SUMMARY

This standard gives the requirements of the Overseeing Organisations of England, Scotland, Wales and Northern Ireland in respect of quality management systems applicable to the design of highways including construction and maintenance Works. It provides interpretation and guidance on ISO 9001:2000 for highway designers including advice on the development and use of competence management systems.

INSTRUCTIONS FOR USE

This Standard is to be incorporated in the Manual.

1. This document supersedes HD 46/05.


4. Remove HD 46/05 from Volume 5, Section 2, Part 1.

5. Insert GD 02/08 into Volume 0, Section 2, Part 1.

6. 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.
Quality Management Systems for Highway Works

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May 2008
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PART 1

GD 02/08

QUALITY MANAGEMENT SYSTEMS FOR HIGHWAY DESIGN

Contents

Chapter
1. Introduction and Scope
2. References (Normative and Informative)
3. Terms and Definitions
4. Quality Management System
5. Management Responsibility
6. Resource Management
7. Product Realisation
8. Measurement, Analysis and Improvement
9. Bibliography
10. Enquiries

Appendices

B Model Requirements for Designers’ Quality Plans
C Guidance on the Use of Competence Management Systems
D Skills Knowledge and Understanding Requirements to Demonstrate Competence
E Project Roles and Indicative Competence Requirements
1. INTRODUCTION AND SCOPE

Introduction

1. The Overseeing Organisation attaches great importance to the thorough and careful preparation of design work carried out on its behalf by Designers. The quality of this work is a vital ingredient in the successful implementation of the Overseeing Organisation’s programme for new highways and for upgrading and maintaining the existing network.

2. This standard gives Overseeing Organisation requirements for work to ISO 9001:2000 and provides guidance to the Overseeing Organisation’s interpretation of this international standard.

Requirements

5. This standard requires Designers to operate a Quality Management System (QMS) complying with ISO 9001:2000 registered with a Certifying Body accredited by UKAS or any equivalent IAF MLA signatory with a scope which includes HD 46.

6. Guidance on the use of ISO 9001:2000 is attached to this document as Appendix A and shall be considered. Any consideration shall be reflected in Designers’ QMS and quality plans (as defined in ISO 9000:2000 Clause 3.7.5). Designers shall prepare a project-specific quality plan, which shall be made available for audit and inspection by the Overseeing Organisation on request.

7. The appendices to this standard give the Overseeing Organisation’s interpretation of how a QMS based on ISO 9001:2000 is designed, presented, implemented, measured, monitored and developed and how these arrangements are communicated to suppliers. This will be achieved by providing guidance on:

   a) what the Overseeing Organisation expects Designers to include in their QMS;
   b) the requirements of ISO 9001:2000 in relation to highway design;
   c) appropriate levels of responsibilities and competence to meet the objectives of the Overseeing Organisation and to control the design process;
   d) how to achieve customer (including end-user) satisfaction;
   e) the continual improvement of the QMS in order to improve its effectiveness;
   f) the various forms of procurement used by the Overseeing Organisation; and
   g) incorporating specific project related matters into a quality plan (See Appendix B).

Mandatory Sections

3. Mandatory sections of this document are contained in boxes. The Design Organisation must comply with these sections or obtain agreement to a Departure from Standard from the Overseeing Organisation. The remainder of the document contains advice and explanation which is commended to users for their consideration.

Scope

4. This standard applies to all Designers carrying out work on behalf of the Overseeing Organisation including:

   a) feasibility and other studies;
   b) new works, temporary works, maintenance and renewal works;
   c) work for other contracting organisations; and
   d) work as suppliers to other Designers.
8. This standard follows the structure of ISO 9001:2000 and, uses the same paragraph numbering for Sections 4 to 8. In order to understand the requirements of the Overseeing Organisation, it is essential that this document is read in conjunction with ISO 9001:2000.

Implementation and Supersession

9. This standard supersedes HA 46/92 and shall be used on new projects with effect from the date of issue. It shall be used on existing projects, with the agreement of the Overseeing Organisation, except where, in the opinion of the Overseeing Organisation, this would result in significant additional expense or delay.

10. Designers may apply at anytime after 1 March 2006 to UKAS accredited certification bodies in order for their existing ISO 9001:2000 certification to be validated in terms of its ability to meet the requirements of HD 46.

11. The scope wording of the ISO 9001:2000 certificate will confirm that the QMS has been validated by the certification body against the requirements of HD 46.

12. The Designer’s QMS will be verified by the certification body, against the requirements of HD 46, using example(s) of completed design activities.

13. The scope wording of the ISO 9001:2000 certificate will confirm that the QMS has been verified by the certification body against the requirements of HD 46.

14. Confirmation of continued compliance with the requirements of HD 46 will be undertaken during routine surveillance visits by certification bodies.
2. REFERENCES (NORMATIVE AND INFORMATIVE)

General

1. For dated references, subsequent amendments to, or revisions of, any of the publications listed below do not apply. However, Designers are encouraged to investigate the possibility of applying the most recent edition of the documents. For undated references, the latest edition of a document applies.

Normative References

2. The following normative documents contain provisions, which, through reference in this text, are applicable to this standard:

- ISO 9000:2000, Quality management systems – Fundamentals and vocabulary;
- ISO 9001:2000, Quality management systems – Requirements;
- Design Manual For Roads and Bridges Volume 1, Section 1, Part 1 – BD 2 Technical Approval of Highway Structures;
- Design Manual For Roads and Bridges Volume 5, Section 2, Part 2 – HD 19 Road Safety Audit;
- Design Manual For Roads and Bridges Volume 4, Section 1, Part 2 – HD 22 Managing Geotechnical Risk;
- Design Manual For Roads and Bridges Volume 5, Section 3, Part 1 – HD 34 Implementation and Use of the Standards Improvement System;
- Design Manual For Roads and Bridges Volume 5, Section 2, Part 5 – HD 42 Non-Motorised User Audits; and
- Design Manual For Roads and Bridges Volume 8, Section 1, Part 2 – TA 84 Traffic Signals and Control Equipment.

Informative References

3. The following informative documents contain additional guidance, which, through reference in this text, are applicable to this standard:

- ISO 9004:2000, Quality management systems – Guidelines for performance improvements; and
3. TERMS AND DEFINITIONS

1. For the purposes of this standard, the terms and definitions given in ISO 9000:2000 Quality management systems – Fundamentals and vocabulary apply. ISO 9000:2000 describes the supply chain using the following vocabulary:

   supplier → organisation → customer

2. These terms also need to be considered in context of the definition of interested party, which is defined in ISO 9000:2000 as the person or group having an interest in the performance or success of an organisation.

3. Table 3/1 below indicates how the Overseeing Organisation considers the relationship between the various parties in the supply chain.

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Organisation</th>
<th>Customer</th>
<th>Interested Party</th>
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<tbody>
<tr>
<td>Sub consultants, survey companies, etc</td>
<td>Designer</td>
<td>Generally the Overseeing Organisation but can include contracting organisations or other designers</td>
<td>Road users, road neighbours, stakeholders and the Overseeing Organisation in circumstances where they are not the customer</td>
</tr>
<tr>
<td>Designer</td>
<td>Overseeing Organisation</td>
<td>Road users, road neighbours, stakeholders</td>
<td>Customers and other organisations within the supply chain</td>
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Table 3/1: Supply Chain Relationship

4. Other Terms and Definitions:

   a) Competence Management System
      – a system to identify, train, develop, monitor, verify, assess, improve and record competence of personnel in order to carry out the processes and activities identified in the QMS and quality plans.

   b) Designer – any organisation which carries out design activities for or on behalf of the Overseeing Organisation:
      - Managing Agent (MA) – the organisation responsible for carrying out all design work, asset inspections and network maintenance management of the Overseeing Organisation’s assets;
      - Maintenance Contractor (MC) – the contracting organisation (for example Managing Agent Contractor in England, Operating Company in Scotland and Maintenance Agency in Wales) responsible for managing and maintaining the Overseeing Organisation’s assets;
      - Design Agent (DA) – a consultant or other organisation commissioned to undertake the various stages of project preparation and supervision of construction;
      - Companies working on Design Build Finance and Operate (DBFO) projects;
- Organisations carrying out the design of temporary works;

- Organisations carrying out independent checks of designs prepared by other organisations;

- Organisations carrying out work during the course of site supervision; and

- Organisations working as a supplier to any of the above.
4. QUALITY MANAGEMENT SYSTEM

4.1 General Requirements

1. Designers are required by ISO 9001:2000 to identify the processes needed for their QMS. These processes include processes for management activities, provision of resources, product realisation and measurement. Designers are also required to continually improve these processes.

2. ISO 9004:2000 identifies the following eight quality management principles:
   a) Customer Focus;
   b) Leadership;
   c) Involvement of People;
   d) Process Approach;
   e) Systems Approach to Management
   f) Continual Improvement;
   g) Factual Approach to Decision Making; and
   h) Mutually Beneficial Supplier Relationships.

Appendix A provides guidance to Designers on what to include in their QMS in order to embrace these principles.

4.2 Documentation Requirements

4.2.1 General

1. No additional requirements.

4.2.2 Quality Manual

1. No additional requirements.

4.2.3 Control of Documents

1. No additional requirements.

4.2.4 Control of Records

1. No additional requirements.
5. MANAGEMENT RESPONSIBILITY

5.1 Management Commitment

1. ISO 9001:2000 requires top management to provide evidence of its commitment to the development and implementation of the QMS and to continually improve its effectiveness. In order to meet the aims and objectives of the Overseeing Organisation, the Designers’ commitments shall demonstrate:

a) adequate quality policy, system design, application, implementation and development;

b) identification and compliance with applicable legislation;

c) adequate provision and development of resources;

d) communication of objectives, policies and principles;

e) provision and communication of relevant technical information and data;

f) promotion of innovation in design and testing; and

g) evidence of continual improvement as an objective.

5.2 Customer Focus

1. Guidance is provided in Appendix A.

5.3 Quality Policy

1. Guidance is provided in Appendix A.

5.4 Planning

5.4.1 Quality Objectives

1. Guidance is provided in Appendix A.

5.4.2 Quality Management System Planning

1. No additional requirements.

5.5 Responsibility, Authority and Communication

5.5.1 Responsibility and Authority

1. Top management shall identify named individuals within the Designer’s organisation who are responsible for:

a) health and safety aspects;

b) ensuring that the activities, including preventive action required by the QMS or contract are planned, implemented and controlled and their progress monitored;

c) communicating requirements specific to the product, project or contract to the customer and interested parties and resolving problems that arise at the interfaces between them;

d) reviewing the results of any nonconformities, system failures, supplier failures and audits;

e) reviewing interested party and customer feedback; and

f) controlling corrective and preventive actions.

5.5.2 Management Representative

1. No additional requirements.
5.5.3 Internal Communication

1. Top management shall communicate its desire to meet customer requirements to the workforce. The Overseeing Organisation requires Designers’ project teams to be made aware of and cascade as necessary their:

a) latest strategies (e.g. on safety, environment, economy, accessibility, integration, diversity and disability); and

b) requirements concerning the implementation and use of systems including quality, environmental management and occupational health and safety.

5.6 Management Review

5.6.1 General

1. Guidance is provided in Appendix A.
6. RESOURCE MANAGEMENT

6.1 Provision of Resources

1. No additional requirements.

6.2 Human Resources

6.2.1 General
1. Guidance is provided in Appendix A.

6.2.2 Competence, Awareness and Training
1. Quality plans shall:
   a) provide details of and explain the Designer’s Competence Management System. This may be by reference to a separate document;
   b) identify the competencies required for the processes identified in the quality plan;
   c) include any project-specific competency matrices;
   d) identify any specific training that may be required for personnel carrying out a process that is a subject of the quality plan; and
   e) demonstrate how the Designer evaluates training effectiveness.
2. Guidance is provided in Appendix A.

6.3 Infrastructure

1. Guidance is provided in Appendix A.

6.4 Work Environment

1. Guidance is provided in Appendix A.
7. PRODUCT REALISATION

7.1 Planning of Product Realisation

1. Designers are required to plan and develop the processes for product realisation. Product delivered to customers, including the Overseeing Organisation, will typically include surveys, reports, approval in principle documents, design risk assessments, requests for departures from standards, drawings, specifications, calculations, bills of quantities, various forms of certification and like items. This standard classes such product as Design Product resulting from a Design Production process.

2. Design planning for individual projects must include the following items which shall be identified in quality plans:
   a) project-specific processes, their interdependence and organisation;
   b) resources and required competencies (design team personnel, suppliers, support and administration);
   c) processes required for checking and review of design production (verification, validation and design review);
   d) management of scope of work, programme and budget;
   e) monitoring, inspection and test activities; and
   f) processes for design change control during design production and post design (during construction).

3. Guidance is provided in Appendix A.

7.2 Customer-Related Processes

7.2.1 Determination of Requirements Related to the Product

1. Designers shall determine the following and embrace them as appropriate:


   b) The Overseeing Organisation requirements relating to particular design elements including:
      - Technical Approval of Highway Structures (BD 2);
      - Managing Geotechnical Risk (HD 22);
      - Road Safety Audit (HD 19);
      - Implementation and Use of the Standards Improvement System (HD 34);
      - Non-Motorised User Audits (HD 42); and
      - Traffic Signals and Control Equipment (TA 84);

   c) The Overseeing Organisation’s project related requirements including:
      - economic appraisal and approval;
      - environmental assessment;
      - procedures for departures from standard;
      - design certification;
      - value engineering/value management;
      - risk management;
- Line and Side Roads Orders; and
- Compulsory Purchase Orders.

d) Statutory and regulatory requirements included in the Construction (Design and Management) Regulations (CDM). CDM issues relevant to Designers’ processes include:
   - competence;
   - design risk assessments; and
   - resources.


3. Designers shall identify the Overseeing Organisation’s requirements in relation to aspects such as the environment and sustainability. See 5.5.3.

4. Customer related processes relevant to a project shall be identified in quality plans and shall:
   a) identify and document or reference specific customer-related requirements;
   b) identify the person in the organisation responsible for Standards Improvement System (HD 34) reports;
   c) identify how the Overseeing Organisation’s requirements for involvement in design production activities, such as participation in design production reviews, design production verification, value engineering and risk management will be met; and
   d) include details of customer and interested party contacts and communication protocols.

7.2.2 Review of Requirements Related to Product

1. Quality plans shall:
   a) identify arrangements for the review of requirements specified for the product;
   b) indicate how the results of this review are to be recorded and how conflicts or ambiguities in requirements are to be resolved; and
   c) include arrangements for a review/confirmation of the Overseeing Organisation’s requirements and any agreed amplifications.

7.2.3 Customer Communication

1. Quality plans shall identify the arrangements for communicating with the Overseeing Organisation.

7.3 Design and Development

1. Specific design and development processes including design and development review, design and development verification and design and development validation shall be included in quality plans.

2. Guidance is provided in Appendix A.

7.4 Purchasing

7.4.1 Purchasing process

1. Quality plans shall indicate:
   a) any goods and services affecting the Overseeing Organisation’s specific products that are to be purchased and the relevant quality management requirements;
   b) requirements for, and reference to, supplier’s Quality plans and QMS where appropriate;
   c) the methods to be used to satisfy regulatory requirements that apply to purchased goods or services affecting the Overseeing Organisation’s specific products; and
d) how the Designer will verify supplier product conformance to specified requirements for goods or services affecting the Overseeing Organisation’s specific products, particularly if the supplier does not operate a registered QMS.

2. Guidance is provided in Appendix A.

7.4.2 Purchasing Information

1. Guidance is provided in Appendix A.

7.4.3 Verification of Purchased Product

1. No additional requirements.

7.5 Production and Service Provision

1. Guidance is provided in Appendix A.

7.5.1 Control of Production and Service Provision

1. Where this is the control of Design Production, the following sections identified in ISO 9001:2000 Section 7.3 shall apply:
   a) 7.3.1 Design and development planning;
   b) 7.3.2 Design and development inputs;
   c) 7.3.3 Design and development outputs; and
   d) 7.3.7 Control of design and development changes.

2. The Overseeing Organisation requires its product:
   a) to be controlled to ensure that changes and the current revision and status of documents are identified; and
   b) to be prepared, verified and approved by competent personnel.

3. Quality plans shall identify:
   a) the specific design process and how it is to be carried out, controlled and documented;

4. Section 4.1 of ISO 9001:2000 requires control of such outsourced processes to be identified within the QMS. Quality plans shall identify such processes specific to product. Examples of outsourced processes are:
   a) design carried out by suppliers;
   b) topographical survey work;
   c) third-party design checks; and
   d) road safety audits.

5. The following sections of ISO 9001:2000 shall apply to documents produced during design production:
   a) 4.2.3 Control of documents; and
   b) 4.2.4 Control of records.

6. Quality plans shall indicate how records specific to the product are to be controlled, including:
   a) identification and format of records to be established and maintained;
   b) arrangements for storage, protection, retrieval, retention time and disposal of records;
   c) identification and compliance with confidentiality, legal or regulatory and other contractual requirements;
   d) details of records that are to be supplied to the customer and other interested parties; and
   e) language(s) in which records will be provided.
7. Guidance is provided in Appendix A.

7.5.2 Validation of Processes for Production and Service Provision

1. When validating the processes for Design Production, the following section identified in ISO 9001:2000 Section 7.3 shall apply:

   a) 7.3.6 Design and development validation – validation that the processes adopted will achieve output that meets requirements and applies when the output cannot be verified by subsequent monitoring or measurement.

2. Quality plans shall identify:

   a) processes requiring specific validation and the format of the validation;
   
   b) competencies of people involved in validation; and
   
   c) specific validation to be carried out by third parties or regulatory authorities.

7.5.3 Identification and Traceability

1. Product identification and traceability is a requirement.

2. Quality plans shall document the methods necessary to ensure identification and traceability of the product.

7.5.4 Customer Property

1. Guidance is provided in Appendix A.

7.5.5 Preservation of Product

1. No additional requirements.

7.6 Control of Monitoring and Measuring Devices

1. Quality plans shall identify:

   a) the project specific control process applicable to the product;
   
   b) records of equipment used;
   
   c) software used to prove conformity; and
   
   d) expected controls and requirements for accuracy, calibration and verification of measuring devices.

2. Guidance is provided in Appendix A.
8. MEASUREMENT, ANALYSIS AND IMPROVEMENT

8.1 General

1. Where monitoring, measurement, analysis and improvement processes are project specific they shall be included in quality plans which shall identify:
   a) the scope and frequency of audits to be undertaken; and
   b) how the results are to be used to correct and prevent recurrence of nonconformities that affect the product.

2. Such audits may include:
   a) internal audits;
   b) customer audits;
   c) audits of suppliers; and
   d) third-party audits of designers and suppliers, including those carried out for QMS certification/registration purposes.

8.2 Monitoring and Measurement

8.2.1 Customer Satisfaction

1. The Overseeing Organisation may use specific Key Performance Indicators as a means of measuring the performance of their suppliers.

2. Where used, Designers shall consider these specific Key Performance Indicators when monitoring information relating to customer perception as to whether Designers have met customer requirements.

3. Designers shall establish and use the following sources of customer satisfaction information:
   a) customer feedback and complaints;
   b) regular meetings with customers to review performance; and
   c) questionnaires and surveys where appropriate.

8.2.2 Internal Audit

1. Guidance is provided in Appendix A.

8.2.3 Monitoring and Measurement of Processes

1. This is a measure of the ability of the processes to achieve planned results. Designers shall:
   a) evaluate whether the design related processes achieve planned results, taking into account budget and timescale;
   b) validate calculation methods used in the design related processes; and
   c) evaluate suitability of software used for design related processes.

8.2.4 Monitoring and Measurement of Product

1. Where this is the monitoring and measurement of Design Production, the following sections identified in ISO 9001:2000 Section 7.3 shall apply:
   a) 7.3.4 Design and development review; and
   b) 7.3.5 Design and development verification – verification that product requirements have been met – this is a check of the design outputs against the design input, for example, calculation checks.

2. Designers shall provide evidence that product delivered to the Overseeing Organisation has been released in accordance with planned arrangements and that the planned arrangements are appropriate to the status of product. For example, different levels of authority would be required for:
a) product used in the Overseeing Organisation’s own processes such as construction information, or a commissioned report;
b) product, such as the above, produced in draft form; and
c) product of possibly lower importance such as a collation of data used by the Overseeing Organisation for record purposes only.

3. Quality plans shall identify:
   a) where design reviews are located in the process sequence and the format of reviews;
   b) characteristics to be reviewed or verified at each point;
   c) responsibilities and competencies of people involved in reviews and verification; and
   d) reviews or checks to be carried out by third parties or regulatory authorities.

8.4 Analysis of Data

1. Designers are required to determine, collect and analyse data to demonstrate the suitability and effectiveness of the QMS and to evaluate where continual improvement can be made. Where required by the Overseeing Organisation, Designers shall provide data and analysis relating to:
   a) customer satisfaction;
   b) satisfaction of other interested parties; and
   c) benchmarking of Designers’ performance.
2. Guidance is provided in Appendix A.

8.5 Improvement

8.5.1 Continual Improvement

1. Designers shall compare their processes and product with those of other designers using benchmarking, Key Performance Indicators or other methods.
2. Guidance is provided in Appendix A.

8.5.2 Corrective Action

1. The QMS shall identify the preventive and corrective actions and follow-up activities that are specific to the product, in order to avoid the appearance or repetition of nonconformities and to act as a tool for improvement.

8.5.3 Preventive Action

1. ISO 9001:2000 requires designers to determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence.
2. Nonconformities can occur at any stage of a project including design, construction, maintenance and demolition. Examples of potential nonconformities are:
a) clash of services/drainage with other services/drainage or other works; and

b) design that results in product that cannot be safely maintained.

3. Quality plans shall identify what proactive preventive action will be taken.
9. BIBLIOGRAPHY


2. CIRIA C618. Benchmarking the performance of design activities in construction.


10. 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, Major Transport Infrastructure Projects
Transport Scotland
8th Floor, Buchanan House
58 Port Dundas Road
Glasgow G4 0HF
A C McLAUGHLIN
Director, Major Transport Infrastructure Projects

Chief Highway Engineer
Transport Wales
Welsh Assembly Government
Cathays Parks
Cardiff CF10 3NQ
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Chief Highway Engineer
Transport Wales

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
APPENDIX A  GUIDANCE ON THE USE OF ISO 9001:2000

4. QUALITY MANAGEMENT SYSTEM

4.1 General Requirements

1. Designers should embrace the eight quality management principles identified in ISO 9000:2000 and top management should use these principles as the basis of its role. Designers should display the following attributes.

Customer Focus

- be customer orientated and demonstrate how specific customer aims and objectives are to be obtained and disseminated to staff and suppliers;
- use processes for meeting the customers’ requirements;
- identify how they, as Designers, will strive to enhance customer satisfaction; and
- consider interested parties as customers.

Leadership

- active involvement and commitment of top management;
- top management to establish unity of purpose and direction of the organisation;
- top management to create and maintain the internal environment in which people can become fully involved in achieving the organisation’s objectives and in which a QMS can operate effectively;
- top management to lead the Capability Assessment Toolkit (CAT) process used in England; and
- consider the use of a business excellence model as essential for developing and maintaining an effective and efficient QMS to achieve benefits for interested parties.

Involvement of People

- use processes for the competence management of personnel;
- use processes for allocating personnel to particular tasks; and
- involve personnel in feedback and improvement activities.

Process Approach

- consider design as a process transforming inputs into outputs, all of which have to be defined;
- display evidence of design planning, review, checking and verification and constructability reviews;
- use processes that consider construction methods, installation, maintenance, cleaning, demolition, other post-design activities and legislation;
- use processes that consider health, safety and environment during design, construction maintenance and demolition;
- include temporary works design where this work is carried out by a Designer; and
- use processes that consider the environment, sustainable design and construction methods.

**Systems Approach to Management**

- identify, understand and manage interrelated processes as a system in order to contribute to the Designer’s effectiveness and efficiency in achieving its objectives.

**Continual Improvement**

- use processes for continual improvement of the effectiveness and efficiency of the QMS;
- use processes for understanding the needs (explicit and implicit), including diversity and disability issues, of customers to facilitate continual improvement; and
- use processes for design planning, design review and constructability reviews.

**Factual Approach to Decision Making**

- no additional guidance considered necessary.

**Mutually Beneficial Supplier Relationships**

- use processes to comply with the Overseeing Organisation’s specific requirements for example, the Capability Assessment Toolkit (CAT) used in England;
- use specific processes to identify the suppliers that are most likely to deliver best value solutions and services; and
- demonstrate a partnership approach to supplier relationships.

5. **MANAGEMENT RESPONSIBILITY**

5.2 **Customer Focus**

1. Designers should aim to improve customer satisfaction by:
   a) demonstrating their understanding of the needs of the Overseeing Organisation and other interested parties; and
   b) embracing the Overseeing Organisation’s latest published strategies and objectives.

5.3 **Quality Policy**

1. Top Management is required by ISO 9001:2000 to establish a Quality Policy and ensure that quality objectives are established.

2. The Quality Policy and objectives should recognise and embrace the needs and expectations of customers and be relevant to the Overseeing Organisation.
5.4 Planning

5.4.1 Quality Objectives

2. The type of quality objectives important to the Overseeing Organisation relate to:
   a) customer focus;
   b) the provision, training and development of resources;
   c) continual improvement; and
   d) specific objectives related to the Design Product.

3. These quality objectives need to be SMART (Specific, Measurable, Achievable, Realistic, Time-bound) and typically might involve targets based on benchmarking and Key Performance Indicators.

5.6 Management Review

5.6.1 General

1. The management reviews required by ISO 9001:2000 shall take place at regular intervals and the Overseeing Organisation expects that these intervals are not greater than six months.

6. RESOURCE MANAGEMENT

6.2 Human Resources

6.2.1 General

1. ISO 9001:2000 requires personnel performing work affecting product quality to be competent based on appropriate education, training, skills and experience. Competence is defined as demonstrated ability to understand and apply knowledge and skills.

2. The Construction (Design and Management) Regulations 1994 require that “No person shall arrange for a designer to prepare a design unless he is reasonably satisfied that the designer has the competence to prepare that design”.

6.2.2 Competence, Awareness and Training

1. Effective management of competence is achieved by assessing levels of experience and attainment in individuals and matching these to the requirements of particular activities. Competence is also concerned with the recruitment, training, development and career progression of staff members.

2. Designers should demonstrate competence by developing and implementing a Competence Management System for those staff involved in the production of the Overseeing Organisation’s product.

3. Appendix C contains guidance on the development of a Competence Management System including examples of competence assessment matrices. These matrices are intended to be specific to a Design Subject Area and Competency Area/Discipline.

4. Details of the skills, knowledge and understanding requirements for each Design Subject Area and Competency Area/Discipline are given in Appendix D. These are broad requirements, which are not intended to demonstrate the level of competence.
5. Appendix E gives details of the level of experience, professional status, training and competency that the Overseeing Organisation consider necessary to enable Designers to fulfil typical project roles. This appendix is a development of Appendix D and may be used by the Designer as part of his Competence Management System.

6.3 Infrastructure

1. In determining the infrastructure needed to achieve conformity to product requirements, Designers should at least consider and embrace as necessary:

   a) information technology;
   b) design tools;
   c) design support systems;
   d) technical information;
   e) drawing material and equipment;
   f) computer aided design;
   g) specification systems;
   h) administration to cover filing, accounting and cost control, insurance and legal advice;
   i) intangible resources such as intellectual property;
   j) health and safety;
   k) contingency planning and data backup;
   l) environmental aspects;
   m) sustainability;
   n) applicable legislation; and
   o) security and confidentiality.

6.4 Work Environment

1. Designers should consider staff welfare issues and encourage staff to work in a manner mutually beneficial to all parties in order to maintain quality of product. Issues to be considered include but are not limited to:

   a) eyestrain, backstrain and repetitive strain injuries;
   b) tiredness;
   c) workplace assessments;
   d) health and safety on site;
   e) working environment including temperature and humidity;
   f) tidy workplace policies;
   g) security; and
   h) diversity.
7. **PRODUCT REALISATION**

7.1 **Planning of Product Realisation**

1. ISO 9001:2000 considers any process as a sequence of related activities or a single activity that has input and output. Design Production can be considered as a process or processes comprising a number of design stages or activities which may include but is not limited to:

   a) data collection;
   b) conceptual design;
   c) preliminary design;
   d) detailed design; and
   e) construction information before, during and after construction.

2. Designers’ QMS should:

   a) identify and maintain a strategic overview of the products it provides and the processes used to realise the product (see also 4.1);
   b) determine quality objectives and requirements for these products and processes;
   c) set design, review, verification and validation strategy which may include certification and compliance monitoring;
   d) establish authorities for the approval to issue Design Product; and
   e) promote co-ordination and communication.

7.3 **Design and Development**

1. Design and Development as defined in ISO 9000:2000 is a “set of processes that transforms requirements into specified characteristics or into the specification of a product, process or system”.

2. Examples of Design and Development are:

   a) the development of the processes and methodology to prepare the design;
   b) the design of a service, such as the design of an inspection and maintenance regime, which is concerned with holding the condition of the Overseeing Organisation’s infrastructure quality at a certain agreed level; and
   c) the development of bespoke software or calculation aids such as spreadsheets.

3. Many of the requirements identified in Section 7.3 of ISO 9001:2000 will also apply elsewhere in the product realisation process such as design review, design verification and design validation. See 7.5 and 8.2.

7.4 **Purchasing**

7.4.1 **Purchasing Process**

1. The Overseeing Organisation expects supplier organisations affecting product quality to operate a UKAS or equivalent registered QMS complying with ISO 9001:2000. Exceptions to this would be small organisations, such as single person companies, where the operation of a registered QMS would not be viable or where the supplier operates using the QMS of the Designer.
7.4.2 Purchasing Information

1. Examples of purchased product are:
   a) computer software;
   b) surveys carried out by suppliers; and
   c) work carried out by sub consultants.

7.5 Production and Service Provision

1. Design Production is the set of processes that transforms the requirements into construction information or other product required by the Overseeing Organisation and includes the preparation of design leading to reports, drawings, specifications, bills of quantities etc. Whilst it is covered by Section 7.5 of ISO 9001:2000, the requirements of Section 7.3 also apply.

7.5.1 Control of Production and Service Provision

1. The Overseeing Organisation must consider longevity of storage and access of required records both in electronic and hard copy formats and define their requirements in the brief.

2. Designers should consult the Overseeing Organisation regarding its requirements for the timely delivery of records.

7.5.4 Customer Property

1. Examples of customer property that may be provided to Designers include:
   a) the original versions of any documents; and
   b) source data and software.

7.6 Control of Measuring and Monitoring Devices

1. Measuring and monitoring devices will be required in some cases but generally the type of product produced by Designers is such that conformity of product to requirements will not be determined by measuring and monitoring devices. Examples where measuring and monitoring devices are necessary include:
   a) topographical surveys;
   b) traffic counts;
   c) ground investigation test results;
   d) water quality measurements; and
   e) air and noise measurements.

2. Consideration may be given to the use of software to prove conformity.

3. The requirements of Section 7.6 of ISO 9001:2000 will however apply elsewhere in a Designer’s QMS, such as the product realisation process.
8. MEASUREMENT ANALYSIS AND IMPROVEMENT

8.2 Monitoring and Measurement

8.2.2 Internal Audit

1. The Overseeing Organisation attaches great importance to the Designer’s internal audit of their QMS in order to:

   a) give confidence regarding quality of product; and

   b) promote a means of identifying improvement activities and opportunities for continual improvement.

8.3 Control of Nonconforming Product

1. Management systems should define:

   a) the process for the identification of nonconforming product and, where applicable, control to prevent misuse until disposal;

   b) specific limitations, such as the degree or type of rework allowed; and

   c) the process whereby the Designer would seek a concession for a product that does not meet specified requirements including:

      - who would have the responsibility to request such concessions;

      - how such a request would be made; and

      - what information is to be provided and in what form.

8.4 Analysis of Data

1. Designers should analyse data from their various sources to assess performance against plans, objectives and other defined goals, and to identify areas for improvement including possible benefits for interested parties.

2. The results of these analyses can be used by the Designer to support, for example, the Highways Agency’s Capability Assessment Toolkit process and in the development of business excellence models. They can also be used by the Designer to determine:

   - trends;

   - customer satisfaction;

   - satisfaction of other interested parties;

   - effectiveness and efficiency of its processes;

   - supplier contribution;

   - success of its performance improvement objectives;

   - economics of quality, financial and market-related performance;

   - benchmarking of its performance; and

   - competitiveness.
APPENDIX B  MODEL REQUIREMENTS FOR DESIGNERS’ QUALITY PLANS

The purpose of the quality plan is to tie the specific requirements of a project to the existing generic integrated QMS of the Designer. The quality plan may require documented procedures to be produced, over and above those that may already be in existence as part of the QMS.

Much of the necessary quality plan documentation will normally exist as part of the QMS documentation. The quality plan need only refer to this documentation and show how it is to be applied to the specific situation in question. Where an element of such documentation does not exist but is required, the quality plan shall identify it and also identify when, how and by whom it will be prepared and approved.

The contents of the quality plan shall be based on ISO 9001:2000, this Standard and the Designer’s documented QMS. The elements described in the following sub-clauses shall be addressed, where relevant to the requirements of the product.

The scope of the quality plan shall be defined and include, but not be limited to:

- the product to which it is to be applied;
- the scope of the project to which it is to be applied;
- the product quality objectives;
- specific exclusions; and
- the conditions of its validity.

The following is a collation of the quality plan requirements contained in Sections 4 to 8 of this standard.

1  Human Resources (Ref 6.2)

Competence, Awareness and Training

- Provide details of and explain the Designer’s Competence Management System. This may be by reference to a separate document.
- Identify the competencies required for the processes identified in the quality plan.
- Include any project-specific competency matrices.
- Identify any specific training that may be required for personnel carrying out a process that is a subject of the quality plan.
- Demonstrate how the Designer evaluates training effectiveness.
2 Planning of Product Realisation (Ref 7.1)

Design Planning for Individual Projects

- Project-specific processes, their interdependence and organisation.
- Resources and required competencies (design team personnel, suppliers, support and administration).
- Processes required for checking and review of design production (verification, validation and design review).
- Management of scope of work, programme and budget.
- Monitoring, inspection and test activities.
- Processes for design change control during design production and post design (during construction).

3 Customer-Related Processes (Ref 7.2)

Customer Related Processes Relevant to a Project

- Identify and document or reference specific customer related requirements.
- Identify the person in the organisation responsible for Standards Improvement System (HD 34) reports.
- Identify how the Overseeing Organisation’s requirements for involvement in design production activities, such as participation in design production reviews, design production verification, value engineering and risk management will be met.
- Include details of customer and interested party contacts and communication protocols.

Review of Requirements Related to Product

- Identify arrangements for the review of requirements specified for the product.
- Indicate how the results of this review are to be recorded and how conflicts or ambiguities in requirements are to be resolved.
- Include arrangements for a review/confirmation of the Overseeing Organisation’s requirements and any agreed amplifications.

Customer Communication

- Identify the arrangements for communicating with the Overseeing Organisation.

4 Design and Development (Ref 7.3)

- Specific Design and Development processes including Design and Development Review, Design and Development Verification and Design and Development Validation.

5 Purchasing (Ref 7.4)

- Any goods and services affecting the Overseeing Organisation’s specific products that are to be purchased and the relevant quality management requirements.
- Requirements for, and reference to, supplier’s quality plans and QMS where appropriate.
- The methods to be used to satisfy regulatory requirements that apply to purchased goods or services affecting the Overseeing Organisation’s specific products.

- How the Designer will verify supplier product conformance to specified requirements for goods or services affecting the Overseeing Organisation’s specific products, particularly if the supplier does not operate a registered QMS.

6 Production and Service Provision (Ref 7.5)

Control of Production and Service Provision

- The specific design process and how it is to be carried out, controlled and documented.

- The process for the specific review, verification and validation of design process output conformity to design production input requirements.

- The process for providing evidence that design production has met requirements.

- Approval authorities (to be included within competency matrices).

- Identification of outsourced processes specific to product.

Control of Records Specific to Product

- Identification and format of records to be established and maintained.

- Arrangements for storage, protection, retrieval, retention time and disposal of records.

- Identification and compliance with confidentiality, legal or regulatory and other contractual requirements.

- Details of records that are to be supplied to the customer and other interested parties.

- Language(s) in which records will be provided.

Validation of Processes for Production and Service Provision

- Processes requiring specific validation and the format of the validation.

- Competencies of people involved in validation.

- Specific validation to be carried out by third parties or regulatory authorities.

Identification and Traceability

- Documentation of the methods necessary to ensure identification and traceability of the product.

7 Control of Monitoring and Measuring Devices (Ref 7.6)

- The project specific control process applicable to the product.

- Records of equipment used.

- Software used to prove conformity.

- Expected controls and requirements for accuracy, calibration and verification of measuring devices.
8 Measurement Analysis and Improvement – General (Ref 8.1)

Project Specific Monitoring, Measurement, Analysis and Improvement Processes

- The scope and frequency of audits to be undertaken.
- How the results are to be used to correct and prevent recurrence of nonconformities that affect the product.

9 Monitoring and Measurement (Ref 8.2)

Monitoring and Measurement of Product

- Where design reviews are located in the process sequence and the format of reviews.
- Characteristics to be reviewed or verified at each point.
- Responsibilities and competencies of people involved in reviews and verification.
- Reviews or checks to be carried out by third parties or regulatory authorities.

10 Improvement (Ref 8.5)

Preventive Action

- Identification of proactive preventive action to be taken.
APPENDIX C  GUIDANCE ON THE USE OF COMPETENCE MANAGEMENT SYSTEMS

This standard does not define requirements for the structure or contents of Competence Management Systems. However, projects ordered by the Overseeing Organisation require Designers to develop and operate such systems.

As part of the Competence Management System, Designers are required to:

- demonstrate the identification of activities and the competencies required for these activities;
- ensure that personnel used on the Overseeing Organisation’s projects are competent to undertake the duties that will be assigned to them;
- demonstrate the methods used for the recruitment, training, development, monitoring and assessment of competent resources;
- evaluate the effectiveness of training and develop accordingly;
- undertake assessments of competency regularly at intervals appropriate to the specific task;
- demonstrate the maintenance and development of professional, technical and managerial capability;
- ensure the effective deployment of appropriately qualified staff;
- ensure that designers achieve consistent standards of competence appropriate to their work activities; and
- ensure that the particular safety requirements of the customer and statute are met.

Figure C/1 is a flowchart showing one of the processes from a Competence Management System, which indicates how the above requirements are linked in order to ensure the use of competent resources.

An example of how to assess competence is included in the competency matrices on the following pages. These are generic and show the types of information required to assess competence (qualifications, skills, knowledge, understanding, experience, etc).

These matrices are intended to be specific to a Design Subject Area and Competency Area/Discipline. Details of the skills, knowledge and understanding requirements are given in Appendix D and the levels of experience and training are given in Appendix E.
Identify how competence is to be assessed e.g. based on appropriate skills training and experience

Develop Skills Matrices

Identify activities in QMS which require inclusion in Competence Management System

Identify required competence levels i.e. what a person must be able to do and how well

Identify suitable candidates (internal and external) with potential to carry out activities

Assess Competence

Carry out work supervised or unsupervised depending on level of competence

Monitoring and Mentoring

Reassess Competence

Has person achieved/maintained required competence level?

Assess Training Effectiveness and develop if appropriate

Is further training appropriate

Training and Development

Figure C/1: Competence: Development and Assessment
## COMPETENCE ASSESSMENT MATRIX Example 1 – Activity involving control of design

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Skills</th>
<th>Knowledge and Understanding</th>
<th>Training and Development</th>
<th>Experience</th>
<th>Method of Assessment</th>
<th>Competence</th>
<th>Training and Development Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree HND/HNC Inc. Engineer Eur Ing Chartered Engineer Member of Professional body Relevant NVQ Successful In-house Assessment Engineering Technician</td>
<td>Ability to locate and use new research and development. Ability to consider design in relation to the whole project.</td>
<td>Understanding of DMRB, Traffic Signs Manual and TSRGD. Understanding of Overseeing Organisation procedures for technical approval, departures from standards, etc.</td>
<td>Continuing Professional Development verified by 3rd party. 3rd party accredited training course. Relevant NVQ.</td>
<td>Experience of projects of similar type and scale.</td>
<td>Formal appraisal, examination of output, observation of performance, simulation. In-house Assessment.</td>
<td>Expert. Competent to supervise activity. Competent. Competent to carry out work under supervision. Developing Competency/Little Experience – further training and development required. Not competent/ No experience.</td>
<td>Identified training and development following assessment.</td>
</tr>
<tr>
<td>Competency Area/Discipline</td>
<td>Highways Design and Appraisal</td>
<td>Design Subject Area: Traffic Signs and Road Marking</td>
<td>Name:</td>
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</table>
## COMPETENCE ASSESSMENT MATRIX Example 2 – Activity involving design

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<th>Qualifications</th>
<th>Skills</th>
<th>Knowledge and Understanding</th>
<th>Training and Development</th>
<th>Experience</th>
<th>Method of Assessment</th>
<th>Competence</th>
<th>Training and Development Requirements</th>
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<tr>
<td>HND/HNC</td>
<td>Collection, analysis and evaluation of data including survey work.</td>
<td>3rd party accredited training course.</td>
<td>Experience of lesser scale of work if working supervised.</td>
<td>Formal appraisal, examination of output, observation of performance, simulation.</td>
<td>Competent.</td>
<td></td>
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</tr>
<tr>
<td>Incorporated Engineer</td>
<td>Application of accepted design standards unsupervised.</td>
<td>Relevant NVQ or NVQ Units.</td>
<td>Experience of DMRB, Traffic Signs Manual and TSRGD.</td>
<td>In-house Assessment.</td>
<td>Competent to supervise activity.</td>
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<tr>
<td>Eur Ing</td>
<td>Application of accepted design standards under supervision/unsupervised.</td>
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<td></td>
<td>Competent.</td>
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<tr>
<td>Chartered Engineer</td>
<td>Application of proven techniques and procedures.</td>
<td>Identifying and assessing significant factors affecting design solutions.</td>
<td></td>
<td></td>
<td>Competent to carry out work under supervision.</td>
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</tr>
<tr>
<td>Member of Professional body</td>
<td>Selecting, evaluating and refining design solutions.</td>
<td>Ability to locate and use new research and development.</td>
<td></td>
<td></td>
<td>Developing Competency/Little Experience – further training and development required.</td>
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<tr>
<td>Relevant NVQ or NVQ Units</td>
<td>Attention to detail.</td>
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APPENDIX D   SKILLS KNOWLEDGE AND UNDERSTANDING REQUIREMENTS TO DEMONSTRATE COMPETENCE

This appendix describes indicative skills, knowledge and understanding required in order to demonstrate competence in a number of design subject areas covering various competency areas/disciplines. These are broad requirements which are not intended to demonstrate the level of competence. The level of competence is assessed by the Designer as part of the Competence Management System. Appendix E, which gives levels of experience and training that the Overseeing Organisation consider necessary to achieve certain roles, may be used as a tool by the Designer to assist this process.

The following table is based on the Manual of Contract Documents for Highway Works (MCHW), mainly Volume 1 Specification for Highway Works (SHW), and relevant standards included in the Design Manual for Roads and Bridges (DMRB). The list is not exhaustive and there is a need to identify relevant requirements for each Design Subject Area. Many skills, knowledge and understanding requirements are common to all Design Subject Areas. These are Basic, Health and Safety, Environmental Management and Sustainability and Quality Management.

The Design Subject Area and Competency Area/Discipline below are intended to be used in the Competence Assessment Matrix in Appendix C.

<table>
<thead>
<tr>
<th>Design Subject Area (See Appendix C)</th>
<th>Competency Area/ Discipline (See Appendix E)</th>
<th>MCHW Series/ DMRB Ref</th>
<th>Skills, Knowledge and Understanding Requirements</th>
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<tr>
<td>All</td>
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<td>MCHW Volumes 0 to 6</td>
<td>Relevant MCHW clauses</td>
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<td>Highways Act</td>
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<td>MCHW, DMRB, Interim Advice Notes (IAN), advice</td>
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<td>notes and standards in the SA and SD Series etc.,</td>
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<td></td>
<td>and how they work and are included in contracts</td>
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<td></td>
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<td>Competency Area/ Discipline (See Appendix E)</td>
<td>MCHW Series/ DMRB Ref</td>
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</table>
| All                                 | Quality Management                         | MCHW Series 100 DMRB 5.2.1 | Relevant sections of the DMRB, MCHW and IANs  
DMRB 5.2.1 – Quality Management Systems for Highway Design  
Designer’s QMS  
ISO 9000:2000  
European technical specifications  
Construction Products Directive, Public Procurement Directives and other European Directives as they affect the specification and works  
National Highway Sector Schemes (NHSS) |
| Project Management                  | Design Management                          | –                     | Design process and its interaction with customer requirements  
Project management skills  
Programming of Design Works using industry recognised software  
Cost control and monitoring  
Risks to project delivery related to cost and time predictions  
Management of resources  
Overseeing Organisation’s DMRB and MCHW  
Design process and its interaction with customer requirements  
Risk management including Highways Agency Risk Model (HARM) or other relevant models  
Presentation and IT communication skills |
| General                             | Highways Design and Appraisal, Site Management | MCHW Series 100, 200 | MCHW Volumes 1, 2 and 4 Series 100 – Preliminaries  
MCHW Volumes 1, 2 and 4 Series 200 – Site Clearance  
BA 41 – The Design and Appearance of Bridges  
HA 12 – Management of Contractual Claims  
HA 19 – Engineer/Contractor Relationship on Trunk Road Contracts  
HD 23 – Pavement Design and Maintenance – General Information  
HD 34 – Implementation and Use of the Standards Improvement System  
HD 35 – Conservation and the Use of Secondary and Recycled Materials  
HD 46 – Quality Assurance for Highway Design  
TA 30 – Choice Between Options for Trunk Road Schemes  
TA 49 – Appraisal of New and Replacement of Lighting on Trunk Roads and Trunk Road Motorways  
TA 57 – Roadside Features [Chapter 2 ** S/S by TA 69] – As amended by IAN 44 Appendix 1  
TA 83 – Guide to the Use of Variable Message Signs for Strategic Traffic Management on Trunk Roads and Trunk Road Motorways  
TD 9 – Highway Link Design  
TD 11 – Use of Certain Departmental Standards in the Design and Assessment of Trunk Road Schemes  
TD 27 – Cross Sections and Headroom  
TD 37 – Scheme Assessment Reporting  
TD 40 – The Layout of Compact Grade Separated Junctions  
TD 50 – The geometric layout of signal-controlled junctions and signalised roundabouts  
DMRB 11.1 – Environmental Assessment – Introduction  
DMRB 11.2 – General Principles of Environmental Assessment  
DMRB 11.3.12 – Environmental Assessment Techniques – Impact of Road Schemes on Policies and Plans |
### Design Subject Area (See Appendix C)

<table>
<thead>
<tr>
<th>Competency Area/Discipline (See Appendix E)</th>
<th>MCHW Series/DMRB Ref</th>
<th>Skills, Knowledge and Understanding Requirements</th>
</tr>
</thead>
</table>
| Temporary Traffic Management and Vehicle Recovery | Site Management and Temporary Design | MCHW Series 100 DMRB Vol 8.4 | MCHW Volumes 1, 2 and 3 Series 100 – Preliminaries (Clauses 117, 120, 125)  
Design standards and advice notes contained in DMRB Volume 8.4 – Traffic Management at Roadworks  
Sector Scheme 12A, 12B, 12C, 12D: Temporary Traffic Management  
Sector Scheme 17: Vehicle Recovery at Highway Construction Sites  
Traffic Signs Manual – Chapter 8  
Safety at Street Works and Road Works  
An Introduction to the use of Vehicle Actuated Portable Traffic Signals  
Guidance for Safer Temporary Traffic Management  
Temporary Traffic Management on High Speed Roads Good Working Practice  
Traffic demand and capacity  
Diversion Route Planning  
Road Traffic Regulation Act 1984  
Road Traffic (Temporary Restrictions) Act 1991  
Liaison Procedures  
Traffic management practical site experience  
Non traffic management related site activities  
New Roads and Streetworks Act (NRSWA)  
Attendance at Temporary Traffic Management Foreman’s/Operative Course  
The role of Traffic Control Centres and Traffic Control Officers  
The use and requirements of CCTV for traffic monitoring  
PAS 43 |
| Fencing | Highways Design and Appraisal, Site Management | MCHW Series 300, 2500 | MCHW Volumes 1, 2 and 4 Series 300 – Fencing  
MCHW Volumes 1, 2 and 4 Series 2500 – Special Structures  
MCHW Volumes 1, 2 and 4 Series 2600 – Miscellaneous  
HA 65 – Design Guide for Environmental Barriers  
HA 66 – Environmental Barriers: Technical Requirements  
TA 57 – Roadside Features [Chapter 2 ** S/S by TA 69] – As amended by IAN 44 Appendix 1  
Sector Scheme 1: Manufacture of Fencing Components  
Sector Scheme 2A: The Design and/or Supply and Repair of Fences  
Sector Scheme 2C: The Design, Supply, Installation and Repair of Environmental Barriers (Structural)  
Sector Scheme 3: Manufacture of Industrial Fasteners and Associated Items  
Sector Scheme 4: Preservative Treatment of Timber (BWPDA Guidance Note QGN – 2) |
<table>
<thead>
<tr>
<th>Design Subject Area (See Appendix C)</th>
<th>Competency Area/ Discipline (See Appendix E)</th>
<th>MCHW Series/ DMRB Ref</th>
<th>Skills, Knowledge and Understanding Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Restraint Systems</td>
<td>Highways Design and Appraisal</td>
<td>MCHW Series 400</td>
<td>MCHW Volumes 1, 2 and 4 Series 400 – Road Restraint Systems (Vehicle and Pedestrian)</td>
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<tr>
<td></td>
<td>Structures Design and Appraisal</td>
<td></td>
<td>IAN 44 – Interim Requirements for Road Restraint Systems</td>
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<td>BA 37 – Priority Ranking of Existing Parapets</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BD 52 – The Design of Highway Bridge Parapets – As amended by IAN 44 Appendix 1</td>
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<td>BD 60 – Design of Highway Bridges for Vehicle Collision Loads</td>
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<td>BD 65 – Design Criteria for Collision Protector Beams</td>
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<td>TA 45 – Treatment of Gaps in Central Reserve Safety Fences – As amended by IAN 44 Appendix 1</td>
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<td>TD 19 – Safety Fences and Barriers – As amended by IAN 44 Appendix 1</td>
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<td>TD 32 – Wire Rope Safety Fence – As amended by IAN 44 Appendix 1</td>
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<td>Sector Scheme 5: Bridge Parapets; Fabrication and Installation of Bridge Parapets and Cradle Anchorages</td>
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<td>Sector Scheme 5A: The Manufacture of Parapets for Road Restraint Systems</td>
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<td>Sector Scheme 5B: The Installation of Parapets for Road Restraint Systems</td>
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<td>MCHW Volumes 1, 2 and 4 Series 2500 – Special Structures (Drainage structures and Buried Rigid Pipes for Drainage Structures)</td>
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<td>BA 59 – Design of Highway Bridges for Hydraulic Action</td>
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<td>BD 82 – Design of Buried Rigid Pipes</td>
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<td>HA 102 – Spacing of road gullies</td>
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<td>MCHW Series 500, 2500</td>
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<td></td>
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<td>DMRB Vol 4.2</td>
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<td>MCHW Volumes 1, 2 and 4 Series 600 – Earthworks</td>
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<td>MCHW Volume 5 Section 3</td>
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<td>Highways Design and Appraisal</td>
<td>MCHW Series 700, 800, 900, 1000 DMRB Vol 7</td>
<td>MCHW Volumes 1, 2 and 3 Series 700 – Road Pavements – General MCHW Volumes 1, 2 and 3 Series 800 – Road Pavements – Unbound, Cement and Other Hydraulically Bound Mixtures MCHW Volumes 1, 2 and 3 Series 900 – Road Pavements – Bituminous Bound Materials MCHW Volumes 1, 2 and 3 Series 1000 – Road Pavements – Concrete Materials Design standards and advice notes contained in DMRB Volume 7 – Pavement Design and Maintenance HA 39 – Edge of Pavement Details HA 74 – Treatment of Fill and Capping Materials Using Either Lime or Cement or Both HA 79 – Edge of Pavement Details for Porous Asphalt Surface Courses HD 33 – Surface and Sub-surface Drainage System for Highways TA 81 – Coloured Surfacing on Urban Roads (Excluding Traffic Calming) Sector Scheme 13A: The Supply and Application of Surface Dressing to Road Surfaces Sector Scheme 13B: The Supply and Application of Microsurfacing Sector Scheme 14: The Quality Assurance of the Production of Asphalt Mixes Sector Scheme 15: Supply of Paving Grade Bitumen Sector Scheme 16: The Laying of Asphalt Mixes</td>
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<td>Highways Design and Appraisal</td>
<td>MCHW Series 1200, 1400</td>
<td>MCHW Volumes 1, 2 and 4 Series 1200 – Traffic Signs</td>
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<td>DMRB Vol 8.2</td>
<td>MCHW Volumes 1, 2 and 3 Series 1400 – Electrical Work for Road Lighting and Traffic Signs</td>
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<td>TA.68 – The Assessment and Design of Pedestrian Crossings</td>
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<td>Road Lighting</td>
<td>Electrical and Lighting Design and Appraisal</td>
<td>MCHW Series 1300, 1400</td>
<td>MCHW Volumes 1, 2 and 3 Series 1300 – Road Lighting Columns and Brackets, CCTV Masts and Cantilever Masts</td>
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<td>DMRB Vol 8.3</td>
<td>MCHW Volumes 1, 2 and 3 Series 1400 – Electrical Work for Road Lighting and Traffic Signs</td>
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<td></td>
<td>Design standards and advice notes contained in DMRB Volume 8.3 – Traffic Signs and Lighting – Lighting</td>
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<tr>
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<td>BD.2 – Technical Approval of Highway Structures</td>
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<td>TA.57 – Roadside Features [Chapter 2 ** S/S by TA 69] – As amended by IAN 44 Appendix 1</td>
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<td>Demonstrable ability to apply an understanding of Road Lighting Design Standards applicable in the U.K. (currently BS EN 13201 and BS 5489)</td>
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<td>Safety during the Installation and Removal of Lighting Columns and similar street furniture in proximity to High Voltage Overhead Lines published by the ILE in partnership with HSE</td>
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<td>Competency Area/ Discipline (See Appendix E)</td>
<td>MCHW Series/ DMRB Ref</td>
<td>Skills, Knowledge and Understanding Requirements</td>
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<td><strong>Motorway Communications</strong></td>
<td>Highways Design and Appraisal Site Management</td>
<td>MCHW Series 1500 DMRB Vol 9</td>
<td>MCHW Volumes 1, 2 and 3 Series 1500 – Motorway Communications Design standards and advice notes contained in DMRB Volume 9 – Network – Traffic Control and Communications TA 60 – Use of Variable Messages Signs on Al-Purpose and Motorway Trunk Roads TA 82 – The installation of Traffic Signals and Associated Equipment TA 84 – Code of Practice for Traffic Control and Information Systems for All-purpose Roads</td>
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<td><strong>Piling and Embedded Retaining Walls</strong></td>
<td>Structures Design and Appraisal Site Management</td>
<td>MCHW Series 1600</td>
<td>MCHW Volumes 1, 2 and 3 Series 1600 – Piling and Embedded Retaining Walls</td>
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<td><strong>Concrete</strong></td>
<td>Structures Design and Appraisal Site Management</td>
<td>MCHW Series 1700</td>
<td>MCHW Volumes 1, 2 and 4 Series 1700 – Structural Concrete MCHW Volumes 1, 2 and 4 Series 2600 – Miscellaneous BA 24 – Early Thermal Cracking of Concrete BA 38 – Assessment of the Fatigue Life of Corroded or Damaged Reinforcing Bars BA 39 – Assessment of Reinforced Concrete Half-Joints BA 40 – Tack Welding of Reinforcing Bars BA 43 – Strengthening, Repair and Monitoring of Post-Tensioned Concrete Bridge Decks BD 24 – The Design of Concrete Highway Bridges and Structures. Use of BS 5400: Part 4: 1990 BD 27 – Materials for the Repair of Concrete Highway Structures BD 28 – Early Thermal Cracking of Concrete BD 31 – The Design of Buried Concrete Box and Portal Frame Structures BD 43 – The Impregnation of Reinforced and Prestressed Concrete Highway Structures using Hydrophobic Pore-Lining Impregnations BD 54 – Post Tensioned Concrete Bridges – Prioritisation of Special Inspections BE 23 – Shear Key Decks Sector Scheme 11: Supply and Installation of Post-Tensioning Systems in Concrete Structures</td>
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| Protection Systems                  | Structures Design and Appraisal Site Management | MCHW Series 1900, 5000 | MCHW Volumes 1, 2 and 4 Series 1900 – Protection of Steelwork Against Corrosion  
MCHW Volumes 1, 2 and 4 Series 5000 – Maintenance Painting of Steelwork  
BD 7 – Weathering Steel for Highway Structures  
BD 35 – Quality Assurance Schemes for Paints and Similar Protective Coatings  
BD 43 – The Impregnation of Reinforced and Prestressed Concrete Highway Structures using Hydrophobic Pore-Lining Impregnations |
| Waterproofing for Concrete Structures | Structures Design and Appraisal Site Management | MCHW Series 2000 | MCHW Volumes 1, 2 and 4 Series 2000 – Waterproofing for Concrete Structures  
BD 47 – Waterproofing and Surfacing of Concrete Bridge Decks |
| Bridge Bearings                     | Structures Design and Appraisal Site Management | MCHW Series 2100 | MCHW Volumes 1, 2 and 4 Series 2100 – Bridge Bearings  
BD 20 – Bridge Bearings. Use of BS 5400: Part 9: 1983 |
| Bridge Expansion Joints and Sealing of Gaps | Structures Design and Appraisal Site Management | MCHW Series 2300 | MCHW Volumes 1, 2 and 4 Series 2300 – Bridge Expansion Joints and Sealing of Gaps  
BA 26 – Expansion Joints for Use in Highway Bridge Decks  
BD 33 – Expansion Joints for Use in Highway Bridge Decks |
| Brickwork, Blockwork and Stonework   | Structures Design and Appraisal Site Management | MCHW Series 2400 | MCHW Volumes 1, 2 and 4 Series 2400 – Brickwork, Blockwork and Stonework  
BS 5628  
BD 41 – Reinforced Clay Brickwork Retaining Walls of Pocket-Type Construction |
| Environmental Design, Assessment and Management | Environmental Management and Sustainability | MCHW Series 3000, DMRB Vols 10, 11 | MCHW Volumes 1, 2 and 4 Series 3000 – Landscape and Ecology Design standards and advice notes contained in DMRB Volume 10 – Environmental Design and Management  
Design standards and advice notes contained in DMRB Volume 11 – Environmental Assessment  
BA 59 – Design of Highway Bridges for Hydraulic Action  
HA 13 – The Planting of Trees and Shrubs  
HA 71 – The Effects of Highway Construction on Flood Plains  
TA 81 – Coloured Surfacing on Urban Roads (Excluding Traffic Calming) |
| Tunnels, Movable Bridges and Bridge Access Gantryes (Mechanical and Electrical Installations) | Mechanical and Electrical Design and Appraisal Site Management | MCHW Series 7000, 7100, 7200, 7300 | MCHW Volume 5.7 Series 7000 – General Requirements  
MCHW Volume 5.7 Series 7100 – Mechanical, Electrical and Communications Work for Road Tunnels  
MCHW Volume 5.7 Series 7200 – Mechanical, Electrical and Communications Work for Movable Bridges and Bridge Access Gantryes  
MCHW Volume 5.7 Series 7300 – Testing and Inspection for Road Tunnels, Movable Bridges and Bridge Access Gantryes |
| Tunnels (General)                   | Highways Design and Appraisal Site Management |                     | BD 53 – Inspection and Records for Road Tunnels  
BD 78 – Design of Road Tunnels |
<table>
<thead>
<tr>
<th>Design Subject Area (See Appendix C)</th>
<th>Competency Area/ Discipline (See Appendix E)</th>
<th>MCHW Series/ DMRB Ref</th>
<th>Skills, Knowledge and Understanding Requirements</th>
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<tbody>
<tr>
<td>Geodetic Surveys</td>
<td>Survey</td>
<td>MCHW 5 Section 1, DMRB Vol 4.1</td>
<td>MCHW Volume 5.1 – Contract Documents for Specialist Activities – Geodetic Surveys SH 3/84 – Model Contract Document for Topographical Surveys (Scotland) SH 5/89 – Topographical Surveys: Certification Procedure (Scotland)</td>
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<td>Design Subject Area (See Appendix C)</td>
<td>Competency Area/ Discipline (See Appendix E)</td>
<td>MCHW Series/ DMRB Ref</td>
<td>Skills, Knowledge and Understanding Requirements</td>
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DMRB Volume 12.2 – Traffic Appraisal of Road Schemes – Traffic Appraisal Advice  
DMRB Volume 14 – Economic Assessment of Road Maintenance – The QUADRO Manual  
HD 24 – Pavement Design and Maintenance – Traffic Assessment  
TA 11 – Traffic Surveys by Roadside Interview  
TA 22 – Vehicle Speed Measurement on All-Purpose Roads  
TA 46 – Traffic Flows Ranges for Use in the Assessment of New Rural Road Standards  
TA 49 – Appraisal of New and Replacement of Lighting on Trunk Roads and Trunk Road Motorways  
TA 79 – Traffic Capacity of Urban Roads  
TA 82 – The installation of Traffic Signals and Associated Equipment  
TA 83 – Guide to the Use of Variable Message Signs for Strategic Traffic Management on Trunk Roads and Trunk Road Motorways  
TD 50 – The geometric layout of signal-controlled junctions and signalised roundabouts  
DMRB 11.3.9 – Environmental Assessment Techniques – Vehicle Travellers  |
| Assessment of Road Schemes          | Highways Design and Appraisal               | DMRB Vols 5, 13, 14, 15 | Design standards and advice notes contained in DMRB Volume 5.1 – Assessment of Road Schemes  
DMRB Volume 14 – Economic Assessment of Road Maintenance – The QUADRO Manual  
DMRB Volume 15 – Economic Assessment of Road Schemes in Scotland  
BA 28 – Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures  
BD 36 – Evaluation of Maintenance Costs in Comparing Alternative Designs for Highway Structures  
TA 49 – Appraisal of New and Replacement of Lighting on Trunk Roads and Trunk Road Motorways  
DMRB Volume 12.2 – Traffic Appraisal of Road Schemes – Traffic Appraisal Advice |
APPENDIX E  PROJECT ROLES AND INDICATIVE COMPETENCE REQUIREMENTS

This appendix gives indicative levels of experience, professional status, training and competency that the Overseeing Organisation considers necessary to enable Designers to fulfil typical project roles. This appendix is a development of Appendix D: it includes the Competency Areas/Disciplines taken from that appendix; and the Indicative Professional Status, Training and Competency Requirements refer back to the Design Subject Areas included in Appendix D.

Where training is required, it is anticipated that accreditation will be provided through nationally recognised channels such as Construction Skills, Transportation Vocational Group, City and Guilds, Edexcel or other recognised specialists. The Transportation Vocational Group is a partnership between ICE, IHT, IHIE and CILT UK, which is the awarding body for NVQs in transportation (www.transportationvg.org.uk)

The table overleaf is intended to be used in conjunction with Appendices C and D to assess competence.

The table is based on a medium size ECI project: requirements for larger or smaller projects should be adjusted accordingly.
<table>
<thead>
<tr>
<th>Role</th>
<th>Examples of Experience</th>
<th>Competency Area/Discipline (See Appendix D)</th>
<th>Indicative Professional Status, Training and Competency Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Director</strong></td>
<td>At least ten year’s experience in planning and delivery of major highways projects at a senior level. Appointed as a Director within the Consultant’s organisation for at least the last five years. For the purposes of the contract, the Consultant’s Design Director is deemed to have authority for certifying all design of the Works carried out by his company.</td>
<td>Design Management, Site Management</td>
<td>Membership of appropriate professional institution (e.g. Institution of Civil Engineers. Institution of Highways and Transportation or equivalent). Registered with the Engineering Council to at least C.Eng level. Relevant experience in planning and delivering major highways. Broad Project Management skills as identified in Appendix D. Broad skills knowledge and understanding requirements of most Design Subject Areas described in Appendix D and competent in other Design Subject Areas. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months. Conversant with recent developments in the procurement methods being developed by the Overseeing Organisation, including detailed knowledge of the Highways Agency’s CAT assessment process. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Broad knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Designer’s obligations of CDM as a minimum. CSCS Management (Platinum) Card holder, as a minimum. Understanding of environmental requirements appropriate for the relevant Design Subject Areas identified in Appendix D and detailed knowledge of the Defender’s EMS. Broad knowledge and understanding of Quality Management as identified in Appendix D and in-depth knowledge of Designer’s QMS. Excellent communications skills. Experience in preparing and giving evidence at Public Inquiry. Relevant vocational qualifications.</td>
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<tr>
<td><strong>Quality Manager</strong></td>
<td>Minimum of 5 years post chartered experience in the design processes for major highway projects in the UK. Minimum of 2 years experience in the role of Quality Manager.</td>
<td>Quality Management</td>
<td>Membership of the Institute of Quality Assurance or equivalent. International Register of Certificated Auditors (IRCA) certificated auditor. Competent in the Quality Management area as identified in Appendix D. Basic skills knowledge and understanding requirements of most Design Subject Areas described in Appendix D and competence in other Design Subject Areas. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months. Basic skills knowledge and understanding of the Designer’s EMS. Excellent communications skills. Relevant vocational qualifications including ISO 9000 lead auditor course.</td>
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<td>Planning Supervisor</td>
<td>An experienced Planning Supervisor with at least ten year’s experience in design and construction of highways projects, including both on-line and off-line construction. He/she must have had at least five years recent experience in the Planning Supervisor’s role, both in the design and construction stages.</td>
<td>Health and Safety</td>
<td>Membership of appropriate professional institution (e.g. Institution of Civil Engineers. Institution of Highways and Transportation, Institution of Structural Engineers or equivalent). Registered Planning Supervisor. Registered with the Engineering Council to at least I.Eng level. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months. Detailed knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Planning Supervisor’s obligations for CDM. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. CSCS Management (Platinum) Card Holder. Basic knowledge of QA as identified in Appendix D, including as a minimum in-house training by quality manager and knowledge of the Designer’s QMS. Excellent communications skills. Relevant vocational qualifications.</td>
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<tr>
<td>Road Safety Auditor (Audit Team Leader)</td>
<td>As detailed in HD 19.</td>
<td>Health and Safety</td>
<td>Membership of appropriate professional institution (e.g. Institution of Civil Engineers. Institution of Highways and Transportation, Institution of Structural Engineers or equivalent). Registered with the Engineering Council to at least I.Eng level. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months. Detailed knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Planning Supervisor’s obligations for CDM. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. CSCS Management (Platinum) Card Holder. Basic knowledge of QA as identified in Appendix D, including as a minimum in-house training by quality manager and knowledge of the Designer’s QMS. Excellent communications skills. Relevant vocational qualifications.</td>
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<tr>
<td>Design Manager</td>
<td>At least ten year’s experience in planning and design management of major highways projects, of which the last five will have been at Project Manager level.</td>
<td>Design Management, Site Management</td>
<td>Membership of appropriate professional institution (e.g. Institution of Civil Engineers, Institution of Highways and Transportation, Institution of Structural Engineers or equivalent). Registered with the Engineering Council to at least C.Eng level. Relevant experience in planning and delivering major highways. Broad Project Management skills as identified in Appendix D. Recent experience of leading multi-disciplinary teams and coordinating effective liaison with internal and external stakeholders. Broad skills knowledge and understanding requirements of most Design Subject Areas described in Appendix D and competence in other Design Subject Areas. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months. Conversant with recent developments in the procurement methods being developed by the Overseeing Organisation, including detailed knowledge of the Highways Agency’s CAT assessment process. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Broad knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Designer’s obligations of CDM as a minimum. CSCS Management (Platinum) Card Holder. Understanding of environmental requirements appropriate for Design Subject Areas identified in Appendix D and detailed knowledge of the Designer’s EMS. Broad knowledge and understanding of Quality Management as identified in Appendix D and in-depth knowledge of the Designer’s QMS. Good communications skills. Experience in preparing and giving evidence at Public Inquiry. Relevant vocational qualifications.</td>
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<tr>
<td>Design Team Leader</td>
<td>Minimum of 5 years post chartered experience in their discipline in the design process for major highway projects in the UK including recent experience in Design and Build projects.</td>
<td>Design Management, Design and Appraisal</td>
<td>Membership of appropriate professional institution (e.g. Institution of Civil Engineers, Institution of Highways and Transportation, Institution of Structural Engineers or equivalent). Registered with the Engineering Council to at least C.Eng level. Basic Project Management skills as identified in Appendix D. Recent experience of leading design team and coordinating interfaces with other disciplines. Competent in the activity descriptions related to their Design Subject Area as detailed in Appendix D. Broad skills, knowledge and understanding of other Design Subject Areas detailed in Appendix D. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months, including a minimum of 3 days related to their discipline. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Broad knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Designer’s obligations of CDM as a minimum. CSCS Management (Platinum) Card Holder. Understanding of environmental requirements appropriate for Design Subject Areas identified in Appendix D and detailed knowledge of the Designer’s EMS. Broad knowledge and understanding of Quality Management as identified in Appendix D and in-depth knowledge of the Designer’s QMS. Good communications skills. Experience in preparing evidence for Public Inquiry. Relevant vocational qualifications.</td>
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<tr>
<td>Structures Team Leader</td>
<td>At least ten years experience in design and construction of highway structures. He/she must have had at least five years recent experience as a team leader with direct responsibility for the design of highway structures, including bridges over or under railways.</td>
<td>Design Management, Design and Appraisal</td>
<td>Membership of appropriate professional institution (e.g. Institution of Structural Engineers or equivalent). Registered with the Engineering Council to at least C.Eng level. Basic Project Management skills as identified in Appendix D. Recent experience of leading design team and coordinating interfaces with other disciplines. Competent in the Design Subject Areas relevant to their discipline and identified in Appendix D. Broad skills, knowledge and understanding of other Design Subject Areas. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months, including a minimum of 3 days related to their discipline. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Broad knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Designer’s obligations of CDM as a minimum. CSCS Management (Platinum) Card Holder. Understanding of environmental requirements appropriate for Design Subject Areas identified in Appendix D and detailed knowledge of the Designer’s EMS. Broad knowledge and understanding of Quality Management as identified in Appendix D and in-depth knowledge of the Designer’s QMS. Good communications skills. Experience in preparing and giving evidence at Public Inquiry. Relevant vocational qualifications. Good communication skills.</td>
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<tr>
<td>Designer</td>
<td>Appropriate recent experience.</td>
<td>Design and Appraisal</td>
<td>Membership of or working towards membership of appropriate professional institution (e.g. Institution of Civil Engineers. Institution of Highways and Transportation, Institution of Structural Engineers or equivalent). Registered with or working towards registration with the Engineering Council. Recent experience of working in a multi-disciplinary design team. Competent in the Design Subject Areas related to their discipline and identified in Appendix D. Broad skills, knowledge and understanding of other Design Subject Areas. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months, including a minimum of 3 days related to their discipline. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Broad knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Designer’s obligations of CDM as a minimum. CSCS Supervisor (Gold) Card Holder. Understanding of environmental requirements appropriate for Design Subject Areas identified in Appendix D and basic knowledge of the Designer’s EMS. Basic knowledge of QA as identified in Appendix D, including as a minimum in-house training by quality manager and knowledge of the Designer’s QMS. Good communications skills. Relevant vocational qualifications.</td>
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<tr>
<td>Assistant Designer</td>
<td>Appropriate recent experience.</td>
<td>Design and Appraisal</td>
<td>Working towards membership of appropriate professional institution (e.g. Institution of Civil Engineers. Institution of Highways and Transportation, Institution of Structural Engineers or equivalent). Registered with or working towards registration with the Engineering Council. Recent experience of working in a multi-disciplinary design team. Developing Competency in the Design Subject Areas related to their discipline and identified in Appendix D. Basic skills, knowledge and understanding of other Design Subject Areas. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months, including a minimum of 3 days related to their discipline. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Basic knowledge of CDM and health and safety legislation as identified in Appendix D and developing competency in exercising the Designer’s obligations of CDM as a minimum. CSCS Trainee (Red) Card Holder. Understanding of environmental requirements appropriate for Design Subject Areas identified in Appendix D and basic knowledge of the Designer’s EMS. Basic knowledge of QA as identified in Appendix D, including as a minimum in-house training by quality manager and knowledge of the Designer’s QMS. Good communications skills. Relevant vocational qualifications.</td>
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<tr>
<td>Lighting Designer</td>
<td>Appropriate recent experience.</td>
<td>Design and Appraisal, Site Management</td>
<td>Member of the Institution of Lighting Engineers. Competent as defined in TA 84: Code of Practice for Traffic Control and Information Systems. ILE/ASLEC health and safety test. ILE Exterior Lighting Diploma or equivalent (as determined from time to time by the ILE). Registered with the Engineering Council to at least I.Eng level. Recent experience of working in a multi-disciplinary design team. Competent in the Design Subject Areas related to their discipline and identified in Appendix D. Broad skills, knowledge and understanding of other Design Subject Areas. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months, including a minimum of 3 days related to their discipline. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Broad knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Designer’s obligations of CDM. CSCS Supervisor (Gold) Card Holder. Understanding of environmental requirements appropriate for Design Subject Areas identified in Appendix D and basic knowledge of the Designer’s EMS. Basic knowledge of QA as identified in Appendix D, including as a minimum in-house training by quality manager and knowledge of the Designer’s QMS. Good communications skills. Relevant vocational qualifications.</td>
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Note: The table continues with similar entries for other roles and indicative competence requirements.
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<td><strong>Design Geotechnical Advisor</strong></td>
<td>As given in HD 22 Managing Geotechnical Risk, which requires the Design to appoint a Design Geotechnical Advisor as defined in the “Site Investigation in Construction” series documents. Site Investigation Steering Group (1993) ‘Site Investigation in Construction. Part 2 – Planning, Procurement and Quality Management’, published by Thomas Telford, London.</td>
<td>Design and Appraisal Geotechnical Site Management</td>
<td>Membership of appropriate professional institution (e.g. Institution of Civil Engineers. Institution of Highways and Transportation, Institution of Structural Engineers or equivalent). Membership of the British Geological Survey. Registered with the Engineering Council to at least I.Eng level. MSc or equivalent (minimum 5 yrs post graduate experience). Recent experience of working in a multi-disciplinary design team. Competent in the Design Subject Areas related to the Geotechnical discipline as detailed in Appendix D. Broad skills, knowledge and understanding of other Design Subject Areas detailed in Appendix D. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months, including a minimum of 3 days related to their discipline. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Broad knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Designer’s obligations of CDM. CSCS Management (Platinum) Card Holder. Understanding of environmental requirements appropriate for Design Subject Areas identified in Appendix D and detailed knowledge of the Designer’s EMS. Basic knowledge of QA as identified in Appendix D, including as a minimum in-house training by quality manager and knowledge of the Designer’s QMS. Good communications skills. Experience in preparing and giving evidence at Public Inquiry. Relevant vocational qualifications.</td>
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<tr>
<td><strong>Environmental Co-ordinator/ Environmental Manager</strong></td>
<td>At least 10 years experience in environmental assessment, design and management for major highways projects, with specific experience as Environmental Co-ordinator/Environmental Manager on a UK highways project within the last 3 years.</td>
<td>Environmental Impact Assessment Landscape &amp; Ecology Site Management</td>
<td>Chartered membership or equivalent of a relevant professional institution. Recent experience of working in a multi-disciplinary design team. Competent in the Design Subject Areas related to the Environmental Management and Sustainability discipline as detailed in Appendix D. Broad skills, knowledge and understanding of other Design Subject Areas detailed in Appendix D. Can demonstrate a minimum of 5 days Continuous Professional Development in the previous 12 months, including a minimum of 3 days related to their discipline. Understanding of health &amp; safety requirements for the relevant Design Subject Areas identified in Appendix D. Broad knowledge of CDM and health and safety legislation as identified in Appendix D and competent in exercising the Designer’s obligations of CDM as a minimum. CSCS Management (Platinum) Card Holder. Competent in exercising the environmental requirements appropriate for Design Subject Areas identified in Appendix D and detailed knowledge of the Designer’s EMS. Basic knowledge of QA as identified in Appendix D, including as a minimum in-house training by quality manager and knowledge of the Designer’s QMS. Good communications skills. Experience in preparing and giving evidence at Public Inquiry. Relevant vocational qualifications.</td>
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