



PROJECT REPORT CPR2035

Independent Review of Decisions Involving Safety Barrier at the Junction of Sans Souci Park and Malone Road, Belfast

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TRL's Project Team

Gavin Williams

A world-leading technical specialist in the field of vehicle restraint systems, including standards and associated regulations. He represents TRL and the UK on many National, European & International committees, and is seen by industry peers as a leading expert. His work includes safety barrier, terminals, transitions and crash cushions, and passively safe roadside furniture. By example, Gavin services as Technical Secretary to European Committee TC226/WG1/TG1 for Vehicle Restraint Systems, Chairman of British Standards Committee B509/10 for Break-Away Safety, Technical Author for the Revision of PAS68:2010. Gavin also serves as the Technical Advisor for two international Notified Bodies in the field of vehicle restraint systems.

Stuart Blackwood

A leading TRL incident investigator, building on 20 years prior experience as a Police Officer. His specialisms include Forensic Collision Investigation and he has investigated and reconstructed collisions involving passenger carrying vehicles, large goods vehicles, cars, motorcycles and bicycles, as well as both adult and child pedestrian fatalities. His work today includes operating on a call-out basis for police forces, lawyers and insurance companies. As an expert witness, he has prepared expert reconstruction reports and delivered oral evidence in Sheriff and High Courts. Stuart has been commended by the Judiciary as an expert in his field.

1 Background

A safety barrier had been installed at the junction between Sans Souci Park and Malone Road, Belfast in the late 1970s following the death of two passengers in a vehicle at the site. It is thought by representatives from the Department for Regional Government (DRDNI) that this incident involved a vehicle impacting a lighting column which was originally located at the front of the pavement (and has since been replaced and relocated at the rear of the pavement).

A routine inspection was carried out on the safety barrier by DRDNI officials in 2011. The inspector assessed the system as being "Hazardous" (to the road user in the event of a collision). A decision was therefore taken that the existing barrier needed to be removed and it was placed on a programme for intervention. The requirement for a replacement barrier at this site was then assessed and scored as "Low Priority". It was therefore decided not to replace the barrier, and works to remove the existing safety barrier were completed on site on 18th September 2014.

Subsequently, in the early hours of 15th October 2014, a vehicle mounted the footway on the Malone Road in the vicinity of Sans Souci Park and struck a pedestrian, resulting in fatal injuries.

TRL has been engaged by the DRDNI to:

- Carry out a review of the inspection and assessment of the Malone Road safety barrier at Sans Souci Park which led to the decision to remove it.
- Review the decision not to provide a replacement safety barrier at this site.
- Consideration is also to be given to the extent to which the original reason for the installation of the barrier should feature in the assessment process.

2 Objectives of the Review

In order to achieve the aforementioned requirements, the following objectives have been allocated to the TRL team:

- To review whether the assessment of the existing barrier as hazardous was reasonable and in accordance with the Department's policy.
- To review whether the categorisation for a safety barrier at this site as "Low Priority" was reasonable and in accordance with the Department's policy.
- To assess whether the overall process followed was a reasonable approach to the removal of the safety barrier and in line with national guidance.
- To make any recommendations arising from this review, regarding future arrangements for the inspection and provision of safety barriers.

3 Documentation Reviewed

In the course of this review, the following items of pertinent documentation have been provided by representatives of the DRDNI for the sole purpose of this review:

- Roads Service Restraint System Inspection Sheet for Restraint System No. 01/05/20013 (the material vehicle restraint system), dated 6th August 2007
- Report entitled 'Safety fence 01/05/20013, Malone Rd at Sans Souci Park, Belfast: DEM 128 and DEM 127 Report', by the Roads Service Consultancy, dated 24th September 2013
- Photographs of the material vehicle restraint system, dated 23rd and 24th September 2013
- Director of Engineering Memorandum (DEM) 109/07: Road Restraint Systems – TD19/06, dated July 2007
- DEM 127/11: Prioritisation of Potential Sites for Road Restraint Systems, version 1, dated May 2011
- DEM 128/10: Management of Existing Vehicle Restraint Systems, version 1, dated December 2010
- DEM 128/10: Management of Existing Vehicle Restraint Systems, version 2, dated April 2012
- RSPPG_E019: Roads Service Policy and Procedure Guide – Road Maintenance Standards for Safety, version 6, dated 9th October 2012
- Details of the training provided to those carrying out the inspection of Vehicle Restraint Systems, in accordance with DEM128

- Extract from the Safety Barrier Programme 2013-14 and 2014-2015 Network Maintenance Programme, dated 6th November 2014, showing the priority ranking of the material safety barrier
- Malone Road at San Souci Traffic Survey Summary
- Project Brief and Estimated Cost for the removal of the material barrier and reinstatement of the footpath surface
- Letter from Kevin Monaghan (Eastern Division Manager of the DRDNI) to redacted correspondent, entitled 'Fatal RTC on Malone Road, Belfast', reference MT30555, dated 15th January 2015, containing pertinent background to the provision of the material barrier, and the inspection and maintenance schedule undertaken
- Email from Norman Chambers to Trevor McClay dated 15th January 2015, regarding the incident history of the material location
- Full set of maintenance records for Malone Road and Sans Souci Park

In to the provision of this documentation, two members of TRL staff, Mr G Williams (Technical Specialist, Vehicle Restraint Systems) and Mr S Blackwood (Lead Incident Investigator) attended the material location on the 20th March 2015 and discussed the pertinent issues regarding the decisions made in this case with the following DRDNI representatives:

- Kevin Monaghan – Divisional Manager (Eastern Division)
- Colin Sykes - Network Maintenance Manager (Eastern Division)
- Stephen Bradshaw – CoPE Manager – Traffic Northern Ireland (TNI) Engineering Services
- Peter McParland – Senior Engineer Transport Projects (at the time of the material barrier assessment he was an engineer in the TNI Design and Consultancy Services).

4 Examination of the Documentation

4.1 Commentary on the Decision to Remove the Barrier at the Material Location

The methodology for assessing the condition of a pre-existing safety barrier is contained within the DRDNI Memorandum DEM 128/10. This is currently released as revision 2 (dated 19th April 2012), but at the time of the assessment of the condition of the material barrier (on the 17th October 2011), it was the original version of DEM 128/10 (version 1, dated 14th December 2010) which was applicable.

The assessment of the condition of the barrier was recorded within Appendix 1 of the report entitled '*Safety fence 01/05/20013, Malone Rd at Sans Souci Park, Belfast: DEM 128 and DEM 127 Report*', by the Roads Service Consultancy, dated 24th September 2013. The results of the assessment were recorded using the form contained within Appendix 1 of DEM 128/10, v1.

Based on the photographs provided in the aforementioned Roads Service Consultancy report, and after discussions with local DRDNI representatives, TRL have independently reviewed the assessment of the condition of the material barrier, and given their opinion on the scoring allocated in Table 1:

Criteria	Score in the Road Service Consultancy report	Author Score	Justification for author's score
Location Factor			
Road Category/Type (Score A)	2 (AADT 7,000 to 20,000)	2 (AADT 7,000 to 20,000)	The road at the material location is a category B road. A 'recent' traffic count has shown the incident location to have an AADT of 17,522. Clause 1.1 of Appendix 1 of DEM 128/10, v1 states that "where a road is not consistent with the typical AADT for its type of classification, the actual AADT figure should be used to score".
Road Speed adjacent to hazard (Score B)	0 (30mph plated road speed)	0 (30mph plated road speed)	The road at the material location is a 30mph plated speed road. A 'recent' traffic count has shown the 85 th percentile speed to be 32.1mph.
Hazard type to be protected (Score C)	1.5 (Housing)	1.5 (Housing)	Of the hazards listed within DEM 128/10, only 'Housing' is present
Site Characteristics (Score D)	1+1 (Radius with hazard on outside of bend + Multiple road furniture within setback)	1+1 (Radius with hazard on outside of bend + barrier located close to junction)	TRL do not consider that the lighting columns and signs are within the setback of the barrier, but the location is close to a junction – the same overall score applies
Overall Location Factor	5.5	5.5	

Table 1: Assessment of the Condition of the Barrier, using criteria from Appendix 1 of DEM 128/10, v1

Whilst the distribution of TRL's scoring for 'site characteristics' differs from that of the initial assessor, **TRL conclude the same site characteristics and overall location factor score.**

Again, based on the photographs provided in the aforementioned Roads Service Consultancy report, and after discussions with local DRDNI representatives, **TRL have independently reviewed the beam/wire, post, terminal and transition condition assessment, and concur with the overall condition factor of 6H.** This is primarily due to the presence and poor condition of the wooden posts, the damage to both of the end terminals, and the substandard height of the safety barrier beam.

Taking both the location factor and condition factor scores into account, **TRL therefore agree with the overall priority for replacement/repair score of 33H, in accordance with DEM 128/10, v1, December 2010.**

It is worthy of note that Clause 2.0 of DEM 128/10, v1 identifies that wooden posts do not function as originally intended, with paragraph 2 of Clause 8 of DEM 128/10, v1 going further, requiring that:

"Existing wooden post barrier...should be prioritised in each Division with a 5 year period for the replacement programmed and initiated."

In addition, Clauses 6.0, 7.0 and 8.0 of DEM 128/10, v1 each indicate that where the barrier under consideration has wooden posts, consideration of a full replacement should be given.

4.2 Commentary on the Decision to Not Replace the Barrier at the Material Location

DEM 109/07 is the DRDNI Memorandum which translates the requirements of the English Highways Agency's Technical Document for the provision of road restraint systems (TD19/06) into applicable requirements for the roads in Northern Ireland. DEM 109/07 states (in Clause 2) that:

"For all Roads Service schemes and developer led projects proposed for adoption or which affect public roads, with design speed or imposed speed limit < 50mph, the Design Organisation must identify local features or hazards, within or immediately adjacent to the highway, which may cause a potential danger to the occupants of an errant vehicle."

"Roads Service, as with the other UK road authorities, generally do not protect hazards...in urban 30/40mph areas."

These requirements were in place at the time of an inspection of the material barrier on the 15th February 2002, the results of which were reported on the *Roads Service Restraint System Inspection Sheet for Restraint System No. 01/05/20013* (dated 6th August 2007). At this time, the material barrier was assigned a level 3 priority.

The Inspection Sheet then further states that as of the 6th August 2007, the condition of the barrier was now rated as a level 2 priority. The sheet states that this was due to the unacceptable condition of the barrier's beams, posts, fixings and terminals. The height of the beam of the barrier is also noted as being too low (0.46m), and it is stated on the Inspection Sheet that *"the necessity of a safety fence at this location is questionable"*.

Taking into account the condition of the safety fence as shown in the photographs within the Inspection Sheet, **TRL concur with these conclusions**. Note is also made of the damage to the 'bull nose' terminal in the last of the three photographs which demonstrates a compression to the end of the terminal, and missing fasteners.

Whilst DEM 109/07 requires an assessment to “*identify local features or hazards, within or immediately adjacent to the highway*”, it is DEM 127/11 (first issued to users on the 12th May 2011) which contains a quantitative framework for such an assessment. The Memorandum details the procedure to be followed in determining whether the provision of a safety barrier is appropriate for a specified site which is not affected by planned road improvement schemes. It is TRL’s understanding that this was the case at the material site. As in DEM 109/07, it is stated within Clause 3.0.3 of DEM 127/11 that

“Roads Service, as with the other UK road authorities, generally do not protect hazards...in urban 30/40mph areas.”

Due to its date of publication, DEM 127/11 would have been in place at the time of the inspection at the material location in 2013. **TRL feel that it was appropriate to apply the requirements of DEM 127/11 to the material location at the time of the 2013 inspection** as the road is in a 30mph urban area and hence the use of the alternative method, the RRRAP (developed for high speed roads), would not have been appropriate in this case.

DEM 127/11 requires that two types of site assessment should be carried out; an initial assessment and (if a proposed scheme achieves a score of 4 or higher in the initial assessment), a detailed assessment (refer to Clause 3.2 of DEM 127/11).

Appendix 2 of the report entitled ‘*Safety fence 01/05/20013, Malone Rd at Sans Souci Park, Belfast: DEM 128 and DEM 127 Report*’, by the Roads Service Consultancy, dated 24th September 2013 details the results of the initial assessment, awarding the site a total score of 1. It is not known for what reason this score was awarded (as it is not a requirement to note this on the assessment form) but, based on the information which TRL have reviewed, TRL hypothesise that the value of ‘1’ was awarded for a location having “*an increased likelihood of a vehicle reaching the hazard (e.g. due to road geometry)*”, as detailed in footnote 4 of the report and extract from DEM 127/11. Given the bend in the road, this may be feasible, although this is not based (or judged) on any quantitative information.

With reference to the scoring requirements of DEM 127/11, TRL’s understanding is that there have been no incidents at the site within the last 3 years, or any collisions where the safety barrier may have reduced severity (i.e. Safety = 0).

Whilst there are lighting columns and a small electrical cabinet at the material location, these are located at the back of the pavement, and therefore represent only minor hazards (i.e. Hazards = 1 [see above]).

Given the particulars of the site, it is TRL’s opinion that the provision of barrier at this location would not represent good value for money (Value for money = 0).

TRL therefore agree with the outcome of the initial assessment of the material location, in that the total score should be '1'.

Therefore in accordance with DEM 127/11 there was no requirement for the site to progress to the detailed assessment. However after discussions with DRDNI officials, TRL have been informed that whilst not a requirement, it is common practice to carry out the detailed assessment in any case.

The detailed assessment, as recorded within Appendix 2 of the report entitled '*Safety fence 01/05/20013, Malone Rd at Sans Souci Park, Belfast: DEM 128 and DEM 127 Report*', was carried out on the 17th October 2011. The results of the assessment were recorded using the form within DEM 127/11. TRL have independently reviewed this assessment, and given their opinion on the scoring allocated below:

Criteria	Max	Score in the Road Service Consultancy report	Author Score	Justification for author score
Section 1: Safety				
1.1 Collision History	20	0	0	Email from Norman Chambers to Trevor McClay, dated 15/01/15 confirms that there was one personal injury collision within the 5 years prior to completing the assessment. However this was a 'turn right/rear end shunt' incident, and will not have been affected, in any way, by the presence of the barrier
1.2 Road Classification	10	3 * ¹	7.5	The road at the material location is a category B road. A 'recent' traffic count has shown the incident location to have an AADT of 17,522. DEM 127/11 states that "where a road is not consistent with the typical AADT for its type of classification, the actual AADT figure should be used to score"
1.3 Vehicle Speeds	10	0	0	The road at the material location is a 30mph plated speed road. A 'recent' traffic count has shown the 85th percentile speed to be 32.1mph
1.4 Hazards present within 5m of carriageway	15	3 * ¹	5	Of the hazards listed within DEM 127/11, only 'Housing' is present within 5m of the carriageway at the material location
1.5 Site Characteristics	15	3 * ¹	5	At the material location there is a radius with a hazard (housing) on the outside of a bend - refer to Figure 1
Section 1 Total:		9	17.5	
Section 2: Practicality				
2.1 Practicality	±10	10	10	Given that a barrier currently exists, a new barrier could be installed with no associated works
Section 2 Total:		0*²	10	
Section 3: Economy				
3.1 Scheme Costs	±15	0	5	<i>Construction Cost:</i> comparable DRD contract estimated at £289/m (score = 0) <i>Accommodation works and land purchase:</i> There would be no such costs (score =+5) <i>Services:</i> Relocation of services would be required due to current insufficient concrete foundations (score =0)
Section 3 Total:		*³	5	
Section 4: Environment				
4.1 Environmental Factors	±5	0	0	TRL agree that the installation of a barrier at this site would have a negligible effect on the local environment
Section 4 Total:		0	0	
TOTAL:		19	32.5	

Table 2: Assessment of the Need for a Barrier, Using Criteria from Appendix 2 of DEM 127/11

*¹ Note that a score of '3' is not possible within the framework of DEM 127/11, Version 1

*² This appears to be an error on the form

*³ This appears to be an omission on the form



Figure 1: Approach to the Malone Road and Sans Souci Park junction

A revised score of '32.5' would still categorise the site as being of "Low" priority when assessed in accordance with DEM 127/11 as concluded by the original assessment.

This result concurs with the requirements of Clause 2 of DEM 109/07, and Clause 3.0.3 of DEM 127/11 which state that

"Roads Service, as with the other UK road authorities, generally do not protect hazards...in urban 30/40mph areas."

This takes into account the fact that a barrier is in itself a hazard and hence, if following internationally recognised roadside design rules, barrier systems should only be used as a 'last resort'. This is reflected within Clause 3.0.4 of DEM 127/11 which states that

"RRS inherent element of risk and this issue needs to be considered against the benefits afforded by a barrier in mitigating the severity and implications of collisions. In certain circumstances, it may be better to move or not protect a hazard."

5 Conclusions

With regard to the objectives for this Independent Review of Decisions Involving Safety Barrier at the Junction of Sans Souci Park with Malone Road, in Belfast, the following conclusions are reached, based on the documents presented and reviewed, and taking into account discussions with DRDNI representatives:

- **To review whether the assessment of the existing barrier as hazardous was reasonable and in accordance with the Department's policy.**

TRL agree that the existing barrier was hazardous (primarily due to the presence and poor condition of the wooden posts, the damage to both of the end terminals, and the substandard height of the safety barrier beam). TRL also agree that the score of 33H in accordance with DEM 128/10, v1, December 2010 was reasonable and in accordance with the Department's policy.

- **To review whether the categorisation for a safety barrier at this site as "Low Priority" was reasonable and in accordance with the Department's policy.**

Based on the assessment in accordance with DEM 127/11, TRL would disagree with the scheme score of 19 ("Low Priority"). Instead TRL would rate the scheme with a score of 32.5, but this would still rate the site as being of "Low Priority".

TRL feel that this site and the conditions contained therein, do not warrant the provision of a safety barrier as, in accordance Clause 2 of DEM 109/07, and Clause 3.0.3 of DEM 127/11 the Roads Service generally do not, and in TRL's opinion should not, protect hazards in urban 30/40mph areas. In fact, the initial assessment of the site in accordance with DEM 127/11 determined that no barrier was needed; it was only as a result of the due diligence of the DRDNI staff that a detailed assessment was completed, and the prioritisation of the site rose. TRL see no specific hazard, nor combination of hazards which would warrant the provision of a safety barrier at the material site.

Indeed, photographs which TRL have seen (dated 23rd August 2013) clearly show pedestrians walking along Malone Road adjacent to the line of the barrier, and climbing over the barrier to access the pavement in Malone Road. Hence the presence of the barrier appeared, from the photographs, to represent a hazard to pedestrians.

In addition, as stated in Clause 3.0.4 of DEM 127/11 there is an inherent risk in using barriers and again, TRL feel that at the material location, it would be better not to install a barrier system.

- **To assess whether the overall process followed was a reasonable approach to the removal of the safety barrier and in line with national guidance.**

TRL agree that the overall process followed was a reasonable approach to the removal of the safety barrier, and that the decision was in line with national guidance.

TRL feel that the content of DEM 109/07, DEM 127/11 and DEM 128/10 provide, in general (see below), a well thought out, quantitative platform for the assessment of barrier condition and need, based on pre-existing best practice from British standards such as BS7669-3.

- **To make any recommendations arising from this review, regarding future arrangements for the inspection and provision of safety barriers.**

From completion of the assessment in accordance with DEM 127/11, v1, it has become clear that the prioritisation of a site can be subjective in some areas and hence, the quantification of risks present in urban areas specifically could be investigated further. This could then be used to enhance any subsequent versions of DEM 127/11.