360

A1152 Linear scheme from B1083 roundabout to Cherry Tree Public House, Suffolk County Council

Situation:	Long stretch of wide single carriageway, some bends. Accidents mainly occurred when on car stationary in the road.
Treatment:	Road markings: centre hatching and edge lining and 'Slow' road markings, road studs Signs: Bend, staggered junction and roundabout warning sign
Date implemented:	3/93 to 5/93
Accidents before:	8 Accidents after: 0 (3 year figures)
Cost:	£4000
Estimated cost benefit:	£92,720

Whilst no work has been documented on whether poorly maintained signs and markings contribute to accidents, it must follow that if an improvement in signing leads to improved sign recognition and action on its instructions, then a reduction in the visibility of the sign leads to less recognition and less time to take action on it.

It is important not to forget that signs and lines work 24 hours a day. Old, or poorly maintained markings will not reflect the amount of light needed for them to be effective at night, serving the driver badly.

Good maintenance practice

Road markings and signing will not continually perform to their installed standards without regular, good maintenance.

The Local Authority Associations already publish a code of good practice[12]. In it there are stated objectives for sign and road marking maintenance and recommended practices and frequencies of inspection.

It is suggested that illuminated signs are inspected along with street lighting, and cleaned at least annually.

Road markings should be reinstated as soon as possible after surfacing work and renewed when 30% of their area becomes worn away. We would like to suggest though that better than this standard is needed especially on highly trafficked roads or accident black spots. The AA agree too that it is a 'do minimum' standard for all drivers, and one that conflicts with the growing evidence that good quality road markings are an aid and comfort to older drivers[10].

The AA have also called for maintenance standards to be reviewed to ensure that all traffic signs can be seen and can be understood by all road users. They would also like to see more research into the importance of road markings and the benefits that additional investment in maintenance of road markings will bring in accident savings.

The government's road users charter and charter statements also commit to clean and maintain road signs so that they are clear and visible at all times.

Whilst there are many new products on the market in the sign and road marking industry, such as brighter reflective materials, anti-skid materials and products that perform well in the wet, all of these still need good maintenance practices to be effective over their intended lives.

Making the best of the budget

The relative cost of signing or lining is low compared with other highway activities.

Comparative costs

HIGHWAY MAINTENANCE

Resurfacing single carriageway:	£90,000 per mile
Single carriageway directional sign:	£4,000
Re-laying white lines on single carriageway:	£0.50 *per linear metre*

SAFETY MEASURES

Traffic signals:	£35,000
Street Lighting:	£40,000 per km

Anti-skid surface:	£7,000 per 100m
Zebra crossing:	£8000
Islands:	£4,000
Hazard sign (white with red border):	£100
Hatching:	£5/m2
Right Turn Lane (lining only):	£1,000

These measures can be quite effective. Cost and effectiveness varies according to site and conditions but the table below shows representative mid-range figures in typical cases[9].

MEASURE	COST	EFFECTIVENESS	%
Anti-skid Surface	*£7000/100m*	*Wet accidents*	*60*
Signs	*£250 - £1,500*	*Awareness*	*50*
Right-turn lane (lining)	*£1,000*	*Right turning conflict*	*30*
Hatching	*£4/m2*	*Shunts & overtaking*	*30*
Traffic Signals	£35,000	Turning conflict	30
Mini roundabout	£10,000 +	Turning conflict	30
Street Lighting	£40,000 km	Night time accidents	30

Good signing and lining also contributes to civic pride because the Authority is seen to be maintaining standards in the community.

Litigation is increasingly becoming a fact of life. Authorities are paying out increasing sums in compensation to members of the public who said that they have suffered as a result of the poor state of the roads and footpaths. The Institute of Civil Engineers quote figures for the cost of theses claims rising from £13 million in 1982 to £100 million in 1995[11]. Whilst as yet no claims have been made to our knowledge relating to the appropriateness and adequacy of signs and road markings there is a real chance of this happening. This means that where legal minimum requirements exist for signs and road markings, and such a sign or marking is deemed to contribute to the accident, the maintenance agent could be financially liable. This would strain already overstretched budgets.

References

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10 Road Design and Maintenance Standards: The Needs of Older Drivers, H T Morris, AA, BITER Conference on the Older Road User, 1991

11 Transport Committee: The Road and Bridge Maintenance Programme, January 1997
12 Code of Good Practice for Highway Maintenance, Local Authorities Association, 1989