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**VOLUME 1    HIGHWAY STRUCTURES:  
                  APPROVAL PROCEDURES  
                  AND GENERAL DESIGN**  
**SECTION 1    APPROVAL PROCEDURES**

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**PART 1**

**BD 2/12**

**TECHNICAL APPROVAL OF HIGHWAY  
STRUCTURES**

**SUMMARY**

This Standard specifies the procedures for Technical Approval for Highway Structures. It updates and supersedes BD 2/05.

**INSTRUCTIONS FOR USE**

This revised Standard is to be incorporated in the Manual.

1. This document supersedes BD 2/05, which is now withdrawn.
2. Remove existing contents pages for Volume 1, and insert new contents page for Volume 1, dated May 2012.
3. Remove BD 2/05, which is superseded by BD 2/12, and archive as appropriate.
4. Insert BD 2/12, in Volume 1, Section 1, Part 1.
5. Archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.



THE HIGHWAYS AGENCY



TRANSPORT SCOTLAND

An agency of  The Scottish Government



WELSH GOVERNMENT  
LLYWODRAETH CYMRU

Llywodraeth Cymru  
Welsh Government



THE DEPARTMENT FOR REGIONAL DEVELOPMENT  
NORTHERN IRELAND

# Technical Approval of Highway Structures

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**REGISTRATION OF AMENDMENTS**

<b>Amend No</b>	<b>Page No</b>	<b>Signature &amp; Date of incorporation of amendments</b>	<b>Amend No</b>	<b>Page No</b>	<b>Signature &amp; Date of incorporation of amendments</b>

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**PART 1**

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# 1. INTRODUCTION

## General

1.1 This Standard specifies the Technical Approval (TA) procedures for highway structures on motorways and other trunk roads or designated roads.

1.2 Major changes in this version of BD 2 are (all clause references quoted are for this version of BD 2 unless stated otherwise):

- Amended clauses to make reference to the Overseeing Organisation's current requirements for the use of Eurocodes for the design of highway structures.
- Amended clauses and model AIP to include CDM co-ordinator, which is stipulated in Construction (Design and Management) Regulations 2007.
- Amended clauses to replace reference of Type A and Type B Proposals for temporary works with Type S and Type P Proposals respectively.
- Clause 2.13.1: added a new item for 'structural resilience'.
- Clause 2.29: clarified the need for an addendum to AIP and/or additional certificate where changes are made to the design during construction.
- Clause 2.34: clarified some aspects of checking procedure.
- Clause 4.6(ii): permitted some Type P Proposals to be Category 0.
- Deleted chapter on "Small Service Tunnels" .
- Clause 5.2: added procedure for dealing with service tunnels of internal diameter less than 2m.
- Annex A1: separate model AIP forms are given for the design of highway structures to UK National Standards (Eurocodes) and for the design and assessment of highway structures to UK National Standards (Non-Eurocodes).
- Annex A1: temporary works designer is required to certify that details of design will be passed to the permanent works designer for review.
- Annex B: general notes for compiling a model Technical Approval Schedules are given instead of a model TAS.
- Annexes C3 and C4: permanent works designer is required to certify that the temporary works have no detrimental effects on the permanent works.
- Annex C6: substantially revised.
- Deleted entire Annex on "Special Requirements for Records in Overseeing Organisations".
- Annex D: avoidance of "barriers to trade" requirements for proprietary manufactured structures and products are given in Chapter 2.
- Added requirements with respect to proprietary structures supplied in accordance with EU directive 89/106/EEC – the Construction Products Directive (CPD).

1.3 In the early 1970s, failures at Yarra (Australia), Milford Haven (Pembrokeshire, Wales), Koblenz (Germany) and over the Danube (Austria) occurred during erection. Resulting from these failures and the subsequent Report of the Merrison Committee, the following important changes were made by the then Ministry of Transport:

- (i) The Department would continue to examine design criteria and methods but not computations.
- (ii) The requirements by the Department for a certificate of independent check of the design and computations.
- (iii) The application of Approval in Principle (AIP) stage to all but minor structures, which would cover the selection of bridge type, the materials for its construction and methods of analysis and design to be adopted.

1.4 The TA procedures as described in this Standard generally require the proposer to submit an AIP to the Overseeing Organisation and to receive endorsement of the AIP before proceeding with any design or assessment. The completed design or assessment cannot be implemented until the Overseeing Organisation is in receipt of certified confirmation that the implementation documents are accurate and fully in compliance with the

requirements of the AIP. TA procedures for proprietary manufactured structures and products are given in 2.4 to 2.6.

1.5 The TA procedural requirements impose a discipline on the process that encourages good practice and should reduce the possibility of errors affecting structural fitness for purpose. Most importantly however, the procedures minimise the possible risks to highway users and others who may be affected. The procedures may be applied to any other circumstances where the highway authority considers the requirements to be appropriate.

### Objectives

1.6 The fundamental objectives of the TA procedures are to give increased assurance for the required execution, refurbishment or demolition of highway structures. This will help to ensure that the Proposals are safe to implement, that any new structures procured are serviceable in use, economic to build and maintain, comply with the objectives of sustainability, have due regard for the environment and that they satisfactorily perform their intended functions. The TA procedures also ensure, as far as reasonably practicable, that highway users, the public and any others who may be affected are protected from adverse effects resulting from any work carried out to any highway structure.

1.7 TA provides procedures to demonstrate that the Overseeing Organisation, in its capacity of highway authority, has carried out its duty to safeguard the highway users and others who may be affected.

### Scope

1.8 Subject to any exclusions expressly stated in this document TA procedures must be applied to all Proposals, including private development, to construct, widen, assess, improve, repair (where structural integrity may be implicated) or demolish a structure within the highway boundary. It must also be applied to Proposals for highway structures that are outside the highway boundary, where the structures are to be adopted by the Overseeing Organisation.

It is recommended TA procedures also be applied to Proposals for structures that are outside the highway boundary where the design, construction, maintenance or demolition of the structure may affect the highway, highway structure or the safety of the highway user.

1.9 The scope of TA must be as specified in Chapters 3 to 6.

1.10 In cases where the design and construction of a Third Party Proposal for temporary works or temporary structures are outside the expertise of the Overseeing Organisation, the TAA should consider implementing the special requirements given in Annex E.

1.11 TA procedures are not necessary where there are no public safety issues e.g. temporary works in green field sites or works within the highway boundary where there will be no interface with the public. However, TA procedures apply to temporary works where the permanent works Proposal has identified the need for an independent check.

### Contractual Responsibilities and Procedures

1.12 TA does not in any way modify or reduce the contractual and statutory responsibilities of any party for the work carried out or the legal responsibilities of professional engineers.

1.13 This Standard has been written such that it is applicable in principle to all current and likely future forms of procurement (with the exception of DBFO Contracts –see Annex F). The procedures, format and terms used in this Standard, including the model AIP forms and certificates provided in Annexes A and C, are intended to be contract-neutral and are to be taken as models. Different procedures, format or terms may be used subject to the agreement of the Overseeing Organisation.

1.14 In departing from the procedures, format or terms used in this Standard, users must ensure that the following objectives are achieved:

- (i) That the required design or assessment principles are formally agreed, prior to award of any contract, to a sufficient extent to avoid contractual repercussions.
- (ii) That execution is not allowed to proceed until there is formal agreement to a comprehensive submission of the design or assessment principles in accordance with the requirements of this Standard.

1.15 The model AIP forms and certificates provided in Annexes A and C must be amended and agreed with the Overseeing Organisation, to suit specific contract requirements. Timings and procedures must be identified in the scheme specific contract requirements.

1.16 The contract requirements may clarify whether the Proposals and the AIP are of an outline nature sufficient for the invitation or acceptance of tenders or whether they are comprehensive and sufficient for detailed design or assessment. The principles, detailed requirements and recommendations contained in this Standard should apply accordingly. The Outline AIP (O/AIP) may be based on the relevant sections of the model AIP Annex A1 or D.4.

1.17 For some forms of procurement, TA for the design would typically be completed in detail before tenders for carrying out the construction work required by the design are invited. For other forms of procurement, where the design has not yet been completed prior to inviting tenders, the TA process would typically only be partially completed during the tender period. Submission of a final detailed AIP would usually take place following award of contract. The TAA are to be consulted to agree the TA procedures where there are any uncertainties.

## Implementation

1.18 This Standard must be used forthwith on all projects for the assessment, design, execution, operation and maintenance of motorway and all-purpose trunk roads (and all roads in Northern Ireland) except where procurement of works has reached a stage at which, in the opinion of the Overseeing Organisation, its use would result in significant additional expense or delay progress (in which case the decision must be recorded in accordance with the procedure required by the Overseeing Organisation).

1.19 This Standard must also be used to implement the procedures for private development within the highway boundary. (See 1.8)

## Mandatory Sections

1.20 Sections of this Standard containing mandatory requirements are identified by being contained in boxes. These requirements must be complied with or a prior agreement to a Departure from Standard must be obtained from the Overseeing Organisation. The text outside boxes contains advice and explanation, which is commended to users for consideration.

## Definitions

1.21 For the purpose of this Standard, the following definitions apply (see also 1.13):

<b>Approval in Principle (AIP)</b>	The document, which records the agreed basis and criteria for the detailed design or assessment of a highway structure.
<b>Assessment Team</b>	The group of engineers responsible for the assessment. It may comprise an appropriate mix of specialists under the direction of a Team Leader.
<b>Assessor</b>	The organisation responsible for the overall assessment.
<b>Category</b>	The classification of the Proposals, which determines the need for AIP, the form of check to be applied and the certificates to be prepared.
<b>CDM co-ordinator</b>	The person appointed by the client on a notifiable project to perform the duties specified in the Construction (Design and Management) Regulations 2007.
<b>CE marking</b>	The marking that the manufacturer applies to declare compliance of a product with relevant EU product directives including the directive 89/106/EEC the Construction Products Directive.
<b>Checker</b>	The organisation responsible for the independent check of the design or assessment.
<b>Check Team</b>	The group of engineers responsible for the independent check of the design or assessment. It may comprise an appropriate mix of specialists under the direction of a Check Team Leader.
<b>Construction Compliance</b>	Execution works in compliance with the documents agreed before and during the execution.
<b>Contractor</b>	The organisation contracted by the Overseeing Organisation to undertake execution works on its behalf.
<b>Contractor's Representative</b>	A representative of the Contractor, with responsibility for overseeing the execution works.
<b>Departure</b>	Criterion, which departs from, or is an aspect not covered by, the standards contained in the Technical Approval Schedule.
<b>Designer</b>	The organisation responsible for the overall design.
<b>Design Team</b>	The group of engineers responsible for the design. It may comprise an appropriate mix of specialists under the direction of a Design Team Leader.
<b>Eurocodes</b>	<i>As defined in BS EN 1990</i>
<b>execution</b>	<i>As defined in BS EN 1990</i>
<b>foundation</b>	Generally in a highway structure, that part of the substructure in direct contact with, and transmitting load to, the ground.  Note: Specific elements forming the foundation should be given in the AIP.
<b>Geotechnical Design Report</b>	A report that contains geotechnical information relevant to the design or assessment (see HD 22 (DMRB 4.1.2)).
<b>highway structure</b>	Structure or installation coming within the scope of this Standard and situated under, over or adjacent to a motorway or other trunk road or road designated by the Overseeing Organisation.
<b>Lighting Column System</b>	Range of combinations of column heights and lengths of brackets together with the weights and windage areas of lanterns and attachments for which the column has been designed.
<b>Maintaining Agent (MA)</b>	The organisation with delegated responsibility for the maintenance of a highway structure.
<b>Outline Approval in Principle (O/AIP)</b>	The document, which records the agreed basis and outline criteria for the detailed design of a highway structure.

<b>Overseeing Organisation</b>	This refers to the following organisations (or their successors): The Highways Agency; Transport Scotland; Welsh Government (Llywodraeth Cymru) and The Department for Regional Development (Northern Ireland)
<b>Principal</b>	A senior representative of the Designer, Assessor, Checker, Contractor or Works Examiner having authority to sign certificates on its behalf.
<b>Project Manager of the Overseeing Organisation</b>	Representative of the Overseeing Organisation with responsibility for project management of tunnel or bridge gantry operating procedures.
<b>Proposal</b>	The proposal relating to the design or assessment of a highway structure including the mechanical and electrical (M&E) installations covered by this Standard.
<b>Proprietary Manufactured Structure or Products</b>	A structure with CE marking or product with CE marking manufactured to a system covered by a patent and/or a registered design.
<b>road tunnel</b>	A subsurface highway structure enclosed for a length of 150m or more.
<b>service tunnel</b>	A tunnel structure installed by trench-less technology beneath a highway for any purpose. This can be regarded as a service crossing if the internal diameter is 2m or less.
<b>substructure</b>	Generally in a highway structure, the wing walls, piers, columns, towers and abutments that support the superstructure.  Note: Specific elements forming the substructure should be given in the AIP.
<b>superstructure</b>	Generally in a highway structure, that part of the structure which is supported by the piers, columns and abutments.  Note: Specific elements forming the superstructure are to be given in the AIP.
<b>Team Leader</b>	The person responsible for overseeing and co-ordinating the work of the Design, Assessment or Check Team and having authority to sign on behalf of the team. The Team Leader must be appropriately qualified and competent in relevant fields of engineering related to the work and is to be a Chartered Member of a relevant Institution or suitable equivalent.
<b>Technical Approval (TA)</b>	The submission of Proposals for agreement by the Technical Approval Authority and the subsequent provision and acceptance of certificates confirming that the design, assessment, specification or construction works complies with the agreed Approval in Principle and design/assessment and specification certificates as appropriate.
<b>Technical Approval Authority (TAA)</b>	The organisation responsible for agreeing the Approval in Principle and subsequently accepting the relevant certificates.
<b>Technical Approval Schedule (TAS)</b>	The schedule of documents to be used for the design or assessment of a highway structure.
<b>Third Party</b>	Any person, organisation or other legal identity that is not employed directly or indirectly by the Overseeing Organisation.
<b>UK National Standards (Eurocodes)</b>	The suite of Eurocodes to be implemented by BSi as UK National Standards, covering structural design of all civil engineering works, including bridges.
<b>UK National Standards (Non-Eurocodes)</b>	British Standards that, prior to being replaced by UK National Standards (Eurocodes), were used for the design of highway structures or British Standards that apply to aspects not covered by Eurocodes.
<b>Works Examiner</b>	The organisation nominated in the Contract to undertake independent examination of the execution, commissioning (of M&E) or testing of works carried out by the Contractor.

## Mutual Recognition

1.22 Any reference in this specification to a “British Standard”, or to a “British Standard which is an adopted European Standard”, is to be taken to include reference also to the following standards:

- (a) a standard or code of practice of a national standards body or equivalent body of any EEA state;
- (b) any international standard recognised for use as a standard or code of practice by any EEA state;
- (c) a technical specification recognised for use as a standard by a public authority of any EEA state; and
- (d) a European Technical Approval (ETA) issued in accordance with the procedure set out in directive 89/106/EEC.

Where there is a requirement in this specification for compliance with any part of a British Standard or a British Standard which is an adopted European Standard, that requirement may be met by compliance with any of the standards given above, provided that the relevant standard imposes an equivalent level of performance and safety provided for by a British Standard or a British Standard which is an adopted European Standard.

“EEA State” means a state which is a contracting party to the EEA Agreement.

“EEA Agreement” means the agreement on an European Economic Area signed at Oporto on the 2nd of May 1992 as adjusted or amended.

## 2. GENERAL REQUIREMENTS AND PRINCIPLES

### Overseeing Organisation's Requirements

2.1 Technical requirements for the design, execution, operation and maintenance of highway structures are contained in the TAS. In some forms of contract, such as design and construct, technical requirements may be contained in the contract requirements. The TAS normally includes the Design Manual for Roads and Bridges (DMRB), the British Standards (including Eurocodes, National Annexes and Published Documents), Manual of Contract Documents for Highway Works (MCHW) and other supplementary Standards for specific project requirements (see Annex B).

2.2 Unless agreed otherwise with the TAA, two sets of documents (AIP and Certificates) with original manuscript signatures must be submitted. In England, this requirement may be waived if the use of electronic signatures is agreed with the TAA.

2.3 Third Party Proposals must be dealt with as follows:

- (i) Inside highway boundary: the principles given for the TA procedures in this Standard must be adopted to meet the objective stated in 1.6. However the TAA must not take on the responsibility that belongs to the Third Party. The principles of special requirements given in Annex E must be applied where the Overseeing Organisation would not be able to give an opinion on whether the Third Party Proposal is safe or not as the Overseeing Organisation does not have a specific knowledge or expertise. For Third Party Proposal of temporary work or temporary structure, refer to Chapter 4.
- (ii) Outside highway boundary: refer to 1.8

### Proprietary Manufactured Structures and Products

2.4 Proprietary manufactured structures and products are to be subject to the full TA procedures, with the exception of those that comply with the requirements of the CPD and will be used for their intended purpose. An essential consideration for adoption of proprietary

manufactured structures or products is the avoidance of discrimination against any structure or product that has the required declared performance either under a CE mark applied in compliance with the CPD or a recognised product registration system and would satisfy the specified end use. Any discrimination that does create a "barrier to trade" would be in contravention of European Community legislation. The procedures are to avoid two forms of discrimination in particular: (a) discrimination between different forms of construction or product that will satisfy the same end use, and (b) discrimination between directly competing proprietary systems or products.

2.5 When considering proprietary manufactured structures or products CE marked in accordance with the CPD the procedures must comply with the following principles:

- (a) The proprietary manufactured structures with CE markings or products with CE markings may be accepted for their correct intended use and satisfy the specified performance requirements. The TA procedures must not be applied to any aspect related to this acceptance except to confirm that the declared performance of the product meets that required.
- (b) Additional requirements must not be imposed on manufactured structures with CE markings or products with CE markings that are used for their intended use. If additional requirements are given in the Design Manual for Roads and Bridges (DMRB) documents, they must be waived unless there are safety issues, in which case TAA must be consulted.

2.6 Notwithstanding the requirements and advice given in 2.4 and 2.5 above, TA procedures may apply to issues relating to installation of structures or products but not their manufacture. TA procedures may also apply to proprietary manufactured structures or products with CE markings for an unintended use. Also see 3.5(f) and Annex D.

### Use of UK National Standards

2.7 For the design of highway structures using UK National Standards (Eurocodes), refer to the Overseeing Organisation's current requirements for the use of Eurocodes for the design of highway structures. The model AIP form in Annex A1a is to be used.

2.8 For the design or assessment of highway structures using UK National Standards (Non-Eurocodes), the model AIP form in Annex A1b is to be used.

### Category of Proposals

2.9 The Proposals must be placed in one of four Categories: 0, 1, 2 or 3, according to the criteria described in Chapters 3 to 6. The Category must be proposed by the Designer or Assessor and outline details submitted to the TAA for agreement. The Category boundaries are not rigid and the category of each Proposal will be decided on its merits, having regard to potential consequences of failure, design complexity and whole life costs.

2.10 AIPs are required for Categories 1, 2 and 3, but not Category 0.

2.11 Where a structure has been placed in Category 0 or 1, and a Proposal arises subsequently requiring a Departure, the Design Organisation must contact the TAA requesting a review of the Category. Typically a change to Category 2 will be required but if the TAA considers that the Departure has little or no structural implication, then a change of Category may not be necessary. In such circumstances for Category 1, an amendment or addendum to the AIP must be submitted. The agreement of the TAA will be required before the Proposals can be incorporated in the design or assessment.

### Proposals

2.12 Proposals for Categories 1, 2 and 3 must:

- (i) Provide sufficient information and evidence to demonstrate compliance with the Overseeing Organisation's requirements and to justify their viability. Potential risks and hazards during the whole life of the structure such as execution, operation, maintenance and demolition, must be identified, assessed and considered, with a view to eliminating or minimising them as far as reasonably practicable. The CDM co-ordinator, if appointed, must be informed by the Designer of all risks and hazards identified, assessed and considered. Where available, references, special investigations and studies that have been carried out must be included. The overall project should consider appropriate methods of risk management.
- (ii) List in the AIP only risks and hazards that would not be apparent to an experienced and competent Contractor or are likely to require special attention to manage them effectively.
- (iii) Provide evidence that appropriate consultation has taken place with all relevant stakeholders having a direct interest in the Proposals, and that full and proper consideration has been given to their respective interests. Risks and hazards which may affect the structure as a result of other stakeholders' requirements (e.g. leakage of gas or water mains) must also be identified, assessed and considered. Likewise, risks and hazards posed by the structure to other infrastructure belonging to a Third Party must be identified, assessed and considered. Documentation relating to consultation and special requirements of those consulted must be included as part of the AIP submission. This must include any comments from the CDM co-ordinator.
- (iv) Describe the information that is available concerning existing records and assumptions made regarding the interpretation of available data that will be relevant to the design or assessment.

- (v) List in the TAS all relevant documents that are being proposed for use in the design or assessment.

2.13 Proposals for Designs must, in addition to 2.12:

2.13.1 Consider aspects relating to:

- (a) Sustainability (sustainable development which meets the needs of the present without compromising the ability of future generations to meet their own needs e.g. prudent use of natural resources)
- (b) Environment (give regard for both the natural and built environment)
- (c) Aesthetics
- (d) Buildability (the extent to which the design facilitates ease and safety of construction, allowing the most efficient and economic use of resources, subject to the overall requirements for the completed project)
- (e) Structure robustness (the ability of a structure not to be damaged disproportionately in the event of accident, misuse or deterioration)
- (f) Structure resilience (the ability of structure to resist deliberate damage which may arise from the actions of vandals, thieves and terrorists)
- (g) Durability
- (h) Maintenance and operational commitments in terms of whole life costs in design options and choices of materials
- (i) Provision of safe access for periodic inspection
- (j) Avoidance of 'barrier to trade' and the requirements for using Proprietary Manufactured Structures or Products.

2.13.2 Where specified, consider and make provisions for future heavier loads or future widening and describe how the structure may be upgraded. In the case of road tunnels, it may also be necessary to make provision for future development above or adjacent to the tunnel.

2.13.3 Consult the TAA at an early stage to determine whether submission is required to the Commission for Architecture and the Built Environment (CABE) in England or to equivalent bodies in Scotland, Wales and Northern Ireland. This applies to major structures, including tunnel portals, tunnel service buildings and landscaping, and those structures in environmentally sensitive locations (such as National Parks), areas of outstanding natural beauty, green-belts and urban areas.

2.13.4 Ensure that the required environmental and planning legislation is complied with during the development of the design. This includes, but is not limited to Environmental Assessments, Environmental Statements and Habitat Surveys. Affected stakeholders such as Natural England (and the equivalent bodies for Scotland, Wales and Northern Ireland) and the Wildlife Trusts must be consulted to ascertain environmental requirements during and post construction, including translocation of endangered species (e.g. greater crested newts, rare plants/soils), acceptable environmental mitigation (e.g. sustainable urban drainage systems) and other measures such as otter ledges along banks on river bridges and wildlife tunnels where existing habitats are disrupted. Where Proposals are located close to or cross watercourses, the Environment Agency for England and Wales (and the equivalent bodies for Scotland and Northern Ireland) must also be consulted.

2.13.5 State any assumptions that have been made with regard to construction processes or temporary works aspects that are significant factors in the design. If construction processes or temporary works during the course of construction have structural implications different from those assumed by the Designer, a further TA must be completed before the commencement of construction of that part of the works.

2.14 Proposals for Assessments must, in addition to 2.12, describe proposed arrangements for access, traffic management and intrusive investigation where required.

### Departures from Standards

2.15 Designers or Assessors may seek to introduce innovative techniques, research findings or developments in the state of the art and best practice by the adoption of Departures.

2.16 Where UK National Standards (Eurocodes) are used, the limitations for Departures are given in the Overseeing Organisation's current requirements for the use of Eurocodes for the design of highway structures.

2.17 In cases where a structure is in the ownership of the Overseeing Organisation but accommodates a highway, railway, waterway or other infrastructure that is the responsibility of another owner, authority or Third Party, the Designer or Assessor must consult the party concerned and seek its comments on, and if possible, acceptance of the Proposal. This should be recorded in the AIP.

2.18 All applications for Departures must be subject to the approval procedures of the Overseeing Organisation and details of the proposed Departures together with reasons and justification, including benefits and disbenefits to the Overseeing Organisation, must be submitted to the Overseeing Organisation for consideration. Applications for Departures must allow adequate time for consideration by the Overseeing Organisation prior to inclusion in the AIP or an addendum to the AIP.

2.19 In some cases the Checker's comments on the proposed Departure may be required to assist the TAA in the deliberation.

### Submissions for AIP

2.20 Submissions for AIP to the TAA must be in accordance with the Overseeing Organisation's particular requirements. Generally submissions comprise a completed AIP, a location plan, a

general arrangement drawing, relevant parts of the Geotechnical Design Report, documents relating to consultation and any other relevant information or reports. The reports should be referenced in the AIP and written with a clear proposal or objective. Calculations and detailed drawings are not required as part of the submission.

2.21 The O/AIP may be based on the relevant sections of the model AIP Annex A1 or Annex D, Section D.4 for some generic AIPs e.g. sign gantries, Model AIPs for temporary works systems, modular arch systems, etc.

2.22 If the designs of the superstructure, substructure and/or foundation are carried out by different teams, the Designer of the superstructure and/or substructure must give the conditions and loads to be taken into account by the Designer of the substructure and/or foundation respectively. The conditions and loads must be covered in the AIP. (See also 2.42)

2.23 The AIP must record all the agreed criteria on which the design or assessment is to be based. Changes to an agreed AIP to account for subsequent variations during design, assessment or execution render the AIP subject to re-approval and agreement by the TAA. This must be confirmed either in the form of an amended version of the agreed AIP or as a separate addendum to the agreed AIP. Submissions must clearly indicate deletions or additions that have been made to the agreed AIP, must be signed by the Designer or Assessor and forwarded with supporting information to the TAA for agreement. Addenda must refer to the original AIP by the date of agreement by the TAA.

2.24 AIP is a continuing exercise that should start at an early stage of development of Proposals. This is particularly important for structures where early submission of AIP to the TAA allows timely consideration of other fundamental aspects, such as crossing requirements, carriageway alignment.

2.25 The period over which TA extends will vary according to the size and complexity of the structure and number of Departures. To avoid any unnecessary delay, AIP may be given in stages in the form of interim AIP as principles are evolved. However, the use of interim AIP will not prejudice the agreement of an AIP for the full structure.

### Technical Approval

2.26 The Designer must provide sufficient information to enable the TAA to carry out the following aspects, where applicable:

- (i) Appraise the proposed design or assessment criteria, principles and methods.
- (ii) Agree the required working life for the structure and its main components.
- (iii) Agree the Category of the Proposals.
- (iv) Ensure consideration has been given to any special studies concerning safety and risk assessment and management that have a bearing on the final design or assessment or the construction process.
- (v) Be satisfied that adequate consideration has been given to safety, sustainability, buildability, traffic management, environmental impact, aesthetics, structure robustness, durability, maintainability, access and inspection, upgradeability, whole life costs, demolition and compliance with the Overseeing Organisation's requirements.
- (vi) Agree the list of documents included in the TAS and Departures.
- (vii) Appraise the geotechnical conditions and other relevant investigations.
- (viii) Appraise the adequacy of existing records and investigation data and the need for further investigations or studies that have a significant bearing on the preliminary or final design, assessment, execution, operation, maintenance or demolition processes.
- (ix) Review the adequacy of consultation with other stakeholders and the incorporation of agreed requirements.
- (x) Agree proposed Category 3 Checker based on their relevant experience and competence.
- (xi) Resolve any point(s) of difference between the Designer or Assessor and the Checker.

2.27 When satisfied with the Proposals, the TAA will confirm its agreement by signature of the AIP. On completion of the detailed design, check or assessment, the TAA will receive and consider the appropriate certificates for acceptance.

2.28 The agreement of the AIP or acceptance of the certificates by the TAA does not relieve the Designer, Assessor or Checker of any of their responsibilities including the validity and arithmetical correctness of the calculations, methods and techniques and their translations into design details and drawings, specification clauses or assessed capacities.

2.29 The AIP is valid for three years after the date of agreement by the TAA. If the construction has not yet commenced within this period, the AIP must be re-submitted to the TAA. The Designer will review the AIP and determine whether any updating or amendment to the design is required. In such circumstances the outcome must be recorded in an amendment or addendum to the AIP and the agreement of the TAA will be required before the execution can proceed. The Works Examiner must inform the TAA of any amendments to the design, during execution, which have structural implications and such amendments must normally be included in an addendum to the AIP. Certificates must be revised to take account of such amendments. Additionally, where the proposed erection procedure induces different stresses in the completed structure from those anticipated in the design, any changes to agreed details in the AIPs or certificates will need to be covered by an AIP addendum and/or additional certificates as appropriate and accepted by the TAA before erection commences.

### Design and Assessment Procedure

2.30 The design/assessment must comply with the AIP.

2.31 The Designer or Assessor must ensure the applicability and accuracy of all computer programs used and the validity of the programs for each application.

### Checking Procedure

2.32 Assessments, designs and drawings, together with bar bending schedules, must be checked as follows:

- (a) Categories 0 and 1 require an independent check by another engineer who may be from the Design/Assessment Team.
- (b) Category 2 requires a check by a Check Team, which may be from the same organisation but must be independent of the Design/Assessment Team.
- (c) Category 3 requires a check to be carried out by a Check Team from a separate organisation proposed by the Designer or Assessor and agreed by the TAA.

2.33 The Checker must carry out a comprehensive examination of all aspects of the design or assessment and must check that it complies with the Overseeing Organisation's requirements. Where required by the TAA, the scope of work also includes any proposed Departure, including Specification clauses that affect structural integrity (e.g. new materials). The Checker must check that the calculations are translated accurately into design details and drawings, specification clauses or assessed capacities.

2.34 The Checker must carry out the check, with due professional skill and care, in accordance with the agreed AIP. In the course of the check the Checker must submit a report to the Designer or Assessor and TAA for any aspect of the agreed AIP, design or assessment where changes are considered necessary. The agreement of the TAA to variations in the AIP must be confirmed in accordance with 2.23. Any disagreement arising between Designer or Assessor and Checker that they cannot resolve must be notified immediately to the TAA.

2.35 The Checker's analytical models and analytical work must be independent of that of the Designer or Assessor and carried out without exchange of calculation sheets or similar analytical work between the Designer or Assessor and the Checker. However, the method of analysis employed by the respective teams need not be the

same. The Designer or Assessor and the Checker may consult with each other during the course of their work to ensure that the results they are obtaining are comparable.

2.36 The Checker must take responsibility for the applicability and accuracy of all computer programs used in the check and the validity of the programs for each application.

2.37 It is not necessary to await the completion of the design/assessment before commencing the check. Both activities of design/assessment and check may proceed in parallel as far as is practicable.

### Certification

2.38 The certificates are required to be signed to declare the satisfactory completion of the work involved and that the organisations concerned have exercised due professional skill and care. For some structures the TAA may call a pre-certification meeting with the Designer/ Assessor and the Checker, to discuss their findings prior to accepting certificates.

2.39 For structures where assessed capacity is less than current operational needs, the Assessor must notify the TAA and agree any necessary actions before submitting the certificates.

2.40 Where several similar Category 0 or 1 structures occur in a project, with the agreement of the TAA a single certificate may be used to cover them.

2.41 For all Proposals, a single organisation must assume responsibility for the whole of each activity; the Design, Assessment, Check or Construction Compliance for the entire structure. The Designer, Assessor, Checker, Contractor's Representative or Works Examiner must endorse each certificate as appropriate, which will be countersigned where required upon acceptance by the TAA. All signatories to certificates must be competent in the field of work undertaken and have relevant experience and appropriate engineering qualifications, which must be clearly indicated on the certificate along with their name

and position in their organisation. One signatory from the Designer, Assessor or Checker must be the Team Leader and the other must be a Principal of the organisation concerned. Signatories for the Construction Compliance certificate must comprise a representative of the Contractor and Principals of both the Contractor and of the Works Examiner. The signatory for the TAA will be a person delegated to undertake this task on its behalf.

2.42 Where the TAA agrees that the design of the superstructure, substructure and/or foundation of highway structures are carried out by different teams, the conditions and loads imposed by the superstructure and/or substructure for the design of the substructure and/or foundation respectively must be given in the AIP and/or certificate as appropriate.

2.43 The Design, Assessment and Check certificates must refer to the relevant AIP and any addenda by their respective dates of agreement by the TAA and any Departures or in the case of Category 0 structures, relevant Standards and Departures if any, and be submitted for acceptance by the TAA, unless otherwise stated in Chapters 3 to 6.

2.44 A copy of the general arrangement drawing and any relevant supporting information must accompany Certificates for Category 0 structures.

2.45 Where additional and substitute Specification clauses have been prepared by the Designer, they must be submitted for acceptance by the TAA. They may be submitted either individually or collectively on a Specification Certificate. Where clauses might affect structural integrity, for example clauses concerning new materials, they must be checked in accordance with the AIP.

2.46 Unless otherwise stated in Chapters 3 to 6, the Construction Compliance certificate must refer to, if available, the relevant AIP, Design and Check Certificates, Specification and As-Constructed drawings and must be submitted to the TAA (the Overseeing Organisation if in Northern Ireland) for acceptance.

2.47 Model certificates are contained in Annex C. However, the wording may vary depending on the Overseeing Organisation's particular requirements/type of contract. If the completed certificate consists of more than one page, each page should be identifiable by the name of the project and by the name and reference number of the Structure and the date of preparation.

2.48 The forms of certificate specified in the contract requirements must be used.

### Records

2.49 Relevant data, information and documents, which have an effect on safety, access, structural or traffic management e.g. assessed load carrying capacity of structure, must be recorded as required by the Overseeing Organisation's management system for structures.

2.50 For Categories 2 or 3 checks, when Eurocodes are used, the Designer record for the choices and options adopted, which is not required to be submitted to the TAA, must be recorded as required by the Overseeing Organisation's management system for structures. In Wales the schedule of options and choices must be included in the AIP.

## 3. BRIDGES AND OTHER HIGHWAY STRUCTURES

### Introduction

3.1 This Chapter describes specific TA requirements for bridges and other highway structures and must be read in conjunction with Chapters 1 and 2.

3.2 The TA requirements must be applied without limitation to:

- (a) Design and execution of new structures.
- (b) Assessment and related construction work, whether refurbishment, maintenance or strengthening, that affects structural integrity.
- (c) Assessment relating to loading beyond that for which a structure has been designed or previously assessed.
- (d) Assessment relating to loading for which a structure has been designed or previously assessed but the condition of the critical structural elements has subsequently deteriorated to the extent that a re-assessment is required.

### Scope

3.3 In addition to 1.8, the procedures described in this Chapter must be applied to the following highway structures:

- (a) Bridge, buried structure, subway, underpass, culvert and any other structure supporting the highway with clear span or internal diameter greater than 0.9m, (2.0m or greater in Scotland except that corrugated steel buried structures are included if they have spans of 0.9m or more).
- (b) Overhead crossing carrying conveyor or utility service.
- (c) Moveable inspection access gantry, gantry rail and gantry support system.

- (d) Earth retaining structure where the effective retained height, i.e. the level of the fill at the back of the structure above the finished ground level in front of the structure, is greater than 1.5m (1.0m or greater in Northern Ireland).
- (e) Reinforced/strengthened soil/fill structure, with hard facings, where the effective retained height is greater than 1.5m (1.0m or greater in Northern Ireland).
- (f) Reinforced/strengthened soil/fill which is an integral part of another highway structure.
- (g) Portal and cantilever sign and/or signal gantry.
- (h) Cantilever mast for traffic signal and/or speed camera.
- (i) Lighting column.
- (j) High mast of more than 20m in height i.e. the vertical distance from top of post to bottom of flange plate, for lighting.
- (k) Mast for camera, radio and telecommunication transmission equipment.
- (l) Catenary lighting support system.
- (m) Environmental barrier.
- (n) Proprietary manufactured structure or product.
- (o) Traffic sign/signal posts of more than 7m in height, i.e. the vertical distance from top of post to bottom of flange plate or top of foundation whichever is the lesser.
- (p) (In Northern Ireland only) Mass gabion steep slope/retaining structure, face slope not greater than 70° to the horizontal where the effective retained height is 1.0m or greater.

- (q) (In Wales only) Reinforced/strengthened soil/fill structure where hard facings are not provided and the face inclination exceeds 45 degrees, the Overseeing Organisation may decide to require structural TA in accordance with this Standard.
- (r) Fitting of M&E apparatus and fixtures to existing structures, including Tunnels, either permanent or temporary (Wales and Northern Ireland only). The Category must be proposed by the designer and is subject to agreement by the TAA.

### Category

3.4 In addition to 2.9 to 2.11, the following criteria must be considered when determining Category:

#### 3.4.1 Category 0:

Structures, which conform in all aspects of design, assessment and execution to DMRB and MCHW Standards and contain no Departures, provided they also conform to one of the following:

- (a) Single span simply supported structures with span of less than 5m.
- (b) Buried concrete boxes, buried rigid pipes and corrugated steel buried structures of less than 3m clear span/diameter and having more than 1m cover.
- (c) Multi-cell buried structures, where the cumulative span is less than 5m, and having more than 1m cover.
- (d) Earth retaining structures with an effective retained height of greater than 1.5m (1.0m or greater in Northern Ireland) but less than 2m.
- (e) Minor structures within the scope of BD 94 (DMRB 2.2.1) and not situated at a very exposed site as defined in BD 94.
- (f) High masts  $\leq 25$ m and not situated at a very exposed site as defined in BD 94.

- (g) Environmental barriers less than 3m high and without overhangs.
- (h) Masonry arches with span of less than 6.5m (for assessment only).

#### 3.4.2 Category 1:

Structures, other than those in Category 0, which conform in all aspects of design, assessment and execution to DMRB and MCHW Standards and contain no Departures, provided they also conform to one of the following:

- (a) Structures with a single simply supported span of 5m or greater but less than 20m and having less than 25° skew.
- (b) Buried concrete boxes, buried rigid pipes and corrugated steel buried structures with a clear span/diameter of 8m or less.
- (c) Earth retaining structures with an effective retained height of 2m or greater but less than 7m.
- (d) Minor structures outside the scope of BD 94 (DMRB 2.2.1) or situated at a very exposed site as defined in BD 94.
- (e) High masts  $>25$ m or situated at a very exposed site as defined in BD 94.
- (f) Environmental barriers 3m or more in height or with overhangs.
- (g) Portal and cantilever sign and/or signal gantries with a span of less than 20m.

#### 3.4.3 Category 2

Structures, not within the parameters of Categories 0, 1 or 3.

### 3.4.4 Category 3

Complex structures, which require sophisticated analysis or with any one of the following features:

- (a) High structural redundancy.
- (b) Unconventional, novel or esoteric design aspects.
- (c) Any span exceeding 50m.
- (d) Skew exceeding 45°.
- (e) Difficult foundation problems.
- (f) Moveable bridges.
- (g) Moveable inspection access gantries, gantry rail and gantry support systems.
- (h) Bridges with suspension systems.
- (i) Steel orthotropic decks.
- (j) Internal grouted duct form of post tensioned concrete structures.
- (k) Earth retaining structures with an effective retained height of 14m or greater.
- (l) Rock anchorages (Wales only).

### 3.4.5 Assessment and related construction work

In general the assessment of load carrying capacity of existing structures and related construction work such as demolition, repair, renewal, refurbishment and strengthening work that affects structural integrity must be categorised on the same basis that the original structure would have warranted. However, the TAA may decide to require a higher or lower Category where deemed appropriate.

### Technical Approval

3.5 In addition to 2.26, the Designer or Assessor must provide sufficient information to enable the TAA to consider the following aspects, where applicable (this list is not necessarily exhaustive):

- (a) Cross-section and headroom clearances.
- (b) The loading and design or assessment criteria.
- (c) Any provision to be made additional to items (a) and (b) for abnormally high and/or heavy loads.
- (d) In the case of construction work, such as repairs, strengthening, monitoring, partial renewals or demolitions, that the structural adequacy at all stages of the work has been fully considered.
- (e) Proposals for the independent checking of temporary works.
- (f) In the case of proprietary manufactured structures with CE markings or products with CE markings where circumstances are appropriate, that proper consideration has been given to facilitate their adoption by the Overseeing Organisation (see Annex D).

### Certification

3.6 For Category 0 minor structures as defined in 3.4.1(e), approval by the TAA is not required. However, a certificate in the form given in Annex C2 or an EC certificate or declaration of conformity must be submitted to the TAA for retention.

### Documentation

3.7 The relevant model AIP form for highway structures within the scope of this Chapter are A1a and A1b from Annex A. TASs are to be prepared in accordance with the notes given in Annex B. Relevant model certificates are C1, C2 and C6 from Annex C. The form of certificates may vary depending on the Overseeing Organisation's particular requirements.

## 4. TEMPORARY WORKS

### Introduction

4.1 This Chapter describes the TA requirements for temporary works including temporary structures and must be read in conjunction with Chapters 1 to 3.

4.2 The TA requirements must be applied to the following types of Proposals:

(a) **Type S (Structure) Proposals:**

Erection proposals or temporary works which require:

- (i) An independent check of the effects of temporary works on permanent works (refer to the AIP for permanent works), **and**
- (ii) Where the works would not affect or potentially affect any highway or other way or area used by or accessible to the public.

(b) **Type P (Public) Proposals:**

Erection proposals, temporary works including those over, under, alongside or otherwise affecting or potentially affecting any highway or other way or area used by, or accessible, to the public.

4.3 Where necessary and depending on the degree of risk, the TAA may change the Proposal from Type S to Type P in order to require a submission of an AIP.

4.4 In cases where the temporary works are subsequently permanently left in place e.g. sheet piling, they may be considered instead, if appropriate, in the AIP of the permanent highway structure.

### Scope

4.5 In addition to 1.8, the procedures described in this Chapter must be applied without limitation to the following temporary structures:

- (a) Temporary works and falsework for major and complex structures.
- (b) Proposals where erection procedure, method of construction or the procedure for the demolition or removal of an existing structure is of critical importance.
- (c) Purpose built or prefabricated forms of temporary works that are alongside or temporarily support or span live carriageways or railway lines or other areas with public access, including facilities or construction procedures that maintain the structural integrity or safe operation of an existing structure.
- (d) Temporary works details, erection proposals or construction procedures involving work that affects or potentially affects the structural integrity or operating procedures of a structure during its reconstruction, demolition and removal, maintenance, monitoring, alteration or repair.

### Category of Temporary Works

4.6 The Category adopted must reflect the adverse consequences of any potential failure and comply with 2.9 and 2.10.

- (i) For Type S Proposals, the Category must be the same as the Category of the permanent structure.
- (ii) For Type P Proposals, the Category must be 2 or 3, unless it has been agreed with the TAA that the Proposal may be lowered to Category 1 or 0 as the risk is relatively minor and the reasoning is recorded in the AIP (or certificate in the case of Category 0).

### Design Criteria Relating to Permanent Works

4.7 Design criteria for temporary works must include all relevant design data concerning the design and construction of the permanent works. This includes the protection and/or safe operation of the permanent work or live carriageway during the use of a temporary highway structure, or temporary conditions of construction of new designs or the alteration of existing structures (e.g. allowable deflections, settlements, rotations, loading, jacking forces, propping requirements, clearances, impact protection, erection or demolition procedures, traffic control, carriageway possessions, etc).

### Proposals

4.8 The limits of application of a submission and related certification must be clearly described and, where applicable, related to constraints of staged construction.

4.9 Proposals must state the criteria that have been adopted to encompass the technical, operational and safety requirements of the authorities consulted and must demonstrate to the satisfaction of the TAA that adequate safeguards and contingency measures have been introduced and will be maintained throughout the duration of the work.

### Type S Proposals

4.10 Check certificate is required to confirm that checking is carried out.

4.11 Design certificate and AIP of temporary works are not required as there is no risk to the public and the Contractor is responsible for the safety and adequacy of erection or temporary works Proposals.

4.12 Prior to the commencement of the relevant parts of the Works, check certificate(s) in the form given in Annex C related to Type S Proposals must be submitted to the TAA. The certificate must be recorded and kept in the Overseeing Organisation's management system for the permanent structure.

4.13 The purpose of requiring a certified independent check is to ensure that not only are the erection proposals and/or temporary works details properly prepared but also that an independent engineer examines and certifies for their adequacy.

### Type P Proposals

4.14 Unless otherwise stated in 4.16, Proposals for temporary works must be described in an AIP in accordance with the requirements and form of submission described in Chapter 2.

4.15 Unless otherwise stated in 4.16, all design, checking and certification of temporary works for Type P Proposals must comply with the TA procedures of Chapters 1 and 2. The Type P certificate must be accepted by the TAA before consent to proceed with the works can be given.

4.16 Special requirements given in Annex E must be complied with for Third Party Proposals of temporary works or temporary structures that are not described in Chapters 3 to 6, or where the Overseeing Organisation has no specific knowledge or expertise to enable it to review the safety aspects of the Proposal.

### Technical Approval

4.17 In addition to 2.26, the Designer must provide sufficient information to enable the TAA to consider the following aspects, where applicable (this list is not necessarily exhaustive):

- (a) Structural adequacy and stability at all stages.
- (b) Precautions during erection/dismantling operations.
- (c) Protection of the temporary works (including protection against vehicle or other impact).
- (d) General provisions in terms of permanent works execution.
- (e) Loading and design criteria, including Factors of Safety where limit states design codes for bridges are not used.

- (f) Effects on any existing structures or earthworks (these must be assessed by the permanent works Designer during design).
- (g) Working spaces for installation and removal.
- (h) Clearances and access for construction plant and machinery.
- (i) Provision for periodic inspection and checking.

### Documentation

4.18 The relevant model AIP for temporary works within the scope of this Chapter is A1a or A1b, as relevant, from Annex A. TASs should be prepared in accordance with the notes given in Annex B. Relevant model certificates are C3, C4 and C6 from Annex C. Generally a certificate of construction compliance is not required for temporary works. The exception is for temporary bridges and those structures and installations where certification is required by the TAA. The form of certificates may vary depending on the Overseeing Organisation's particular requirements.

## 5. ROAD TUNNEL AND SERVICE TUNNEL STRUCTURES

### Introduction

5.1 This Chapter describes specific TA requirements for road tunnel structures including service tunnels (internal diameter greater than 2m) and major tunnelling or building operations within the zone of influence of an existing road tunnel. It must be read in conjunction with Chapters 1, 2 and 6, and in the case of cut and cover construction and for tunnel portals and road decks, the relevant sections of Chapter 3. The requirements of the Tunnel Design and Safety Consultation Group must be complied with.

5.2 For service tunnels where the internal diameter is 2m or less, the TA requirements given in this Standard do not apply. However they must comply with the requirements of HD 22 (DMRB 4.1.2).

### Scope

5.3 In addition to 1.8, the procedures described in this Chapter must be applied to:

- (a) The design and execution of new road tunnels, tunnel services buildings and service tunnels,
- (b) The assessment of existing tunnels that are subject to the effects of new temporary or permanent construction above or adjacent to the tunnel structure,
- (c) The refurbishment and strengthening of existing road tunnels.

### Category

5.4 In addition to 2.9 and 2.10, Proposals for the design or assessment of road tunnel structures and service tunnels must be in Category 3.

### Technical Approval

5.5 In addition to 2.26, the Designer must provide sufficient information to enable the TAA to consider the following aspects, where applicable (this list is not necessarily exhaustive):

#### 5.5.1 Structure and Form

- (a) Methods of excavation and construction including proposed ground categorisation for tunnelling,
- (b) Tunnel profile,
- (c) Bore spacing,
- (d) Portal design,
- (e) Waterproofing,
- (f) Maintenance access,
- (g) Ventilation shafts,
- (h) Proposed tunnel wall finish,
- (i) Fire resistance,
- (j) Stability of ground above portals,
- (k) Primary support design,
- (l) Ground water control,
- (m) Effect on overlying or adjacent structures or tunnels,
- (n) Secondary lining and cladding,
- (o) Ground movements,
- (p) Loading history of the site and effect of proposed new loading sequences,
- (q) The adequacy of the assessment of the loading conditions involved.

### 5.5.2 Alignment and Clearances

- (a) Site constraints,
- (b) Highway and tunnel alignment,
- (c) Stopping sight distances,
- (d) Carriageway and verge widths,
- (e) Duct provision for services,
- (f) Horizontal and vertical clearances,
- (g) Effect of super-elevation,
- (h) Space requirements for equipment beyond the traffic space,
- (i) Cross-connections between traffic bores and escape passages,
- (j) Emergency point spacing,
- (k) Tunnel signing,
- (l) Parking for emergency vehicles,
- (m) Area for casualty attendance,
- (n) Emergency crossovers and portal space.

### 5.5.3 General

- (a) Provision made for inspection and maintenance,
- (b) Proposals for the checking of temporary works,
- (c) The safeguards adopted to ensure that construction effects are kept within tolerable limits,
- (d) An intervention facility being in place to regulate progress or halt work in the event of unforeseen situations which might adversely affect or compromise the structural integrity or operational regime of the tunnel,
- (e) The arrangements to sustain all necessary liaison between interested stakeholders.

### Documentation

5.6 The relevant model AIP for road tunnel and service tunnel structures within the scope of this Chapter is A2 from Annex A. TASs should be prepared in accordance with the notes given in Annex B. The relevant model certificates are C1 and C6 from Annex C. The form of certificates may vary depending on the Overseeing Organisation's particular requirements.

## 6. MECHANICAL AND ELECTRICAL INSTALLATIONS

### Introduction

6.1 This Chapter describes specific TA requirements for mechanical and electrical (M&E) installations in highway structures and must be read in conjunction with Chapters 1, 2 and 3 or 5 as appropriate.

### Scope

6.2 In addition to 1.8, the procedures described in this Chapter must be applied without limitation to the following:

- (a) Moveable bridges and bridge access gantries.
- (b) Road tunnels and tunnel services buildings.
- (c) Pumped drainage installations for underpasses.

### Category

6.3 In addition to 2.9 and 2.10, Proposals for work covered by this Chapter must be in Category 3.

### Proposals

6.4 In addition to 2.12 to 2.14, Proposals must:

- (i) Be presented in terms of preliminary and/or final design Proposals as appropriate with due consideration to whole life costs.
- (ii) Fully describe the provision to be made for component replacement and provision for keeping the facility operational in the event of component failure.
- (iii) Include a draft report on maintenance and operating procedures (Safety Consultation Document) based on the relevant model document in Annex A.

### Technical Approval

6.5 In addition to 2.26, the Designer must provide sufficient information to enable the TAA to consider the following aspects, where applicable (this list is not necessarily exhaustive):

- (i) The adequacy of the consultation and Proposals forming the basis of the draft Operating Procedures (Safety Consultation Document).
- (ii) For moveable bridges:
  - (a) The provision of integrated methods of incorporating safety of road users and bridge operatives e.g. road barriers and traffic lights, linked to the bridge moving mechanism, to safeguard bridge users.
  - (b) The static and dynamic loading and design criteria under normal and adverse operating conditions including 'locked-in' stresses and over-turning.
  - (c) That all loads for the M&E design are consistent with those for the design of the bridge structure.
  - (d) The adequacy of system redundancy to guard against single component failure.
  - (e) The provision for manual operation in the event of power failure or equipment failure.

### Mechanical and Electrical Installations Certification

6.6. The design and check certificates must take account of 2.38 to 2.48 and be carried out in two stages.

- (i) Stage 1 certificates must confirm that the principles in the AIP are valid and that they have been translated into appropriate levels of equipping, design and specification. It must also confirm that sufficient information has been provided to enable the detailed design of the installation to be developed and completed in accordance with the Overseeing Organisation's requirements and that details of work tests for equipment/ systems tested at the manufacturer's work site and commissioning trials have been specified for the purpose of performance verification and formal handover.
- (ii) Stage 2 certificates must confirm that the completed design Proposals, the testing of components and the commissioning of the complete installation meet the Overseeing Organisation's requirements.

6.7 The format and wording of Stage 1 and Stage 2 certificates must be agreed with the TAA.

6.8 A copy of the relevant Safety Consultation Document with original signatures must accompany the design and check certificates.

### Documentation

6.9 The relevant model AIPs for highway structures within the scope of this Chapter are A3 and A4 from Annex A. The relevant Safety Consultation Documents are A5 and A6 from Annex A. TASs should be prepared in accordance with the notes given in Annex B. Relevant model certificates are C1 and C6 from Annex C. The form of certificates may vary depending on the Overseeing Organisation's particular requirements.

## 7. REFERENCES

### 7.1 National Standards

BS EN 1990 – Eurocode – Basis of structural design

BS EN 1991-2:2003 Eurocode 1: Actions on structures. Traffic loads on bridges

### 7.2 Design Manual for Roads and Bridges

BD 94 – Design of Minor Structures  
(DMRB 2.2.1)

HD 22 – Managing Geotechnical Risk  
(DMRB 4.1.2)

### 7.3 Regulations

Construction (Design and Management)  
Regulations 2007

### 7.4 EU Legislation

Council Directive 89/106/EEC on construction products

## 8. ENQUIRIES

All technical enquiries or comments on this Standard should be sent in writing as appropriate to:

Chief Highway Engineer  
The Highways Agency  
123 Buckingham Palace Road  
London  
SW1W 9HA

G CLARKE  
Chief Highway Engineer

Director, Trunk Road and Bus Operations  
Transport Scotland  
Buchanan House  
58 Port Dundas Road  
Glasgow  
G4 0HF

R BRANNEN  
Director, Trunk Road and Bus Operations

Director of Transport  
Welsh Government  
Cathays Park  
Cardiff  
CF10 3NQ

F DUFFY  
Director of Transport

Director of Engineering  
The Department for Regional Development  
Roads Service  
Clarence Court  
10-18 Adelaide Street  
Belfast  
BT2 8GB

R J M CAIRNS  
Director of Engineering

This document was notified in draft to the European Commission in accordance with Directive 98/34/EC, as amended by Directive 98/48/EC.

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## ANNEX A MODEL APPROVAL IN PRINCIPLE FORMS

- A1a For the design of bridges and other highway structures where UK National Standards (Eurocodes) are used
- A1b For the design or assessment of bridges and other highway structures where UK National Standards (Non-Eurocodes) are used (*see NOTE*)
- A2 For the design or assessment of road tunnel structures and service tunnels
- A3 For M&E installations in moveable bridges and access gantries
- A4 For M&E installations in road tunnels and services buildings
- A5 Safety Consultation Document  
Operation, Control and Maintenance of Moveable Bridges and Bridge Access Gantries
- A6 Safety Consultation Document  
Tunnel Operation, Control and Maintenance

NOTE: The use of UK National Standards (Non-Eurocodes) for new designs will require approval from the TAA.

## **Annex A1a**

**Model form of Approval in Principle for the design of bridges and other highway structures where UK National Standards (Eurocodes) are used**

**Name of Project** \_\_\_\_\_

**Name of Bridge or Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

### **1. HIGHWAY DETAILS**

1.1 Type of highway

1.2 Permitted traffic speed

1

1.3 Existing restrictions

2

### **2. SITE DETAILS**

2.1 Obstacles crossed

### **3. PROPOSED STRUCTURE**

3.1 Description of structure and design working life

3

3.2 Structural type

3.3 Foundation type

3.4 Span arrangements

3.5 Articulation arrangements

3.6 Classes and levels

4

3.6.1 Consequence class

3.6.2 Reliability class

3.6.3 Inspection level

3.7 Road restraint systems requirements

3.8 Proposed arrangements for future maintenance and inspection

3.8.1 Traffic management

3.8.2 Arrangements for future maintenance and inspection of structure.  
Access arrangements to structure.

3.9 Environment and sustainability

3.10 Durability. Materials and finishes

5

3.11 Risks and hazards considered for design, execution, maintenance and demolition.  
Consultation with and/or agreement from CDM co-ordinator

6

3.12 Estimated cost of proposed structure together with other structural forms considered (including where appropriate proprietary manufactured structure), and the reasons for their rejection (including comparative whole life costs with dates of estimates)

- 3.13 Proposed arrangements for construction
  - 3.13.1 Construction of structure
  - 3.13.2 Traffic management
  - 3.13.3 Service diversions
  - 3.13.4 Interface with existing structures

#### **4. DESIGN CRITERIA**

- 4.1 Actions
  - 4.1.1 Permanent actions
  - 4.1.2 Snow, Wind and Thermal actions
  - 4.1.3 Actions relating to normal traffic under AW regulations and C&U regulations 7
  - 4.1.4 Actions relating to General Order traffic under STGO regulations 8
  - 4.1.5 Footway or footbridge variable actions
  - 4.1.6 Actions relating to Special Order traffic, provision for exceptional abnormal indivisible loads including location of vehicle track on deck cross-section 9, 10
  - 4.1.7 Accidental actions
  - 4.1.8 Action during construction
  - 4.1.9 Any special action not covered above 11
- 4.2 Heavy or high load route requirements and arrangements being made to preserve the route, including any provision for future heavier loads or future widening
- 4.3 Minimum headroom provided
- 4.4 Authorities consulted and any special conditions required
- 4.5 Standards and documents listed in the Technical Approval Schedule
- 4.6 Proposed Departures relating to departures from standards given in 4.5
- 4.7 Proposed Departures relating to methods for dealing with aspects not covered by standards in 4.5
- 4.8 (Wales only) List of record of options and choices (for Categories 2 and 3 checks)

#### **5. STRUCTURAL ANALYSIS**

- 5.1 Methods of analysis proposed for superstructure, substructure and foundations 12
- 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 range of soil parameters to be used in the design of earth retaining elements

#### **6. GEOTECHNICAL CONDITIONS**

- 6.1 Acceptance of recommendations of the Geotechnical Design Report to be used in the design and reasons for any proposed changes
- 6.2 Summary of design for highway structure in the Geotechnical Design Report
- 6.3 Differential settlement to be allowed for in the design of the structure
- 6.4 If the Geotechnical Design Report is not yet available, state when the results are expected and list the sources of information used to justify the preliminary choice of foundations 13

**7. CHECK**

- 7.1 Proposed Category and Design Supervision Level
- 7.2 If Category 3, name of proposed Independent Checker
- 7.3 Erection proposals or temporary works for which Types S and P Proposals will be required, listing structural parts of the permanent structure affected with reasons

**8. DRAWINGS AND DOCUMENTS**

- 8.1 List of drawings (including numbers) and documents accompanying the submission 14

**9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE**

We confirm that details of the temporary works design will be/have been<sup>15</sup> passed to the permanent works Designer for review.<sup>16</sup>

Signed \_\_\_\_\_

Name \_\_\_\_\_

Design Team Leader

Engineering Qualifications \_\_\_\_\_<sup>17</sup>

Name of Organisation \_\_\_\_\_

Date \_\_\_\_\_

**10. THE ABOVE IS REJECTED/AGREED<sup>15</sup> SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW<sup>18</sup>**

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_

Engineering Qualifications \_\_\_\_\_<sup>17</sup>

TAA \_\_\_\_\_

Date \_\_\_\_\_

**Notes**

1. *For a bridge, give over and/or under.*
2. *Include weight, height, width and any environmental restrictions at or adjacent to the bridge.*
3. *The design working life of the structure, including temporary structure, and replaceable structural parts should be given. They should be expressed as a number of years rather than a range of years. A design working life should be based on the DMRB if stated. Otherwise it may be based on the guidance given in the Overseeing Organisation's current requirements for the use of Eurocodes for the design of highway structures.*
4. *State the classes and levels for the whole structure, as well as those for the individual structural elements if higher or lower. See the Overseeing Organisation's current requirements for the use of Eurocodes for the design of highway structures.*
5. *For concrete structures, give applicable exposure classes for particular structural elements. For all material strengths given, list the relevant codes/standards.*
6. *Designers should name the CDM co-ordinator and confirm that the CDM co-ordinator has reviewed the risks and hazards identified in the AIP and is satisfied. Also see clause 2.12(i), (ii) and (iii).*
7. *e.g. Load Models 1 and 2, BS EN 1991-2.*
8. *e.g. SV model vehicle in Load Model 3, BS EN 1991-2.*
9. *e.g. SOV model vehicle in Load Model 3, BS EN 1991-2 and/or individual vehicle which includes the following information as applicable:*
  - a) *Gross weight of the vehicle in tonnes and vehicle type and number.*
  - b) *Axle load and spacing (longitudinally and transversely).*
  - c) *Air cushion in tonnes over area applied (in metres, longitudinally and transversely).*
  - d) *Single or twin tyres and wheel contact areas.*
10. *If in doubt, the heavy or high load route requirements should be confirmed by the relevant administration e.g. Abnormal Indivisible Load team in HA. Initial indication can be found from the route maps which are available from Circular Roads No 61/72 – Routes for heavy and high abnormal loads, and also from the website <http://www.esdal.com> or in Scotland <http://www.transportscotland.gov.uk/reports/road/j12054-00.htm>*
11. *e.g. seismic action, atmospheric icing, floating debris etc.*
12. *List the main structural elements for superstructure, substructure and foundation. If the designs of the superstructure, substructure and/or foundation are carried out by different teams, refer to cl. 2.22 and 2.42.*
13. *When the Geotechnical Design Report becomes available, an addendum to the AIP, covering section 6, must be submitted to the TAA. The addendum must have its own sections 8, 9 and 10 to provide a list of drawings, documents and signatures.*
14. *Include, without limitation:*
  - a) *Technical Approval Schedule (TAS).*
  - b) *General Arrangement Drawing.*
  - c) *Relevant extracts from the Geotechnical Design Report.*
  - d) *Departures.*
  - e) *Relevant correspondence and documents from consultations.*
15. *Delete as appropriate.*
16. *This statement is applicable to temporary works design AIP only.*
17. *CEng, MICE, MStructE or equivalent.*
18. *AIP is valid for three years after the date of agreement by the TAA. If the construction has not yet commenced within this period, the AIP must be re-submitted to the TAA for review.*

## **Annex A1b**

**Model form of Approval  
in Principle for the design/  
assessment<sup>1</sup> of bridges and  
other highway structures  
where UK National Standards  
(Non-Eurocodes) are used**

**Name of Project** \_\_\_\_\_

**Name of Bridge or  
Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

### **1. HIGHWAY DETAILS**

1.1 Type of highway

1.2 Permitted traffic speed

2

1.3 Existing restrictions

3

### **2. SITE DETAILS**

2.1 Obstacles crossed

### **3. PROPOSED STRUCTURE**

3.1 Description of structure and design working life

3.2 Structural type

3.3 Foundation type

3.4 Span arrangements

3.5 Articulation arrangements

3.6 Road restraint systems requirements

3.7 Proposed arrangements for future maintenance and inspection/Inspection for Assessment1

3.7.1 Traffic management

3.7.2 Arrangements for future maintenance and inspection of structure.  
Access arrangements to structure.

3.7.3<sup>A</sup> Intrusive or further investigations proposed

3.8 Environment and sustainability

3.9 Durability. Materials and finishes/Materials strengths assumed and basis of assumptions<sup>1</sup>

4

3.10 Risks and hazards considered for design, execution, maintenance and demolition.  
Consultation with and/or agreement from CDM co-ordinator

5

3.11<sup>D</sup> Estimated cost of proposed structure, together with other structural forms considered  
(including where appropriate proprietary manufactured structure), and the reasons for  
their rejection (including comparative whole life costs with dates of estimates)

3.12<sup>D</sup> Proposed arrangements for construction

3.12.1 Construction of structure

3.12.2 Traffic management

3.12.3 Service diversions

3.12.4 Interface with existing structures

- 3.13<sup>A</sup> Year of construction
- 3.14<sup>A</sup> Reason for assessment
- 3.15<sup>A</sup> Part of structure to be assessed

#### **4. DESIGN/ASSESSMENT<sup>1</sup> CRITERIA**

- 4.1 Actions
  - 4.1.1 Permanent actions
  - 4.1.2 Snow, Wind and Thermal actions
  - 4.1.3 Actions relating to normal traffic under AW regulations and C&U regulations 6
  - 4.1.4 Actions relating to General Order traffic under STGO regulations 7
  - 4.1.5 Footway or footbridge variable actions
  - 4.1.6 Actions relating to Special Order traffic, provision for exceptional abnormal indivisible loads including location of vehicle track on deck cross-section 8
  - 4.1.7 Accidental actions
  - 4.1.8 Actions during construction
  - 4.1.9 Any special action not covered above 9
- 4.2 Heavy or high load route requirements and arrangements being made to preserve the route, including any provision for future heavier loads or future widening 10
- 4.3 Minimum headroom provided
- 4.4 Authorities consulted and any special conditions required
- 4.5 Standards and documents listed in the Technical Approval Schedule
- 4.6 Proposed Departures relating to departures from standards given in 4.5
- 4.7 Proposed Departures relating to methods for dealing with aspects not covered by standards in 4.5

#### **5. STRUCTURAL ANALYSIS**

- 5.1 Methods of analysis proposed for superstructure, substructure and foundations 11, 12
- 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 range of soil parameters to be used in the design/assessment of earth retaining elements 13

#### **6. GEOTECHNICAL CONDITIONS**

- 6.1 Acceptance of recommendations of the Geotechnical Design Report to be used in the design/assessment<sup>1</sup> and reasons for any proposed changes
- 6.2 Summary of design for highway structure in Geotechnical Design Report
- 6.3 Differential settlement to be allowed for in the design/assessment<sup>1</sup> of the structure
- 6.4<sup>D</sup> If the Geotechnical Design Report is not yet available, state when the results are expected and list the sources of information used to justify the preliminary choice of foundations 14

**7. CHECK**

- 7.1 Proposed Category
- 7.2 If Category 3, name of proposed independent Checker
- 7.3<sup>D</sup> Erection proposals or temporary works for which Types S and P Proposals will be required, listing structural parts of the permanent structure affected with reasons

**8. DRAWINGS AND DOCUMENTS**

- 8.1 List of drawings (including numbers) and documents accompanying the submission 15
- 8.2<sup>A</sup> List of construction and record drawings (including numbers) to be used in the assessment
- 8.3<sup>A</sup> List of pile driving or other construction records 19
- 8.4<sup>A</sup> List of previous inspection and assessment reports

**9. THE ABOVE IS SUBMITTED FOR ACCEPTANCE**

We confirm that details of the temporary works design will be/have been<sup>1</sup> passed to the permanent works Designer for review.<sup>16</sup>

Signed \_\_\_\_\_

Name \_\_\_\_\_  
Design/Assessment<sup>1</sup> Team Leader

Engineering Qualifications \_\_\_\_\_<sup>17</sup>

Name of Organisation \_\_\_\_\_

Date \_\_\_\_\_

**10. THE ABOVE IS REJECTED/AGREED<sup>1</sup> SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW<sup>18</sup>**

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_

Engineering Qualifications \_\_\_\_\_<sup>17</sup>

TAA \_\_\_\_\_

Date \_\_\_\_\_

**Notes**

- D. *Indicates clauses to be used in Design AIP only.*
- A. *Indicates clauses to be used in Assessment AIP only.*
1. *Delete as appropriate.*
2. *For a bridge, give over and/or under.*
3. *Include weight, height, width and any environmental restrictions at or adjacent to the bridge.*
4. *In cases of design, give applicable exposure classes for particular concrete structural elements. In cases of assessment, give material strengths from record drawings or intrusive investigation. For all material strengths given, list the relevant codes/standards.*
5. *Designers should name the CDM co-ordinator and confirm that the CDM co-ordinator has reviewed the risks and hazards identified in the AIP and is satisfied. Also see clause 2.12(i), (ii) and (iii).*
6. *e.g. HA Loading.*
7. *e.g. HB or SV Loading.*
8. *e.g. Individual vehicle which includes the following information as applicable:*
  - a) *Gross weight of the vehicle in tonnes and vehicle type and number.*
  - b) *Axle load and spacing (longitudinally and transversely).*
  - c) *Air cushion in tonnes over area applied (in metres, longitudinally and transversely).*
  - d) *Single or twin tyres and wheel contact areas.*
9. *e.g. seismic loading, atmospheric icing, floating debris etc.*
10. *If in doubt, the heavy or high load route requirements should be confirmed by the relevant administration e.g. Abnormal Indivisible Load team in HA. Initial indication can be found from the route maps which are available from Circular Roads No 61/72 – Routes for heavy and high abnormal loads, and also from the website <http://www.esdal.com> or in Scotland <http://www.transportscotland.gov.uk/reports/road/j12054-00.htm>*
11. *List the main structural elements for superstructure, substructure and foundation. If the designs of the superstructure, substructure and/or foundation are carried out by different teams, refer to cl. 2.22 and 2.42.*
12. *Factors of Safety are required where limit state design codes for bridges are not used. See 4.17(e).*
13. *Where no such geotechnical information is available, suggested earth pressure coefficient values given in relevant DMRB parts should be used instead.*
14. *When the results of the ground investigation become available, an addendum to the AIP, covering section 6, must be submitted to the TAA. The addendum must have its own sections 8, 9 and 10 to provide a list of drawings, documents and signatures*
15. *Include, without limitation:*
  - a) *Technical Approval Schedule (TAS).*
  - b) *General Arrangement Drawing.*
  - c) *Relevant extracts from the Geotechnical Design Report, Inspection Report, Intrusive Investigation Report, Previous Assessment Report (or reference for Report).*
  - d) *Departures.*
  - e) *Relevant correspondence and documents from consultations.*
16. *This statement is applicable to temporary works design AIP only.*
17. *CEng, MICE, MStructE or equivalent.*
18. *AIP is valid for three years after the date of agreement by the TAA. If the construction has not yet commenced within this period, the AIP must be re-submitted to the TAA for review.*
19. *Include details of previous structural maintenance and/or strengthening works.*

## **Annex A2**

**Model form of Approval  
in Principle for the design/  
assessment<sup>1</sup> of road tunnel  
structures and service tunnels**

**Name of Project** \_\_\_\_\_

**Name of Bridge or  
Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

### **1. HIGHWAY DETAILS**

- 1.1 Type of highway.
- 1.2 Permitted traffic speed.

### **2. TUNNEL DETAILS**

- 2.1 Basic layout. 2
- 2.2 Restrictions to traffic.

### **3. BRIEF DESCRIPTION OF TUNNEL, TRAFFIC AND TUNNEL GEOMETRY**

- 3.1 Structural form of tunnel and design working life.
- 3.2 Structural form of portal structures.
- 3.3 Traffic and Geometry.
  - 3.3.1 Horizontal and vertical alignment of tunnel and tunnel approaches. 2
  - 3.3.2 Cross-section. 3
  - 3.3.3 Highway Standards. 4
  - 3.3.4 Accommodation of M&E services in Tunnel. 5
  - 3.3.5 Minimum headroom (traffic gauge), horizontal clearances.
  - 3.3.6 Structure gauge. 6
- 3.4 Classes and levels. 6
  - 3.4.1 Consequence class.
  - 3.4.2 Reliability class.
  - 3.4.3 Inspection level.
- 3.5 Proposed arrangements for future inspection and maintenance.
- 3.6 Provision to be made in the tunnel layout for emergency communication and escape facilities, fire points, cross passages etc.
- 3.7 Landscaping above tunnel and protection of tunnel roof.
- 3.8 Sustainability issues considered. Materials and finishes for structural walls, ceiling and secondary cladding including fire protection.
- 3.9 Estimate cost of proposed structure together with other structural forms considered and the reasons for their rejection – give comparative whole life costs (with date of estimate).
- 3.10 Compliance with EU road tunnel Safety Directive requirements or alternatives with accompanying risk analysis.
- 3.11 Risks and hazards considered for design, execution, maintenance and demolition. Consultation with and/or agreement from CDM co-ordinator 7

**4. DESIGN/ASSESSMENT1 CRITERIA**

- 4.1 Actions.
  - 4.1.1 Permanent actions.
  - 4.1.2 Actions relating to normal traffic under AW regulations and C&U regulations. 8
  - 4.1.3 Actions relating to General Order traffic under STGO regulations. 9
  - 4.1.4 Actions relating to Special Order traffic, provision for exceptional abnormal indivisible loads including location of vehicle track on deck cross-section. 10
  - 4.1.5 Side verge actions.
  - 4.1.6 Accidental actions.
  - 4.1.7 Any special action not covered above.
- 4.2 Authorities consulted and any special conditions required.
- 4.3 Is the tunnel on a heavy and/or high load route, and any provision for future heavier loads or future widening.
- 4.4 Any loading from planned development over or adjacent to tunnel.
- 4.5 Technical Approval Schedule.
- 4.6 Proposed Departures relating to departures from standards given in 4.5.
- 4.7 Proposed Departures relating to methods for dealing with aspects not covered by standards in 4.5.
- 4.8<sup>D</sup> (Wales only) List of record of options and choices (for Categories 2 and 3 checks).

**5. DESCRIPTION AND DIAGRAM OF IDEALISED STRUCTURE TO BE USED FOR ANALYSIS. METHODS OF ANALYSIS AND DESIGN PROPOSED FOR TUNNEL SUPPORT SYSTEM(S) AND PORTAL STRUCTURES**

- 5.1 Methods of analysis proposed.
- 5.2 Assumptions intended for calculation of structural element stiffness.
- 5.3 Proposed range of angle of shearing resistance ( $\phi$ ) representative of the soil type(s) concerned.
- 5.4 Proposed fire design including protection of structure and cables.

**6. GEOTECHNICAL CONDITIONS**

- 6.1 Acceptance of recommendations of the Geotechnical Design Report to be used in the design/assessment<sup>1</sup> and reasons for any proposed changes. (A copy of the Geotechnical Design Report should be supplied to the TAA in advance of the AIP submission whenever possible).
- 6.2 Summary of design for highway structure in Geotechnical Design Report Highway Structure Summary Information. Give details of any further geotechnical investigation required to validate basis of design/assessment.
- 6.3 Is there any evidence of past mining or is any current or future mineral extraction likely to affect the tunnel?
- 6.4 If the Geotechnical Design Report is not yet available, state when the results are expected and list the sources of information used to justify the preliminary choice of foundations. 11



**12. THE ABOVE IS REJECTED/AGREED SUBJECT TO THE AMENDMENTS AND  
CONDITIONS SHOWN BELOW<sup>1</sup>**

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_  
Engineering Qualifications \_\_\_\_\_<sup>14</sup>  
TAA \_\_\_\_\_  
Date \_\_\_\_\_

**Notes**

1. *Delete as appropriate.*
2. *Number of tubes, lanes, length between portals.*
3. *Include widths of lanes, verges, emergency stopping lanes, space outside traffic gauge provided for M&E equipment.*
4. *Include design flows and speeds and any proposed Departures.*
5. *A separate submission is required for M&E functions and tunnel services buildings.*
6. *State the classes and levels for the whole structure, as well as those for the individual structural elements if higher or lower. See the Overseeing Organisation's current requirements for the use of Eurocodes for the design of highway structures.*
7. *Designers should name the CDM co-ordinator and confirm that the CDM co-ordinator has reviewed the risks and hazards identified in the AIP and is satisfied. Also see clause 2.12(i), (ii) and (iii).*
8. *e.g. Load Models 1 and 2 of BS EN 1991-2.*
9. *e.g. SV model vehicle in Load Model 3 in BS EN 1991-2.*
10. *e.g. SOV model vehicle in Load Model 3 in BS EN 1991-2 and/or Individual vehicle which includes the following information as applicable:*
  - a) *Gross weight of the vehicle in tonnes and vehicle type and number.*
  - b) *Axle load and spacing (longitudinally and transversely).*
  - c) *Air cushion in tonnes over area applied (in metres, longitudinally and transversely).*
  - d) *Single or twin tyres and wheel contact areas.*
11. *When the Geotechnical Design Report becomes available, an addendum to the AIP, covering Section 6, must be submitted to the TAA. The addendum must have its own sections 10, 11 and 12 to provide a list of drawings, documents and signatures.*
12. *Category 3 for road tunnel and service tunnel structures.*
13. *Include, without limitation:*
  - a) *Technical Approval Schedule (TAS).*
  - b) *General Arrangement Drawing.*
  - c) *Relevant extracts from the Geotechnical Design Report.*
  - d) *Departures.*
  - e) *Relevant correspondence and documents from consultations.*
14. *CEng, MICE, MStructE or equivalent.*

## **Annex A3**

**Model form of Approval in Principle for M&E installations in moveable bridges and access gantries**

**Name of Project** \_\_\_\_\_

**Name of Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

### **1. HIGHWAY DETAILS**

- 1.1 Type of highway.
- 1.2 Permitted traffic speed.

1

### **2. STRUCTURE DETAILS**

- 2.1 Brief description of structure.
- 2.2 Date of AIP for structure.

### **3. GENERAL DESCRIPTION OF MECHANICAL AND ELECTRICAL INSTALLATION (M&E)**

- 3.1 Proposed mode of operation of structure.
- 3.2 Location of operating and control mechanism.
- 3.3 Electrical power supply and distribution.
- 3.4 Stand-by-power facilities (UPS etc).
- 3.5 Design working life, whole life cost and sustainability considerations.

### **4. OPERATIONAL DESIGN CRITERIA (As relevant)**

- 4.1 Variable actions.
- 4.2 Traffic actions.
- 4.3 Snow actions.
- 4.4 Wind actions.
- 4.5 Thermal actions including temperature range.
- 4.6 Any Special actions not listed above (e.g. ship impact).
- 4.7 List of relevant Safety Consultation documents.
  - 4.7.1 Additional relevant standards and publications
- 4.8 Proposed Departures relating to departures from Standards given in 4.7 and 4.7.1
- 4.9 Proposed Departures relating to methods of dealing with aspects not covered by Standards in 4.7 and 4.7.1

### **5. BASIS OF OPERATION AND CONTROL**

- 5.1 Normal operation conditions
- 5.2 Authorities consulted
- 5.3 State any special requirements imposed during liaison with such authorities
- 5.4 Describe communications system involved
- 5.5 Design requirements for emergency works testing and site operating conditions
- 5.6 Fail safe operation safety systems, failure and mode effect (FME) analysis
- 5.7 Arrangements for commissioning and handover to maintaining authority including relevant documentation, operators' manuals.

2

**6. PLANT ROOM**

- 6.1 General layout.
- 6.2 Drainage and associated pumping requirements.
- 6.3 Plant room environment; heating, lighting, humidity, ventilation.
- 6.4 Mechanical and electrical equipping.
- 6.5 Security; intruder and fire alarm systems.
- 6.6 Proposed fire fighting measures.

**7. DESCRIPTION OF INSPECTION AND MAINTENANCE ARRANGEMENTS**

- 7.1 Proposals for inspection and maintenance of the moveable bridge structure or gantry are given in the AIP for the structure.
- 7.2 Proposals for inspection and maintenance of M&E installation.
- 7.3 Proposed documentation. 3
- 7.4 Proposals for plant monitoring, data collection and management.

**8. CHECK**

- 8.1 M&E installation to be Category 3. 4
- 8.2 Name of proposed independent Checker.

**9. DRAWINGS AND DOCUMENTS**

- 9.1 List of drawings and documents (including numbers) accompanying the submission. 5
- 9.2 List of documents relating to inspection, maintenance and safe operation.

**10. THE ABOVE IS SUBMITTED FOR ACCEPTANCE**

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Design Team Leader  
Engineering Qualifications \_\_\_\_\_ 6  
Name of Organisation \_\_\_\_\_  
Date \_\_\_\_\_

**11. THE ABOVE IS REJECTED/AGREED SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW<sup>7</sup>**

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_  
Engineering Qualifications \_\_\_\_\_ 6  
TAA \_\_\_\_\_  
Date \_\_\_\_\_

**Notes**

1. *For a bridge, give over and/or under.*
2. *For example; Traffic, Police, Highway, Maintenance, Local, Harbour, River, Emergency Services.*
3. *Maintenance manual and operator's manual including safe operating procedures.*
4. *Category 3 for all M&E Installations.*
5. *Include, without limitation:*
  - a) *AIP for Structure.*
  - b) *General Arrangement Drawing.*
  - c) *Departures.*
  - d) *Relevant correspondence and documents from consultations.*
  - e) *Relevant loading data from the structural design.*
6. *CEng from an appropriate Chartered Engineering Institution.*
7. *Delete as appropriate.*

## **Annex A4**

**Model form of Approval in  
Principle for M&E  
installations in road tunnels  
and services buildings**

**Name of Project** \_\_\_\_\_

**Name of Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

### **1. HIGHWAY DETAILS**

- 1.1 Type of highway 1
- 1.2 Permitted traffic speed 2
- 1.3 General description 2
- 1.4 Any restriction to traffic including maintenance

### **2. BRIEF DESCRIPTION OF STRUCTURE OPERATION AND MAINTENANCE FRAMEWORK**

- 2.1 Type of structure
- 2.2 Accommodation of M&E services in the tunnel
- 2.3 Location of tunnel monitoring centre and maintenance building(s)
- 2.4 Proposed arrangements for inspection and maintenance
- 2.5 Location of tunnel services building
- 2.6 Design working life and estimated costs of M&E services including all running, maintenance and replacement costs and sustainability considerations

### **3. AUTHORITIES CONSULTED**

- 3.1 List authorities consulted and any special requirements 3

### **4. LAYOUT AND BASIC DESIGN CRITERIA**

- 4.1 Basic tunnel geometry 4
- 4.2 Environmental conditions within the tunnel plant rooms and buildings 5
- 4.3 Technical Approval Schedule
- 4.4 Proposed Departures relating to departure from standards given in 4.3
- 4.5 Proposed Departures relating to methods for dealing with aspects not covered by standards in 4.3

### **5. VENTILATION**

- 5.1 General description including justification
- 5.2 Design criteria 6
- 5.3 Pollution and vehicle emissions 7
- 5.4 Fresh air requirements 8
- 5.5 Proposed ventilation system
- 5.6 Ventilation fans
- 5.7 Monitoring and control 9

**6. LIGHTING**

- 6.1 General description
- 6.2 Design criteria
- 6.3 Surface reflectivity 10
- 6.4 Special operating conditions
- 6.5 Monitoring and control

**7. DRAINAGE**

- 7.1 General description, design criteria
- 7.2 Effluent standards 11
- 7.3 Amounts to be handled
- 7.4 Pumping equipment 12
- 7.5 Safety precautions 13
- 7.6 Siting of sumps
- 7.7 Sizing of sumps

**8. FIRE SAFETY**

- 8.1 Design criteria 14
- 8.2 Active protection 15
- 8.3 Passive protection 16
- 8.4 Services building and plant rooms 17

**9. COMMUNICATIONS AND TRAFFIC CONTROL**

- 9.1 General description, design criteria. Traffic management authority
- 9.2 Telephone system 18
- 9.3 Emergency liaison 19
- 9.4 Traffic signs 20
- 9.5 Traffic monitoring 21

**10. TUNNEL OPERATION AND PLANT CONTROL**

- 10.1 Basis of tunnel operation. Operating and maintaining authority 22
- 10.2 Plant monitoring and control
- 10.3 Data logging and transfer
- 10.4 Plant inspection and maintenance

**11. ELECTRICAL POWER SUPPLY AND DISTRIBUTION**

- 11.1 General description and design criteria including an analysis of power requirements, supply costs and tunnel operating conditions in relation to security of supply
- 11.2 Supply distribution 23
- 11.3 Emergency arrangements 24
- 11.4 Cabling 25

**12. TUNNEL SERVICES BUILDINGS AND PLANT ROOMS**

- 12.1 General description 26
- 12.2 Design criteria and layout 27
- 12.3 Building security and protection 28

**13. CHECK**

- 13.1 Give Proposals for checking M&E installations including the design of tunnel services buildings
- 13.2 Name of proposed Checker

**14. DRAWINGS AND DOCUMENTS**

- 14.1 List of drawings (including numbers) and documents accompanying the submission 29

**15. THE ABOVE IS SUBMITTED FOR ACCEPTANCE**

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Design Team Leader  
Engineering Qualifications \_\_\_\_\_ 30  
Name of Organisation \_\_\_\_\_  
Date \_\_\_\_\_

**16. THE ABOVE IS REJECTED/AGREED SUBJECT TO THE AMENDMENTS AND CONDITIONS SHOWN BELOW<sup>31</sup>**

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_  
Engineering Qualifications \_\_\_\_\_ 30  
TAA \_\_\_\_\_  
Date \_\_\_\_\_

**Notes**

1. *Design speed and during maintenance.*
2. *Number of tubes, lanes, length between portals.*
3. *For example; Traffic, Police, Highway, Maintenance, Local, Harbour, River, Emergency Services.*
4. *Widths, heights, horizontal and vertical alignments.*
5. *Ambient temperature variations, relative humidity, effects of tunnel washing, road salts etc.*
6. *Traffic composition and system, tunnel site aspects, environmental effects, air velocities, response to fire.*
7. *Pollution thresholds and emission criteria.*
8. *Basis of determination of fresh air requirements, provision for smoke control details of computer modelling.*
9. *Management of carbon monoxide, visibility, wind speed and direction, tunnel air velocity.*
10. *Road and wall surface maintenance factor.*
11. *Including any limitations imposed by the Drainage Authority.*
12. *Ground water, precipitation, wall washing, fire fighting supplies.*
13. *Ventilation, gas detectors, fire prevention and control including automatic systems.*
14. *Fire scenarios and fire modelling, fire loading.*
15. *Fire points and equipment communications, escape means, smoke control, operating procedures.*
16. *Protection of structure, cabling, role of secondary cladding, cross connection doors.*
17. *Fire detection and control including automatic systems.*
18. *Emergency public, service, fire phones.*
19. *Communication between Police, Fire Brigade, Ambulance, Maintaining Authority including system of underground communication.*
20. *Including advance warning and diversions, vehicle over height detection.*
21. *Automatic traffic surveillance, closed circuit television.*
22. *Provision for various operating conditions and resources entailed.*
23. *Details of high voltage distribution on the road tunnel side of Electricity Supply Authority boundary.*
24. *Uninterrupted power supply, justification for standby generator.*
25. *Type, location and protection.*
26. *Including a drawing of all plant floors showing equipment layout.*
27. *Plant room and access way loading indicating any loading restrictions in the provision made for transfer and temporary positioning of heavy plant during installation maintenance or replacement.*
28. *Including fire alarm systems.*
29. *Include, without limitation:*
  - a) *Technical Approval Schedule (TAS).*
  - b) *General Arrangement Drawing.*
  - c) *Departures.*
  - d) *Relevant correspondence and documents from consultations.*
30. *CEng from an appropriate Chartered Engineering Institution.*
31. *Delete as appropriate.*

## **Annex A5**

**Model form of background  
discussion document for  
appending to AIP**

**Name of Project** \_\_\_\_\_

**Name of Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

### **THE OPERATION, CONTROL AND MAINTENANCE OF MOVEABLE BRIDGES AND BRIDGE ACCESS GANTRIES – SAFETY CONSULTATION DOCUMENT**

#### **1. INTRODUCTION**

- 1.1 Purpose of Moveable Bridge/Bridge Access Gantry Design and Safety Consultation Group <sup>1</sup>
- 1.2 Terms of reference
- 1.3 Systems overview (see Appendices)
- 1.4 Safety considerations in the use of moveable bridges/access gantries
- 1.5 Plant
- 1.6 Communications
- 1.7 Power Supply
  - 1.7.1 Emergency supply arrangements
- 1.8 Emergency breakdown arrangements
- 1.9 Organisational responsibilities, e.g. Maintaining Authority

#### **2. MAINTAINING AUTHORITY**

- 2.1 General
- 2.2 Lines of communication and cover
- 2.3 Documentation
  - 2.3.1 Operator's Manuals
  - 2.3.2 Maintenance & Inspection manuals
  - 2.3.3 Permit to work
  - 2.3.4 Condition monitoring
- 2.4 Day to day operations
- 2.5 Planned maintenance activities
- 2.6 Emergencies
- 2.7 Plant failures

#### **3. TRAINING**

#### **4. MAINTENANCE COSTS**

- 4.1 General

#### **5. PROCEDURAL TRIALS AND HANDOVER**

- 5.1 Normal use
- 5.2 Emergency drill

6. The provisions and procedures described in this document, draft No (number) dated (date) were accepted by the working party on (date)

Signed

\_\_\_\_\_  
Project Manager of the Overseeing  
Organisation

Name

Engineering Qualifications

Date

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ 2

## **APPENDICES**

- A General Layout
- B General details of system
- C Communications
  - (i) General provision
  - (ii) Location of contacts

## **Notes**

1. *The Moveable Bridge/Bridge Access Gantry Design and Safety Consultation Group should carry out similar functions to the Tunnel Design and Safety Consultation Group (TDSCG).*
2. *CEng from an appropriate Chartered Engineering Institution.*

**Annex A6**

**Model form of background  
discussion document for  
appending to AIP**

**Name of Project** \_\_\_\_\_

**Name of Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

**TUNNEL OPERATION, CONTROL AND MAINTENANCE – SAFETY CONSULTATION DOCUMENT**

**1. INTRODUCTION**

- 1.1 Purpose of Tunnel Design and Safety Consultation Group (TDSCG)
- 1.2 Terms of reference
- 1.3 Organisational responsibilities
- 1.4 Overview (see Appendices)
- 1.5 Safety considerations for road tunnels
- 1.6 Traffic Management & Signing
- 1.7 Tunnel Plant
  - 1.7.1 Ventilation
  - 1.7.2 Lighting
  - 1.7.3 Drainage
  - 1.7.4 Role in emergencies
- 1.8 Communications
  - 1.8.1 Tunnel
  - 1.8.2 Regional
  - 1.8.3 Emergency
- 1.9 Power Supply
  - 1.9.1 Normal distribution
  - 1.9.2 Emergency arrangements
- 1.10 Emergency Equipment
  - 1.10.1 Fire points
  - 1.10.2 Telephones
  - 1.10.3 CCTV
  - 1.10.4 Cross Connections between tunnel bores
- 1.11 Tunnel Services Building and Plant Room
  - 1.11.1 Functions
  - 1.11.2 Maintenance Access
  - 1.11.3 Security Protection
  - 1.11.4 Fire Protection

1

**2. POLICE AND/OR HA TRAFFIC OFFICERS**

- 2.1 Functions
- 2.2 Police HQ facilities
- 2.3 Traffic control
- 2.4 Emergency closures
- 2.5 Radio communication
- 2.6 Police computer terminal operations manual
- 2.7 Special requirements

**3. FIRE BRIGADE**

- 3.1 Fire fighting facilities – Tunnel
- 3.2 Fire fighting facilities – Services building
- 3.3 Accidental spillages
- 3.4 Radio communications

**4. AMBULANCE SERVICE**

- 4.1 General
- 4.2 Radio communications

**5. ENVIRONMENT AGENCY**

- 5.1 General
- 5.2 Specific requirements

**6. MAINTAINING AUTHORITY**

- 6.1 General
- 6.2 Lines of communication and emergency cover
- 6.3 Documentation
  - 6.3.1 Maintenance and Inspection manuals
  - 6.3.2 Permit to work
  - 6.3.3 Condition monitoring
- 6.4 Use of tunnel data
- 6.5 Day-to-day operations
- 6.6 Planned maintenance activities
- 6.7 Emergencies
- 6.8 Plant failure recording
- 6.9 Tunnel maintenance equipment
  - 6.9.1 Wall washing requirements
  - 6.9.2 Maintenance access

**7. TRAINING**

**8. MAINTENANCE CONTRACTS**

- 8.1 General

**9. TUNNEL EMERGENCIES**

- 9.1 General
- 9.2 Fire plan
- 9.3 Major incident response
  - 9.3.1 Use of emergency cross passages (doors)
  - 9.3.2 Emergency drill exercise

**10.** The provisions and procedures described in this document draft No. (number) dated (date), were accepted by the working party on date.

Signed

\_\_\_\_\_  
Project Manager of the Overseeing  
Organisation

Name

Engineering Qualifications

Date

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ <sup>2</sup>

**APPENDICES**

- A. Plan of route
- B. Cross section of tunnel
- C. Plan of tunnel identifying:
  - (i) EPD's Fire points by number
  - (ii) Bores
  - (iii) Cross passages
  - (iv) Fan positions, overrides and controls
- D. Communications
  - (i) General layout
  - (ii) Location of CCTV
- E. Tunnel drainage
- F. Traffic management plan

**Notes**

- 1. *Police, Fire Brigade, Ambulance Service, Environment Agency, Maintaining Authority.*
- 2. *CEng from an appropriate Chartered Engineering Institution.*

---

## ANNEX B NOTES FOR COMPILING TECHNICAL APPROVAL SCHEDULES

- (i) Only relevant standards should be listed. The Technical Approval Schedule (TAS) should include the current, relevant publications of the following groups of standards and guidance documents:
- British Standards
  - Eurocodes and associated UK National Annexes
  - BSi Published Documents
  - Execution Standards referenced in British Standards or Eurocodes
  - Product Standards referenced in British Standards or Eurocodes
  - The Manual Contract Document for Highway Works (MCHW)
  - The Design Manual for Roads and Bridges (DMRB)
  - Interim Advice Notes (or the equivalent in Scotland, Wales and Northern Ireland)
- (ii) The date of the publications (and any amendment) included in the TAS should be given, in the following forms:
- the year of publication for British Standards, Eurocodes and associated UK National Annexes, BSi Published Documents, Execution Standards and Product Standards
  - the month and year of publication for MCHW
  - the last two digits of the year of publication for DMRB and Interim Advice Notes
- The latest information on DMRB Standards can be obtained from the following website  
<http://www.standardsforhighways.co.uk/index.htm>
- (iii) Insert other relevant supplementary references in the TAS. These may include Acts and Regulations, Department for Transport or Highways Agency publications, industry approved codes of practice or guidance literature on best practice, technical papers/journals, and relevant information from recognised sources.
- (iv) For new designs, the use of British Standards conflicting with Eurocodes will require approval from the TAA.

## ANNEX C MODEL CERTIFICATES

- C1 Highway structures, including road and service tunnels, in Categories 0, 1, 2 or 3.  
*(May also be used as basis for Stage 1 and Stage 2 certification of M&E Installations.)*
- C2 Minor Structures and Telecom Masts on Motorways and Trunk Roads.
- C3 Type 'S' temporary works.
- C4 Type 'P' temporary works.
- C5 Specification variation.
- C6 Construction compliance.

**Annex C1**

**Model form of certificate  
for the design/assessment<sup>1</sup>  
and/or check<sup>1</sup> of highway  
structures, including road  
and service tunnels**

**Name of Project** \_\_\_\_\_  
**Name of Structure** \_\_\_\_\_  
**Structure Ref No** \_\_\_\_\_

1. We certify that reasonable professional skill and care has been used in the preparation of the design/assessment<sup>1</sup> and/or check<sup>1</sup> of (*name of structure*) with a view to securing that: 2
- i. It has been designed/assessed<sup>1</sup> and/or checked<sup>1</sup> in accordance with 3  
The following Standards; or 3  
The Approval in Principle dated (*date*) including the following: 4  
5  
6
  - ii. It has been checked for compliance with the relevant standards in i; or 7  
The assessed capacity of the structure is as follows: 8
  - iii. It has been accurately translated into construction drawings and bar bending schedules (all of which have been checked)<sup>9</sup>. The unique numbers of these drawings and schedules are:

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Design/Assessment/Check<sup>10</sup> Team Leader

Engineering Qualifications \_\_\_\_\_ 11

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_ 12  
Name of Organisation \_\_\_\_\_  
Date \_\_\_\_\_

2. The Departures and additional criteria given in paragraph 1 are agreed 13

3. The certificate is accepted by the TAA

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_

Engineering Qualifications \_\_\_\_\_ 14

TAA \_\_\_\_\_

Date \_\_\_\_\_

**Notes**

1. *Delete as appropriate.*
2. *Where several similar Category 0 or 1 structures occur in a project, they may be listed on one certificate.*
3. *Used for Category 0 only. Insert relevant current Standards including amendments to date. This certificate should be accompanied by a General Arrangement drawing.*
4. *Not required for Category 0. Insert date of agreement of the AIP by the TAA including the dates of any addenda. Note the AIP is valid for three years after the date of agreement by the TAA. If the construction has not yet commenced within this period, the AIP should be re-submitted to the TAA for review.*
5. *List any Departures and additional methods, criteria or specification clauses.*
6. *For the certification of M&E functions for highway structures, include here the reference number and date of the relevant Safety Consultation Document.*
7. *Delete for Categories 2 and 3, which require a separate check certificate.*
8. *Used for assessments only. Assessed capacity is to be recorded in the Overseeing Organisation's management system for structures.*
9. *The statement "(all of which have been checked)" is not applicable to Categories 2 and 3 design certificates.*
10. *Delete as appropriate or repeat two columns if they are signed by both Design/Assessment and Check Teams.*
11. *CEng, MICE, MStructE or equivalent, but this qualification can be relaxed for Categories 0 and 1 with the agreement of TAA.*
12. *A Principal of the organisation responsible for the design or assessment.*
13. *Delete as appropriate. Note: not permitted for Categories 0 or 1 unless the TAA considers that the Departure has little or no structural implication.*
14. *Engineer with appropriate qualification and experience for Categories 0 and 1, and with CEng, MICE, MStructE or equivalent for Categories 2 and 3.*

## **Annex C2**

**Model form of certificate  
for Minor Structures and  
Telecom Masts on motorways  
and trunk roads**

**Name of Project** \_\_\_\_\_

**Column/Mast<sup>1</sup> Ref No** \_\_\_\_\_

1. We certify that the Lighting Column System/CCTV Masts/Cantilever Masts for Traffic Signs/Signals and/or Speed Cameras and Telecom Masts<sup>1</sup> accurately shown on drawing(s) numbers (*list drawing numbers*) has/have<sup>1</sup> been designed/checked<sup>1</sup> for the following range of parameters<sup>2</sup> and fully complies with:
- i. The Specification for Highway Works (*edition, date*)
  - ii. BD 94 (DMRB 2.2.1) or
  - iii. the following standards (for the design of Telecom masts)

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Designer/Checker <sup>3</sup>  
Engineering Qualifications \_\_\_\_\_ <sup>4</sup>  
Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_ <sup>5</sup>  
Name of Organisation \_\_\_\_\_ <sup>6</sup>  
Date \_\_\_\_\_

2. This certificate is accepted by the TAA<sup>7</sup>

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_  
Engineering Qualifications \_\_\_\_\_ <sup>4</sup>  
TAA \_\_\_\_\_  
Date \_\_\_\_\_

**DESIGN AND CHECK CERTIFICATE  
(Minor Structures/Telecom Masts on motorways  
and trunk roads)**

**Name of Project  
Name of Structure  
Structure Ref No  
Date**

---

**Notes**

1. *Delete as appropriate.*
2. *For lighting column system, specify the range of combinations of column heights and lengths of brackets together with the weights and windage areas of the attachments such as lanterns, design wind speed and assumed ground conditions for which the column has been designed. For CCTV mast, cantilever mast and telecom mast, specify the design wind speed and assumed ground conditions for which the column has been designed.*
3. *Delete as appropriate or repeat if signed by both Designer and Checker.*
4. *Engineer with appropriate qualification and experience for Categories 0 and 1, and with CEng, MICE, MIStructE or equivalent for Categories 2 and 3.*
5. *A Principal of the organisation responsible for the design or check.*
6. *Manufacturer or organisation responsible for the design or check.*
7. *For Category 0 minor structures, Section 2 is not required.*

**Annex C3**

**Model form of certificate  
for type 'S' temporary works<sup>1</sup>**

**Name of Project** \_\_\_\_\_

**Name of Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

1. We certify that reasonable professional skill and care has been used in the checking of the design for the temporary works comprising (*description of temporary works*)<sup>2</sup> listed in the attached schedule.

We also certify, but without undertaking any responsibility other than towards (*name of organisation procuring the temporary works*) that in our opinion the erection proposals and proposed temporary works details specified in the attached schedule for the execution of (*project title*) are satisfactory for the proper discharge of his responsibilities, for the safety of the said part of the Works and for their safe execution in accordance with the drawings and specification and without detriment to the related permanent works<sup>3, 4</sup>.

Signed \_\_\_\_\_

Name \_\_\_\_\_  
Temporary Works Checker

Engineering Qualifications \_\_\_\_\_<sup>5</sup>

Name of Organisation \_\_\_\_\_

Date \_\_\_\_\_

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_

Name of Organisation  
procuring the temporary works \_\_\_\_\_

Date \_\_\_\_\_

2. The permanent works Designer is satisfied that the temporary works have no detrimental effects on the permanent works<sup>6</sup>

Signed \_\_\_\_\_

Name \_\_\_\_\_  
Permanent Works Designer

Engineering Qualifications \_\_\_\_\_<sup>5</sup>

Name of Organisation \_\_\_\_\_

Date \_\_\_\_\_

**DESIGN AND CHECK CERTIFICATE  
(Type S Temporary Works)**

**Name of Project  
Name of Structure  
Structure Ref No  
Date**

---

**Notes**

1. *A copy of this certificate should be forwarded to the TAA for retention with the AIP, except for Category 0, for the permanent structure to which it relates.*
2. *The description to be inserted must define unambiguously the extent of the structure to which the check is to be applied. Where necessary the extent of the Works must be shown on the drawings and the relevant Drawing numbers stated.*
3. *Delete 'and without detriment to the related permanent works' if the check is carried out by permanent works Designer.*
4. *If there is a detrimental effect on the permanent works, an Addendum to the permanent works AIP must be submitted to the TAA for review.*
5. *Engineer with appropriate qualification and experience for Categories 0 and 1, and with CEng, MICE, MStructE or equivalent for Categories 2 and 3.*
6. *This clause is not required if the check is carried out by permanent works Designer.*

**Annex C4**

**Model form of certificate  
for type 'P' temporary works**

**Name of Project** \_\_\_\_\_

**Name of Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

1. We certify that reasonable professional skill and care has been used in the preparation of the design/check<sup>1</sup> of the temporary works comprising (*description of temporary works*) with a view to securing that:
- i. It has been designed/checked<sup>1</sup> in accordance with:
    - a. The Approval in Principle dated (*date*) including the following: 2  
3
    - b. The TAA directives for the items listed in 3.ii below. 1
  - ii. The design Proposals reflect the requirements of the relevant highway authorities for all affected highways.
  - iii. The design of the temporary works has been accurately translated into temporary works drawings. The unique numbers of these drawings and schedules are:

Signed \_\_\_\_\_

Name \_\_\_\_\_  
Design/Check<sup>1</sup> Team Leader

Engineering Qualifications \_\_\_\_\_ 4

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_ 5

Name of Organisation \_\_\_\_\_

Date \_\_\_\_\_

2. This certificate is received \_\_\_\_\_ 6

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_

Name of Organisation \_\_\_\_\_

Date \_\_\_\_\_

**DESIGN AND CHECK CERTIFICATE  
(Type P Temporary Works)**

**Name of Project  
Name of Structure  
Structure Ref No  
Date**

- 
3. i. The Departures and additional criteria given in paragraph 1 are agreed. 1  
ii. It has been directed that the following items must be dealt with as described. 1  
7
4. The permanent works Designer is satisfied that the temporary works have no detrimental effects on the permanent works<sup>8</sup>
- Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Permanent Works Designer<sup>8</sup>
- Engineering Qualifications \_\_\_\_\_ 4  
Name of Organisation \_\_\_\_\_  
Date \_\_\_\_\_
5. We have considered and recommend the TAA to accept this certificate 9
- Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_  
Name of Organisation \_\_\_\_\_  
Engineering Qualifications \_\_\_\_\_ 4  
Date \_\_\_\_\_
6. The certificate is accepted by the TAA 10
- Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_  
Engineering Qualifications \_\_\_\_\_ 4  
TAA \_\_\_\_\_  
Date \_\_\_\_\_

**DESIGN AND CHECK CERTIFICATE  
(Type P Temporary Works)**

**Name of Project  
Name of Structure  
Structure Ref No  
Date**

---

**Notes**

1. *Delete as appropriate.*
2. *Insert date of acceptance of the AIP by the TAA including the dates of any addenda.*
3. *List any Departures and additional methods or criteria.*
4. *CEng, MICE, MIStructE or equivalent.*
5. *A Principal of the organisation responsible for the design/check.*
6. *This is to be completed by the organisation that procures the temporary works. This certificate is to be accepted by the TAA before consent to proceed can be given.*
7. *Describe the point at issue and the directed course of action.*
8. *Not applicable to design certificate. Not necessary for existing structures if agreed by the TAA.*
9. *This is to be completed by the Employer's representative on site when applicable.*
10. *The TAA should inform of its acceptance of this certificate to the organisation that procures the temporary works so that work may then proceed.*

**Annex C5**

**Model form of certificate  
 for specification variation**

**Name of Project** \_\_\_\_\_

**Name of Structure** \_\_\_\_\_

**Structure Ref No** \_\_\_\_\_

1. We certify that reasonable professional skill and care has been used in the preparation/check<sup>1</sup> of the following additional and substitute clauses; list clause numbers<sup>2</sup> to the bridgework series clauses of the Specification for Highway Works for (*name of project or structures*).

The text of these clauses is appended to this certificate.

Signed \_\_\_\_\_

Name \_\_\_\_\_  
 Design/Check<sup>1</sup> Team Leader

Engineering Qualifications \_\_\_\_\_ <sup>3</sup>

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_ <sup>4</sup>

Name of Organisation \_\_\_\_\_

Date \_\_\_\_\_

2. The additional and substitute clauses listed in paragraph 1 above and appended to this certificate are agreed as Departures.

3. The certificate is accepted by the TAA

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_

Engineering Qualifications \_\_\_\_\_ <sup>3</sup>

TAA \_\_\_\_\_

Date \_\_\_\_\_

**Notes**

1. Delete as appropriate.
2. Only clauses that affect structural integrity e.g. new materials are required to be checked. The Category of check should be the same as in the AIP.
3. Engineer with appropriate qualification and experience for Categories 0 and 1, and with CEng, MICE, MIStructE or equivalent for Categories 2 and 3.
4. A Principal of the organisation responsible for the design or check.

**Annex C6**  
Model form of certificate  
of construction compliance

Name of Project \_\_\_\_\_  
Structure Ref No \_\_\_\_\_

**Name of Structure**

Approval in Principle<sup>1</sup> dated (*date*) and addenda<sup>1</sup> (*date*):

Construction drawings (permanent and temporary works<sup>1,2</sup>) and bar bending schedules listed within the Design and Check Certificate/Certificates<sup>1</sup> (*date*)<sup>3</sup>:

As Constructed drawings<sup>3</sup> and Bar Bending Schedules<sup>3</sup>, the unique numbers of these drawings and schedules are:

The Specification for Highway Works (*date*), including additional and substituted clauses recorded in certificates for specification variations<sup>1,3</sup> (*date*):

1. We certify that (*name of structure*) and its equipment<sup>4</sup>:
  - i. Have been constructed, commissioned and tested<sup>1</sup> in accordance with:
    - a. The construction drawings and bar bending schedules listed within the above Design and Check Certificate/Certificates<sup>1</sup>, with any modifications in accordance with the technical approval procedures given in BD2/(*date*),<sup>1</sup> except (*list exception(s) and give appropriate information and reason for non-compliance*<sup>5</sup>).
    - b. The above Specification for Highway Works and specification variations,<sup>1</sup> except (*list exception(s) and give appropriate information and reason for non-compliance*<sup>5</sup>).
  - ii. The execution of the works has been accurately translated into As Constructed drawings and bar bending schedules as listed above.

Signed \_\_\_\_\_

Name \_\_\_\_\_  
Contractor's Representative

Engineering Qualifications \_\_\_\_\_ <sup>6</sup>

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position held \_\_\_\_\_ <sup>7</sup>

Name of Organisation \_\_\_\_\_

Date \_\_\_\_\_

2. We certify reasonable professional skill and care has been used, relating to the execution of (*name of structure*), in the task described below (*choose either a, b or c*):
- a. <sup>1</sup>Examining the execution and that it has been constructed, commissioned and tested in accordance with:
    - i. The above Approval in Principle, Design and Check Certificate/Certificates<sup>1</sup>, with any modifications in accordance with the technical approval procedures given in BD2/(*date*),<sup>1</sup> except (*list exception(s) and give appropriate information and reason for non-compliance<sup>7</sup>*).
    - ii. The construction drawings and bar bending schedules listed within the Design and Check Certificate/Certificates<sup>1</sup> (*date*)<sup>3</sup>, as modified by authorised variations accepted by the Overseeing Organisation,<sup>1</sup> except (*list exception(s) and give appropriate information and reason for non-compliance<sup>5</sup>*).
  - b. <sup>1</sup>Hands off audit role assessment to ensure that the correct quality control procedures have been followed
  - c. <sup>1</sup>(*state task/role required under the contract's work specification or if different, the actual task/role performed and give appropriate information and reason for non-compliance<sup>7</sup>*)

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Work Examiner's Representative  
Engineering Qualifications \_\_\_\_\_<sup>6</sup>  
Position held \_\_\_\_\_<sup>2</sup>  
Name of Organisation \_\_\_\_\_  
Date \_\_\_\_\_

3. This certificate is accepted by the TAA

Signed \_\_\_\_\_  
Name \_\_\_\_\_  
Position held \_\_\_\_\_<sup>7</sup>  
Engineering Qualifications \_\_\_\_\_<sup>6</sup>  
TAA \_\_\_\_\_  
Date \_\_\_\_\_

**Notes**

1. *Delete as appropriate.*
2. *Temporary works are required where they may have significant effect on the permanent works.*
3. *A full list to be given including any addenda.*
4. *Certification for mechanical and electrical installations are not required as they are covered in Section 6 of BD2. However all the maintenance and operation manuals, including guarantees, should be provided to the Overseeing Organisation.*
5. *Consider appropriate measure if required and advise the TAA if it needs to be recorded in the Overseeing Organisation's management system for structures.*
6. *Competent engineer with appropriate qualification and experience e.g. for Categories 0 and 1, and with CEng, MICE, MIStructE or equivalent for Categories 2 and 3. The acceptance of competency criteria may be varied subject to TAA agreement.*
7. *A Principal of the Contractor or organisation responsible for the execution.*

# ANNEX D PROPRIETARY MANUFACTURED STRUCTURES

## D.1 Scope

D.1.1 The range of proprietary manufactured structures may include various types of culverts; small span underbridges (up to 8 metres span) in precast concrete; various systems for earth retaining structures such as reinforced/anchored earth systems; crib and gabion walls, lighting columns, large sign supports (greater than 7m high) and environmental barriers.

These structures may be supplied with their performance declared in accordance with the requirements of the CPD (under a CE mark) either through compliance with a European harmonised standard or a European Technical Approval (ETA) issued by the European Organisation for Technical Approvals (EOTA).

D.1.2 Requirements for avoiding “barriers to trade” when specifying proprietary manufactured structures and products and for application of the TA procedure to proprietary products that have their performance declared in accordance with the CPD are given in 2.4 to 2.6.

## D.2 Different forms of construction

D.2.1 Generally the form of structure appropriate for a particular application will fall into one of the following groups:

- (a) Those where a uniquely designed structure is most suitable for the site conditions and end requirements. Such a design will be based substantially on non-proprietary materials such as reinforced concrete or structural steel, although some of the individual components may be proprietary products.
- (b) Those where a proprietary manufactured structure is the most suitable, e.g. a corrugated steel buried structure, a precast concrete culvert selected from a manufacturer’s range of products, or a proprietary reinforced earth wall system.
- (c) Those where either form of construction would be more or less equally suitable.

D.2.2 To avoid the risk of discrimination, the Designer should demonstrate to the TAA at the AIP stage that all three groups as described in D.2.1 have been considered. However there is no obligation on the Designer to adopt a design in a particular form, if there are sound engineering or aesthetic reasons for believing it to be inappropriate, or another option has clearly identified advantages that justify limiting the choice. The reasons for the final selection should be clearly recorded on the AIP form agreed by the TAA.

D.2.3 Where the use of a proprietary manufactured structure is not considered appropriate for aesthetic or other reasons, the status and authority of the person(s) making that judgment should be clearly established and recorded on the AIP form. Where others, such as planning or water authorities, with a legitimate interest or statutory duty to consider the form of structure to be provided, will not permit a particular form, that authority should be asked to provide a written justification of its position and confirmation that it is aware of the legal implications.

D.2.4 In assessing the suitability of a particular form of construction, the Designer will consider whether maintenance costs may affect the choice. In order to ensure fair competition between different structures, the foreseeable special maintenance costs may need to be added to the contract construction costs. Where this is considered necessary, it should be made clear in the O/AIP (see D.4).

### D.3 Proprietary Designs

D.3.1 Where the Designer decides that a proprietary manufactured structure is the most suitable, an outline AIP (O/AIP) should be provided for all the relevant design parameters and end use requirements for the structure. This should include appropriate statements regarding appearance, environment and maintenance considerations. A check list of requirements for the O/AIP is given in D.4. The O/AIP should be submitted to the TAA for agreement.

### D.4 Outline AIP

D.4.1 The O/AIP for proprietary manufactured structures may be based on the relevant sections of the model AIP Annex A1 and include any other additional requirements. A check list of requirements for the O/AIP is given as follows:

#### **CHECK LIST OF ESSENTIAL REQUIREMENTS FOR AN OUTLINE AIP (O/AIP)**

1. Location
2. Operational dimensions/levels
3. Requirements for traffic loads
4. Requirements for other actions
5. Relevant Departmental Standards, UK National Standards (Eurocodes and Non-Eurocodes), BSi Published Documents, Codes of Practice etc.
6. General Arrangement drawing including the Designated Outline

#### **CHECK LIST OF OTHER REQUIREMENTS FOR AN OUTLINE AIP (O/AIP)**

7. Ground investigation data
8. Appearance of structure
9. Environmental factors
10. Constraints/external control during execution
11. Operational or user requirements
12. Special maintenance
13. Any other essential requirements

### D.5 Confirmation of compliance

D5.1. Where a proprietary structure or product is supplied in accordance with an O/AIP and the item has been CE marked in accordance with the CPD the Designer must confirm to the TAA in a certificate that they have inspected the declared performance under the CE mark and that declared performance of the item meets the requirements of the O/AIP.

# ANNEX E SPECIAL REQUIREMENTS FOR OVERSEEING ORGANISATIONS CONCERNING THIRD PARTY PROPOSALS OF TEMPORARY WORKS OR TEMPORARY STRUCTURES

## E.1 Motorways and Trunk Roads in England

E.1.1 For Third Party Proposals of temporary works or temporary structures that are not described in Chapters 3 to 6 or where the Highways Agency (HA) does not have a specific knowledge or expertise, HA would not be able to give an opinion on whether they are safe or not. The Third Party is considered to have the required experience and competence to carry out the proposed works and be responsible for them. The following steps as described below must be taken to ensure that the Proposal is safe and the works are safely carried out.

E.1.2 The Third Party must seek an Agreement for its Proposal and draw up a legal agreement with the HA.

E.1.3 The legal agreement must contain, amongst other things, the following:

- (i) Outline procedures in dealing with Proposal which may include:
  - (a) Certification to confirm that the principles of design and/or execution have been appropriately transformed into an appropriate design using due reasonable professional skill and care.
  - (b) Required information to be submitted to HA. Where appropriate this could be a general arrangement drawing, reason for structure, type of highway, traffic speed, description of structure, span arrangements, headrooms, foundation types, arrangement for inspection and maintenance, highway and other live loadings, ground conditions, risks and hazards, period of service etc.
  - (c) Seeking and taking into consideration of HA considered comments on the Proposal. If HA consider there is any safety issue and that safety issue is not resolved to the satisfaction of the HA, the works must not be carried out.
  - (d) Administrative processes e.g. establish contact points; agree relevant periods of notices; Third Party to give notifications; HA to give comments and requirements; HA to grant Agreement; Third Party to start work; HA to serve notice to stop work etc.
- (ii) For Temporary Works or Temporary Structures, consider the following:
  - (a) HA should not approve or disapprove the Temporary Works or Temporary Structures or any of their isolated aspects.
  - (b) A statement to confirm that the Proposal is in compliance with normal industry standards and practices.
  - (c) Clearances e.g. headroom.
  - (d) Effect of Temporary Works or Temporary Structures on roads e.g. sight line or other highway structures e.g. load on bridges.
  - (e) Where appropriate, requirement of Geotechnical certification to HD22 (DMRB 4.1.2).

- (f) Where there is little or no proven track record of the Proposal or the Proposal is an innovative solution, the Proposal should first be tried on a test site or a minor road.
  - (g) Certification to confirm that the Proposal has been checked by an appropriately qualified and competent organisation which is independent from the Third Party. The relevant experience/competence of the Checker should be agreed with the HA before employing them.
- (iii) For aspects other than Temporary Works or Temporary Structures, consider the following:
- (a) For road traffic operations and/or management such as signage, parking and access of support vehicles, coning, lighting etc that are described in Chapters 3 to 6 or where HA have the necessary expertise, the normal HA practices required for appropriate HA technical approval processes or operational requirements must be applied.
  - (b) The relevant parts of the Design Manual for Roads and Bridges must be applied and Departures sought where appropriate.
- (iv) Agree an amount of public liability insurance by the Third Party and provide a copy of certificate to HA.
- (v) Providing confirmation to the HA that the Third Party has taken appropriate safety advice identifying what advice has been taken and from whom.
- (vi) Making good of any damages due to the work by the Third Party. Obtain a certificate from the HA Area Maintaining Agent that the condition of the road network is almost the same before and after the work by the Third Party.
- (vii) All costs associated with the Third Party Proposal will be borne by the Third Party.

## E.2 Motorways and Trunk Roads in Scotland

The requirements must be the same as for England in E.1, except that Highways Agency is to be replaced by Transport Scotland.

## E.3 All Roads in Northern Ireland

E.3.1 For Third Party Proposals for temporary works or temporary structures that are not described in Chapters 3 to 6 or where the Roads Service does not have a specific knowledge or expertise, Roads Service would not be able to give an opinion on whether they are safe or not. The Third Party is considered to have the required experience and competence to carry out the proposed works and be responsible for them.

E.3.2 The proposer/developer must ensure that structures not covered by Chapters 3 to 6 are safe and the works are safely carried out. The proposer/developer must contact the appropriate Roads Service Divisional Headquarters regarding the necessary certification procedures.

## E.4 Motorway and Trunk Road Structures in Wales

The requirements must be the same as for England in E.1, except that Highways Agency is to be replaced by the Welsh Government.

## ANNEX F USE OF INTERIM REQUIREMENTS FOR TECHNICAL APPROVAL OF HIGHWAY STRUCTURES IN ENGLISH DBFO SCHEMES

F.1 When used on the A69 Carlisle to Newcastle DBFO Contract, this standard is to be amended as follows:

Para No.	Description
Whole document	Delete whole document except the paragraphs identified below.
3.4.1 to 3.4.4 Criteria for Categories 0, 1, 2 and 3.	These criteria replace the criteria in Paragraph 34 of Section A of Part 3 of Schedule 4.

F.2 When used on the A1(M) Alconbury to Peterborough DBFO Contract, the A417/A419 Swindon to Gloucester DBFO Contract, the M1A1 Link Road (Lofthouse to Bramham) DBFO Contract, the A50/A564 Stoke-Derby Link DBFO Contract, the A30/A35 Exeter to Bere Regis DBFO Contract, the M40 Junctions 1 to 15 DBFO Contract, the A19 Dishforth to Tyne Tunnel DBFO Contract, the A1 Darrington to Dishforth DBFO Contract and the A249 Stockbury (M2) to Sheerness DBFO Contract, this standard is to be amended as follows:

Para No.	Description
Whole document	Delete whole document except the paragraphs identified below
3.4.1 to 3.4.4 Criteria for Categories 0, 1, 2 and 3.	These criteria replace the criteria in Paragraph 35 of Section A of Part 3 of Schedule 4.

F.3 When used on the M25 DBFO Contract, this standard is to be amended as follows:

Para No.	Description
Whole document	Delete whole document except the paragraphs identified below
3.4.1 to 3.4.4 Criteria for Categories 0, 1, 2 and 3.	These criteria replace the criteria in Paragraph 35 of Section A of Part 1 of Schedule 8