THE HIGHWAYS AGENCY

THE SCOTTISH OFFICE DEVELOPMENT DEPARTMENT

THE WELSH OFFICE
Y SWYDDFA GYMREIG

THE DEPARTMENT OF
THE ENVIRONMENT FOR NORTHERN IRELAND

BA 32/89

Technical Approval of Highway Structures on Motorways and Other Trunk Roads Part I: General Procedures

Summary: This Advice Note gives guidance on the general procedures for the technical approval requirements for highway structures on Motorways and other Trunk Roads.

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SECTION 1	APPROVAL PROCEDURES

BA 32/89

TECHNICAL APPROVAL OF HIGHWAY STRUCTURES ON MOTORWAYS AND OTHER TRUNK ROADS PART I: GENERAL PROCEDURES

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October 1989

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1. INTRODUCTION

1.1 This Advice Note should be read in conjunction with Departmental Standard BD 2/89, Part I. It gives further guidance on the application of the technical approval procedures for highway structures under, over or adjacent to motorways and other trunk roads. The procedures apply to all structures in the Department's contracts.

1.2 This document does not provide advice on the application of Departmental Standard BD 2/89, Part III - civil, mechanical and electrical content of tunnels. Hence early contact should be made to Bridges Engineering Division (BE) for technical approval of all tunnel schemes.

2. SCOPE

2.1 The procedures apply to the design, assessments, alterations, strengthening and repairs of all highway structures: these include bridges, tunnels, subways, culverts, retaining walls, reinforced earth structures, signs/signal gantries, catenary lighting systems, high masts for lighting and television cameras, pipe bridges, sign/signal mast arm structures, inspection gantries, buried corrugated steel structures, noise barriers, and temporary structures under or over motorway or other trunk road carrying public traffic and any other such structures that BE decide fall within the scope of technical approval procedures. For any other structures, BE should be approached to ascertain whether they fall within the scope of these procedures.

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3. DEFINITION OF TECHNICAL APPROVAL

3.1 Technical approval (TA) can consist of several stages including outline agreement to form of structure within overall scheme concept, development of Approval in Principle (AIP) document and certification. It is a continuing process and can involve many discussions between the designer and the TAA; so to avoid programme delays, it is advisable that preliminary discussions should take place at a very early stage before the AIP document id drafted. Any special criteria and departures from standards requiring BE agreement should be identified as early as possible. Delays can arise when the TAA or BE are brought in at a late stage. The scheme preparation programme should allow adequate time for the TA procedures.

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4. THE ROLE OF THE TECHNICAL APPROVAL AUTHORITY (TAA)

4.1 The category of structure check should be agreed with the TAA at an early stage and could well be prior to formal application for AIP.

4.2 Any potential Category III, indicated by the guidelines of paragraph 6.5, should be identified as early as possible and the Regional Office should send a brief description of the structures to BE with a recommendation and reasons for the proposed category.

4.3 Proposed departures from, or aspects not covered by Standards, including additional criteria and specification clauses, are to be submitted to BE Division for acceptance together with the Designer's reasons and justification with a recommendation by the TAA. All criteria should be submitted as soon as the need has been identified, in the case of design criteria preferably prior to AIP, and the TAA should ensure that any accepted criteria are entered on the certificate and sent to BE for formal endorsement by HOD at least four weeks prior to tender invitation.

4.4 The BE Architect/Planner provides advice on the aesthetic aspects of the design and appearance of highway structures in the environment. Major structures and those in environmentally sensitive locations, such as National Parks, Areas of Outstanding Natural Beauty, Green-Belts, Urban areas, etc, may require submission to the Royal Fine Art Commission (RFAC). Early consultation should take place between the TAA and the BE Architect/Planner to determine the extent and timing of RFAC involvement. The TAA must be satisfied about the choice and form of structure prior to any RFAC submission and completion of AIP should await the outcome of the submission.

5. THE ROLE OF BE DIVISION

5.1 To avoid abortive work or disruption to the scheme programme BE should be advised, at an early stage, of any structures for which it may have to act as TAA. Any cases of doubt should be referred to BE for a decision. Where BE is TAA it will liaise with the Regional Office on matters of road alignment, scheme programme together with access and maintenance provisions, etc and coordinate with the Regional bridge engineer on matters of common interest.

5.2 Should the TAA, the Designer and the Checker disagree over the interpretation of any requirement or applicability of a Code or Standard, the matter should be referred to BE by the TAA with a recommendation for a decision. This may result in a directive being given by HOD, BE.

5.3 Where the need for additional criteria, interpretation of standards or resolution of differences occurs after AIP, it may be appropriate to record such information on an addendum to the AIP document which subsequently would be included in the certificate.

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6. APPROVAL IN PRINCIPLE

6.1 The purpose of AIP is stated in paragraph 6.1 of BD 2/89 Part I. It is intended that any other aspect which could affect the integrity of the structure be identified and taken into account at this stage. The relative merits of different forms of constructions eg steel, concrete etc, should be considered and the most economic span and form of construction in each medium investigated. The cost of future access and maintenance should be considered where this varies with the type of structure. The maintaining authority should be consulted about access and maintenance provisions.

6.2 The information required for AIP will vary and is unique for each structure; however an AIP model which should be suitable for the majority of structures is given at Appendix A. This is a comprehensive document drawn up to cover the design of new bridges; some of the information requested may not be applicable to other types of structures or other purposes, eg assessment. Only information pertinent to the particular AIP is needed by the TAA; irrelevant information should not be included for the sake of completing a form, eg 3.7, 3.8, 3.9 and 3.10 may have no relevance in AIP for assessment. On the other hand the TAA may ask for additional information before AIP can be granted. The initial AIP for assessments will cover the standards to be used, material properties any known special criteria and methods of analysis, etc. It is unlikely to cover departures from standards and shortfalls because in most cases they will not be identified before the structural analysis has been carried out; these can be covered by addenda to the AIP.

6.3 AIP is a continuing process and the period required for consideration will vary according to the size and complexity of the structure and the items falling outside current design standards. The TAA may agree certain aspects of the AIP submission in outline as the consideration of the proposals proceed prior to formal acceptance of the final AIP.

6.4 The AIP submission is required to have original signature and when signed as accepted by the responsible engineer within the TAA, is to be retained by the Department. A facsimile of the endorsed approval in principle will be returned to the Designer to confirm AIP has been granted.

6.5 All highway structures are to be placed in one of four categories in order to establish the need for AIP and the type of independent check. The following guidelines are not rigid boundaries and each case will be decided on its merits having regard to cost, complexity and consequences of failure.

a) Category 0 - Minor Structures with the features described in paragraph 6.6 and 6.7 below and noise barriers.

b) Category I - Simple Structures which contain no departures from or aspects not covered by current Departmental Standards and which are either a) single simply supported spans less than 20 m with less than 25° skew, b) buried concrete box type structures with less than 7.5 m span, c) corrugated steel buried structures, or d) retaining walls with a retained height of less than 7 m.

c) Category II - Intermediate Structures ie all those not within the parameters of categories 0, I & III.

d) Category III - Complex Structures with any one of the following features:- High redundancy, unconventional design aspects, any span exceeding 50 m, skew exceeding 45°, difficult foundation problems, Estimated cost over £2.0 m at 1988 prices, etc.

All assessment, strengthening and maintenance work, other than routine maintenance covered by the Department's Codes of Practice - TRMM 4/85, also falls within the scope of this standard and normally shall be categorised on the same basis that the original structure would have warranted. The TAA should take account of the cost together with structural significance and complexity when considering category and BE is available to advise in cases of doubt.

6.6 Individual structures with an estimated cost of less than £50,000, (1988 prices) for which all aspects of design and construction are covered by standards contained in the current TAS and relevant Departmental Standards issued subsequent to this TAS, may be classified as Category 0 provided they are either (a) single span of under 10 m and

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statically determinate or (b) buried structures less than 3m clear span/diameter, or multicell buried structures where the cumulative span is less then 5 m, having more than 1m cover. Brief details of any such proposals, preferably shown on a general arrangement drawing, should be submitted by the Designer to the TAA for agreement of category.

6.7 Assessments for single span simply supported structures under 10m and masonry arches under 6.5 m span, provided the assessment is being carried out fully in accordance with the current Departmental Standards, may be classified as Category 0.

7. DESIGN

7.1 Any addenda to the AIP during the design stage will be subject to the same procedures as the original submission as described in paragraph 6.4 above.

7.2 Global analysis and load effect computer programs should be validated and calibrated and will be the responsibility of the Designer. Computer programs will not be treated as departures from standard provided they are based on established structural principles. It is a matter for the designer to ensure that small 'in-house' computer programs which replace calculations in long hand, are verified by an alternative method. Such programs should not be subject to AIP.

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8. CHECKING

8.1 In the case of category III, the independent checker should be appointed by the Designer subject to BE agreement.

8.2 It is not intended that the start of the check should await the completion of the design; both can proceed together as far as possible so that agreement or resolution of differences is obtained progressively through the design period.

8.3 Should any disagreement arise between Designer and Checker, they should try to resolve it but it is important that any unresolved issues are submitted immediately to the TAA to avoid delay to the scheme programme. If the disagreement cannot be resolved by the TAA, then the matter should be referred by the TAA to BE with recommendations for any endorsement, if necessary, by HOD, BE.

8.4 For some structures the TAA may call a pre-certification meeting with the Designer and the Checker, to discuss their findings prior to accepting certificates.

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9. CERTIFICATION

9.1 Bar bending schedules should be identifiable and are to be included on the certificates together with the list of drawings.

9.2 The certificates in Appendix B of the Standard cover most normal requirements but occasionally situations may arise which require a special certificate. In such situations the wording should be agreed with the TAA and should be broadly on the lines of the existing certificates.

9.3 Only one certificate of each type required for the Category need be submitted with original signatures, and when signed as accepted by the responsible engineer within the TAA and endorsed by HOD, BE when necessary, is to be retained by the TAA. A facsimile will be returned to the Designer and the Independent Checker, as relevant, to confirm completion of the technical approval procedures.

9.4 Certificates for Category 0 structures should be accompanied by a general arrangement drawing.

10. SUBSEQUENT PROCEDURE

10.1 For temporary structures proposed by a contractor, the loading and design criteria should be related to the particular requirements of the structure's purpose and location having regard to the temporary nature of the structure. Any departures from, or aspects not covered by, standards and additional criteria require the agreement of HOD, BE before implementation in the design. Temporary structures will normally be regarded as Category II unless they are particularly complex when Category III will apply. Temporary structures do not include temporary works provided by the Contractor to enable him to construct the permanent structure under the contract, which are covered by the requirements of Technical Memorandum BE 1/74.

10.2 An alternative design submitted by a contractor should be examined by the Engineer to ensure that it is structurally viable and he should inform the TAA accordingly. The alternative design will be subject to AIP before acceptance and the TAA should be satisfied on all relevant factors to ensure overall benefit to the Department. These factors should include direct saving between the alternative and the original designs, appearance, provision of maintenance facilities and cost of additional future maintenance requirements, any extra construction work, acquisition of land, possible delay to programme, additional specialist inspection charges, reimbursable costs by outside bodies, additional staff resources of the Engineer and the Department including the independent checking of the design. Following AIP and normally prior to construction, the Contractor will normally submit a design certificate and the Engineer an independent check certificate to the TAA. Final approval of the design will follow acceptance of the design and the check certificates by the TAA and the Engineer will assume responsibility for the design of the permanent works.

10.3 Only in exceptional cases, interim certification on parts of the structure may be accepted in order to expedite construction work. All such interim certification shall however be superseded by the final design and check certifications upon completion of the design of the whole structure. It must be made clear to the Contractor that he will be responsible for the costs of any works or alterations which may arise out of partial or complete invalidation of an earlier interim certificate by the final certificates.

10.4 Copies of TA Database input sheets should be obtained from the Regional Office.

11. DOCUMENTS REFERRED TO IN THE TEXT

Departmental Standard BD 2/89, Part I & Part III

Trunk Road Management and Maintenance Notice TRMM 4/85

Technical Memorandum BE 1/74

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12. ENQUIRIES

Technical enquiries arising from the application of this Departmental Advice Note to a particular structure should be addressed to the Technical Approval Authority for that scheme.

All other enquiries or comments should be sent in writing to:

Head of Bridges Engineering Division
Department of Transport
St Christopher House
Southwark Street
LONDON
SE1 0TE

Quoting reference:
BE 1/001

Orders for further copies of this Departmental Standard should be accompanied by the remittance shown on the cover and addressed to:

DOE/DTp Publications Sales Unit
Building One
Victoria Road
South Ruislip
Middlesex HA4 0NZ

Telephone No: 01- 841 3425

APPROVAL IN PRINCIPLE

1. NAME OF SCHEME .....

   1.1 Type of Highway
   1.2 Permitted traffic speed (for a bridge give over and/or under).

2. NAME OF STRUCTURE .....

   2.1 Obstacle crossed

3. PROPOSED STRUCTURE

   3.1 Description of Structure
   3.2 Structural type)
   3.3 Foundation type) Include reasons for choice
   3.4 Span arrangements)
   3.5 Articulation arrangements)
   3.6 Parapet type
   3.7 Proposed arrangements for inspection and maintenance
   3.8 Materials and finishes
   3.9 Estimated cost of proposed structure together with other structural forms considered and the reasons for their rejection including comparative costs with date of estimates
   3.10 Reasons for the non-adoption of Standard Bridge designs

4. DESIGN/ASSESSMENT CRITERIA

   4.1 Live Loading, Headroom
      4.1.1 HA loading
      4.1.2 HB loading ..... units
      4.1.3 Footway or footbridge live loading
      4.1.4 Provision for exceptional abnormal loads
         4.1.4.1 Gross weight ..... tonnes on vehicle No .....
         4.1.4.2 Axle load and spacing
         4.1.4.3 Air cushion ..... tonnes over .....mx .....m
         4.1.4.4 Location of vehicle track on deck cross-section
      4.1.5 Any special loading not covered above
      4.1.6 Departmental heavy or high load route requirements and arrangements being made to preserve the route
      4.1.7 Minimum headroom provided .....m
      4.1.8 Authorities consulted and any special conditions required
   4.2 List of relevant documents from the TAS (dated .....)
      4.2.1 Additional relevant DOT Standards published since the above edition of the TAS including amendments
   4.3 Proposed departures from standards given in 4.2 and 4.2.1
   4.4 Proposed methods of dealing with aspects not covered by standards in 4.2 and 4.2.1

5. STRUCTURAL ANALYSIS

   5.1 Methods of analysis proposed for superstructure, substructure and foundations
   5.2 Description and diagram of idealised structure to be used for analysis
   5.3 Assumptions intended for calculation of structural element stiffness
   5.4 Proposed earth pressure coefficients (ka, ko or kp) to be used in design of earth retaining elements.

6. GROUND CONDITIONS

6.1 Acceptance of interpretative recommendations of the soils report to be used in the design and reasons for any proposed departures.
6.2 Describe foundations fully including the reasons for adoption of allowable and proposed bearing pressures/pile loads, strata in which foundations are located, provision for skin friction effects on piles and for lateral pressures due to compression of underlying strata, etc.
6.3 Differential settlement to be allowed for in design of structure
6.4 Anticipated ground movements or settlement due to embankment loading, mineral extraction, flowing water, measures proposed to deal with these effects as far as they affect the structure
6.5 Results of tests of ground water and any counteracting measures proposed.

7. CHECKING

7.1 Proposed category of structure.
7.2 If Category III, name of proposed Independent Checkers.
7.3 Erection proposals or temporary works for which the Contractor will be required to arrange an independent check listing the parts of the structure affected with reasons for recommending an independent check.

8. DRAWING AND DOCUMENTS

8.1 List of drawings (including numbers) and documents accompanying the submission.

9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE

Signed .....

Name .....
Team Leader, Design Office

_____ _____
(Name of Organisation)

Date .....

10. THE ABOVE IS AGREED SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW

Signed .....
BE/ ..... RO(T) TAA

Name .....

Date .....

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ADVICE NOTES RELEVANT TO TAS (JUNE 1989)

(TAS - 8.1) TRAFFIC ENGINEERING AND CONTROL

TA 26/81 - Withdrawal of Motorway Design Memorandum (H9/71)

TA 28/82 - Layout of Roads in Rural Areas, Guide to Revisions 1982

TA 32/82 - Roads in Urban Areas - Revisions

TA 45/85 - Gaps in Central Reserve Safety Fences

(TAS - 8.2) BRIDGES AND STRUCTURES

BA 1/78 - User Guide for Slab and Pseudo-Slab Bridge Decks

BA 2/79 - Wood Armer Post Processor for Grids (BD 6/81)

BA 3/80 - Drawings of F E & Grillage Meshes - Grafnet (BD 6/81)

BA 6/81 - Dynamic Behaviour of Bridges - Brgvib (BD 6/81)

BA 8/81 - Pile Group Analysis; P Group (BD 6/81)

BA 9/81 - Use of BS 5400: Pt 10: 1980: CP for Fatigue (BD 9/81)

BA 10/82 - FE Program for Earthworks (BD 6/81)

BA 12/82 - Corrugated Steel Buried Structures (BD 12/82)

BA 16/84 - The Assessment of Highway Bridges and Structures (BD 21/84)

BA 17/84 - Standard Bridges - Operational Guide (BD 19/83)

BA 19/85 - The Use of BS 5400: Part 3: 1982

BA 21/85 - Coldes 2 Computer Program HCSL/B/12 (BD 6/81)

BA 22/86 - Pile Group Analysis, Computer Program HCSL/B/35 (MPILE) (BD 6/81)

BA 23/86 - The investigation and Repair of Concrete Highway Structures

BA 24/87 - Early Thermal Cracking of Concrete (BD 28/87)

BA 25/88 - Piled Foundations (BD 32/88)

BA 26/88 - Expansion Joints for use on Highway Bridge Decks (BD 33/88)

BA 27/88 - QA Scheme for Points and Similar Protective Coatings (BD 35/88)

BA 28/88 - The Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures (BD 36/88)

BA 32/89 - Technical Approval of Highway Structures on Motorway and Other Trunk Roads

(TAS - 8.3) HIGHWAYS

HA 34/87 - Ground Investigation Procedure