SERIES NG 400
SAFETY FENCES, SAFETY BARRIERS AND PEDESTRIAN GUARDRAILS

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SAFETY FENCES, SAFETY BARRIERS AND PEDESTRIAN GUARDRAILS

NG 401 Performance Criteria for Safety Fences and Safety Barriers

General

1 The safety fences and barriers described in this Series and in the HCD: Section 2 are deemed to meet the criteria given in Clause 401. Other fences and barriers may be acceptable provided they comply with Clause 401 and Clause 104.

2 (05/01) Standard layouts and details, including fabrication requirements for safety fences and safety barriers are shown in the HCD: Section 2.

3 (05/01) The use of Double Rail Open Box Beam (DROBB) safety fence requires additional clearance distances.

NG 402 Components for Safety Fences and Safety Barriers

Contract Drawings

1 Appendix 4/1 should contain a schedule of all the safety fences and barriers required in the Contract. Where operational needs do not determine this choice, the type of safety fence already provided on adjacent lengths of highway should be considered and/or advice sought from the Overseeing Organisation. The Contract should include the relevant drawings shown in the HCD: Section 2.

2 The Drawings should also show the type of intermediate post foundation, (ie. standard driven, long driven, or concrete), which has been selected on the basis of assumed, or wherever possible, tested ground conditions. Where it is anticipated that Wire Rope Safety Fencing may be used attention is drawn to the smaller reaction plate used with this type of fence and the effect on the lateral resistance of the fence post should be considered.

Welding

3 Prior to the anticipated start of delivery of safety fence 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 by UKAS for such tests.

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

(a) 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 nick break test in accordance with BS 709 on a length of weld of not less than 50 mm shall be made for each joint type on each component. Additional sections and nick break tests may be required in cases of borderline acceptance. Non-compliance with the imperfection acceptance levels of BS EN 288 : Part 3 should be recorded. Non-compliance with the requirements of sub-Clause 402.5 should be cause for rejection, except that in sub-Clause 402.5 (iv)(a) the throat and leg dimensions should be the true rather than the apparent dimensions.

(b) 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.

NG 403 Installation of Safety Fences

1 The principal types of safety fences and barriers recommended for use on major roads are classified according to their functional properties. The Overseeing Organisation should be consulted when considering whether safety fences or safety barriers should be provided.

2 Further information on the general design and use of safety fences and barriers may also be obtained from the Overseeing Organisation.

3 Adjustments to line and level of safety fences at connections to bridge parapets may be necessary as noted in the HCD: Section 2.

Anchorages and Attachment Systems

4 Examples of the evidence required by sub-Clause 403.9(i) include (a) the results of testing to BS 5080 by a testing laboratory accredited by UKAS for such test or (b) a Certificate from any UEAtc 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 403.9 is unrealistic then the appropriate time period should be stated in Appendix 4/1.

5 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 403.9(i) should show that these are satisfactory when installed in holes having these tolerances.

6 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.

7 Where safety fence 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.

8 Where safety fence posts are installed on hardened central reserves, the preferred method is by the use of cast-in post sockets. The filler, where used, should prevent the ingress of water and detritus and should be easily removable. Alternatively a sealing cap approved by the Overseeing Organisation may be used.

NG 404 Site Testing

Anchorages in Drilled Holes

1 The anchorage test results should be included with the as-built records.

Post Foundations

2 Testing should be carried out at the location where the posts are to be installed 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.

NG 409 Wire Rope Safety Fence

1. (05/01) Tensioning of interwoven ropes to achieve the correct level of tension throughout the length of the rope may be difficult when there is a tight radius and close post spacing. It has been found that the correct level of tension may be obtained by applying a tensile force of 120% of that required and vibrating the wires by gently tapping the posts with a soft faced mallet. This accelerates the creep and redistribution of the tensile force by reducing the friction between the posts and the interwoven ropes. When a tensile force of between 100% and 120% is recorded along the whole length of the rope the procedure is complete.

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2. Turnbuckles should be lubricated before assembly to facilitate adjustment and/or removal during maintenance or repair of the safety fence.

NG 411 Concrete Safety Barriers

1 (05/01) Temporary Vertical Concrete Safety Barriers (TVCB(80)) as shown in the HCD: Section 2 are for use during construction and maintenance works where the road is subject to a speed limit not exceeding 80 km/h.

2 Temporary Vertical Concrete Safety Barriers can be provided by:

(i) The Contractor as part of Temporary Works and remaining his property.

(ii) The Contractor but becoming the property of the Overseeing Organisation on completion of the Works.

(iii) The Overseeing Organisation for the Contractor's use during the Works.

Appendix 4/1 should state which of the above applies, and where appropriate, details of locations from which they can be collected and/or returned.

3 A Temporary Vertical Concrete Barrier (TVCB (110)) with enhanced performance suitable for use with a speed limit not exceeding 113 km/h is also available. Details of this type of barrier may be obtained from the Overseeing Organisation. Such use should be agreed with the Overseeing Organisation on a site specific basis.

4 A Temporary Higher Vertical Concrete Barrier (THVCB) suitable for the protection of bridge piers and temporary structural supports is available for use where the road is subject to a speed limit not exceeding 80 km/h. Details of this type of barrier may be obtained from the Overseeing Organisation. Such use should be agreed with the Overseeing Organisation on a site specific basis.

5 A Permanent Higher Vertical Concrete Barrier (HVCB) suitable for the protection of bridge piers and other structures/locations is available for use where the road is subject to a speed limit not exceeding 113 km/h. Details of this type of barrier may be obtained from the Overseeing Organisation. Such use should be agreed with the Overseeing Organisation on a site specific basis.

NG 412 Pedestrian Guardrails

1 The type and the location of pedestrian guardrails should be described in Appendix 4/2.

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NG SAMPLE APPENDIX 4/1: SAFETY FENCES AND SAFETY BARRIERS

Sheet 1

[Note to compiler: Include here:]

1 The locations of safety fences and barriers are shown on Drawings Nos .....
[generally the 1:500 or 1:1000 Site Plans]

2 The layout details for safety fences and safety barriers are shown on Drawings Nos .....
[HCD: Section 2 Drawings should be utilised where possible]

3 Fabrication and erection requirements for safety fences are shown on the following Series of Drawings. Appendix 0/4 gives the full list of these Drawings included in the Contract:

Tensioned Corrugated Beam (TCB) Safety Fence	HCD: Section 2, - GA and SF Series
Open Box Beam (OBB) Safety Fence	HCD: Section 2, - GA and SF Series
Double Rail/Single Sided Open Box Beam (DROBB) Safety Fence	Available from Overseeing Organisation
Untensioned Corrugated Beam (UCB) Safety Fence	HCD: Section 2, - GA and SF Series
Combined Open Box Beam (OBB) Safety Fence and Environmental Barrier	HCD: Section 2, - EOB 38 Series
Wire Rope (WR) Safety Fence	Promoter's approved drawings
Rectangular Hollow Section (RHS) Safety Fences	HCD: Section 2, - RHS47 and RHS48 Series

4 Concrete Safety Barriers

[Note to compiler: State here:]

(i) Who is to provide Temporary Vertical Concrete Safety Barriers (TVCB).

(ii) Type of Temporary Vertical Concrete Safety Barrier to be used.

(iii) Location for removal of Temporary Vertical Concrete Safety Barrier on completion of the Works.

(iv) Location(s) from which Temporary Vertical Concrete Safety Barrier is to be collected and returned by the Contractor if provided by Overseeing Organisation.

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NG SAMPLE APPENDIX 4/1: SAFETY FENCES AND SAFETY BARRIERS

Sheet 2

5 Schedule of Safety Fences and Barriers

Safety Fence/ Barrier Type	Location* & Start Chainage (m)	Finish Chainage (m)	Position on Cross Section	Length (m)	End Termination/ Connection Detail		Foundation Type	Post Spacing (m)	Other Comments
					At Start Chainage	At Finish Chainage			

* NOTE: eg. Road name

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NG SAMPLE APPENDIX 4/1: SAFETY FENCES AND SAFETY BARRIERS

Sheet 3

6 Other Details *[to be included as required]*

(a) Any special requirements for materials, fabrication and installation

(b) Any special requirements for post spacings, lengths of closing beams or mounting brackets

(c) Any special welding of components required

(d) Any non-standard connections to bridge parapets, other safety fences, barriers or other structures

(e) Any requirements for non-standard posts

(f) Any special requirements for setting out details

(g) Any requirements for special beam or attachment fabrications for use on radii

(h) Any special requirements, including locations, for expansion joints in safety fences

(i) Details of testing requirements for anchorages and attachment systems, posts and foundations *[cross-referenced in Appendix 1/5]*

(j) Whether cast-in post sockets are to be filled after erection *[403.6]*.

Schedule of Safety Fences and Safety Barriers

[Note to compiler: Schedule within Appendix 4/1 all the safety fences and barriers required using the headings on Sheet 2]

NG SAMPLE APPENDIX 4/2: (05/01) PEDESTRIAN GUARDRAILS

[Note to compiler:

Details should be given here of locations and type of pedestrian guardrails required. Cross-reference may be made to the Drawings where appropriate]