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**VOLUME 0    MODEL CONTRACT  
DOCUMENT FOR MAJOR  
ROAD WORKS AND  
IMPLEMENTATION  
REQUIREMENTS**

**SECTION 3    ADVICE NOTES**

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**PART 3**

**SA 3/05**

**TESTING AND CERTIFICATION IN  
HIGHWAY CONSTRUCTION  
CONTRACTS**

**SUMMARY**

This Advice Note gives guidance to the Compiler of documents on the provisions for sampling and testing of work, goods and materials to be included in the various forms of highway and road construction contracts using the Manual of Contract Documents for Highway Works (MCHW). Advice is also provided to the Overseeing Organisation's Design Agents in the preparation of Employer's Requirements and provides specific directions regarding completion of Appendices 1/5 and 1/6 to the Specification for Highway Works (SHW).

**INSTRUCTIONS FOR USE**

1. Remove SA 3/93 from Volume 0, Section and archive as appropriate. (Advice on archiving is given in Advice Note SA 4/01.)
2. Insert SA 3/05 into Volume 0, Section 3.
3. Please 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**



**SCOTTISH EXECUTIVE**



Llywodraeth Cynulliad Cymru  
Welsh Assembly Government

**WELSH ASSEMBLY GOVERNMENT  
LLYWODRAETH CYNULLIAD CYMRU**



**THE DEPARTMENT FOR REGIONAL DEVELOPMENT  
NORTHERN IRELAND**

# Testing and Certification in Highway Construction Contracts

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**REGISTRATION OF AMENDMENTS**

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# 1. INTRODUCTION

## General

1.1 This Advice Note replaces SA 3/93 in its entirety.

1.2 The purpose of this Advice Note is to give guidance to the Compiler of documents on the provisions for sampling and testing of work, goods and materials to be included in the various forms of highway and road construction contracts using the Manual of Contract Documents for Highway Works (MCHW). Advice is also provided to the Overseeing Organisation's Design Agents in the preparation of Employer's Requirements.

1.3 General requirements for the testing of work, goods and materials on highway and road construction contracts are given in Clause 105 of the Specification for Highway Works (SHW) contained in Series 100 of Volume 1 of the MCHW. Detailed requirements are identified on a Contract-specific basis by completion of Appendix 1/5 for tests to be carried out by the Contractor, or in Appendix 1/6 where the Overseeing Organisation requires samples for testing by others. Sample Appendices 1/5 and 1/6 are contained in the Notes for Guidance on the Specification for Highway Works (NGSHW) of Volume 2 of the MCHW.

## Scope

1.4 This Advice Note gives an overview of the various aspects of sampling and testing and provides specific directions regarding completion of Appendices 1/5 and 1/6 to the SHW.

1.5 Advice is also given on the specification of testing requirements for goods and materials produced to harmonised European Standards. The introduction of harmonised European Standards includes requirements for factory production control (FPC) and attestation of conformity (AoC). This will vary from self-certification by the manufacturer to approved third party product certification.

## Implementation

1.6 This advice should be followed on all contracts for which SHW is used.

## 2. IDENTIFIED AND DEFINED TERMS

2.1 In this Advice Note, unless the context otherwise requires, the following words and expressions shall have the following meanings:

- i) “Compiler” means the individual or company responsible for drafting and completing the contract documents.
- ii) “Test” means any procedure carried out to ensure that the Contractor has or will incorporate into the Works work, goods and materials that comply with the requirements of SHW and any Contract-specific Appendices.
- iii) “Audit Test” means any test carried out to confirm suppliers’ or manufacturers’ production testing carried out as part of a quality management scheme (QMS), or testing requirements under harmonised European Standards.
- iv) “Check” means any procedure carried out to ascertain whether workmanship complies with the requirements of SHW and any Contract-specific Appendices.
- v) “Trial” means any procedure carried out to demonstrate the Contractor’s ability to achieve the particular requirements of the Contract and includes procedural trials, trial panels and trial areas.
- vi) “Contractor” means the organization appointed by the Overseeing Organisation to carry out the Works, as described in the Contract, in accordance with the terms of the Contract.
- vii) “Manufacturer” means an organization responsible for performing at least one of the activities constituting the manufacture of the goods in accordance with the requirements of Contract.
- viii) “Supplier” means an organization responsible for the design and/or supply, installation and/or repair of the goods in accordance with the requirements of Contract. (Under ISO 9000:2000 this body would be known as the ‘Organization’).

Note, a “Check” is deemed not to be a “Test” and is not to be included in Appendix 1/5.

## 3. PHILOSOPHY

### General

3.1 Tests are carried out to ensure that the Contractor has, or will, incorporate into both the Temporary and Permanent Works work, goods and materials that comply with the requirements of SHW and any Contract-specific Appendices.

3.2 The SHW makes provision for the testing of work, goods and materials in Clause 105. It also provides for carrying out procedures to confirm that the Contractor's workmanship is of the specified standard. For the purposes of this Advice Note and for the avoidance of doubt, where SHW describes these procedures as a 'check', then they would not be identified in Appendix 1/5, however, where SHW describes these procedures as a 'test', then they would be identified in Appendix 1/5.

3.3 This can be illustrated by reference to SHW Clause 509. This requires drains identified as requiring watertight joints to be 'tested' where shown in Appendix 1/5, whereas it requires all drains to be 'checked' by use of a mandrel, which does not require completion of an appropriate part of Appendix 1/5.

3.4 Testing or checking may be carried out either by the Contractor or by the Engineer/Project Manager/Overseeing Organisation and it is the responsibility of the Compiler to make it clear in the contract documentation who is to carry out the testing or checking. In addition, the Compiler will need to address such matters as frequency, type, certifications and any other requirements and to complete the contract documents accordingly.

3.5 Sampling and testing to be carried out for a particular contract should be detailed in:

- (i) Appendix 1/5 - Testing of work, goods and materials to be carried out by the Contractor;
- (ii) Appendix 1/6 - Supply and delivery of samples to the Overseeing Organisation [i.e. to be tested by the Overseeing Organisation]; and
- (iii) Other SHW Clauses and Numbered Appendices, where sampling and testing requirements are either stated or Contract-specific requirements are to be detailed. Note that for some SHW Clauses the requirements for testing will only be

described in Appendix 1/5, whereas, where testing requirements are Contract-specific, these requirements will be described in SHW Clauses and Numbered Appendices and included in Appendix 1/5.

3.6 The NGSHW lead the Compiler in the completion of the relevant Appendices mentioned above. In this regard, Table NG 1/1 of Series NG 100 of the NGSHW presents a non-exhaustive list from which Contract-specific requirements for testing of work, goods and materials may be drawn, as a starting point.

3.7 In compiling Appendices 1/5 and 1/6, it is important to include only those samples and tests relevant to the particular contract, as these will form part of the Contractor's programme and price. Clearly, any irrelevant samples or tests will make pricing a contract more difficult for tenderers.

3.8 Under an Early Contractor Involvement (ECI) contract the specific contract appendices including Appendices 1/5 and 1/6 may be compiled before the scheme design is undertaken, that is, before testing requirements would be known. It is likely that the Contractor would be required to establish a testing schedule as part of the scheme design. This should be written using the philosophy of this advice note where appropriate. Table NG 1/1 should be used as a starting point to establish tests to be carried out and testing frequency.

### Testing of Work, Goods and Materials

3.9 The testing of work, goods and materials scheduled in Appendix 1/5 will cover:

- (i) tests for goods and materials, which the Contractor uses for the Works;
- (ii) tests to prove or validate the Contractor's design for any element or structure;
- (iii) tests to prove the design or validate design assumptions;
- (ii) tests of completed work;
- (iii) tests to support self-certification; and
- (iii) audit testing.



3.10 If the Contractor is required to carry out testing of work, goods and materials then Appendix 1/5 should give details of the tests and their frequency. Separate items should not be included in the Bills of Quantities for these tests where the Method of Measurement for Highway Works (MMHW), contained in Volume 4 of the MCHW, is used to ascertain the price of the Works.

### **Workmanship Compliance Checks**

3.11 In Clause 105 it states that the following are not to be included in Appendix 1/5:

- i) checking, inspecting, examining and measuring;
- ii) trials and demonstrations;
- iii) routine testing carried out by manufacturers and suppliers in compliance with a specified standard or specification; and
- iv) testing of plant.

3.12 Procedures carried out to check the Contractor's workmanship should not be listed in Appendix 1/5 as these procedures are fully described elsewhere in SHW and allowed for in Item Coverage where the MMHW is used to ascertain the price of the Works.

### **Contractor Design Tests**

3.13 The SHW makes no reference in respect of procedures to prove the Contractor's design. If any tests to prove or validate the Contractor's design are required and these are to be carried out by the Contractor, then the Compiler should ensure that these are adequately detailed in the contract documents (particularly in Appendices 1/10 or 1/11) and listed in Appendix 1/5.

3.14 Where, in the case of Contractor's Designed Structures or Elements, the associated materials are to be tested by the Contractor, the Compiler should ensure that Appendix 1/5 covers testing for all the options permitted by the design specification. Similarly, where a part of the Permanent Works designed by the Contractor is to be tested by the Overseeing Organisation, the samples scheduled in Appendix 1/6 should cover all the permitted options. The same considerations apply where the Contractor selects materials from a range of permitted options for example, type of pavement, type of pipe for drainage, etc.

3.15 Separate items should not be included in the Bills of Quantities for these tests where the MMHW is used to ascertain the price of Works.

### **Employer's Design Tests**

3.16 Employer's design tests are in respect of those parts of the Permanent Works, which have not been designed by the Contractor but for which the Designer, on behalf of the Employer, requires the design to be proven or design assumption to be validated. These tests would include, for example, CBR tests on the sub-grade.

3.17 The purpose of these tests is to give reassurance to the Designer/Overseeing Organisation that the design is adequate and if necessary to afford the opportunity to make any changes. These tests should be described in Appendix 1/5.

3.18 Separate items should not be included in the Bills of Quantities for these tests where the MMHW is used to ascertain the price of Works.

## 4. PROCUREMENT METHODS

### General

4.1 The Overseeing Organisations have a number of different forms of procurement, each of which require a different approach to the determination of testing requirements. Current forms of procurement include:

- (i) Institution of Civil Engineers Conditions of Contract 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> Edition (ICE);
- (ii) Engineering Construction Contract (ECC);
- (iii) Design and Build (D&B);
- (iv) Design Build Finance and Operate (DBFO);
- (v) Early Design and Build (EDB);
- (vi) Early Contractor Involvement (ECI).

Any of the above forms may also be used to procure maintenance works.

4.2 In respect of testing and checking, the number of interested parties will vary, depending upon the form of procurement:

- (i) The Employer's Agent (or Department's Agent in the case of a DBFO Contract);
- (ii) The Designer (Employer's or Contractor's);
- (iii) The Compiler (Employer's or Contractor's);
- (iv) The Employer;
- (v) The Contractor;
- (vi) The Overseeing Organisation;
- (vii) The Engineer/Project Manager.

### Conditions of Contract

4.3 ICE 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> editions all rely upon Clause 36 of the Conditions of Contract to ensure that the Contractor allows for sampling and testing insofar as the requirements for testing "is particularised in the Specification or Bill of Quantities in sufficient detail to enable the Contractor to have priced or allowed for the same in his Tender."

4.4 Other forms of contract, including the ECC suite, do not include in their standard clauses an equivalent Clause 36. However, the Preamble and Notes for Guidance in Volume 4 of the MCHW have been revised and published as the May 2001 amendments to Volume 4 to overcome this.

### Roles and Responsibilities

#### *ICE and ECC*

4.5 The Designer, is responsible for deciding:

- (i) what tests, if any, are required to validate any design assumptions;
- (ii) what tests are required for work, goods and materials;
- (iii) what audit tests, if any, are required;
- (iv) what Workmanship Compliance Checks are required, where these are not described in SHW;
- (v) when appropriate, what Contractor's Design Tests are required;
- (vi) the extent and frequency of the above tests/ checks; and
- (vii) in consultation with the Employer or Overseeing Organisation, what arrangements are or will be in place for receiving and testing samples supplied in accordance with Appendix 1/6.

4.6 The Compiler is responsible for:

- (i) deciding who is to carry out the testing after consultation with the Employer;
- (ii) completing Appendix 1/5 and/or 1/6 as appropriate after consultation with the Designer; and
- (iii) completing any other relevant Contract-specific Appendices (for example, Appendix 1/13: Programme of Works).

4.7 The Employer is responsible for:

- (i) making any specific testing and checking requirements known to the Compiler.

4.8 The Contractor is responsible for:

- (i) carrying out the tests listed in Appendix 1/5 including supplying results and certificates where required by the Contract;
- (ii) supplying and delivering samples listed in Appendix 1/6;
- (iii) carrying out Workmanship Compliance Checks where detailed and required by the Contract;
- (iv) carrying out Contractor's Design Tests where detailed and required by the Contract; and
- (v) carrying out Design Tests where detailed and required by the Contract.

4.9 The Overseeing Organisation is responsible for:

- (i) making any specific testing requirements known to the Compiler; and
- (ii) providing the Engineer/Project Manager with the test results of samples supplied under Appendix 1/6.

4.10 The Engineer/Project Manager is responsible for:

- (i) advising the Contractor of any test results that show non-compliance with the requirements of the contract for tests carried out on samples provided under Appendix 1/6.

#### ***D&B***

4.11 The Employer's Agent is responsible for:

- (i) deciding what design parameters should be included in the Employer's Requirements for each element of the project; and
- (ii) deciding upon any specific testing requirements relating to these.

The D&B Contractor should submit outline proposals for testing as part of his Tender Quality Plan. The D&B Contractor submits detailed testing proposals including an Appendix 1/5 as part of his design and construction proposals to the Employers Agent following Contract Award.

#### ***DBFO***

4.12 The DBFO Company is entirely responsible for the testing and examination of the Works but these would form part of the Designer's and the Contractor's Quality Plan. Both the Quality Plans and the detailed testing proposals such as an Appendix 1/5 are submitted to the Department's Agent under the Review Procedure. The Department's Agent would also carry out audits of the quality processes. The testing and examination of the works is certified by the Designer and the DBFO Company in accordance with the DBFO Contract's Design and Certification Requirements prior to opening of the new road to traffic.

#### ***ECI and EDB***

4.13 The Contractor is responsible for:

- (i) deciding the testing to be carried out;
- (ii) deciding what tests are required to validate any design assumptions;
- (iii) deciding what tests are required for work, goods and materials;
- (iv) deciding what audit tests are required;
- (v) deciding what Workmanship Compliance Checks are required, where these are not described in SHW;
- (vi) deciding the extent and frequency of the above tests/checks;
- (vii) carrying out the tests as appropriate; and
- (viii) supplying and delivering samples listed in Appendix 1/6.

## 5 QUALITY ASSURANCE, AGRÉMENT CERTIFICATES AND OTHER APPROVALS

5.1 The requirements for a Contract-specific Quality Plan are described in Appendix 1/24 of SHW.

5.2 A Contract-specific Quality Plan should be prepared by the Contractor, which should be as brief as possible but cover all the topics in the “Model Requirements” described in NG Sample Appendix 1/24 of Series NG 100 in NGS HW. The Quality Plan should also include the requirements listed in the model quality plans contained in the relevant quality management scheme documents (QMSD) described in Appendix A of SHW. Copies of sector scheme documents (SSD) are available from UKAS Publication Sales or on request from accredited certification bodies with whom the Organization is registered. They can also be accessed from UKAS web site: <http://www.ukas.com>.

### Quality Management and Product Certification Schemes

5.3 Quality management schemes were recognised by the Department for Transport/Highways Agency (HA) as far back as 1986, when they were introduced into SHW. At that time there were six quality management schemes, of which three have now become product certification schemes (cement, pipes and reinforcing and prestressing steel). Over the intervening period, the number of quality management schemes has expanded and some of these are now implemented as National Highway Sector Schemes (NHSS).

5.4 NHSS are being developed, as a partnership, by all sides of the highway industry to interpret BS EN ISO 9001 as it applies to a particular highway activity/industry within the United Kingdom.

5.5 Organizations’ quality management schemes, listed in Appendix A of SHW, and product certification schemes, listed in Appendix B of SHW, comply with BS EN ISO 9001, and are third party certificated by a certification body satisfying the requirements of EN 45012 or EN 45011 and accredited for the scheme.

5.6 The need for inspection of manufacturer’s premises and the testing of goods and materials subject to a quality management scheme or product certification scheme should be reviewed by the Overseeing Organisation. If the Overseeing Organisation has reasonable confidence in the operation

of a quality management scheme or product certification scheme, it can substantially reduce the level of inspection and testing or in some cases eliminate it. It should be noted that a quality management scheme differs from a product certification scheme by being based solely on written management procedures. Such schemes do not guarantee the quality of the actual product or workmanship. In the case of product certification schemes, the goods and materials have already undergone independent testing. Nevertheless, if the Overseeing Organisation is not satisfied with a product, appropriate testing should be undertaken. If the performance of a quality assurance scheme is not satisfactory it is essential that the certification body, the Employer and UKAS should be informed in writing by the Overseeing Organisation.

### Certification for Proprietary Products

5.7 Appendix C of SHW describes the work, goods and materials that are required to have certification for proprietary products such as a British Board of Agrément Certificate, a HAPAS Roads and Bridges Certificate or a CARES Certificate. Clause 104 of SHW requires the Contractor to submit the appropriate certificate to the Overseeing Organisation where such work, goods or materials are used. The details of the certificates to be supplied by the Contractor should be abstracted from the appropriate sections of Table NG 1/1 and scheduled in Appendix 1/5. This enables tenderers to allow for their provision in their prices.

### Statutory Type Approval

5.8 Appendix D of SHW describes the types of traffic signs such as variable message signs, retroreflecting road studs and traffic signals and control equipment that are to have Statutory Type Approval. Clause 104 of SHW requires the Contractor to submit written evidence to the Overseeing Organisation that the relevant statutory type approval has been obtained where such traffic signs are used. The information should be abstracted from the appropriate sections of Table NG 1/1 and scheduled in Appendix 1/5. This enables tenderers to allow for their provision in their prices.

### **Type Approval/Registration**

5.9 Appendix E of SHW describes the types of work, goods and materials for which proprietary products are required to have type approval/registration. Clause 104 of SHW requires the Contractor to submit a copy of the type approval/registration certificate to the Overseeing Organisation where such work, goods or materials are used. The details of the certificates to be supplied by the Contractor should be abstracted from the appropriate sections of Table NG 1/1 and scheduled in Appendix 1/5. This enables tenderers to allow for their provision in their prices.

### **Other Standards and Approvals**

5.10 Table NG 1/1 describes the circumstances where the Contractor should provide certification that work, goods and materials comply with the various named standards and specifications. The information should be abstracted from the appropriate sections of Table NG 1/1 and scheduled in Appendix 1/5. This enables tenderers to allow for their provision in their prices.

5.11 National and international standards, which specify tests, are usually written in a form in which test requirements are a matter between the Supplier or Manufacturer and the Purchaser. The Contractor is the Purchaser in this context and Clause 105 of SHW requires the Contractor to obtain test certificates provided for in a standard (or other specification) where stated in Appendix 1/5.

5.12 Any requirement for goods or materials to comply with the specified standard should be satisfied by compliance with Clause 104 of SHW.

## 6. COMPILING APPENDICES 1/5 AND 1/6

### United Kingdom Accreditation Service (UKAS) Laboratory Accreditation or Equivalent

6.1 For various tests, Table NG 1/1 indicates that a UKAS or equivalent accredited laboratory sampling and test report or certificate is required. UKAS or equivalent accreditation should only be specified for tests listed in Table NG 1/1, which are related to the criticality of the items being tested and the stage of their incorporation into the construction process. It is insufficient to simply use an approved laboratory; the accreditation scope should cover the type of test and specialisation required. Accreditation for other tests should not be specified without first consulting the Overseeing Organisation.

6.2 The Contractor is usually given the freedom of choice regarding the location and arrangements for testing and may decide to use a permanent laboratory with accreditation rather than provide a site laboratory.

### Testing by the Overseeing Organisation or the Contractor

6.3 It is not intended that all the testing (appropriate to the Contract) should necessarily be undertaken by the Contractor. The Compiler should consider carefully and decide which of the specified tests would be better undertaken by the Overseeing Organisation. The SHW requires those tests marked '†' in Table NG 1/1 to be undertaken by the Contractor and this requirement should not normally be changed.

6.4 The Compiler should avoid duplication of testing wherever possible.

### Appendix 1/5

6.5 General guidance on the extent and frequency of testing is given in sub-Clause NG 105.5 and Table NG 1/1 of Series NG 100 of NGSHW. However, where materials are known to be marginal or if initial test results show them to be such, the frequency of testing should be increased. Conversely, where material properties are consistently in excess of specified minimum requirements or well below specified maximum limits, then the frequency of testing should be reduced.

6.6 The frequency of testing will also be dependent on the size of contract, how critical the results are to the design and the weather conditions at the time of construction. These issues should be reviewed by the Designer in providing appropriate advice to the Compiler.

6.7 It is extremely difficult to predict the frequencies of testing at contract compilation stage where these are dependent on actual conditions encountered at the time of construction, such as ground conditions, sources of materials, weather, etc. This is particularly applicable to earthworks and the lower layers of pavement construction.

6.8 Where quality management schemes are in place, it should not normally be necessary for the tests included in each scheme to be duplicated by the Contractor or the Overseeing Organisation. The Overseeing Organisation should be consulted regarding the need for any audit testing.

6.9 Appendix 1/5 should indicate, where appropriate, the requirement for a test certificate for each test or series of tests carried out by the Contractor, supplier or manufacturer.

### Appendix 1/6

6.10 All samples required for testing by the Overseeing Organisation should be listed in Appendix 1/6 to enable tenderers to allow for these in their prices. No separate items for supplying samples should be included in the Bills of Quantities, unless there has been an agreed departure from the Method of Measurement (MoM).

6.11 Clause 105 of SHW requires the Contractor to provide samples at the rates specified in Appendix 1/6 at the outset of each activity, with the facility for the sampling rate to be reduced in circumstances where the Overseeing Organisation has increased confidence in the level of control. It is for the Contractor to propose a reduction in sampling rate to the Overseeing Organisation from the site samples tested to date. The evidence needed by the Contractor would be provided by the Overseeing Organisation in the form of test results. The Contractor would then need to analyse the pass and failed results and demonstrate from the results a justified reduction in the sampling rate.

## **7. REFERENCES**

### **1. MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS (MCHW): TSO**

- i) Volume 1: Specification for Highway Works
- ii) Volume 2: Notes for Guidance on the  
Specification for Highway Works
- iii) Volume 4: Method of Measurements for  
Highway Works

## 8. ENQUIRIES

All technical enquiries or comments on this Advice Note 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

Chief Road Engineer  
Scottish Executive  
Victoria Quay  
Edinburgh  
EH6 6QQ

J HOWISON  
Chief Road Engineer

Chief Highway Engineer  
Transport Wales  
Welsh Assembly Government  
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CF10 3NQ

M J A PARKER  
Chief Highway Engineer  
Transport Wales

Assistant Director of Engineering  
The Department for Regional Development  
Roads Service  
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Belfast BT2 8GB

D O'HAGAN  
Assistant Director of Engineering