

PARAPETS

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Parapets

2201 General

- 1 Parapets shall be of concrete or metal or a combination of both as required in Appendix 22/1 and shall comply with this Series.
- 2 Concrete parapets shall comply with the relevant Clauses of the 1700 Series.
- 3 Parapet posts shall be vertical and rails shall follow the horizontal and vertical alignment of the bridge.

2202 Metal Parapets

- 1 Unless otherwise described in Appendix 22/1 metal parapets for vehicle containment shall be designed, fabricated, installed and tested in accordance with the requirements of BS 6779 : Part 1 and the additional requirements given in Clause 2204 and UK Department of Transport Standard BD 52 Clauses 8.9 to 8.13 inclusive and Chapter 9.

- 2 When using BS 6779 : Part 1 : 1992, the parapet group designation as given in UK Department of Transport Standard BD 52 for vehicle and vehicle pedestrian parapets shall be taken to have the following equivalent level of containment as defined in BS 6779:

P1; P2 (113 km/h) : Normal level of containment

P2 (80 km/h) : Low level of containment

P5 (excluding footbridges) : Normal level of containment

P6 : High level of containment

- 3 Unless otherwise described in Appendix 22/1 pedestrian parapets shall be in accordance with the requirements of BS 7818.

Aesthetic Approval

- 4 The design of metal parapets other than those described in Appendix 22/1 shall be submitted to the National Roads Authority for aesthetic approval.

2203 Anchorages and Attachment Systems for Metal Parapets for Vehicle Containment

- 1 Unless otherwise described in Appendix 22/1 the design, fabrication and installation of the anchorage and attachment system shall comply with the requirements of BS 6779 : Part 1 : 1992 and the additional requirements given in Clause 2204.
- 2 The anchorages and attachment systems shall be designed to Limit State principles in accordance with Appendix B of BS 6779 : Part 1 : 1992.
- 3 Only anchorages complying with 2203.1 & 2203.2 and having a current Irish Agrément Board Roads and Bridges Certificate shall be incorporated into the Works. At least 4 weeks before installation commences the Contractor shall submit to the Engineer a copy of the certificate together with copies of all documents referred to therein. Anchorages in drilled holes of an expanding type shall not be used.
- 4 For anchorages in drilled holes, the hole location shall be checked to ensure that the hole will be clear of reinforcement before drilling is carried out.
- 5 Before installation of anchorages in drilled holes, the hole shall be sound, clean and dry and the tolerance of the hole shall be within the values given by the anchorage manufacturer.
- 6 Attachment systems shall be tightened to the appropriate torque.

2204 Amendments and Additions to BS 6779 : Part 1 : 1992

Clause 12.1

Insert additional sentence at end of clause as follows:

"The anchorage shall include an internally threaded component to receive the holding down bolt."

Clause 12.3

Insert additional paragraph as follows:

"For all metal parapets the stainless steel holding down bolts shall comply with BS 6105 grade A4-80. Plain stainless steel washers shall comply with BS 4320 and be made from stainless steel strip grade 316 S 31 or 316 S 33 complying with BS 1449 : Part 2."

Clause 12.5

Insert additional paragraph as follows:

"All voids in anchorages, attachment systems and base plates shall be filled with a non-setting passive filler to prevent the collection of water."

End of Note 1, insert:

"The tensile strength of concrete should be ignored in the calculation."

Delete Note 3.

Clause 12.6

Replace last sentence as follows:

"The bearing stresses developed in any bedding or in the concrete plinth shall be checked at serviceability limit state using partial load factor equal to 1.0. The limiting compressive stress shall be limited to $0.5 \times f_{cu}$ where f_{cu} is the characteristic concrete cube strength."

Clause 12.8

Delete the wording in (c) and insert the revised wording as follows:

(c) All parts of cradle anchorages and anchorages in drilled holes shall be made of stainless steel grade 316 S 31 or 316 S 33 to BS 970 : Part 1 where they are within 80 mm of the upper surface of the plinth or coping, or where the parts are threaded to receive the stainless steel holding down bolt."

Insert additional requirement as follows:

(d) When packers are used under base plates to facilitate construction, they shall be made of materials which do not corrode unless the packers are to be removed prior to placing the grout. Aluminium packers, if used, shall be removed prior to grouting and the parapet suitably supported."

Clause 19

Delete Clause 19 and insert the following:

"19 Workmanship, Inspection and Testing

19.1 General

19.1.1 Laminar Defects. Steel base plates shall not have lamination defects exceeding the limits specified in BS 5996 for quality grade LC2.

19.1.2 Cutting. Flame cut surfaces on steel components shall be smooth and free from gutters.

Cutting of aluminium alloy components shall be in accordance with BS 8118 : Part 2.

19.1.3 Forming of Holes. Holes in steel components shall be drilled except that:

(a) holes may be punched full size in cleats and brackets where the thickness of the material does not exceed 10 mm and where the fabrication is not subject to repeated stresses;

(b) slotted holes may be flame cut.

Holes in aluminium alloy components shall be in accordance with BS 8118 : Part 2.

19.2 Welding

19.2.1 General. Arc welding of carbon manganese steels shall comply with BS 5135. Arc welding of aluminium alloys shall be in accordance with BS 3019 or BS 3571 as appropriate. Processes other than arc welding shall be to the approval of the Engineer. Welding of stainless steel anchorages shall be in accordance with BS 7475.

19.2.2 Welding Procedures. Written welding procedures shall be used with testing in accordance with IS EN 288 : Parts 1, 2 and 3 for steel and Parts 1, 2 and 4 for aluminium alloys and shall apply to all production and repair procedures. These shall be subject to reapproval after a period of seven years. When applying IS EN 288 : Part 3, the welding consumables and procedures used shall be such that the mechanical properties of deposited weld metal will not be less than the respective minimum specified values of the parent metal being welded. Weld procedures for aluminium alloy posts shall be verified by means of a static load test conducted not less than 3 days after welding in accordance with Appendix F of this

Part of BS 6779 and the acceptance criteria shall be as in 27.3.3(a), but adjusted for any differences between the actual and the nominal metal thickness at the fracture line. The test shall be deemed to be invalid if the weld size is less than the nominal size or more than 15% above it. Testing shall be by a laboratory appropriately accredited by ILAB for weld testing. Approval shall be by an Independent Inspecting Authority using appropriately qualified Welding Engineers, Welding Quality Engineers or equivalent.

19.2.3 Welder Qualification. All welders shall be approved to IS EN 287 : Part 1 for steel and Part 2 for aluminium alloys. The tests shall include in addition application tests on all transverse butt welds in steel rails and aluminium alloy post bases. Welders shall be subject to reapproval after two years. Testing shall be by a laboratory appropriately accredited by ILAB for weld testing. Approval shall be by an Independent Inspecting Authority using appropriately qualified Welding Engineers, Welding Quality Engineers or Welding Inspectors.

19.2.4 Production Inspection and Testing

19.2.4.1 Inspection Personnel. The manufacturer shall provide suitable personnel to carry out inspection of production welds as required by 19.2.4.2 to 19.2.4.4. Personnel conducting visual inspection shall have a nationally recognised certificate of competence appropriate to the type of welding being inspected. Personnel conducting non-destructive testing (NDT) shall be certified according to a recognised certification scheme appropriate to the equipment used and the weld groups inspected. Evidence of training and qualification shall be retained and made available for examination when required. The results of all weld inspections shall be recorded.

19.2.4.2 Visual Inspection. All production welds shall be subject to visual inspection in accordance with BS 5289 prior to NDT and protective treatment. Weld surfaces shall be free of slag residues and sharp edges. All surfaces shall be free of traces of weld spatter, arc strikes and contaminants. Weld quality shall comply with the guidance given for Quality Level C in IS EN 25817, however, undercut shall not result in a section loss of more than 5% over any 50 mm length of joint, nor shall its depth exceed 0.5 mm or 10% of the thickness, whichever is the less.

19.2.4.3 Magnetic Particle Inspection (MPI) and Liquid Penetrant Inspection. MPI shall be

applied in accordance with BS 6072 to joints in steel parapets selected in accordance with 19.2.4.5 below. Liquid penetrant inspection in accordance with BS 6443 shall be applied to transverse welds in aluminium alloy posts as selected in accordance with 19.2.4.5. Notwithstanding the requirements of 19.2.4.5, one of the above methods shall be applied as appropriate where on visual inspection, the presence of cracking or lack of fusion may be suspected. To aid inspection the profile of the joint may be dressed by burr grinding provided that the specified throat size and leg length is still maintained. The surface of the weld shall be free of cracks, lack of fusion and slag.

19.2.4.4 Ultrasonic Testing. Post shaft to base plate joints selected in accordance with 19.2.4.5 below shall be ultrasonically tested in accordance with BS 3923 where the post column is butt welded and is 8 mm thick or greater in the traffic face half of the post section or, if fillet welded, the leg length is 12 mm or greater. For aluminium alloys the principles in BS 3923 shall be applied. Weld quality shall comply with the guidance given for Quality Level B in IS EN 25817.

19.2.4.5 Frequency of Non-destructive Testing (NDT). Joints for MPI, liquid penetrant inspection or ultrasonic testing shall be selected as follows:

10% of components of each type shall be inspected. If non-conformances are found, the scope of testing shall be doubled. If further non-conformances are found, the whole batch shall be tested.

19.2.4.6 Reporting. Inspection records for production welds shall be retained by the manufacturer for three years and those covering the production periods relating to the components supplied shall be made available for examination.

19.2.5 Destructive Testing

19.2.5.1 Previous Test Reports. Copies of certified reports of destructive tests on components supplied under earlier roads contracts shall be provided at the request of the Engineer.

19.2.5.2 Supply of Test Components. The Contractor shall supply complete components or sample joints cut from components for destructive testing as selected by the Engineer. The basis of selection shall be as follows:

- (a) For orders containing 1 to 150 posts – One complete intermediate post for each

type, unless successful destructive testing has been carried out within the last 6 weeks on a post of that type, where the post to be tested was selected by the Engineer to another contract.

- (b) For orders of 151 to 300 posts – One complete intermediate post for each type.
- (c) For orders exceeding 300 posts – Two complete intermediate posts for each type.
- (d) For orders containing 1 to 200 intermediate shop or site welded rail splices – One shop splice and one site splice, as appropriate, for each order.
- (e) For orders containing more than 200 intermediate shop or site welded rail splices – Two shop splices and two site splices, as appropriate, for each order.
- (f) For all other components, including end posts, post anchorages, safety fence connections and other components – One component for each type, unless successful destructive testing has been carried out within the last 6 months on a component of that type, where the component to be tested was selected by the Engineer to another contract.

19.2.5.3 Acceptance Criteria. The acceptance criteria shall be as specified in 19.2.4, except that in 19.2.4.2 the throat and leg dimension shall apply to the true rather than the apparent dimension. Where posts have been subjected to static load testing the acceptance criteria in 27.3.3(a) and (b) shall also apply.

19.2.5.4 Non-conformance. In the event that there is a non-conformance arising from a serious deviation in materials, preparation, assembly or welding procedure, the batch concerned shall be rejected and further production of the components affected stopped until such time as the fault has been corrected. A minor non-conformance shall only be accepted on the basis that further sampling and testing shows that fault is not repetitive and in the view of the Engineer will not in that instance impair structural integrity.

If the problem can be traced to a particular manufacturing period, operator, piece of equipment or batch of materials and if proper traceability to individual batches of components can be assured, only those batches affected may be subject to rejection.

19.2.5.5 Test Reports. The destructive test reports shall be retained by the manufacturer and recorded in a register for a period of three

years. The destructive test specimens shall be retained for a period of 18 months. These shall be made available for examination on future roads contracts.

19.2.6 Remedial Work. Welds which do not comply with the Specification may be repaired to an approved procedure, as described in 19.2.2 above. Welds in aluminium alloys shall not be repaired more than once."

Clause 20

Delete Clause 20 in its entirety.

Clause 26.1

Insert additional paragraph as follows:

"The Contractor shall arrange for third party certification that the new parapet design complies with the requirements of this standard. The certification shall be undertaken by a body or testing laboratory in a Member State of the European Communities, offering suitable and satisfactory evidence of technical and professional competence and independence. The Engineer is likely to require to examine the full record of testing."

2205 Bedding Mortar

- 1 Bedding mortar shall comply with Clause 2601.

2206 Protection Against Corrosion

- 1 Surface preparation and protection against corrosion shall comply with the 1900 Series. All steel parapets, mesh and infill panels shall be galvanised after shop fabrication to comply with Clause 1911. Backing materials used internally in site welded rail joints may be provided without a surface finish.

2207 Inspection and Testing of Parapet Posts

- 1 Unless otherwise described in Appendix 22/1, the components for production posts and all completed production posts will be subject to visual and dimensional inspection by the Engineer at the place of fabrication. The acceptance criteria are described in Clause 27 of BS 6779 : Part 1 : 1992.

- 2 Unless otherwise described in Appendix 22/1, the Contractor shall only supply parapet posts of a type which have certification for static destructive testing in accordance with Clause 27 of BS 6779 : Part 1 : 1992. The post test shall be carried out to the approval of the Engineer. The test certificate shall be valid for a period of six months from the date the posts were tested and certified.

2208 Site Tests on Anchorages in Drilled Holes

- 1 The Contractor shall carry out Site tests on anchorages in drilled holes. For the purpose of this sub-Clause the phrase 'Type of fixings' as defined in Clause 1.2 of BS 5080 : Part 1 : 1974 (1982) shall include 'anchorages'. Where anchorages are tested they shall be loaded incrementally in tension in accordance with BS 5080 : Part 1 : 1974 (1982) except that they shall be capable of resisting a test load equal to 10 per cent above the nominal tensile load to be resisted by the anchorage in lieu of testing to failure. The nominal tensile load shall be determined in accordance with the criteria given in Appendix B of BS 6779 : Part 1 : 1992. Incremental loads shall be held for not less than half a minute and the test load for not less than five minutes. Readings shall be taken immediately after applying load and at the end of the time intervals stated above.
- 2 The total movement of the anchorage shall not exceed 1.0 mm during the test. Any evidence of slip during loading up to the test load, as demonstrated by a significant change in the slope of the load/extension curve, shall constitute failure. A test rig deemed to be equivalent to that shown in Figure 10 of BS 5080 : Part 1 : 1974 (1982) is contained in UK Department of Transport Highway Construction Details : Section 2.
- 3 The Contractor shall test the anchorages at the frequency given in Appendix 1/5 and in accordance with any requirements given in Appendix 22/1.