



Highways Asset Management Plan

Vehicle Restraint Systems Code of Practice – July 2023



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Document Change Log		
Version	Date Agreed	Changes Made
1.0	April 2021	Published.
2.0	July 2023	Version 1 withdrawn Version 2 published



1. Introduction

Background

Vehicle restraint systems (VRS) are intended to reduce the number and severity of injuries in the event that a vehicle leaves the carriageway and would otherwise encounter a hazard.

VRS do not stop accidents from occurring and they should only be used when other measures are considered inappropriate or ineffective.

Lancashire County Council currently maintains approximately 1500 individual lengths of vehicle restraint system with a total length of over 150 km comprising of concrete barriers, wire fences, safety fences or parapets. They are distributed across a wide range of locations on our highway network with varying road speeds and traffic flows.

Updates to VRS 2018 CoP

The updates to the VRS2018 CoP are as follows:

- Update of Section 4 – Record keeping and updating of inventory data
- Update of national standards as outlined in appendix A
- Introduction of appendix D for developers
- Minor changes throughout with regard to the risk-based approach and inspections

Scope of this Document

This code of practice promotes the use of a risk-based approach to the deployment of new vehicle restraint systems, as well as the management and maintenance of existing vehicle systems to ensure a consistent approach across Lancashire.

The implementation of this code of practice will ensure that:

- new VRS are only installed after all other measures have been considered
- new VRS are designed to the appropriate standards
- whole life maintenance costs are considered at design stage
- new VRS are installed to the appropriate standards
- VRS are recorded on the Highway Asset Management System
- maintenance of VRS will be prioritised following a risk-based approach
- where we propose a departure from national standards or guidance this decision is fully risk assessed and signed off by appropriate personnel



As national guidance on vehicle restraint systems is not collated in one place, this document is intended to be a reference to support highway design and maintenance engineers when dealing with vehicle restraint systems and to outline the risk-based method by which the council prioritises inspection and maintenance to optimise funds whilst reducing risk.



Guidance and Departure from National Standards

This code of practice has been developed with reference to:

- CD377 Requirements for Road Restraint Systems (**CD377**)
- CS461 Assessment and upgrading of in-service parapets (**CS461**)
- DfT Design & Maintenance Guidance for Local Authority Roads Provision of Road Restraint Systems on Local Authority Roads (**DMG-RRS**)
- Well Managed Highway Infrastructure: A Code of Practice (**WMHCoP**)
- TAL 06/03 Managing accidental rail obstructions by road vehicles (**TAL 06/03**)
- British Standards documents
 - BSEN1317 - Compliant Road Restraint Systems
 - BS 7669-3 - Vehicle restraint systems. Guide to the installation, inspection and repair of safety fences
- Highways Act 1980

We will use the above guidance wherever it is applicable and practicable to do so. The contents and scope for each of the vehicle restraint systems guidance notes listed above is included in appendix A.

Where we propose a departure from national standards or guidance, this decision will only be taken after carrying out the appropriate road safety audit and risk assessment and will be signed off in accordance with the Lancashire County Council Design and Construction 'General Procedure GP008 Departure from Design Standards' Form (**GP008**). Further information about record keeping is provided in **Section 4 – Record Keeping**.



2. Assessment of Need for the Provision of Vehicle Restraint Systems

It is expected that all practical attempts should be made to prevent new hazards being created, thus avoiding the need to consider vehicle restraint system provision.

CD377 and DMG-RRS give examples of the circumstances and hazards considered in determining the need to provide a vehicle restraint system. Examples include roadside obstructions such as structures, trees and lighting columns, hazards that road users may fall off or into, such as embankments and water sources and hazards where others may be affected, such as recreational areas, railways or flammable material storage.

The risk appraisal process for a vehicle restraint system varies depending on the location, speed limit, traffic flow and proximity to a railway line.

Table 1 in appendix B provides a guide to selecting the most appropriate risk appraisal guidance and associated risk assessment.

Table 2 in appendix B converts the results of the different risk assessment methods into the risk and priority bands of 'higher', 'medium' and 'lower' for consistency across different approaches.

Risk assessment is only part of the appraisal process and, regardless of the outcome at a site, consideration should be given to suitable, cost-effective and practicable alternative options which will reduce the risk to a level which will avoid the need to install or continue to provide a vehicle restraint system. DMG-RRS provides examples of alternative solutions for consideration of sites on local roads. This could include the removal or relocation of hazards, speed control or the installation of chevrons and signs, etc.

Where the installation of the VRS is part of a larger scheme where there are physical changes to the highway impacting on road user behaviour or resulting in a change to the outcome of a collision on the network, a road safety audit (RSA) shall be undertaken in accordance with GG119 or the LCC Policy.

Where the above procedure results in a decision to install a vehicle restraint system, appendix C provides guidance on the design and installation of the system.

Comprehensive records of the processes followed, and the decisions made should be kept and stored in line with the relevant guidance and the requirements outlined in **Section 4 – Record Keeping**.

3. Inspection and Maintenance Regime

Highway Safety Inspections (HSI)

All our VRS installations are subject to a regular basic visual inspection as part of the Highway Safety Inspection policy which prescribes the frequency of inspection, the method of assessment, recording and repairing of highway defects. Only those defects which are obvious, clearly visible and pose a threat to safety are picked up, recorded, and actioned by this process.

General / Principal Bridge Inspections

A large proportion of our VRS installations are associated with structures. In accordance with the Well Managed Highway Code of Practice, vehicle restraint systems will be inspected as part of the highway asset, as well as during general and principal inspections for structures, where it is practical to do so.

Risk-based Inspection and Minor Maintenance Programmes

We have developed an Initial Minor Maintenance Programme using a risk assessment and prioritisation process which is based on Method C of the DMG-RRS.

We will develop a risk-based inspection programme based on BS7669-3.

For efficiency purposes, we may include nearby low priority vehicle restraint system installations in these programmes as this will avoid the contractor having to make multiple trips to isolated installations.

As part of the risk-based inspection and minor maintenance programme the contractor will be required to carry out minor repairs. Where defects cannot be repaired as part of the initial inspection, the contractor will be asked to report such defects to the Highway Asset Manager so that appropriate action can be taken. This may lead to a vehicle restraint system installation being assessed and included in a future years Capital Programme.

If insufficient funds are available to address defects at a given site, action will be taken to make the site safe. This may include complete removal of the vehicle restraint system, temporarily reducing road speeds, signing and coning, imposing lane closures or closing roads.



Upgrade or Repair of VRS

CD377 provides guidance on when consideration should be given to upgrading existing vehicle restraint systems which do not meet current standards. We will follow this guidance, wherever it is practicable to do so.

Where a departure from national standards or guidance is proposed, this decision will only be taken after carrying an appropriate road safety audit and risk assessment and will be signed off in accordance with the Lancashire County Council Design and Construction 'General Procedure GP008 Departure from Design Standards' Form **(GP008)**.

Where practicable, every effort will be made to recover costs incurred in repairing sections of accident damaged fencing or barrier in line with countywide services procedures. This includes the cost of traffic management, making safe, administration and repair.

In accordance with the with National Highways Quality Management Sector Scheme 2B and 5B, only suitability qualified personnel should be employed to install, upgrade or repair vehicle restraint systems on our road network. Prior to starting works, contractors will be required to confirm that their personnel are suitably qualified.

Further guidance on the Design and Installation of VRS is provided in appendix C.

Records of the process followed and the decisions made should be kept and stored in line with guidance and the requirements outlined in **Section 4 – Record Keeping**.



4. Record Keeping and Updating of Inventory Data

In addition to complying with appropriate guidance in respect of record keeping, the Highway Asset Management System (HAMS) must also be correctly updated.

Where the information contained in any of the fields in HAMS is affected by the actions arising from the process described in this guidance, then HAMS should be updated using a data collection form, which is available from and returnable to the Highway Asset Team:

The following documents should also be supplied with the completed data collection form as individual documents in pdf format so that they can be attached to the relevant record in HAMS:

- Risk Assessment
- As Built Drawings
- Inspection Sheets in accordance with BS7669-3
- Vehicle Restraint System Information – system details from VRS supplier.
- Lancashire County Council Design and Construction 'General Procedure GP008 Departure from Design Standards' Form – if applicable

All records from external parties should be passed through to the Highways Asset Management Team at: highwaysasset@lancashire.gov.uk



Appendix A: Summary of Key Guidance and Standards

CD377 Requirement for Road Restraint Systems

This document details the requirements for permanent and temporary safety barriers, vehicle parapets, terminals, transitions, crash cushions, pedestrian parapets, pedestrian guardrails and pedestrian restraint and protection, vehicle arrester beds, anti-glare systems and cattle grids.

CS461 Assessment and upgrading of in-service parapets (CS461)

This document provides requirements and advice for the assessment and upgrading of existing vehicle parapets on highway structures. It gives advice on the assessment of parapet and safety barrier supporting members on bridges and retaining walls. The document also sets out the requirements for the management of substandard parapets including parapet connections and transitions.

Well Managed Highway Infrastructure: A Code of Practice (WMHCoP)

The Code is designed to promote the adoption of an integrated asset management approach to highway infrastructure based on the establishment of local levels of service through risk-based assessment.

Design & Maintenance Guidance for Local Authority Roads Provision of Road Restraint Systems on Local Authority Roads (DMG-RRS)

This United Kingdom Roads Liaison Group (UKRLG) Guidance Document is intended for use by highway authorities and their designers considering the introduction or replacement of vehicle restraint systems on roads with low traffic flows and/or low traffic speeds. It describes a process to assist highway authority decision making with regards to investing in vehicle restraint systems at a particular site. It includes the necessary supporting information to assist this process and takes account of risk, risk assessment methods, costs, benefits as well as further advice on performance specification and outline design. The most appropriate methodology for the Risk Assessment can be found in Appendix B. It is applicable to:

- New roads (and the adoption of roads)
- Road improvements e.g. widening, junction improvements
- Where a new hazard is introduced or an existing roadside feature is altered e.g. the addition of roadside features
- Where the upgrade or replacement of a parapet is being considered.

- Maintenance schemes where a significant length of vehicle restraint systems is being replaced
- When the safety performance of a particular site has been questioned and risk reduction options are being assessed.

TAL 06/03 Managing Accidental Rail Obstructions by Road Vehicles (TAL 06/03)

In line with this guidance, all roads that cross or run alongside railways need to be risk assessed to consider how the risk of a vehicle leaving the highway can be reduced. The methodology in the guidance allows high-risk areas to be identified using a consistent scoring sheet for each site and road type. The results provide an auditable record.

BS EN1317 - Compliant Road Restraint Systems

VRS systems in the UK have to meet the requirements of the European Standard EN 1317. BS EN 1317 is divided into 8 parts as listed below and defines common testing and certification procedures for Road Restraint Systems. Part 5 of the standard serves as the framework for the CE marking of road safety systems such as Barriers, Crash Cushions, Barrier Terminal Ends and Transitions.

- EN 1317-1: Terminology and general criteria for test methods
- EN 1317-2: Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicle parapets
- EN 1317-3: Performance classes, impact test acceptance criteria and test methods for crash cushions
- ENV 1317-4: Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers.
- EN 1317-5: Product requirements and evaluation of conformity for vehicle restraint systems
- TR 1317-6: Pedestrian restraint system - Pedestrian parapets
- EN 1317-7: Performance classes, impact test acceptance criteria and test methods for terminals of safety barriers
- TS 1317-8: Motorcycle road restraint systems which reduce the impact severity of motorcyclist collisions with safety barriers

BS 7669-3 - Vehicle restraint systems. Guide to the installation, inspection and repair of safety fences

This standard provides guidance on the installation and erection procedures for vehicle safety fences and the inspection of VRS.



Highways Act 1980

The Highways Act 1980 places a duty on the local Highway Authority, to maintain the public highway network in a condition that is safe for users. The public highway network includes all adopted roads, footpaths and verges. It does not include unadopted or privately owned roads. It outlines our duty of care to maintain the highway in a safe condition and protect the rights of the travelling public to use the highway.

RRRAP

The 'Road Restraint Risk Assessment Process (RRRAP)' is the principal assessment method set out in the Design Manual for Roads and Bridges (DMRB). It forms part of CD377 and is implemented via an Excel spreadsheet that enables the designer to determine the need for a vehicle restraint system and its performance requirements at a given site. It also allows risk to be categorised as 'broadly acceptable', 'tolerable', or 'unacceptable' and enables the impact of mitigation measures to be assessed and recorded. Guidance on the use of the RRRAP associated with CD377 is available online. The most appropriate application of this methodology can be found in appendix B

Design Manual for Roads and Bridges – Specification for Highways Works Series 400

The Manual of Contract Documents for Highway Works (MCHW) is a suite of specification documents for use in construction contracts for works on motorway and all-purpose trunk roads in the UK.

The MCHW is also adopted by Lancashire County Council as the primary specification for its own highway works.

Series 400 of the Specification for Highway Works, covers Road Restraint Systems (Vehicle and Pedestrian).



Appendix B: VRS Risk Appraisal

The most appropriate methodology for determining the need for a VRS at a site is determined by a number of factors including type of road, traffic speed, traffic flows and location.

The table below provides guidance on the most appropriate risk appraisal process for a site, based on certain criteria.

Table 1	Traffic Speed Limit	
AADT	<50mph	>=50 mph
<5000	DMG-RRS with Method A, B* or C	DMG-RRS with Method A, B* or C
>=5000		CD377 with RRRAP
All sites near railway lines – regardless of traffic speed / AADT: TAL 06/03 - 'Managing Accidental Obstruction Railway Approaches'		

(* Method B of DMG-RRS is based on the risk estimation tool which forms part of TAL 06/03)

Key to Abbreviations	
AADT	Annual Average Daily Traffic
DMG-RRS	Design & Maintenance Guidance for Local Authority Roads Provision of Road Restraint Systems on Local Authority Roads
TAL 06/03	Managing Accidental Obstruction Railway Approaches
CD377	Requirement for Road Restraint Systems

For consistency in interpreting the outcome of a chosen risk assessment, the table below converts the results of the different methods into priority bands of 'higher', 'medium' and 'lower'.



Table 2	Risk Assessment Method			
Risk / Priority Band	DMG-RRS - Method A	TAL 06/03 or DMG-RRS - Method B	DMG-RRS - Method C	CD377 - RRRAP
Higher	Above the KSI return period in Table 3.1 in DMG-RRS*	Score of ≥ 100	Score of 14 or more	'Unacceptable'
Medium		Score of ≥ 70	Score of 9-13	'Tolerable'
Lower	Below the KSI return period in Table 3.1 in DMG-RRS	Score of < 70	Score of 0-8	'Broadly Acceptable'

(*DMG-RRS acknowledges that determining the upper bound of a Medium Priority Site category is difficult and needs to be determined by the individual highway authority)



Appendix C: Design and Installation of VRS

Whether designing a vehicle restraint system for a new motorway or an existing low speed road, the fundamentals of the design process remain the same. Therefore, wherever practicable, the layout of vehicle restraint systems, including those on low speed and low flow roads, should be in accordance with the layouts and design guidance given in CD377, which recommends that vehicle restraint system provision is considered at an early stage in a scheme's development (i.e. before the land footprint or land take is decided) and design process. This will :

- ensure that all factors that are under our control including land take, road and cross-section geometry, and location of hazards are considered in determining the overall optimum solution
- minimise the need for 'departures from standard'
- eliminate or mitigate, as far as reasonably practicable, factors that might be detrimental to the safety of those who use and work on the road, and of others that might be affected by use of the road. For example, consideration should be given to prevent grass from growth in front of VRS so that grass cutting operations do not require operatives to be positioned in front of safety barriers

The RRRAP is an integral part of the design process covered in CD377; where reference is made to the results of the RRRAP the designer should refer instead to the results of the relevant DMG-RRS risk assessment where appropriate. A summary of the key information in CD377 relating to design and installation is also provided in DMG-RRS.

Vehicle restraint systems must be designed by suitably qualified persons with knowledge and experience of current standards.

Designers must also consider the whole of life costs of the vehicle restraint systems, including future repair and maintenance. For instance, tensioned VRS systems will only be considered in exceptional circumstances due to the additional maintenance costs associated with these systems.

Vehicle restraint systems must be CE marked and conform to SHW Series 400, EN1317 standards. Only personnel qualified in accordance with National Highways Quality Management Sector Scheme 2B and 5B shall be employed to install, upgrade or repair VRS on our road network.

Where we propose a departure from national standards or guidance, this decision will only be taken after carrying out the appropriate road safety audit and/or risk assessment and will be signed off in accordance with the Lancashire County Council



Design and Construction 'General Procedure GP008 Departure from Design Standards' Form (**GP008**).

Records of the process followed and the decisions made should be kept and stored in line with the relevant guidance and the requirements outlined in **Section 4 – Record Keeping**.



Appendix D: Guidance for Developers

1. Assess the need for a VRS in accordance with section 2 and by using the appropriate VRS risk appraisal process from Appendix B
2. Design VRS in accordance with Appendix C
3. Provide item 1 and 2 above to LCC Development Control for Acceptance by the Highway Authority
4. Install VRS in accordance with Appendix C
5. Provide Records in accordance with section 4.
6. The commuted sum will be calculated at 20% of the construction and installation costs of the VRS. Rates should include Traffic Management (TM) and should be confirmed by the Highways Asset team.

All costs associated with acceptance by the Highway Authority of the proposed VRS system will be recovered via the appropriate legal process e.g. s38 or s278 agreement.

Note on Commuted Sums for VRS

Lancashire County Council requires developers to pay a commuted sum towards future maintenance and inspection.

Provision of a calculation of a commuted sum for every type of compliant VRS included in EN 1317 is impractical so the decision has been taken to calculate the commuted sum at 20% of the supply and installation costs associated with the VRS including any fixtures, fittings, or foundations considered to be part of the system as well as traffic management.

