

Road Safety Audit and Removal of Pedestrian Guardrailings in London



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Pedestrian Guardrailing



Southampton University TSG carried out research for TfL, measuring the safety benefits of guardrails at a variety of sites.



Pedestrian Guardrailing

There were situations where guardrails appeared to have a measurable positive effect, particularly for pedestrian collisions at pedestrian crossings.

At other situations benefits were not so clear.



Pedestrian Guardrailing



TfL engineers have discussed the results with all internal stakeholders and have produced guidelines for the installation/removal of guardrails



- A 'risk sheet' has been developed to identify and provide a systematic assessment of main factors (e.g. pedestrian flow, carriageway width, casualty history)
- The completed assessment will indicate whether removal or provision of guardrail is:
 - not advised
 - could be removed (intelligently and Safely)



- Testing of the assessment method was conducted at real sites.
- Discussions and evaluation will continue on the design, weightings and conclusions drawn by the 'risk sheet'.
- Collision rates are difficult to incorporate.
- The balance between 'prescriptive guidance' and 'engineering judgment' is critical to the success of the 'risk sheet'.



Pedestrian Guardrailing



Our policy is to encourage the use of the **3M's** when reviewing pedestrian guardrail

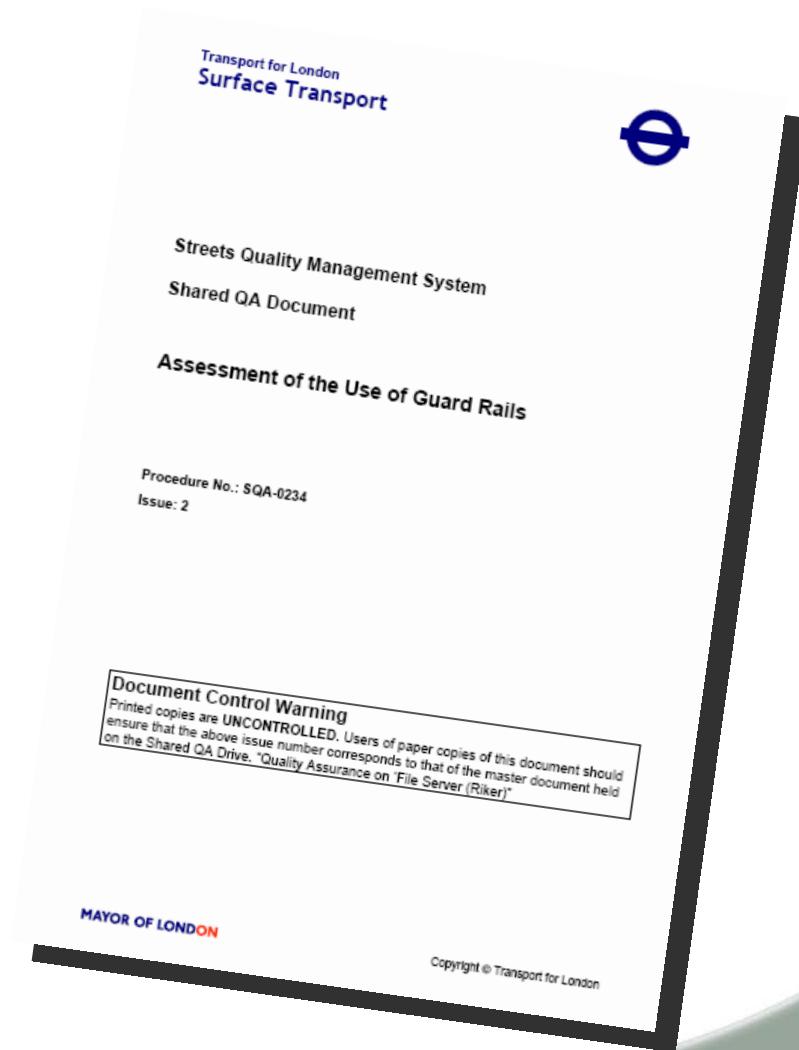


Pedestrian Guardrailing



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Managed: There is an auditable process trail.



Pedestrian Guardrailing



Measured:

Issues such as flows and casualties are monitored before and after any change.

Assessment of the Use of Guardrails
 Appendix A – TLRN Guardrail Assessment Guidance Note
 Issue 2

Level of Service	Site Characteristics	Typical Areas	Example Picture of Conditions
A Walking Not Restricted	Walkway: Walking speeds and directions not restricted. Reverse Flow/Crossing: No restrictions on movements.	Public buildings or plazas without severe peaking characteristics or space restrictions.	
B	Walkway: Normal walking speeds maintained and able to bypass other pedestrians in one direction. Reverse Flow/Crossing: Minor conflicts where crossing movements or whose reverse direction exist.	Transportation terminals and buildings in which movement, but not severe, peaks are likely to occur.	
C	Walkway: Walking speed and ability to pass other pedestrians freely is restricted. Reverse Flow/Crossing: Frequent adjustment of speed and direction to avoid contact.	Heavily used transportation terminals, public buildings, or open spaces where severe peaking combined with space restrictions, limit design flexibility.	
D	Walkway Level: Normal walking speeds restricted and reduced. Reverse Flow/Crossing: Severely restricted with multiple conflicts.	Dense public areas where it is necessary to continually alter walking stride and direction. Momentary stoppages of flow.	
E	Walkway Level: Virtually all pedestrians have their normal walking speeds restricted, frequent adjustments, sufficient area to bypass. Reverse Flow/Crossing: Extreme difficulty for pedestrians. Frequent stoppages and interruptions of flow. Walkway Level: Walking speeds extremely restricted. Shuffling.	Bulk arrival of pedestrians for a short period, such as sports stadiums or railway stations.	
F Walking Severely Restricted	Walkway Level: Virtually impossible. Reverse Flow/Crossing: Virtually impossible.	Representative of cutting. Forward progress based on movement of those in front.	

Walkway Level - This is the dominant direction of pedestrian movement.
 Reverse Flow/Crossing - This is the minor direction of pedestrian movement against the major pedestrian movement.
 Picture Source: DfT, 2004, P.4 Text Source: Fluh, 1987, Pp. 74-75



Pedestrian Guardrailing



Guardrail Risk Assessment Form

Form A : Site Collision Analysis

TLRN Guardrail Risk Assessment Form B: Site Collision Analysis

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Table 1: Collision Data for the 36 Month Period Prior to the Site Visit

Collisions in the 12 month period ending:	Fatal	Serious	Slight	Total
12 month period 1	0	0	9	9
12 month period 2	0	2	7	9
12 month period 3	0	0	7	7
TOTAL COLLISIONS	0	2	23	25

Table 2: Pedestrian Casualty Data for the 36 Month Period Prior to the Site Visit

Pedestrian Casualties in the 12 month period ending:	Fatal	Serious	Slight	Total
12 month period 1	0	0	3	3
12 month period 2	0	1	3	4
12 month period 3	0	0	1	1
TOTAL PEDESTRIAN CASUALTIES	0	1	7	8

Table 3: Collision Totals and Percentages for the Main Collision Types

	PEDESTRIAN	WEL	DRW	POV	KSI	Peds Cycle
Number of Collisions	8	3	3	4	2	4
Percentage of Total (%)	32	12	12	16	8	16
Compassive Collisions (%)	22	19.7	30	32	15	19.6

*Each collision type as a proportion of total collisions at relevant site/area.

Collision Summary

- How many collisions were there in the 36 Month period prior to the site visit?
25
- How many casualties were attributable to these collisions?
8
- How many fatalities resulted from these collisions?
0
- Which comparative collision rate has been used in TABLE 2?
Information Requested

Pedestrian and Cycle Collision Summary

- How many collisions involved pedestrians?
8 / 32%
- How many pedestrian casualties were there at the site?
1
- How many collisions involved cyclists? What percentage is this of the total number of collisions?
4 / 16%
- How many cyclist casualties were there at the site?
4

9. Are there any pedestrian collisions which may be resolved by the addition of pedestrian guardrail? If so, how many?
NA

10. Did any cycle collisions involve conflicts with pedestrian guardrail? If so, how many?
NA

11. If guardrail is present at the site, is it possible that this may be suppressing collisions which may otherwise occur if the guardrail was not present?
YES / NO (Area is exempt)

11a. Please provide an explanation.
Yes due to high pedestrian flow and many double lines conflicting with high traffic flows



Pedestrian Guardrailing



Guardrail Risk Assessment Form

Form B : Site Characteristics

Assessment of the Use of Guardrails
Appendix A – TLRN Guardrail Assessment Guidance Note

TLRN Guardrail Risk Assessment Form A: Site Characteristics

Location: Islington High Street / Pentonville Road, Borough: Islington, Grid Reference: 531449, 183156
Date: 20/02/07, Weather: Clear and dry, Assessor's Name: Andrew Norman (Faber Maunsel), Time: 12.15
Site Type: Pedestrian Crossing, Junction / Link / Central Reservation / Signals: Transport Interchange, School (circle as appropriate)
Guardrail Site Type: Guardrail Present / Guardrail Not Present (delete as appropriate)

Note: This assessment should be carried out with reference to the accompanying "Draft Guardrail Assessment Form - Guidance Note"

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Site Sketch

Photograph 1

Photograph 2



Pedestrian Guardrailing



Guardrail Risk Assessment Form

Form C : Site Specific Analysis

1. Nature of Area
2. Level of Service
3. Existing Crossing Facilities
4. Crossing Usage
5. Carriageway Width
6. Road User Inter-Visibility
7. Number of Traffic Lanes
8. 85th Percentile Speeds
9. Peak Two-Way Traffic Counts
10. Turning Movements

Assessment of the Use of Guardrails
Appendix A – TLRN Guardrail Assessment Guidance Note
TLRN Guardrail Risk Assessment Form C: Site Specific Analysis

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Factor	Options	Score	Factor	Options	Score
F1	Nature of Area Score 1 for rural areas Score 2 for suburban residential areas Score 3 for urban residential areas Score 4 for urban commercial areas Score 5 for areas outside schools and station interchanges	8	F6	Actual User Inter-Visibility Score 1 where the inter-visibility meets the desirable visibility Score 3 where the inter-visibility meets the absolute minimum visibility Score 5 where the inter-visibility is less than the minimum visibility	3
F2	LEVEL OF SERVICE Score 1 for Level of Service A Score 2 for Level of Service B Score 3 for Level of Service C Score 4 for Level of Service D Score 5 for Level of Service E	3	F7	NUMBER OF TRAFFIC LANES Score 1 for one-way road with a single lane Score 2 for one-way road with two lanes Score 3 for two-way road with a single lane in each direction Score 4 for two-way road with more than two lanes in each direction	4
F3	EXISTING CROSSING FACILITIES WITHIN THE AREA OF INFLUENCE Score 1 for no crossing facilities Score 2 for uncontrolled crossing points (i.e. pedestrian crossings etc) Score 3 for controlled crossing points (i.e. pedestrian, zebra, zebra)	4	F8	85th PERCENTILE VELOCITY SPEEDS Score 1 for speed <= 20 mph Score 2 for speed > 20 mph and <= 30 mph Score 3 for speed > 30 mph and <= 40 mph Score 4 for speed > 40 mph	3
F4	CROSSING USAGE Score 1 for no crossing facilities Score 2 for pedestrian crossings Score 3 for pedestrian crossings with 40 metres of the crossing side Score 4 for pedestrian crossings in excess of 40 metres from the site	3	F9	PEAK TWO-WAY TRAFFIC COUNTS Score 1 for counts <= 500 p.d./dly Score 2 for counts > 500 and <= 1,000 p.d./dly Score 3 for counts > 1,000 and <= 1,500 p.d./dly Score 4 for counts > 1,500 and <= 2,000 p.d./dly Score 5 for counts > 2,000 and <= 2,500 p.d./dly Score 6 for counts > 2,500 p.d./dly	7
F5	CARRIAGEWAY WIDTH Score 1 for <= 3.0 metres Score 2 for widths > 3.0 metres and <= 7 metres Score 3 for widths > 7 metres and <= 10.5 metres Score 4 for widths > 10.5 metres and <= 14 metres Score 5 for widths > 14 metres and less than <= 17.5 metres Score 6 for widths > 17.5 metres	9	F10	TURNING MOVEMENTS Score 1 for no turning movements Score 2 for one turning movement Score 3 for two turning movements Score 4 for more than two turning movements	7
Total to be taken forward to Form D					51



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Guardrail Risk Assessment Form

Form D : Site Summary

Assessment of the Use of Guardrails
Appendix A – TLRN Guardrail Assessment Guidance Note

TLRN Guardrail Risk Assessment Form D: Site Summary

Guardrail Issues
1. Explain the general layout of guardrail at the site.
Passive protection at a traffic signal controlled junction with a central pedestrian crossing, guardrail located on both sides of the carriageway

2. What is the length of the existing guardrail (if any)?
In excess of 50m on both sides of the carriageway

3. In the guardrail the appropriate type for the site?
Yes - 200k vertical

4. Are there any specific safety issues highlighted in Form B?
A number of pedestrian trips have been recorded which appear not to be of vehicles. A safety number of accidents over the 12 month period.

5. Is there a nearby school which generates walking activity at the site?
Yes / NO (date in parenthesis)

6. If installation of guardrail is not recommended or provided, then what mitigating measures could be adopted?
NA

Other Issues
7. If there is guardrail at the site, are there any existing points?
None provided.

7a. Please provide details:
On the west side of the crossing, immediately to the east

8. Are there any pedestrian safety issues which are not covered by pedestrian crossing facilities?
Yes / NO (date in parenthesis)

8a. If you please provide an explanation and indicate on the sketch drawing:
A few pedestrians cross the junction diagonally

8. If the visibility between pedestrians and vehicles is poor why is it poor and how may it be improved?
Long blocks of parking, mainly residential or commercial, on both sides of the road

10. Are there any obstacles in the pedestrian environment which may impede pedestrian movement?
None

11. What is the general condition of the footway in the vicinity of the site?
Good

12. Where the roads in the area congested at the time of the survey? YES / NO (date in parenthesis)

12a. If so, are pedestrians weaving amongst the traffic to cross the road against the red light?
Definitely not crossing against the red light aspect, but not weaving

13. If there are proposed works at the site, are they covered by the red light?
Yes / NO (date in parenthesis)

14. Is there potential for cyclist conflict with the guardrail?
Yes / NO (date in parenthesis)

14a. Please provide an explanation?
None

15. Any other problems at the site.
Poor parked parking layout, likely to be used during peak periods

Total Score from Form C: 57
F score = 43 guardrail recommended to be installed or to be retained
E score = 43 guardrail recommended to be installed or to be retained

Overall Assessment
Guardrail Present: GAB/IR TO REMAIN / DO-REMOVED / None or corrected
Guardrail Not Present: Guardrail to be installed - NOT INSTALLED (date in parenthesis)

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Mitigated: If safety is likely to be degraded by removal, then other measures should be used to mitigate this (e.g. measures to reduce average vehicle speed)



Pedestrian Guardrailing



Politically in London there is a wish to drastically reduce the length of PGR on the Transport for London Road Network (TLRN)



Pedestrian Guardrailing



A Pilot study carried out between December 2007 and March 2008 on two sections of the TLRN in North London showed that about 32% of guard rail met the removal criteria.

It concluded that realistically about 16% of the existing guard rail on the whole of the TLRN could safely be removed over a four year period.



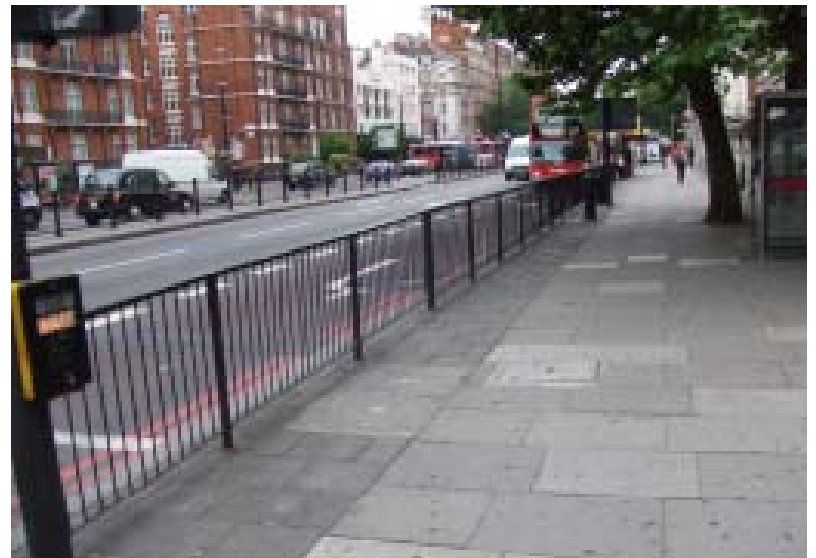
Pedestrian Guardrailing



Factored up to the whole of London meant about 32kms of the existing 200kms of guard rail could be removed.
(8kms per year over four years)

Once the programme started, during the first year 42% of guard rail assessed was suitable for removal. Senior management then agreed to revert to the original estimate of 32% (60kms) removal by June 2010.

– Or remove twice as much in half the time. With a budget of £2.8m



Following TfL procedure, where a GRAF recommends guard rail removal, a full safety audit is carried out.

Including all 4 Stages



Pedestrian Guardrailing



Across the TLRN there are approx. 27kms of of 'high speed' roads (>50mph)

As the GRAF is currently not designed to be used on these roads, the Safety Audit procedure is used to assess all guardrail for possible removal.



Pedestrian Guardrailing



Assessor's qualifications

Experienced Road Safety Engineers

Approver's qualifications

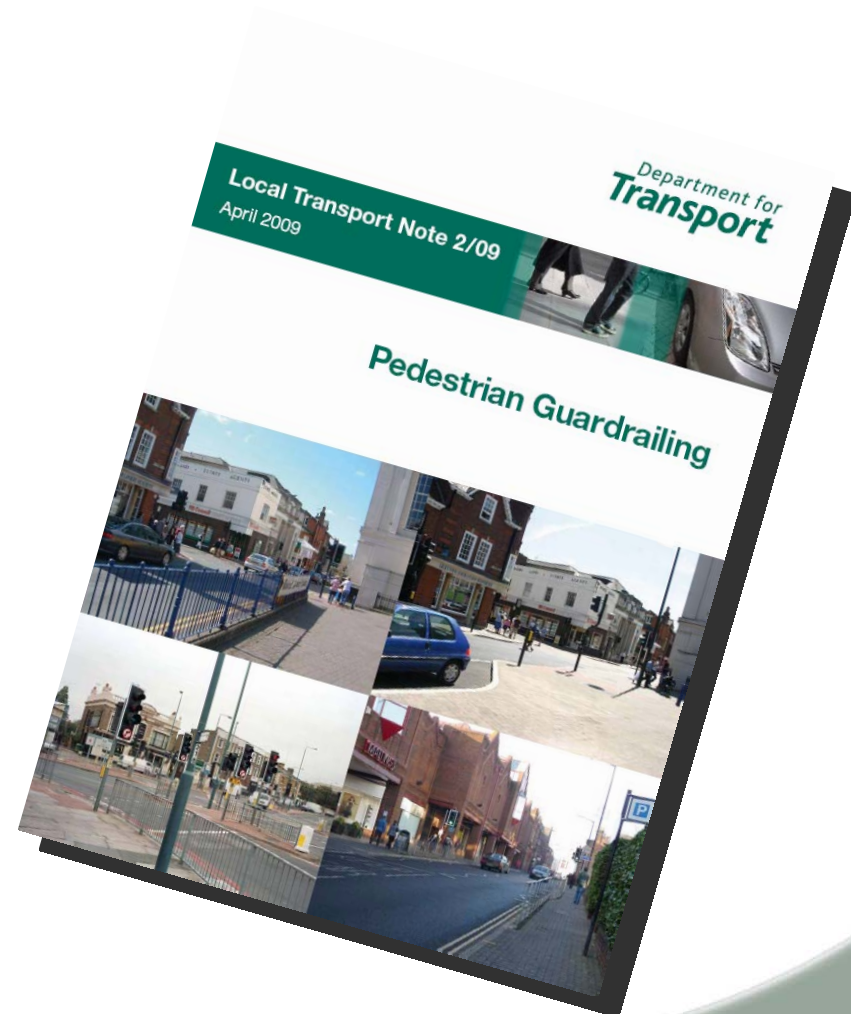
Qualified Road Safety Auditors



Local Transport Note 2/09

April 2009

- Not available when TfL started this project
- Audit trail
- Site details
- Assessment framework (referenced with similar sites with or without guardrail)
- Pedestrian behaviour surveys
- Not practicable for the London programme



Conclusions

- Decide what is the purpose of that part of the network
- Consider the Streetscape
- Encourage the use of the 3Ms
- Use suitably experienced people to assess and approve guardrail assessment forms
- Of particular importance is the monitoring of any change in casualty rate.



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Any Questions?

