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# SERIES NG 400
# ROAD RESTRAINT SYSTEMS (VEHICLE AND PEDESTRIAN)

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# ROAD RESTRAINT SYSTEMS (VEHICLE AND PEDESTRIAN)

## VEHICLE RESTRAINT SYSTEMS

### General Requirements

### NG 401 General

**1** (11/05) Safety barrier, vehicle parapet (excluding concrete vehicle parapet), terminal, transition and crash cushion systems should conform to the various parts of BS EN 1317 and DD ENV 1317-4:2002. The introduction of these Standards ensures a consistent performance based standard is used in the testing and supply of Road Restraint Systems throughout the European Economic Area and will thereby remove any 'barriers to trade'.

**2** (11/05) BS EN 1317 is a performance based standard which requires Design Organisations to specify the performance requirements of any safety barrier, vehicle parapet, terminal, transition or crash cushions for a particular location. Unless otherwise directed by the Overseeing Organisation, Design Organisations should not specify the use of any specific safety barrier or vehicle parapet etc. but instead requirements should be expressed in terms of 'Containment Performance Class', 'Performance Class', 'Performance Level', 'Working Width Class', 'Velocity Class' and 'Lateral Displacement Zone Class'. In determining the performance criteria designers will need to refer to the Interim Requirements for Road Restraint Systems (IRRRS) and BS EN 1317.

**3** Appendix 4/1 should contain a schedule of Containment Performance Class, Performance Class, Performance Level, Working Width Class, Velocity Class and Lateral Displacement Zone Class as appropriate for the safety barriers, vehicle parapets, terminals, transitions and crash cushions [redirective or non-redirective], required in the Contract.

**4** (11/05) A review has been carried out comparing the performance and maintenance of concrete barriers with steel barriers in the central reserve. The evidence indicates that there are significant benefits from a maintenance viewpoint in using rigid concrete rather than deformable steel barriers on busy motorways and dual carriageways. These benefits include significant health and safety benefits for road maintenance and traffic management operatives, as fewer safety barrier repair and maintenance operations are required.

To implement the change in policy for motorways, new performance requirements for the specification of central reserve barriers should be adopted. New installations of safety barriers in the central reserve should be concrete safety barrier with a Containment Performance Class H2 and a Working Width Class W2 and should be designed to achieve an essentially maintenance free serviceable life of not less than 50 years. Where lighting columns are to be mounted on the safety barrier the Working Width should be increased to a minimum of W3 to reflect the additional width of concrete barrier required to accommodate the lighting column and its fixings.

**5** (11/05) Contractors will be allowed to formally propose, in accordance with the contract, any safety barrier, vehicle parapet or crash cushion that complies with the relevant parts of BS EN 1317 and for terminals and transitions DD ENV 1317-4:2002 and the 'Containment Performance Class', 'Performance Class', 'Performance Level', 'Working Width Class', 'Velocity Class' and 'Lateral Displacement Zone Class' requirements specified in Appendix 4/1.

**6** (11/05) The Contractor will be able to choose from a list of approved road restraint systems by contacting the following address:

RoadRestraintSystems@highways.gsi.gov.uk

**7** (11/05) Those vehicle restraint systems proposed by the Contractor should be submitted to the Overseeing Organisation for acceptance with the supporting information stated in Clause 401 demonstrating compliance with the applicable part of BS EN 1317 and DD ENV 1317-4:2002.

### NG 402 Components for Vehicle Restraint Systems

**1** The Contractor should provide Drawings, Specifications and testing requirements for the proposed safety barriers, vehicle parapets, terminals and transitions and crash cushion systems to the Overseeing Organisation for acceptance. The Drawings should show the type of post foundation which have been selected on the basis of assumed, or wherever possible, tested ground conditions.

**2** New British Standards for concrete, BS EN 206-1 and BS 8500 have also been introduced in Series 1700 and Series 2600. These include new terms, new systems of classification and new concepts. Series NG 1700 and



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BSI publication "Standards for fresh concrete - BS EN 206-1 and BS 8500" provide further guidance and a composite of the requirements for concrete in the familiar sequence of events, from specification, through production to delivery.

**Welding**

**3** Prior to the anticipated start of delivery of vehicle restraint components, the Contractor should obtain copies of the most recent certified destructive test reports covering those component types to be supplied under the Contract.

**4** Sample components and/or joints for destructive testing should be selected by a Welding Inspector certified by the Certification Scheme for Weldment Inspection Personnel (CSWIP) or equivalent. Selection should be made taking into account the manufacturer's inspection reports, previous destructive test reports and observations of current production practice on similar component types. Where practicable samples should be selected on the basis that they represent the lower end of quality in the production batch. Particular attention should be given to any features which could adversely affect the true throat size or the mechanical properties of the materials.

**5** Sample components and/or joints selected for destructive testing should be indelibly marked and dispatched to a testing laboratory appropriately accredited in accordance with sub-Clauses 105.3 and 105.4 for such tests.

**6** The following points should be considered when ascertaining the acceptability of components subject to destructive testing:

(i) (11/05) When conducting destructive testing, each length of weld between weld ends or changes of direction should be sectioned at intervals not exceeding 100 mm. One side of each section should be ground, filed, linished or machined to a finish equivalent to that produced by a 120 grit paper complying with BS 871, so that the actual throat and leg dimensions can be measured and any discontinuities exposed. One fracture test in accordance with BS EN 1320 on a length of weld of not less than 50 mm should be made for each joint type on each component. Additional sections and fracture tests may be required in cases of borderline acceptance. Non-compliance with the imperfection acceptance levels of BS EN ISO 15614-1 should be recorded. Non-compliance with the requirements of sub-Clause 402.6 should be cause for rejection, except that in sub-Clause 402.6(iv) (a) the throat and leg dimensions should be the true rather than the apparent dimensions.

(ii) One representative section from each joint type for each type of component should be prepared for macro-examination. A hardness survey should be done where any of the parent material thickness exceeds 20 mm. An additional macro-examination should be made of each non-conforming weld.

**7** The results of the destructive tests including macrographs should be reported and a certified copy sent to the manufacturer. In the event of non-conformances being found, the Contractor and manufacturer should be notified as soon as possible. The test specimens, uniquely identified by hard stamped marks should be returned to the manufacturer's works.

## Safety Barriers, Terminals, Transitions and Crash Cushions

### NG 403 Installation of Safety Barriers, Terminals, Transitions and Crash Cushions - Overall Requirements

**1** Installation of safety barriers, terminals, transitions and crash cushion systems should be in accordance with the Drawings and Specifications supplied by the Contractor and also the Quality Assurance requirements of Clause 104 and the associated quality management schemes detailed in Appendix A.

**2** Adjustments to line and level of safety barriers, terminals and transitions at connections to vehicle parapets may be necessary to achieve an even flowing alignment.

**Anchorages and Attachment Systems**

**3** Examples of the evidence required by sub-Clause 403.15 include (a) the results of testing to BS 5080 by a testing laboratory appropriately accredited in accordance with sub-Clauses 105.3 and 105.4 for such test or (b) a Certificate from any UEAtc (Union européenne pour l'agrément technique dans la construction - European union for technical approval in the construction) member together with the results of testing to the European Union of Agrément Directive for Assessment of Anchor Bolts MOAT No. 42 (adapted to include only anchorage types permitted by the Specification). If the 4 week time period required by sub-Clause 403.15 is unrealistic then the appropriate time period should be stated in Appendix 4/1.

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**4** Anchorages for securing surface mounted posts which utilise drilled holes have been known to fail due to either the lack of cleanliness of the hole or the excessive tolerance in the size of the hole. The manufacturer of the anchorages should provide details of the maximum tolerances permitted and the evidence submitted in accordance with sub-Clause 403.15 should show that these are satisfactory when installed in holes having these tolerances.

**5** Where anchorages and attachment systems are used, the bolts or nuts should be tightened adequately, in accordance with the manufacturer's instructions, to ensure that effective shear transfer will occur between the post baseplate and the base. In addition, it is important to ensure an adequate length of thread engagement. The surrounding concrete should be appropriately reinforced to prevent shear cone failure, particularly where an anchorage is close to the edge of the concrete.

**6** Where safety barriers, terminals and transition posts are to be installed on bridge decks an anchorage and attachment system should be used. Care should be taken to avoid damaging bridge deck waterproofing systems when installing anchorages in drilled holes. Normally, an anchorage and attachment system, which avoids this problem, should be used. In exceptional circumstances, where damage to the waterproofing is unavoidable a compatible sealing system agreed with the Overseeing Organisation to prevent ingress of water and avoid corrosion should be provided.

**7** Where safety barriers, terminals and transition posts are installed in cast in post sockets, an easily removable sealing system should be applied to prevent the ingress of detritus.

## NG 404 Site Testing

### Anchorages in Drilled Holes

**1** The anchorage test results should be included with the 'as-built' records (Health and Safety file, see sub-Clause NG 000.11).

### Post Foundations

**2** Testing should be carried out at the location where the posts are to be installed, in the direction of anticipated deflection, and at a time when the ground is likely to have least resistance.

**3** Appendix 4/1 should identify whether the Overseeing Organisation or the Contractor will provide the test equipment and carry out the tests and details of the test posts and foundations should be shown on the Drawings where appropriate. The Contractor should put forward a testing schedule to check compliance with the safety barrier, terminal and transition system manufacturer's specification. The Contractor should arrange to undertake the tests put forward and report the results to the Overseeing Organisation.

## Vehicle Parapets

## NG 406 General

**1** A schedule of vehicle parapets is to be placed in Appendix 4/1. The schedule should list the Containment Performance Classes and Working Width Classes for the proposed vehicle parapets.

### Aesthetic Requirements

**2** The parapet systems should comply with the aesthetic requirements in Appendix 4/1.

**3** The Overseeing Organisation's Architect Planner should be consulted on the aesthetic requirements to be included in Appendix 4/1 and on the systems put forward by the Contractor.

## NG 407 Anchorages and Attachment Systems for Vehicle Parapets

**1** Failures of anchorages in drilled holes are known to occur due to either the lack of cleanliness of the hole or excessive tolerance in the size of the hole. Manufacturers of the anchorages should give details of the maximum tolerance permitted and test evidence that they are satisfactory when installed in holes having these tolerances.

**2** Where attachment systems are used, bolts or nuts should be tightened in accordance with the manufacturer's recommendations to ensure that effective shear transfer will occur between the post baseplate and the base. In addition, it is important to ensure an adequate length of thread engagement.

**3** (05/05) On 1 April 1988 a scheme entitled the 'Highways Authorities Product Approval Scheme (HAPAS)' came into operation administered by the British Board of Agrément. Only those products which have British Board of Agrément HAPAS Roads and Bridges (or fully equivalent scheme) conforming to the specification, should be incorporated into the Works.

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## NG 408 Amendments and Additions to BS 6779

### 1 BS 6779-1: 1998 (Amd. No. 14290, 21 March 2003)

(i) Sealing of voids in anchorages, attachment systems and base plates with a non-setting or setting passive filler is important to prevent ingress of water and to avoid corrosion.

(ii) Prior to the anticipated start of manufacture of vehicle parapet components copies of the most recent certified destructive test reports covering those component types to be supplied under the Contract should be examined. Provision for supply of copies of reports should be included in Appendix 4/1.

(iii) Arrangements should be made for sample components and/or joints for destructive testing to be selected at the works and on site by a Welding Inspector certified by CSWIP or equivalent. Selection should be made taking into account the manufacturer's inspection reports, previous destructive test reports and observations of current production practice on similar component types. Samples should be selected on the basis that they represent the lower end of quality in the production batch. Particular attention should be given to any features which could adversely affect the true throat size or the mechanical properties of the materials.

(iv) For the purposes of defining component types in sub-clause 9.4.3.2.2 of BS 6779-1: 1998 (Amd. No. 14290, 21 March 2003), differences in either member cross-sectional shape, joint configuration or weld type, constitute a change in component type. Variations in cross-section size or member length need not constitute a change in component type. Variations in parent metal thickness or weld throat dimension from the specified sizes on the sample selected for destructive test may be included within the same type up to a limit of ± 40%.

(v) Sample components and/or joints selected for destructive testing in accordance with sub-clause 9.4.3.2.2 of BS 6779-1: 1998 (Amd. No. 14290, 21 March 2003) should be indelibly marked and dispatched to a testing laboratory appropriately accredited in accordance with sub-Clauses 105.3 and 105.4 for weld testing and in the case of aluminium alloy posts, for static load testing in accordance with Annex E of BS 6779-1: 1998 (Amd. No. 14290, 21 March 2003).

(vi) The following points should be considered when ascertaining the acceptability of components subject to destructive testing:

(a) Aluminium alloy posts should be static load tested in accordance with BS 6779-1: 1998 (Amd. No. 14290, 21 March 2003) clause E.1 and E.2 prior to destructive examination.

(b) (11/05) When conducting destructive examination each length of weld between weld ends or changes of direction should be sectioned at intervals not exceeding 100 mm. One side of each section should be ground, filed, linished or machined to a finish equivalent to that produced by a 120 grit paper complying with BS 871, so that the actual throat and leg dimensions can be measured and any discontinuities exposed. One fracture test in accordance with BS EN 1320 on a length of weld of not less than 50 mm should be made for each joint type on each component. Additional sections and fracture tests may be required in cases of borderline acceptance. Non-compliances with the imperfection acceptance levels of BS EN ISO 15614-1 and BS EN 15614-2, as appropriate, should be recorded.

(c) One representative section from each joint type for each type of component should be prepared for macro-examination. A hardness survey should be done where any of the parent material is 20 mm thick or greater. An additional macro-examination should be made of each non-conforming weld.

(vii) The results of the destructive tests including macrographs and load deflection history where relevant, should be reported and a certified copy sent to the manufacturer. In the event of non-conformances being found the Contractor and the manufacturer should be notified as soon as possible. The test specimens, uniquely identified by hard stamped marks should be returned to the manufacturer's works.

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## NG 409 Inspection and Testing of Vehicle Parapet Posts

**1** Provided that the test certificate and the time limit relating to a test previously carried out are satisfactory, these may be used in relation to current work.

## NG 410 Site Tests on Anchorages in Drilled Holes

**1** The Contractor is responsible for designing the anchorages and carrying out Site tests at the frequency given in Appendix 1/5. Any particular requirements should be included in Appendix 4/1.

**2** The Contractor's calculations for the nominal tensile load should have been correctly carried out and checked, before the anchorages are tested.

**3** The Contractor's test record documents should be included in the 'as-built' records.

# PEDESTRIAN RESTRAINT SYSTEMS

## NG 411 Pedestrian Parapets and Pedestrian Guardrails

**1** The type, class and the location of pedestrian parapets and pedestrian guardrails should be described in Appendix 4/1.

# ANTI-GLARE SCREENS

## NG 412 Anti-glare Screens

**1** The requirements of anti-glare screen systems should be described in Appendix 4/1.

Further recommendations and advice for the design and maintenance of anti-glare screens are given in Chapter 12 of the Interim Requirements for Road Restraint Systems. It should be noted that BS EN 12676-1 does not apply to:

(i) Types of anti-glare screens other than those attached to safety barriers and transitions;

(ii) Regulatory characteristics which might be required to ensure that anti-glare systems are compatible with road signs; and

(iii) Specific requirements resulting from extreme environmental conditions.

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# NG SAMPLE APPENDIX 4/1: ROAD RESTRAINT SYSTEMS (VEHICLE AND PEDESTRIAN)

*[Note to compiler: Include here:]*

**1 Location:**

**1.1 Vehicle Restraint Systems**

(i) The location, Containment Performance Class and Working Width Class requirements for safety barriers and transitions are shown on Drawing Nos. ..... *[Generally the 1:500 or 1:1000 Site Plans]*.

(ii) The location, Containment Performance Class and Working Width Class requirements for vehicle parapets are shown on Drawing Nos..... *[Generally the 1:500 or 1:1000 Site Plans]*.

(iii) The location, Performance Class and Lateral Displacement Zone Class requirements for terminals are shown on Drawing Nos. ..... *[Generally the 1:500 or 1:1000 Site Plans]*.

(iv) The location and Performance Level, Velocity Class, Lateral Displacement Zone Class and type of crash cushion [redirective (R) or non-redirective (NR)] for crash cushions are shown on Drawing Nos..... *[Generally the 1:500 or 1:1000 Site Plans]*.

(v) The location and other requirements for concrete vehicle parapets are shown on Drawing Nos..... *[Generally the 1:500 or 1:1000 Site Plans]*.

**1.2 Pedestrian Restraint Systems**

(i) The location for pedestrian parapets and pedestrian guardrails are shown on Drawing Nos..... *[Generally the 1:500 or 1:1000 Site Plans]*.

**1.3 Anti-glare Screens**

(i) The location for anti-glare screens are shown on Drawing Nos..... *[Generally the 1:500 or 1:1000 Site Plans]*.

**2 Other Details:**

**Safety Barriers, Terminals, Transitions and Crash Cushions**

**2.1** Requirements for safety barriers, terminals and transitions if different from the requirements of Clauses 401, 402 and 403.

**2.2** Requirements for crash cushions if different from the requirements of Clauses 401 and 403. *[Compiler to specify whether redirective(R) or non-redirective (NR)]*

**2.3** Any other details *[to be included as required]:*

(i) Any special requirements [e.g. environmental considerations, lengths of removeable safety barrier, ground conditions and loading requirements for structures];

(ii) Specific connection requirements to existing safety barriers, vehicle parapets or other structures.

**Vehicle Parapets Including Anchorages and Attachment Systems**

**2.4** Requirements for vehicle parapets if different from the requirements of Clauses 401 and 406.

**2.5** Aesthetic requirements for vehicle parapets *[Clause 406]*.

**2.6** Requirements for anchorages and attachment systems if different from the requirements of Clause 407.

**Pedestrian Restraint Systems**

**2.7** Requirements for pedestrian parapets and pedestrian guardrails - see also Table C.1 of BS 7818 *[Clause 411]*.

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**Anti-glare Screens**

2.8 Requirements for anti-glare screens *[Clause 412]*.

**3 Testing** *[Cross - reference with Appendix 1/5 as appropriate]*

**Destructive Testing**

**3.1** Requirements for provision of copies of certified reports of destructive tests and for supply of test components *[Clauses 402.6(v) and 408]*.

**Site Testing on Post Foundations**

**3.2** Requirements for site load tests on safety barrier post foundations *[Clause 404]*.

**Inspection and Testing of Vehicle Parapet Posts**

**3.3** Requirements for inspection if different from the requirements of Clause 409.

**3.4** Requirements for static testing of posts if different from the requirements of Clause 409.

**Site Testing on Anchorages in Drilled Holes**

**3.5** Details of testing requirements for anchorage and attachment systems *[Clauses 404 and 410]*.

**4 Temporary Safety Barriers**

*[Note to compiler: State here:]*

(i) Who is to provide temporary safety barriers *[Clause 405]*.

(ii) Containment Performance Class *[Clause 401]*.

(iii) Working Width Class *[Clause 401]*.

(iv) Locations to be provided *[Clause 405]*.

(v) Location for removal of temporary safety barrier on completion of the Works *[Clause 405]*.

(vi) Location(s) from which temporary safety barrier is to be collected and returned by the Contractor if provided by the Overseeing Organisation *[Clause 405]*.

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## 5 Schedule of Road Restraint Systems (Vehicle and Pedestrian)

*[Note to Compiler: Complete the schedule below and include in Appendix 4/1. Incorporate in the schedule all the Road Restraint Systems (i.e. safety barriers, terminals, transitions, vehicle parapets, crash cushions, pedestrian parapets and pedestrian guardrails) and any associated anti-glare screens required. Cross-reference should be made to the Drawings where appropriate. The Road Restraint Systems should be listed in order of occurrence, irrespective of type, and the respective start and end chainages of the proposed systems listed. Containment Performance Class, Performance Class, Performance Level, Velocity Class, Working Width Class and Lateral Displacement Zone Class requirements and other details such as parapet height should be included as appropriate.]*

| **Location & Start Chainage * (m)** | **Finish Chainage (m)** | **Position on Cross-Section** + | **Type of Road Restraint System** ** (Safety barriers, vehicle parapets, transitions, terminals, crash cushions, pedestrian parapets, pedestrian guardrails) | **Set-back (m)** | **Containment Performance Class** ** (Safety barriers, vehicle parapets, transitions) **Performance Class** (Terminals) **Performance Level** (Crash Cushions) | **Available Working Width** ** **(m)** (Safety barriers, vehicle parapets, transitions) | **Working Width Class** ** (Safety barriers, vehicle parapets, transitions) | **Velocity Class** (Crash Cushions) | **Lateral Displace-ment Zone Class** (Terminals, Crash Cushions) | **Redirective (R) or Non-redirective (NR)** (Crash Cushions) | **Other Requirements/ Comments** ** ++ +++ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

NOTE:
- * e.g. Road name, verge, central reserve, slip road etc.
- ** Enter temporary safety barrier where required.
- \+ e.g. LH verge; central reserve, RH hand verge etc.
- ++ Height requirements etc.
- +++ Anti-glare Screens

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# NG SAMPLE APPENDIX 4/2: INFORMATION REQUIRED TO DEMONSTRATE COMPLIANCE OF ROAD RESTRAINT SYSTEMS TO BS EN 1317-1, BS EN 1317-2, BS EN 1317-3 AND DD ENV 1317-4:2002

*[Note to Compiler: Include the following proformas which the Contractor is to complete and submit to the Overseeing Organisation with supporting information to demonstrate compliance of the proposed road restraint system with BS EN 1317-1,BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002].*

**The Contractor shall submit the following supporting information demonstrating compliance with BS EN 1317-1, BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002 to the Overseeing Organisation for acceptance:**

**EUROPEAN COMMITTEE FOR STANDARDIZATION (CEN) COMPLIANCE [1]**

Initial submission documents to be supplied for consideration of initial type test are as follows:

1. Test report in accordance with BS EN1317-1, clause 9 (and including any additional test data required under BS EN 1317-3, clauses 7.3 and 7.4 and DD ENV 1317-4:2002, clauses 7.3 and 7.4).
2. Video/high speed film of test annotated showing date, test number and performance class.
3. Still photographs of complete installation including anchorage points.
4. Still photographs of vehicle before and after impact.
5. Full drawings of tested items.
6. Certification from the manufacturer that the item tested complies with drawings supplied.
7. Certificate from test house accredited in accordance with the requirements of Series 400 (MCHW 1.400).

Additional information, which will be required on acceptance of initial type test prior to installation.

8. Manufacturer's specification.
9. Installation drawings.
10. Manufacturer's installation instructions including foundation requirements and test methods to verify their performance.
11. Manufacturer's repair and maintenance manual.
12. Certificate of compliance with the Quality Management Scheme 1 for the Manufacture of Fencing Components.[2]
13. Compliance with the Quality Management Sector Scheme 2 - Supply and Installation of Fences:
    (i) Sector Scheme 2B for Vehicle Restraint Systems.[2]
14. Certificate of compliance for the Quality Management Sector Scheme 5 for the Fabrication and Installation of Bridge Parapets and Cradle Anchorages.[3]:
    (i) Sector Scheme 5A for The Manufacture of Parapets for Road Restraint Systems; and
    (ii) Sector Scheme 5B for The Installation of Parapets for Road Restraint Systems.
15. Nominal loads (direct forces, moments and co-existent shears) to be transferred from the parapet to the structure or foundation.[2 & 3]

Notes:

1. All documents, which are not in English, will have to be translated. If they are in a language other than French or German the promoter will be required to supply a full translation.
2. Items 12 and 13 are required for safety barrier systems and transitions
3. Items 14 and, 15 are required for vehicle parapets.

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**SUBMISSION FOR COMPLIANCE WITH BS EN 1317-1, BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002**
**TYPE OF VEHICLE RESTRAINT SYSTEM:**
**CONTAINMENT PERFORMANCE CLASS/PERFORMANCE LEVEL/PERFORMANCE CLASS (*):**
**TEST REPORT NUMBER: (Test of )**
**Test Type: (Primary/Complementary Test) (*)**
**TEST NUMBER: TEST DATE:** (*) delete as appropriate

| | |
|---|---|
| COMPANY NAME:<br>CONTACT:<br>ADDRESS:<br>Tel: / Fax:/ E-mail:<br>PRODUCT NAME: | |

**Initial submission documents to be supplied for consideration of Initial Type Test (ITT).**

| Item | | Comment | Item Received (Y or N) | Date requested |
|---|---|---|---|---|
| 1 | Test report | In accordance with BS EN1317-1, clause 9 (and including any additional test data required under BS EN 1317-3, clauses 7.3 and 7.4 and DD ENV 1317-4:2002, clauses 7.3 and 7.4). | | |
| 2 | Video/high speed film | Of test coverage as specified in relevant part of BS EN 1317 or DD ENV 1317-4:2002.<br>Annotated showing date, test number and performance class. | | |
| 3 | Still photographs | Of complete installation including anchorage points. | | |
| 4 | Still photographs | Of vehicle before and after impact. | | |
| 5 | Drawings | Fully detailed drawings of tested item. | | |
| 6 | Certification from the manufacturer | Confirming that the item tested complies with drawings supplied. | | |
| 7 | Confirmation from test house | That the test conforms to the relevant requirements of BS EN 1317-1 (and including any additional test data required under BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002). | | |
| **Additional information, which will be required on acceptance of initial type test prior to installation.** | | | | |
| 8 | System specification | Manufacturer's specification. | | |
| 9 | Installation details | Manufacturer's drawings. | | |
| 10 | Installation procedures | Manufacturer's installation instructions. | | |
| 11 | Maintenance Manual | Manufacturer's inspection, repair and maintenance instructions. | | |
| 12 | Certificate of compliance | With the Quality Management Scheme 1 for Manufacture of Fencing Components.[2] | | |
| 13 | Certificate of compliance | With the Sector Scheme 2B for the Supply and Installation of Fences Vehicle Restraint Systems.[2] | | |
| 14 | Certificate of compliance | With the Quality Management Schemes 5 for the Fabrication and Installation of Bridge Parapets and Cradle Anchorages[3]:<br>(i) Sector Scheme 5A for The Manufacture of Parapets for Road Restraint Systems; and<br>(ii) Sector Scheme 5B for The Installation of Parapets for Road Restraint Systems. | | |
| 15 | Support loads | Nominal loads (direct loads, bending moments and shear forces) that have to be transferred from the vehicle restraint system to the supporting structure or foundation.[3] | | |

**Notes:**

1. All documents, which are not in English, will have to be translated. If they are in a language other than French or German the promoter will be required to supply a full translation.
2. Items 12 and 13 are required for safety barrier systems and transitions.
3. Items 14 and 15 are required for vehicle parapets.

| | |
|---|---|
| Signature: | Name: |
| Date: | |



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**SUBMISSION FOR COMPLIANCE WITH BS EN 1317-1, BS EN 1317-2 and DD ENV 1317-4:2002**
**TYPE OF VEHICLE RESTRAINT SYSTEM:** **Safety Barrier, Vehicle Parapet or Transition (*)**
**CONTAINMENT PERFORMANCE CLASS/LEVEL(*)**
**TEST REPORT NUMBER:** **(Test of )**
**Test Type: (Primary/Complementary Test) (*)**
**TEST NUMBER:** **TEST DATE:** (*) delete as appropriate

| | |
|---|---|
| COMPANY NAME:<br>CONTACT:<br>ADDRESS:<br>Tel: / Fax:/ E-mail:<br>PRODUCT NAME: | |

| | | | Specified | Actual | Satisfactory (Yes or No) | Compliance |
|---|---|---|---|---|---|---|
| BS EN 1317-1, Table 1 | Vehicle Details | **Impact Conditions**<br>Total vehicle mass (kg)<br>Speed (kmh)<br>Angle (degrees) | <br>…… (± …)<br>…… (0, +7%)<br>…… (-1, + 1.5) | | | |
| | | **Centre of Gravity**<br>Vertical height (m)<br>Longitudinal (m)<br>Lateral (m) | <br>…… (± 10%)<br>…… (± 10%)<br>± …… | | | |
| | | Model | | | | N/A |
| BS EN 1317-2, clause 4.2 | Vehicle Restraint System (VRS) Behaviour | 1) The VRS shall contain and redirect the vehicle without breakage of principal longitudinal elements of the system.<br>2) No major part of the VRS shall become totally detached or present an undue hazard to other traffic, pedestrians or personnel in a work zone.<br>3) Elements of the VRS shall not penetrate the passenger compartment of the vehicle. Deformations of, or intrusions into the passenger compartment that can cause serious injuries are not permitted.<br>4) Ground anchorages and fixings shall perform according to the design of the VRS. | | | | |
| BS EN 1317-2, clause 4.3 | Vehicle Behaviour | 1) The centre of gravity (CG) of the vehicle shall not cross the centreline of the deformed system.<br>2) The vehicle shall remain upright during and after impact, although moderate rolling, pitching and yawing are acceptable.<br>3) The vehicle shall leave the VRS after impact, so that the wheel track does not cross a line parallel to the initial traffic face of the VRS, at a distance A (2.2 m) plus vehicle width + 16% of the length of the vehicle within a distance B (10 m) from the final intersection (break) of wheel track with the initial traffic face of the VRS. | | | | |
| BS EN 1317-2, clause 5.3.2 | Installation | 1) The length of the VRS shall be sufficient to demonstrate the full performance characteristics of the system.<br>2) If the VRS has to develop tension, end anchorages shall be provided in accordance with the VRS specification. Post foundation shall meet the design specification. | | | | |
| BS EN 1317-2, clause 4.4 | Severity Indices | **SPECIFIED**<br>THIV Limit 33 km/h<br>PHD Limit 20 g<br>ASI Limit 1.4 | | **ACTUAL**<br>THIV …. … km/h<br>PHD ……. g<br>ASI ……. | | |
| BS EN 1317-2, clause 5.7, Figure 3 | Photo-graphic coverage | 1) Photographic coverage shall be sufficient to clearly describe behaviour and vehicle motion during and after impact.<br>2) High speed cameras shall be operated at a minimum of 200 frames per second and stills.<br>3) As recommended in clause 5.7 and Figure 3. | | | | |
| | Drawings | Drawings included | | | | |
| | | | | | N/A = Not Applicable | |

**FULLY COMPLIES WITH STANDARD: BS EN 1317-1, BS EN 1317-2, DD ENV 1317-4:2002**

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| Signature: | Name: |
| Date: | |



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**SUBMISSION FOR COMPLIANCE WITH BS EN 1317-1 and BS EN 1317-3**
**TYPE OF VEHICLE RESTRAINT SYSTEM:** **Crash cushion** **(Redirective [R] or Non-redirective [NR](*)**
**TEST REPORT NUMBER:** **TEST TYPE: (Primary/Complementary Test) (*)**
**PERFORMANCE LEVEL:** **VELOCITY CLASS:** **(Test of )**
**TEST NUMBER:** **TEST DATE:** (*) delete as appropriate

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| COMPANY NAME:<br>CONTACT:<br>ADDRESS:<br>Tel: / Fax:/ E-mail:<br>PRODUCT NAME: | |

| | | | **Specified** | **Actual** | **Satisfactory (Yes or No)** | **Compliance** |
|---|---|---|---|---|---|---|
| BS EN 1317-1 | Vehicle Details | **Impact Conditions**<br>Total vehicle mass (kg)<br>Speed (kmh)<br>Angle (degrees) | <br>…… (± …)<br>…… (0, +7%)<br>…… (-1, + 1.5) | | | |
| | | **Centre of Gravity**<br>Vertical height (m)<br>Longitudinal (m)<br>Lateral (m) | <br>…… (± 10%)<br>…… (± 10%)<br>± …… | | | |
| | | Model | | | | N/A |
| BS EN 1317-3, clause 6.2 | Crash Cushion Behaviour | 1) Elements of the crash cushion shall not penetrate the passenger compartment of the vehicle. Deformations of, or intrusions into, the passenger compartment that could cause serious injuries are not permitted.<br>2) No major element of the crash cushion, having a solid mass greater than or equal to 2.0kg, shall become totally detached, unless this is required by the working of the crash cushion. No major element of the crash cushion shall impede the path of adjacent traffic. The final position of the detached element shall be considered to determine the displacement classification. | | | | |
| BS EN 1317-3, clause 6.3 | Vehicle Behaviour | 1) The vehicle shall remain upright during and after the collision although yawing and moderate rolling and pitching are acceptable. The post-impact trajectory of the test vehicle shall be controlled by means of the exit box shown in Figure 2 and specified as detailed in Tables 11 and 12. | | | | |
| BS EN 1317-3, clause 7.3.2 | Installation | 1) The installation of the crash cushion for the test shall comply with the structural design details and the on-road system details as given in the design specification. | | | | |
| BS EN 1317-3, clause 5.4 and Table 4 | Impact Severity Levels | **SPECIFIED**<br>Level A: THIV ≤ 44km/h (Tests 1, 2 & 3<br>THIV ≤ 33km/h (Tests 4 and 5)<br>ASI ≤ 1.0<br>Level B: THIV ≤ 44km/h (Tests 1, 2 & 3)<br>HIV ≤ 33km/h (Tests 4 and 5)<br>ASI ≤ 1.4<br>Levels A & B: PHD ≤ 20 g | **ACTUAL** | | | |
| BS EN 1317-3, clause 7.7, Figure 4 | Photo-graphic coverage | 1) High speed cameras and/or high speed video cameras shall be operated at minimum of 200 frames per second.<br>2) Stills<br>3) As recommended in clause 7.7 and Figure 4. | | | | |
| | Drawings | Drawings included | | | | |
| | | | | | N/A = Not Applicable | |

**FULLY COMPLIES WITH STANDARD: BS EN 1317-1 and BS EN 1317-3**

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**SUBMISSION FOR COMPLIANCE WITH BS EN 1317-1 and DD ENV 1317-4:2002**
**TYPE OF VEHICLE RESTRAINT SYSTEM: Terminal**
**PERFORMANCE CLASS: (Test of )**
**Tesr Type: (Primary/Complementary Test) (*)**
**TEST TYPE NUMBER:**
**TEST NUMBER: TEST DATE:** (*) delete as appropriate

| | |
|---|---|
| COMPANY NAME:<br>CONTACT:<br>ADDRESS:<br>Tel: / Fax:/ E-mail:<br>PRODUCT NAME: | |

| | | | Specified | Actual | Satisfactory (Yes or No) | Compliance |
|---|---|---|---|---|---|---|
| BS EN 1317-1, Table 1, DD ENV 1317-4: 2002, clauses 7.4 and 7.5 | Vehicle Details | **Impact Conditions**<br>Total vehicle mass (kg)<br>Speed (kmh)<br>Angle (degrees) | <br>…… (± …)<br>…… (0, +7%)<br>…… (-1, + 1.5) | | | |
| | | **Centre of Gravity**<br>Vertical height (m)<br>Longitudinal (m)<br>Lateral (m) | <br>…… (± 10%)<br>…… (± 10%)<br>± …… | | | |
| | | Model | | | | N/A |
| DD ENV 1317-4: 2002, clauses 5.4 and 5.5.2 | Terminal Behaviour | 1) Elements of the terminal shall not penetrate the passenger compartment of the vehicle. Deformations of, or intrusions into, the passenger compartment that could cause serious injuries are not permitted.<br>2) No major part of the terminal shall become totally detached and come to rest outside the permanent lateral displacement zones defined in clause 5.4.<br>3) Anchorages and fixings shall perform to the terminal design specifications and other specified requirements as listed in the test report. | | | | |
| DD ENV 1317-4: 2002, clause 5.5.3 | Vehicle Behaviour | 1) The vehicle shall not overturn, although rolling, yawingand moderate pitching may be accepted. For the performance class P1 rolling onto a side may be accepted.<br>2) The exit box values for the specified test are as defined in Figures 5.6 and 7 (as appropriate). | | | | |
| DD ENV 1317-4: 2002, clause 7.3.2 | Installation | 1) The terminal shall conform to the structural design details and with the system installation details as given in the design specification of the manufacturer. | | | | |
| DD ENV 1317-4: 2002, clause 5.5.4 and Table 5 | Impact Severity Classes | **SPECIFIED**<br>Level A: THIV ≤ 44km/h (Tests 1, 2 & 3<br>THIV ≤ 33km/h (Tests 4 and 5)<br>ASI ≤ 1.0<br>Level B: THIV ≤ 44km/h (Tests 1, 2 & 3)<br>HIV ≤ 33km/h (Tests 4 and 5)<br>ASI ≤ 1.4<br>Levels A & B: PHD ≤ 20 g | **ACTUAL** | | | |
| DD ENV 1317-4: 2002, clause 7.7 and Figure 7 | Photo-graphic coverage | 1) Photographic coverage shall be sufficient to describe clearly terminal and vehicle motion during and after impact.<br>2) High speed cameras and/or high speed video cameras at a minimum of 200 framer per second.<br>3) Stills. | | | | |
| | Drawings | Drawings included | | | | |
| | | | | | N/A = Not Applicable | |

**FULLY COMPLIES WITH STANDARD: BS EN 1317-1 and DD ENV 1317-4:2002**

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| Date: | |



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