THE HIGHWAYS AGENCY

THE SCOTTISH OFFICE DEVELOPMENT DEPARTMENT

THE WELSH OFFICE
Y SWYDDFA GYMREIG

THE DEPARTMENT OF
THE ENVIRONMENT FOR NORTHERN IRELAND

HD 22/92
Incorporating Ammendment No1 dated June 1993 and Amendment No2 dated April 1994

Ground Investigation and Earthworks Procedure for Geotechnical Certification

Summary: This Standard sets out the procedures to be followed and certificates to be used during the process of planning and reporting ground investigations and of planning, design and construction of earthworks for trunk road schemes including motorway schemes.

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AMENDMENT NO 2 (APRIL 1994)

Replacement Pages

Replacement Page No	Date
Front sheet 1/2, 1/3, 1/4 Enquiries page 3/1, 3/2	 April 1994 April 1994

The above sheets replace the existing sheets dated August 1992 and June 1993 which are hereby superseded.

Summary

Unintentional repetition/omission of text at the top/bottom of pages 1/2 and 1/3 has been corrected.

Implementation

The replacement pages should be used forthwith on all schemes for the construction, improvement and maintenance of trunk roads, including motorways.

AMENDMENT NO 1 (JUNE 1993)

Replacement Pages

Replacement Page No	Date
Front sheet	
Enquiries page 3/1, 3/2	June 1993
C/1, C/2	June 1993
E/1, E/2	June 1993
G/1, G/2	June 1993

The above sheets replace the existing sheets dated August 1992 which are hereby superseded.

Summary

The words "for and on behalf of" have been added above "Design Organisation" on Geotechnical Certificates 1, 2 and 3.

Implementation

The replacement pages should be used forthwith on all schemes for the construction, improvement and maintenance of trunk roads, including motorways.

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

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Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

VOLUME 4	GEOTECHNICS AND DRAINAGE
SECTION 1	EARTHWORKS

PART 2

HD 22/92

GROUND INVESTIGATION AND EARTHWORKS PROCEDURE FOR GEOTECHNICAL CERTIFICATION

Contents

1. GEOTECHNICAL CERTIFICATION

Introduction

1.1 This standard sets out the procedures to be followed and certificates to be used during the process of planning and reporting ground investigations and of planning, design and construction of earthworks for the Overseeing Department's Trunk Road Schemes, including Motorway Schemes in England, Wales and Northern Ireland. Separate certification procedures currently operating in Scotland are being retained for a further period.

1.2 The procedures to be adopted and documentation to be used for Ground Investigation contracts are set out in HD 13 (DMRB 4.1.1) and advice on ground investigation procedures is given in HA 34 (DMRB 4.1.1). HA 44 (DMRB 4.1.1) provides advice on the design and preparation of contract documents relating to earthworks.

1.3 The procedures set out in this document are relevant to new schemes, improvements and to remedial and reconstruction works and have been developed to accord with three stage consultancy agreements.

Scope

1.4 This standard sets out the procedures and documentation to be used for ground investigation and earthworks on Overseeing Department Trunk Road Schemes, including Motorway Schemes, in England, Wales and Northern Ireland.

1.5 This standard also applies to embankment strengthening and reinforced embankments up to 45 degree slope and to cases between 45 and 70 degree slope other than those where the Overseeing Department has determined that the Technical Approval procedure in BD 2 (DMRB 1.1) will be followed.

1.6 All highway schemes and remedial works involving substantial earthmoving activities or complex geotechnical features shall be certified in respect of geotechnical matters by the Design Organisation (Consulting Engineer or Agent Authority). To ensure that this certification can be accepted with confidence and in order to safeguard the Overseeing Department's interest in its infrastructure and financial commitment, the Design Organisation must identify, and obtain formal agreement to, the activities proposed to be carried out at various stages during the investigation and design processes related to geotechnical problems. The professional responsibility for the geotechnical work rests with the Design Organisation and any agreement or approval given by the Overseeing Department Geotechnical Engineer shall not relieve the Design Organisation of that responsibility.

Implementation

1.7 This Standard should be used forthwith for all schemes currently being prepared provided that, in the opinion of the Overseeing Department this would not result in significant additional expense or delay progress.

Liaison Between Overseeing Department and Design Organisation

1.8 Each Overseeing Department has on its staff a Geotechnical Engineer (GE) with responsibility for the geotechnical aspects of the work of the Overseeing Department. For each scheme, the Design Organisation shall nominate a chartered engineer with appropriate geotechnical engineering experience to be responsible for geotechnical aspects of the scheme including the preparation of procedural statements, reports and the geotechnical certificates as described below. For convenience in this document the nominee will be known as the Geotechnical Liaison Engineer (GLE). The GE and the GLE shall liaise on the geotechnical aspects of the scheme.

The extent and closeness of this liaison will be subject to mutual agreement between the Project Manager, the GLE and GE and will depend on the nature of the scheme and on the geotechnical complexities discovered as investigation and design proceed.

Application to Minor Schemes

1.9 It has not been found possible to devise firm criteria which would enable the identification, at the initial stages of preparation, of those schemes which should and those which should not be certified. Some otherwise small schemes can involve quite important earthworks or geotechnical features and thus should be covered by the certification process. However, once the first stage of planning has been completed some schemes will clearly be shown to require no geotechnical certification and the Overseeing

Department's Director will notify the Design Organisation of these as soon as possible. This decision shall be taken by the Project Manager in consultation with the GE and GLE and shall be based at least on a preliminary sources study appropriate to the scheme. In the event of a difference of opinion between the project manager and the GE, the matter will be referred to the Overseeing Department's Director for decision.

The Procedural Statement (1) and Geotechnical Certificate (1)

1.10 Soon after appointment, the Consulting Engineer or Agent Authority responsible for the design of the scheme (the Design Organisation) shall be required to submit a "Procedural Statement(1)" which is a brief statement of what is proposed to satisfy the basic geotechnical aspects of the scheme. This will in itself require an appraisal of existing available information. An example is given at **APPENDIX A**.

1.11 The GE in consultation with the Overseeing Department's scheme Project Manager (PM) will examine this statement and, if necessary, discuss it with the GLE to reach agreement that the Design Organisation may proceed within the framework of the study to carry out the necessary preliminary sources study, to report on the results and their effect on the design of the main ground investigation.

1.12 The preliminary sources study (desk study) report shall be completed prior to and be taken into account in determining routes for any Public Consultation and shall cover the geotechnical implications for the feasibility of all scheme options. An example of the contents of the report is given at **APPENDIX B**.

1.13 When submitting the preliminary sources study report for the scheme, the Design Organisation shall complete and sign a Geotechnical Certificate(1) in the form given at **APPENDIX C** as confirmation that the report incorporates the results of the study of preliminary sources.

The Procedural Statement 2

1.14 Before submitting draft Contract Documents for the main ground investigation, or any preliminary survey that may be required the Design Organisation shall submit a "Procedural Statement 2" outlining the aims of the investigation and stating with reasons, whether the Contractor is to provide an interpretative as well as a factual report. An example is given at **APPENDIX D**. Procedural Statement 2 is the Design Organisation's statement of how the ground investigation has been designed and details the extent of the ground investigation. Production of ground investigation contract documents from the procedural statement should be a straightforward exercise.

1.15 Ground investigation work will normally be let by the Overseeing Department by competitive tender. A select tender list will be prepared with close collaboration between the Design Organisation and the Overseeing Department. Documentation requirements for Ground Investigation Contracts are covered by HD 13 (DMRB 4.1.1).

1.16 Where a supplementary ground investigation is required after the main investigation, the procedure above shall be repeated and a Procedural Statement 2a produced.

Preliminary Commissions

1.17 Commissions are in some cases let which involve initial studies and the preparation of ground investigation contract documents but nothing further. In these cases a geotechnical certificate will be required at the end of these commissions to certify that the preliminary sources study (desk study) has been carried out using reasonable professional skill, care and diligence and that the contract documents for the ground investigation satisfy the needs of the scheme, the agreed Procedural Statement 2 and have been prepared in accordance with the Overseeing Department's specifications and procedures.

In such cases the Design Organisation shall complete and sign a Certificate in the form given at **APPENDIX C**, suitably modified to cover the circumstances of the particular case.

The Ground Investigation Report and Geotechnical Certificate (2)

1.18 On completion of the ground investigation the Design Organisation shall submit a report containing all the factual records and test results produced by the specialist contractor together with a separate interpretative report produced either by the specialist contractor or the Design Organisation. Confirmation or amplification of problems found in the desk study shall be included in the interpretative report. It shall also include a brief on the earthworks design parameters and where appropriate a commentary on the underlying philosophy and any special measures which need to be incorporated in the design. These shall be included in a form suitable for use in the preparation of the Main Works Contract. Advice on the preparation of factual and interpretative reports is given in HA 34 (DMRB 4.1.1), Ground Investigation Procedure. The Design Organisation shall programme his works so that the interpretative report and all relevant design information are available for consideration shortly before submission of the 1:2500 CPO plans.

1.19 Where a supplementary ground investigation is required, a supplementary factual report shall be produced by the specialist contractor. Interpretative work shall be either included in a supplementary interpretative report or incorporated into the original interpretative report as appropriate after consultation with the GE.

1.20 When submitting the ground investigation report for the scheme, the Design Organisation shall complete and sign a certificate in the form given at **APPENDIX E** as confirmation that the factual and interpretative reports incorporate the results of the investigations and their interpretation.

1.21 Where supplementary investigations require a Procedural Statement 2a to be produced, a Geotechnical Certificate 2a shall be completed and signed to cover this. (see 1.16 above)

Earthworks Design Report and Geotechnical Certificate 3

1.22 The Design Organisation shall prepare an Earthworks Design Report which shall be submitted to the GE on completion of design work and normally at least 2 months prior to submitting the draft contract documents and Geotechnical Certificate 3. The Earthworks Design Report is the Designer's detailed report to the Overseeing Department on his interpretation of the site investigations and design of the earthworks and shall include the items set out in **APPENDIX F**.

1.23 When submitting the draft contract documents for the scheme construction works(the Main Works Contract) the Design Organisation shall complete and sign a Geotechnical Certificate 3, in the form given at **APPENDIX G** as confirmation that the design and contract documents incorporate the results of the investigations and their interpretation. Tenders shall not be invited prior to receipt by the Overseeing Department's Director of Geotechnical Certificate 3. If significant amendments are made to the draft contract documents a revised Geotechnical Certificate 3 shall be submitted. Advice on the design of earthworks and the preparation of contract documents is given in HA 44 (DMRB 4.1.1), Earthworks: design and preparation of contract documents.

Brief for Resident Site Staff

1.24 The Engineer's Representative on the construction site shall be aware of the development, from the ground investigations, of the design parameters and philosophy by the production of a Brief prepared by the Design Organisation, a copy of which should be sent to the Overseeing Department's Geotechnical Engineer. The Brief shall be made available for the guidance of the resident site representative so that he is aware of possible geotechnical problems and is put in a sound position to deal with those arising which are within his delegated powers. The Earthworks Design Report may form the basis for the Brief for the resident site staff.

1.25 During the course of the construction process any significant differences between the actual conditions found and those expected are to be reported formally to the Engineer, who in turn shall report them to the Project Manager and inform the Geotechnical Engineer as soon as they become apparent.

The Geotechnical Feedback Report

1.26 The Engineer's Representative shall produce a Geotechnical Feedback Report and submit it to the

Overseeing Department's Director. The Engineer's Representative shall prepare and record the information required as an ongoing task through the Contract Period and the report shall be submitted as soon as possible after substantial completion but in any case not later than the end of the maintenance period of the scheme construction works. The report shall utilise construction data, preferably in computerised form, to provide a record of the location and nature of materials encountered. Particular geotechnical problems and their solutions shall be recorded. The format of the Geotechnical Feedback Report is given at **APPENDIX H**.

2. REFERENCES

2.1 Design Manual for Roads and Bridges

BD 2 - Technical Approval of Highway Structures on Motorways and other Trunk Roads Part I: General Procedures (DMRB 1.1)

HD 13 - Documentation Requirement for Ground Investigation Contracts (DMRB 4.1.1)

HA 34 - Ground Investigation Procedure (DMRB 4.1.1)

HA 44 - Earthworks: Design and Preparation of Contract Documents (DMRB 4.1.1)

2.2 Manual of Contract Documents for Highway Works

Volume 1: Specification for Highway Works (December 1991): HMSO (MCHW 1)

Volume 4: Bills of Quantities for Highway Works (December 1991): HMSO (MCHW 4)

3. ENQUIRIES

All technical enquiries or comments on this Standard (incorporating Amendment No 1 dated June 1993 and Amendment No 2 dated April 1994) should be sent in writing as appropriate to:

Chief Highway Engineer The Highways Agency St Christopher House Southwark Street London SE1 OTE	T A ROCHESTER Chief Highway Engineer
The Deputy Chief Engineer The Scottish Office Industry Department Roads Directorate New St Andrew's House Edinburgh EH1 3TG	J INNES Deputy Chief Engineer
The Director of Highways Welsh Office Y Swyddfa Gymreig Government Buildings Ty Glas Road Llanishen Cardiff CF4 5PL	K J THOMAS Director of Highways
Chief Engineer - Roads Service Department of the Environment for Northern Ireland Roads Service Headquarters Clarence Court 10-18 Adelaide Street Belfast BT2 8GB	W J McCOUBREY Chief Engineer - Roads Service

APPENDIX A

Procedural Statement (1)
(Before Preliminary Sources Study)

Example of items for inclusion in Procedural Statement (1) submitted to Overseeing Department after appointment of a Design Organisation to design a scheme involving substantial earthmoving or geotechnical features.

1. SCHEME

Name of Scheme, details of route and any alternative routes to be studied, key plan.

2. OBJECTIVES

(For example):
To provide an assessment of local geology and identify geotechnical features associated with the route and any likely alternative routes.

3. EXISTING INFORMATION

List of all relevant reports and sources of information to be appraised ie aerial photography, topographical and soil surveys, geological maps, mineral maps and other sources given in "BS 5930" and "LR 403".

4. GROUND CONDITIONS

An outline resumé of the geography, topography, geology, hydrology, hydrogeology, geomorphology and man made features as known, identifying any difficulties or problems likely to be encountered.

5. PROPOSED STUDIES AND INVESTIGATIONS

Programme for further and more detailed studies and investigations proposed (in the light of 3 & 4) to complete the desk study.

6. SPECIALIST CONSULTATION

Details if required with reasons.

7. PROGRAMME AND COST

Estimated programme and cost of work involved in Desk Study and any physical work required at this stage to support the Desk Study report.

8. REPORTING

Proposed format of report.

APPENDIX B

Preliminary Sources Study Report

Example of contents of the preliminary sources study report, which should cover the geotechnical implications and feasibility of all scheme options.

1. INTRODUCTION

Reference to Procedural Statement (1). Limits of study area and content and note of any previous geotechnical studies in the area.

2. SOURCES OF INFORMATION

A list of all sources tapped for geotechnical data and other general information relevant to the area with results. (Ref TRRL report "LR 403" and "BS 5930").

3. FIELD STUDIES

Description of any field activities undertaken for this report - walkovers, geomorphological/geological mapping, probing, boring, trial pitting and testing work, drainage studies, geophysical surveys etc.

4. SITE DESCRIPTION

The geography, topography, geology, hydrology, hydrogeology, geomorphology, man-made features and historical development of the area. Most conveniently presented as a series of plans and overlays.

5. GROUND CONDITIONS

Description of soils anticipated, with engineering properties known and predicted; significance of geological formations, ground water conditions etc.

6. PRELIMINARY ENGINEERING ASSESSMENT

For each soil type and/or location preliminary consideration of the design implications including:-

General Earthworks	-	location, classification, acceptability criteria, groundwater, likely difficulties and problems, areas/features to avoid.
Cuttings	-	side slopes (short and long term), potential acceptability of material, merits of special drainage or ground treatment, swelling problems.
Embankments	-	side slopes, characteristics and restrictions on use of particular soils, plant use options, drainage requirements foundation treatment.
Subgrade	-	likely CBR values (with reasoning) for cutting areas and for potential fill materials in embankments, capping layers and availability of material, drainage requirements.
Structure foundation Foundations	-	Alternative types of likely to be applicable, estimates of bearing pressures and settlements, groundwater, problem areas/strata, potential construction difficulties etc.
Soil Chemistry	-	possibility of harmful elements present in soil or groundwater.

7. COMPARISON OF SCHEME OPTIONS

List all geotechnical factors which are likely to influence the choice of routes or alignments, a Statement of the preferred routes (on geotechnical grounds).

8. APPENDIX - PROPOSALS FOR GROUND INVESTIGATION

General requirements for ground investigation with more detailed proposals related to any specific problem areas.

9. DRAWINGS

Site Plan (usually 1:10,000) with study limits and scheme options. Plans/overlays to show topography, existing boreholes, geology, geomorphology, hydrogeology, hazards and man made features etc as appropriate. Geological longitudinal sections with cross sections where appropriate.

APPENDIX C

Geotechnical Certificate 1

Scheme Title:-.....

In accordance with Procedural Statement 1 dated ..... a Study of preliminary sources [and the preparation of ground investigation contract documents] has been carried out by .....

I certify that the study of preliminary sources (the desk study) [and the preparation of contract documents for the main ground investigation] have been carried out with reasonable professional skill, care and diligence and that the report of the preliminary sources study covers the geotechnical implications for the feasibility of all the scheme options considered [and that the contract documents for the main ground investigation are fully sufficient for the purposes of investigating all the scheme options considered, comply with the agreed Procedural Statement 2, and have been prepared in accordance with the Overseeing Department's Specifications and procedures].

Signed .....

Name (in block letters) .....

for and on behalf of
Design Organisation

Name (in block letters) .....

Date .....

NOTE 1 This Certificate shall be signed in person by the Design Organisation's nominated Geotechnical Liaison Engineer.

NOTE 2 Items in parenthesis [ ] shall be deleted or included as appropriate to the circumstances of the specific case.

APPENDIX D

Procedural Statement (2)
(Before Preliminary, Main or Supplementary Ground Investigation)

Example of items for inclusion in Procedural Statement 2 submitted to Overseeing Department in advance of Contract Documents for main or supplementary ground investigations.

1. SCHEME

Details of Scheme and any alternatives to be investigated key plan.

2. OBJECTIVES

(For example):
To provide information to confirm and amplify the geotechnical and geomorphological findings of the desk study as reported separately and to obtain detailed knowledge of the soils encountered and their likely behaviour and acceptability. To ascertain ground water conditions and locations of underground workings, if any. Limits of work envisaged.

3. SPECIAL PROBLEMS TO BE INVESTIGATED

Location of structures. Sub-soil conditions below areas of high embankment. Aquifers and likely water-bearing strata affecting the works. Rock stability problems. Effects on adjacent properties etc. Any man-made features to be encountered.

4. EXISTING INFORMATION

List of all relevant reports and data.

5. PROPOSED INVESTIGATION

Fieldwork - Details of exploratory work proposed for specification areas with reasons for choice of investigatory method.

Labwork - Details of proposals with reasons for choice of test and relevance to design.

6. SITE & WORKING RESTRICTIONS

Traffic management, Difficult access, Brucellosis herds, railway etc.

7. SPECIALIST CONSULTATION

Details and reason if proposed.

8. PROGRAMME, COST AND CONTRACT ARRANGEMENTS

Anticipated start dates, contract periods, restrictions on programme, cost estimates (VAT excluded) for factual and interpretative work. Arrangements for contract work and supervision of contract.

9. REPORTING

Responsibility for Factual and Interpretative Reports (with reasons) format and topics to be covered.

APPENDIX E

Geotechnical Certificate 2

Scheme Title:-.....

In accordance with Procedural Statement 2 dated ..... a Ground Investigation has been carried out by .....

I certify that the design and supervision of the Ground Investigation have been carried out and the Factual and the Interpretative Reports have been prepared with reasonable professional skill, care and diligence; and that the Factual and Interpretative Reports have been based on the findings of the Ground Investigation.

Signed .....

Name (in block letters) .....

for and on behalf of
Design Organisation

Name (in block letters) .....

Date .....

NOTE 1 This certificate shall be signed in person by the Design Organisation's nominated Geotechnical Liaison Engineer.

NOTE 2 The Factual and Interpretative Reports will be used as the basis of design and contract documentation for the Main Works contract.

APPENDIX F

Format for Earthworks Design Report

The Earthworks Design Report relates the interpretation of the Ground Investigation to the final design adopted. It should include design summary sheets for cuttings and embankments.

Items to be included where appropriate:

1. EARTHWORKS

Location and types of materials that will be encountered and likely destination in the Works, relevant properties classification and significance of selected acceptability criteria, method and frequency of checking and testing, import and off-site tipping requirements.

2. CUTTINGS

Information as required with discussion and comment on any restraints imposed by the design, installation of drainage for soil improvement and short and long term slope stability, and other special conditions and factors. Suspect areas and features which could prove troublesome and for which the RE should be particularly watchful are to be highlighted.

3. EMBANKMENTS

Information as required with discussion and comment on any restraints imposed by the design, installation of drainage, and other special conditions and factors ie rate of filling, plant restrictions etc.

4. SUBGRADE

Anticipated problem areas, predicted CBR's during construction, design or long term CBR, effect of moisture change, predicted equilibrium moisture content and frost susceptibility, purpose of drainage etc. Discussion on capping materials, thicknesses suitability of subgrade for stabilisation.

5. STRUCTURE FOUNDATIONS

Anticipated ground conditions at each structure, design assumptions, problems foreseen with possible solutions, testing, instrumentation and general monitoring, design recommendations.

6. INSTRUMENTATION AND MONITORING

Full details of purpose, installation requirements, restrictions and frequency of reading. Predicted and critical readings.

7. FEEDBACK

Items to be included in the Feedback Report **(APPENDIX H)** and responsibility for its preparation.

Earthworks Design Report Sheet

Cutting Design Summary

SCHEME
CUT
CHAINAGE

MAX DEPTH
TYPICAL DEPTH
SIDE SLOPE 1 in..N/W: 1 in ....S/E
SLOPE TOPSOIL DEPTH

SOILS/GEOLOGY:

Strata	Typical Depths	Water Bearing

COMMENTS

EARTHWORKS:

Soil Type	Quantity	Suitability Criteria	Design Basis Quantity Suitable	(a) (b) (c) Quantity Unsuitable

TEMPORARY DRAINAGE:
Anticipated Requirements:-

Design Basis (a) (b) (c)

PERMANENT SLOPE DRAINAGE:

Location	Type	Spacing	Depth	Design Basis Backfill/Filter	(a) (b) (c) Special Measures

PAVEMENT DESIGN:

Chainage	Subgrade	Design CBR	Design Basis Capping CBR Thickness	(a) (b) (c) Special Drainage

Design Traffic .....msa

Pavement Options: Rigid/Flexible/Composite

PAVEMENT DRAINAGE:

Location	Type	Depth	Design Basis Backfill/Filter	(a) (b) (c) Special Measures

OTHER DESIGN FEATURES:
(Sections & Notes should be attached as necessary)

NOTE: Design Basis
(a) = Interpretative Report (give page ref)
(b) = Assessment Report (give page ref)
(c) = Other basis (specify)

Earthworks Design Report Sheet

Cutting Design Summary

SCHEME
CUT
CHAINAGE

MAX DEPTH
TYPICAL DEPTH
SIDE SLOPE 1 in..N/W: 1 in ....S/E
SLOPE TOPSOIL DEPTH

SOILS/GEOLOGY:
Strata — Typical Depths

COMMENTS

FOUNDATION TREATMENT: (ie topsoil removal, bulk excavation and replacement, special drainage, advance early or stage construction surcharging etc)

Chainage — Treatment Details — Design Basis (a) (b) or (c)

FOUNDATION SETTLEMENT: Design Basis (a) (b) or (c) . . .

MAX anticipated . . . . . Time period . . . . . .

EARTHWORKS: Design Basis (a) (b) or (c) . . . .
Restrictions on location and use of materials (ie low plasticity topping) and compaction plant

	General Fill	Topping	Drainage	Capping
Quantity				
Onsite/import?•				

DRAINAGE:

Location	Type	Depth	Backfill/ Filter	Special Measures	Design Basis (a) (b) or (c)?

PAVEMENT DESIGN: Design Basis (a) (b) (c) . . .

Chainage	Subgrade	Design CBR	CBR>30	Capping CBR Thickness	Special Drainage

Design Traffic . . . . . .msa — Pavement Options: Rigid/Flexible/Composite

OTHER DESIGN FEATURES:
(Sections & Notes should be attached as necessary)

NOTE: Design Basis
(a) = Interpretative Report (give page ref)
(b) = Assessment Report (give page ref)
(c) = Other basis (specify)

APPENDIX G

Geotechnical Certificate 3

Scheme Title:- .....

I certify that the design calculations and the Contract Drawings and Documents with respect to earthworks incorporate the results of the ground investigations and their interpretation and that they have been prepared with reasonable professional skill, care and diligence, with a view to ensuring that:

i. they constitute an adequate and economic design for this scheme;

ii. solutions to all the reasonably foreseeable geotechnical problems have been incorporated in this Contract;

iii. the documents accurately represent the work intended;

iv. the Bills of Quantities are a true measure of the work shown.

With the exception of any items listed below or appended overleaf the Contract Documents have been prepared in accordance with the Specification for Highway Works (MCHW 1) and Bills of Quantities for Highway Works (MCHW 4).

Signed .....

Name (in block letters) .....

for and on behalf of
Design Organisation

Name (in block letters) .....

Date .....

NOTE 1: This certificate shall be signed in person by the Design Organisation's nominated Geotechnical Liaison Engineer.

NOTE 2: Geotechnical aspects of the design of foundations for structures are covered by the Technical Approval procedure for Structures and not by this Certificate.

APPENDIX H

Format for Geotechnical Feedback Report

(Prepared by the Resident Site Staff during the Maintenance period on completion of construction)

1 EARTHWORKS

General description of earthworks - problems and their solutions, weather conditions, application of Contract suitability criteria, plant used, haul conditions, comparison of predicted and actual quantities of suitable and unsuitable material, topsoil and planting details etc.

2 CUTTINGS

Location of all materials excavated *(and any replacement*) and their subsequent destination in the works* (with dates). Instability problems, unusual ground conditions, ground water conditions and problems (see also 5) etc. Note any Hazardous material taken off site and location of disposal with dates.

3 EMBANKMENTS

Source and location of all materials placed* (with date), plant used, foundation treatment and settlements, instability problems etc.

4 SUBGRADE/PAVEMENT

Problems with subgrade preparation. Placement methods (and problems) for all pavement layers.

5 DRAINAGE

Details of effectiveness of any temporary drainage methods. Installation details and any problems with permanent drainage design and construction.

6 IMPORTED MATERIALS

Details of all imported materials - source, use, location in works *, acceptability, performance etc.

7 STRUCTURE FOUNDATIONS

Record of soil and groundwater conditions encountered, temporary works (and effectiveness). Problems met. Pile logs, pile tests and other relevant test details. Settlement records with dates of each major stage including backfill of abutments and approach fills (give geometry). Settlement control stations, as-built foundation dimensions etc.

8 TESTING

Summary of Site Lab testing - Moisture Condition Value, Dry density, Moisture Content, Particle Size Distribution, Atterberg limits etc with comment on results and effectiveness.

9 INSTRUMENTATION

Location, as built details and purpose, readings (dated), details and effects of resulting action. Performance and usefulness of installation etc. Comment on need to continue monitoring or removal from site.

10 SUMMARY OF PROBLEMS EXPERIENCED AND DESIGN CHANGES

List of problems (referred to above) with any changes in design or specification adopted with reasons. Comment as to how similar problems might be avoided in future.

NOTE 1 Items marked * (and others where possible) may be conveniently presented on longitudinal profiles and accompanying plans compiled as construction proceeds.

NOTE 2 Photographs may be included in the report to illustrate particular points.

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