NATIONAL STRATEGY FOR IMPLEMENTATION OF THE STRUCTURAL EUROCODES: DESIGN GUIDANCE

Report prepared for
The Office of the Deputy Prime Minister
by
The Institution of Structural Engineers

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Executive Summary

After twenty five years in preparation, the implementation of the structural Eurocodes has commenced This is the biggest change to codified structural design ever experienced in the UK.

Change brings both opportunities and threats. The opportunities are for the UK to be in the forefront of this process; having maximum European influence on practical implementation and also creating significant opportunities for increasing export of design services, currently valued at £1.5 billion per year. The threats arise from inaction. Without proper investment in support, design costs will rise substantially; worse, mistakes may occur, with potential implications for safety. Without a strong and expert home market in design to the Eurocodes, existing exports of design services will decline.

The Institution of Structural Engineers therefore welcomed the timely invitation from the Office of the Deputy Prime Minister to facilitate the preparation of a National Strategy for the provision of the design guidance that will be needed by the structural engineering community.

The 'National Strategy for Eurocodes Committee' established for this study has identified a number of issues that require urgent resolution together with the:

- key information needs of the industry
- guidance documents and software required
- requirements for provision of training

Particular emphasis is placed on the need for:

- clear up-to-date information on the timing of the stages of the transition together with guidance on the actions professionals need to take at each stage
- the necessary resources to be provided by a partnership between government and industry
- a body to be established to oversee all aspects of the transition and advise on the changes required to the strategy as it progresses

Specific recommendations for the:

- Office of the Deputy Prime Minister
- British Standards Institution
- professional institutions
- research and development associations

are made.

It is emphasised that this report represents a snapshot of what is believed to be required at the time it was written. The transition will take more than five years and during that time it is inevitable that the timing of events and associated requirements

will change. It is therefore essential that the strategy presented is kept under review and regularly updated.

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Foreword

The Institution of Structural Engineers was pleased to be invited by the Office of the Deputy Prime Minister to coordinate this study designed to ensure that the UK Structural Engineering Community is well prepared for the transition to a working environment based on use of the Structural Eurocodes. Notwithstanding the short (3 months) duration of the project, it proved possible to identify the key challenges, to indicate those measures that must be taken to ensure that UK designers can continue to flourish in their traditional markets as well as benefiting from the opportunities provided by the transition and to estimate the level of resource that needs to be provided collectively so as to ensure that the task is properly discharged.

Great credit is due to all those members of the Committee who have worked most effectively to deliver a coherent vision; it says much for their commitment that so much has been achieved. Without the ODPM grant the project would not have started, without the efforts of the Committee - who have "contributed in kind" to a value approximately 3 times the grant figure – it could not have delivered such a comprehensive result.

It has been my pleasure to preside over a group of enthusiastic, talented and resourceful individuals – many of whom have utilised the resources of their employers to assist with the Committee's work. My sincere thanks to each of them and a special note of appreciation to the Institution's staff so ably marshalled by Sue Doran.

David A Nethercot
30 April 2004

Principal Recommendations

These recommendations are put forward to maximise the opportunities and minimise the threats arising from the implementation of the structural Eurocodes.

It is appreciated that the resources involved (which have been estimated to equate to approximately £10 million) – very largely the time of suitably knowledgeable and well informed people – are substantial. However the cost to the UK of not managing and supporting this essential and inevitable transition is at least one order of magnitude greater than the cost of the programme.

- The UK Structural Engineering community must be properly supported during the transition process, which can be expected to occupy a minimum of five years. If not, much competitive advantage, in terms of both defending the UK home market and enabling exports overseas, will be lost.

- Guidance material related to EN 1990 and EN 1991 is essential and, in the absence of an associated industry sector, 100% Government funding will be required to provide it.

- Partnerships between government, industry and independent bodies are needed for the preparation of guidance to EN 1992 to EN 1998. It is not reasonable to expect industry to carry all these costs. Government, as a major client for construction, should provide at least matching cash funding to ensure it obtains maximum value from the transition.

- A group should be established to monitor the process of implementation of the structural Eurocodes in the UK and advise on changes to the strategy that become necessary as the process progresses.

- BSI needs to urgently address:
  - The strategy for calibration of National Annexes
  - The need for residual standards and the programme for their production
  - Copyright policy with regard to the Eurocodes, the National Annexes and information currently available in British Standards that will be needed beyond the withdrawal of those Standards.

- ODPM needs to issue clear guidance on the use of Eurocodes for contracts for public works.

- The structural engineering community requires a clear timetable for the transition from British Standards to Eurocodes so that it can plan for the necessary changes to its ways of working.

- A user friendly, web based, source of up-to-date information on the publication schedule of the Eurocodes and associated guidance material is required.

- A technical helpdesk should be established. It must be seen as the National source of authoritative guidance.

- The professional institutions, research associations and trade associations who provide authoritative design guidance should prepare a prioritised schedule for those items related to the Eurocodes that they intend to produce.

- A comprehensive programme of education, utilising a number of different means of dissemination, for both students and practitioners should be drawn up.

- The UK should support the formation of maintenance groups for the Eurocodes, if necessary with BSI taking the lead in CEN to ensure that this happens. Government funding needs to be available to enable UK participation in these groups.

- The UK strategy set out herein needs to be continually re-assessed, updated and supported.

1 Introduction

1.1 Background

The structural Eurocodes are a European suite of codes for structural design that have been developed over a period of more than twenty-five years. Between 2004 and 2007 they will be published, as British Standards, initially as an alternative to the existing Standards. By 2010 they will have effectively replaced the current British Standards as the primary basis for designing buildings and civil engineering structures in the UK. They are also likely to be used as an acceptable basis for meeting compliance with UK Building Regulations and the requirements of other public authorities.

Whilst the construction industry is experienced in adapting to the use of new design codes from time to time, it has not previously faced the challenge of implementing a complete suite of new codes encompassing all the major materials and loading requirements. This burden will not be eased by the format and terminology of the Eurocodes both of which are different from British Standards. To ensure that the UK construction industry will be equipped to exploit the export opportunities afforded by pan European standardisation and that its home market is not weakened through lack of facility to operate in the new regime, a coordinated strategy for the provision of guidance material and training programmes is clearly necessary.

In December 2003 the Office of the Deputy Prime Minister (ODPM) invited the Institution of Structural Engineers (IStructE) (see Appendix A) to submit a proposal to produce, within a three month period, a National Strategy to inform ODPM and other stakeholders of the guidance material and other training aids etc, required to ensure the successful implementation of the structural Eurocodes within the UK. The IStructE accepted the invitation and agreed that work would commence on 1 February 2004 with the final report being submitted to ODPM by the end of April 2004.

As requested by ODPM, a 'National Strategy for Eurocodes Committee' was formed under the Chairmanship of Professor David Nethercot, FREng, President IStructE and representation was sought from each of the bodies and sectors suggested in the ODPM specification (see Appendix A) including the IStructE itself. In addition several key individuals with expertise in areas relevant to the Eurocodes but not otherwise covered by the organisations identified by ODPM were invited to join the Committee. The membership of the Committee is listed in Appendix B. The Committee held formal meetings on 16 February 2004 and 30 March 2004 but the majority of its work was conducted within sub-groups of its membership, largely by electronic means.

1.2 Scope of the strategy

The specification from ODPM (see Appendix A) required that the strategy be delivered as a report outlining:

- the range of guidance documents, software, training and dissemination resources needed
- the guides etc., already available or currently being prepared
- the additional guides etc., required

- the preferred authors/publishers and facilitators
- the estimated costs involved, including industrial contributions in the case of collaborative projects/ventures
- the proposed funding arrangements
- the timescales involved

Section 2 of this report outlines the background and scope of the structural Eurocodes, together with the timescales to which they are likely to become available for use in the UK. A detailed list of the various parts of each of the Eurocodes is presented in Appendix C.

The process of implementation of the Eurocodes in the UK and the requirements of the different sectors of the construction industry are discussed in Section 3. The relevant initiatives which are already in place are identified. A detailed list of guidance that is already available, being prepared or definitely planned, that the Committee has been able to identify, is given in Appendix D.

Section 4 makes recommendations as to the way in which the transition to the use of Eurocodes should be facilitated in the UK, including the timing of different activities together with some indication of the resources required. The specific needs of various sectors of the industry are discussed. Appendix E contains a more detailed breakdown of individual items that are required, their suggested facilitators and an indication of the necessary resources.

It should be noted that the information included in this report, including the anticipated dates of publication of documents, is the best that was available to the Committee on 1 April 2004. Readers should be aware that based on the history of code development and production it is inevitable that some of the dates will change.

2 The structural Eurocodes

2.1 Introduction

In 1975 the Commission of the European Community initiated a programme of work aimed at producing a set of technical rules for structural design, the structural Eurocodes, which would initially serve as an alternative to existing national rules and eventually replace them.

The intended benefits of the Eurocodes are to [1]:

- provide common design criteria and methods of meeting necessary requirements for mechanical resistance, stability and resistance to fire, including aspects of durability and economy
- provide a common understanding regarding the design of structures between owners, operators and users, designers, contractors and manufacturers of construction products
- facilitate the exchange of construction services between Members States
- facilitate the marketing and use of structural components and kits in Members States
- facilitate the marketing and use of materials and constituent products, the properties of which enter into design calculations
- be a common basis for research and development, in the construction industry
- allow the preparation of common design aids and software
- increase the competitiveness of the European civil engineering firms, contractors, designers and product manufacturers in their world-wide activities.

The Eurocodes are recognised by Member States of the European Economic Area to serve as [1]:

- a framework for drawing up harmonised technical specifications for construction products
- a means of demonstrating compliance of building and civil engineering works with Building Regulations, the National requirements for other regulated works eg the Highways Agency's BD Standards and with the essential requirements of the Construction Products Directive [2]
- a basis for specifying contracts for construction works and related engineering services

In 1989 the Commission decided to transfer the preparation and publication of the Eurocodes to the European Committee for Standardisation (CEN), whose members are the National Standards Bodies (in the UK this is the British Standards Institution (BSI)) so that they would have the status of European Standards. The UK has taken an active part in the process of drafting the Eurocodes and considerable resources from both industry and government have been expended in support of this activity.

2.2 Scope

The structural Eurocodes cover Basis of Structural Design, Actions (ie Loading), each of the main structural materials, geotechnical design and design of structures for earthquake resistance. The ten Eurocodes are:

- EN 1990 Basis of structural design
- EN 1991 Actions on structures
- EN 1992 Design of concrete structures
- EN 1993 Design of steel structures
- EN 1994 Design of composite steel and concrete structures
- EN 1995 Design of timber structures
- EN 1996 Design of masonry structures
- EN 1997 Geotechnical design
- EN 1998 Design of structures for earthquake resistance
- EN 1999 Design of aluminium structures

Other than EN 1990, each of the codes is divided into a number of parts (See Appendix C) covering specific aspects of the subject.

All of the Eurocodes relating to materials have a Part 1-1 which covers the design of buildings and civil engineering structures. They also have a Part 1-2 for fire design. The codes for concrete, steel, composite construction, timber and earthquake resistance have a Part 2 covering design of bridges. In each case Part 2 is to be used in combination with the appropriate Part 1 which relates to all civil engineering structures.

The Eurocode Parts have been grouped into Packages (see Appendix C) each of which must be published, with their respective National Annex (see Section 2.4) before full implementation of that set of Codes may begin. ENs 1990, 1991, 1997 and 1998 are material independent and are therefore included in each of the packages.

2.3 Programme for publication

All of the Eurocodes were initially published as trial codes, known as ENVs, intended for experimental use. In practice in the UK there was little real use of the ENVs, although there were some projects where a design using them was compared to that using British Standards, for the purpose of calibration.

A minimum of two years after the publication of each ENV, each of the National Standards Bodies submitted comments to CEN on its contents and use. These comments have been used to inform the drafting committees in converting them into the final, EN, codes. In many cases the EN will be significantly different from the corresponding ENV.

As a member of CEN, BSI is required to publish the Eurocodes and, in due course, subsequently withdraw conflicting national standards. Following approval of the final text of a Eurocode, by formal vote by Member States within CEN, it will be made available to BSI. This is known as the ‘Date of Availability’ (DAV). BSI then has a

maximum period of two years in which to prepare the National Annex (See section 2.4) to accompany the code and publish the code as a National Standard. Appendix C lists the dates by which it is currently anticipated that each of the parts of the Eurocodes will be published by BSI with its National Annex as an integral part of the document*. In accordance with CEN requirements each Eurocode Part will be published by BSI, in advance of the availability of the National Annex, within six months of CEN making the text available. Each National Annex will also be published as a separate document. This is, in part, a Commission requirement to prevent barriers to trade, but is also for the practical reason that engineers may work in more than one country.

Following publication of each Eurocode together with its National Annex there will be a period (known as the coexistence period) during which they can be used alongside the existing British Standards as a means of demonstrating compliance with regulatory requirements. As the design of any structure will require reference to more than one of the Eurocodes they have been grouped together into packages (see Appendix C) related to different types of structure. The period of coexistence, which may last a maximum of three years, for all of the Parts within a package will not begin until the last Part included within it is published by BSI with its National Annex. The dates by which it is currently anticipated that each of the packages will be in place are given in Appendix C*.

At the end of the coexistence period BSI is required to withdraw the British Standards having the same scope as the Eurocode Package. Since, in most cases the scope of the Eurocode will not match precisely that of the corresponding British Standard it will be beneficial to retain in some form, for example a residual British Standard, some of the material which is not superseded by the Eurocode for use in UK practice (see Section 3.2.3).

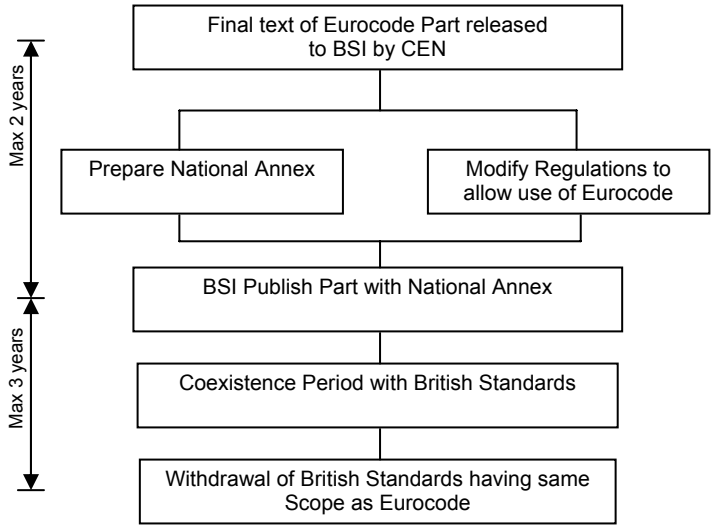

Figure 2.1 Timetable from release of final text of a Eurocode from CEN to withdrawal of British Standards.

* It should be borne in mind that long experience in the preparation of Codes and Code related material indicates that target dates are rarely, if ever, met and that actual publication dates are often many months and sometimes several years later than predicted.

The Public Procurement Directive [3] will mean that tenderers for contracts for public works must either offer technical solutions based on a European Standard (ie a Eurocode) where this exists (ie when the Eurocode and its National Annex have been published) or, alternatively base their offer on equivalent standards/Codes. ODPM will need to give clear guidance on which codes and standards are considered to be equivalent to the Eurocodes. As most projects will include elements constructed of several different materials covered by different Eurocode packages, guidance will also be required as to when the Public Procurement Directive will become applicable to different types of project. If the design of public works is to be carried out to the Eurocodes as soon as they are published it must be recognised that much of the necessary guidance material is not likely be in place at that time and there may be safety risks as a result (see section 4.3.2).

2.4 National Annexes

National Standards Bodies, such as BSI, are not permitted to change any part of the text in the core CEN document. However, they are allowed to add a National title page, a National Foreword and a National Annex.

As the Eurocodes are intended to be used as one approach to satisfy Building Regulations and other requirements that are not currently harmonised across the European Union they recognise the principle, stated in the Construction Products Directive [2], that the level of safety in a country remains its prerogative. Consequently, some safety factors and a number of other parameters, such as those reflecting differences in climatic conditions, are left open in the Eurocodes for selection at a national level. These are termed Nationally Determined Parameters (NDPs).

The National Annex of each Eurocode Part lists the NDPs and other points on which an element of national choice exists, for example, where there is the possibility of a choice of different design methods. The National Annex may also include reference to non-contradictory complimentary information (NCCI), such as national standards or guidance documents.

It is not permissible for National Standards Bodies to publish a version of a Eurocode with the values of the NDPs inserted into the text of the EN.

The UK National Annexes will be developed under the auspices of BSI and will be issued as drafts for public comment before they are finalised.

3 Implementation of the structural Eurocodes in the UK

3.1 Introduction

The implementation of the structural Eurocodes will be the most wide ranging change to the codification of structural design in the UK ever experienced by the construction industry. Whilst they will be in many ways the most technically advanced suite of design codes available anywhere in the world, the way in which they are presented and some of the terminology used will be unfamiliar to those used to working with British Standards.

The adoption of European standards offers significant opportunities in terms of export of UK design expertise and products. A number of countries outside Europe are also likely to adopt the Eurocodes and hence further increase these opportunities. There is also the potential for considerable savings in research and development expenditure. It should also not be forgotten that the introduction of the Eurocodes will allow increased competition for designers within the UK from designers from other European countries.

If the UK construction industry is to be in a position to make the transition to the Eurocodes in an efficient, cost effective manner and therefore to be well placed to capitalise on the opportunities which they present, their implementation must be coordinated across the industry. Guidance on the implications of the use of Eurocodes and the actions that they need to take will be required by various groupings within the industry including clients, designers, regulators, contractors, academics and suppliers.

In the lead up to and throughout the period of transition to the Eurocodes a wide range of authoritative information, Residual Standards, guidance material and design aids will need to be prepared and disseminated. A number of initiatives which will provide some of what is required are already in place (see section 3.3) but other needs remain to be addressed. The specific needs of different sectors of the industry, including appropriate education and training, are presented in section 3.4.

3.2 Issues related to implementation of the structural Eurocodes

A number of issues that will have an effect on the implementation of the structural Eurocodes have been identified; each of these is discussed in the sections that follow.

3.2.1 Background information and interpretation

Production of guidance documents and software will be greatly assisted if information related to the background of the provisions, for example the basis of formulae, of the Eurocodes could be gathered together and made available. Authoritative interpretation of some sections of the codes will be necessary to enable them to be used as intended by their authors.

Interpretation will be required at two levels:

- clarification of the detailed clauses for member design

- the overall approach for building analysis and design addressing issues such as integrity, stability, second-order effects, treatment of frame imperfections etc.

The former could be handled by sector groups facilitated by the appropriate authoritative body in the sector. However, funding of the appropriate experts would be required.

It is inevitable that there will be queries that arise when the Eurocodes are implemented. Whilst currently queries received by BSI, which cannot be dealt with by the appropriate BSI Committee, are referred to the relevant CEN project team these will be disbanded when the drafting of their particular Eurocode part is complete. It is therefore important that the mechanism for dealing with queries is clarified.

3.2.2 National Annexes

Although considerable resource was expended in conducting calibration studies for the ENVs, the changes made during the conversion process mean that much of this work is no longer valid and hence considerable work still remains to be carried out to calibrate the ENs. It is also a matter of concern that there is currently no coherent strategy for calibration across all materials. This must be resolved by BSI as a matter of urgency.

Thus far most of the emphasis in preparing the National Annexes appears to have been on buildings but it is essential that the necessary work in connection with bridges and other types of structures is completed.

Providers of guidance material and software need the National Annexes to be finalised before they will be able to do most of their work. Consequently it will not be possible for the majority of such material to be published until some time after the appropriate National Annex is finalised. This is equally true of Residual British Standards and other NCCI (see Sections 3.2.3 and 3.2.4).

3.2.3 Residual British Standards

At the end of the coexistence period BSI is required to withdraw those British Standards (see Appendix C) having the same scope as the Eurocode Package (these are often referred to as 'conflicting' standards). However, the scope of each of the Eurocodes is such that in the vast majority of cases their content will not match precisely that of the corresponding British Standards. The degree of overlap varies from only a few clauses to virtually complete substitution of the British Standard by the Eurocode. For each British Standard that will eventually be withdrawn a decision needs to be reached as to whether the material within it that is not superseded by the appropriate Eurocode should be retained for use in the UK. Such material might either be reissued as a new British Standard or incorporated into another publication such as a handbook. These documents will need to be available at the time of publication of the relevant Eurocode and its National Annex, or as soon as possible thereafter. Significant resources will be required to identify the residual material that is not in conflict with the Eurocodes, decide what should be done with the remainder of each British Standard and to republish what is to be retained.

In the time available to it the Committee was not able to conduct a comprehensive review of the residual standards that will be necessary. However, a number of those which are believed to be required are identified in Appendix E.

The National Annex of each Eurocode is permitted to contain reference to NCCI which will assist designers in applying it in the UK. Much of the NCCI that it will be desirable to reference is likely to be from existing British Standards that will be withdrawn. If the finalisation of the National Annexes is not to be delayed, decisions on the fate of the material from these standards need to be reached quickly. Schedules for both the withdrawal of the current standards and publication of residual standards need to be prepared so that appropriate references can be included in the National Annexes. It should also be noted that it may be necessary for National Annexes to be revised to include references to NCCI when the current British Standards are withdrawn.

3.2.4 Non conflicting complimentary information from sources other than British Standards

It is likely that the National Annexes will include reference to a wide variety of NCCI drawn from sources other than current British Standards. Much of the necessary material will be updated documents from the various bodies within the industry who regularly publish authoritative guidance. However, finalisation of the National Annexes will require that these organisations decide which documents will be updated to reflect the Eurocodes and to what timescale they will be produced.

3.2.5 BSI

Within the UK the copyright of the Eurocodes will rest with BSI. In order to be useful, guidance documents, in both paper and electronic format, will need to be able to quote extracts from them. It is also likely that material from existing British Standards not republished as residual standards will need to be incorporated in other forms of NCCI. It is therefore essential that arrangements are made which allow reproduction of what is required without unnecessary bureaucracy or prohibitive cost.

BSI should consider its pricing policy for the Eurocodes carefully. It is understood that there is a significant possibility that, because other National Standards Bodies will be publishing them in English and CEN requires BSI to publish the National Annexes as stand alone documents, it may prove cheaper for purchasers to buy the codes themselves elsewhere.

3.2.6 Designers

Designers are unlikely to adopt the structural Eurocodes until they see a competitive advantage, are required to do so by clients or there is effectively no alternative because the British Standards have been withdrawn and references in the Approved Documents to the Building Regulations removed.

The investment required to purchase the Eurocodes themselves and supporting guidance documents and provide the necessary training for staff will be significant.

As an illustration, a conservative estimate of the likely cost of adopting the structural Eurocodes within a small to medium sized consultancy (with 16 fee earning staff) specialising in building structures is presented in Table 3.1. With their fee levels already under pressure, some designers are likely to resist making this expenditure for as long as possible. During the transition it is inevitable that the times taken to both carry out a design and to check it will increase. However, clients are unlikely to accept increased costs when they find there to be little, if any, economic advantage of using the Eurocodes.

Item	£
Cost of purchasing 1 set of structural Eurocodes including National Annexes (estimate)	2,750
Cost of buying guidance documents (assumed)	1,000
Cost of updating software (assumed)	20,000
Attendance at technical seminars (assume 3 days per person) • Cost of seminars (assume £150 net each seminar) = 16x3x£150 • Cost of attendance = 16x3x7.5x£50	 7,200 18,000
Familiarisation with codes in the office (assume 12 man-days for each person) = 16x12x7.5x£50	72,500
Alterations to standard 'in house' specification documents (allow 14 documents at an average of 1 man-day each) = 14x7.5x£50	5,250
Loss of productivity during first year of change (assume average annual billing (productive time) = 1600 hours and 10% loss of productivity) = 1600x16x0.1x£50	128,000
Total	**254,700**
Note: The cost rate is based on costs averaged over all staff, from junior technician to director/partner and is not intended to include an element of profit.	

Table 3.1 – Estimate of cost of adoption of Eurocodes within a consultancy with 16 fee earning technical staff specialising in building structures.

Designers are also concerned that unless steps are taken to convince Professional Indemnity Insurers that the change of Codes will not lead to increased risk their insurance premiums will rise.

3.3 Initiatives already in place

The professional institutions, research associations, trade associations, and other bodies have already started to prepare the industry for the transition to the Eurocodes. A list of the guidance material that is either already available or being prepared, that the Committee has been able to identify, is presented in Appendix D.

It should be noted that many organisations invested significant resources in developing and publishing guidance material based on the ENV versions of the Eurocodes. However, as a result of changes made during the conversion process, the EN versions will be significantly different from the corresponding ENVs. Consequently virtually all of the earlier publications will need to be revised extensively and republished if they are to be of use with the ENs.

3.3.1 'Eurocode Expert'

In April 2003 Thomas Telford Ltd, the trading company of the Institution of Civil Engineers, launched 'Eurocode Expert' which, by means of a web site, newsletters, provision of seminars and a user group (free of charge until May 2004), is aimed at acting as a focus for dissemination of information related to the Eurocodes and their implementation. 'Eurocode Expert' is not currently aimed at providing detailed technical guidance. However, it has the potential to assist the community with both information on the availability of codes and code related material and activities. It could work with other organisations to advise on technical queries. (see Section 4.3.1.2)

3.4 Needs of industry

With the exception of ENs 1990 and 1991 (see section 3.4.1.1) and EN 1999 (see section 3.4.1.9) the information needs of the various stakeholders in the industry which have been identified in respect of each of the Eurocodes are presented, in tables 3.2 to 3.8. In these tables items in regular type are understood to be either already available or definitely planned and items in italics are required.

It should be noted that some sectors of the industry, particularly those with organisations providing a focus within the sector, already have a reasonably clear list of what is likely to be required by their sector. In others the thinking is currently less well advanced. Whilst tables 3.2 to 3.8 include the items that have been identified at the time this report was written, they should not be taken to be a definitive list as it is inevitable that the requirements will change and develop during the transition period.

Table 3.2 EN 1992: Design of concrete structures

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents		• *Introduction to the Eurocodes*				
Technical manuals	• Concise EC2 • Precast Design Manual • Detailing Guide • IStructE Manual • Concrete Fire Design *Manual to EN 1992:1-2* • *Concept Design (RCC update)* • *Consistency of loading across material codes including fire*		• As Designers and regulators	• As Designers and regulators		• As Designers and regulators
Commentary	• Designers' Guide to EN 1992-1-1 • Designers' Guide to EN 1992-2 • *Commentary to EN 1992:1-1* • *BS 8110 and EN 1992 Compared*		• As Designers and regulators	• As Designers and regulators		• As Designers and regulators
Worked examples	• Worked Examples to EC2 • How to Design Leaflets (Core set) • *Worked Examples for fire design*		• As Designers and regulators			• Worked Examples to EC2 • *Worked examples for fire design*

Table 3.2 EN 1992: Design of concrete structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Software	• Design tool - Spreadsheets (Core set) • *Concept Design software* • *Advanced design software updating* • *Software for fire design using advanced methods*					
Teaching materials - students			• CALCRETE update • *PowerPoint presentations and course notes*			
Teaching materials - practitioners	• *Programme of 'Conversion' Courses*		• CALCRETE update • *Programme of 'Conversion' Courses*	• As Designers and regulators	• As Designers and regulators	
Other	• *Update of National Structural Concrete Specification* • *Specification of concrete to EN 206*		• As Designers and regulators	• *Specification of concrete to EN 206*	• As Designers and regulators	

Table 3.3 EN 1993: Design of steel structures

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents	• Implementation of the Structural Eurocodes in the UK • *Threats and opportunities for engineers* • *Design Office guide to Implementing the Structural Eurocodes*	• Implementation of the Structural Eurocodes in the UK • *A Clients' Guide to European Procurement*	• Implementation of the Structural Eurocodes in the UK	• Implementation of the Structural Eurocodes in the UK • *Design for Construction and the European market*	• Implementation of the Structural Eurocodes in the UK • *Product design for a European Market*	
Technical manuals	• IStructE Manual • Section Capacities and Member Properties SCI P202 • Handbook of structural steelwork P201 • Guide to the Design of Medium Rise Structures SCI • *National structural steelwork specification for building construction BCSA/SCI* • *Steelwork Design Guide to BSEN 1993- 1-1: P114* • *Plastic Design of Single Storey Pitched Roof Portal Frames to Eurocode 3 - P147* • *Design of Steel Portal Frames for Europe - P164* • *Fire resistant design of steel structures – P080* • *Modelling of Steel Structures for Computer Analysis P148*		• *Introduction to Steelwork Design to BS EN1993 (like P325)*	• IStructE Manual • Section Capacities and Member Properties as SCI P202 • Handbook of structural steelwork P201 • Guide to the Design of Medium Rise Structures SCI • *National structural steelwork specification for building construction BCSA/SCI* • *Plastic Design of Single Storey Pitched Roof Portal Frames to Eurocode 3 - P147* • *Design of Steel Portal Frames for Europe - P164* • *Fire resistant design of steel structures– P080*	• IStructE Manual • Section Capacities and Member Properties P202 • Handbook of structural steelwork P201 • *Flow charts for design procedures, starting with medium rise* • *Building Design Using Cold Formed Steel Sections: Structural Design to BS 5950-5:1998. Section Properties and Load Tables P276* • *Design Manual for Structural Stainless Steel Design P291* • *Design of stainless steel fixings and ancillary components P119*	• As Designers and regulators plus • *Flow charts for design procedurese* • *Flow charts for portal frame design*

Table 3.3 EN 1993: Design of steel structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Technical manuals (cont.)	• *Structural fire design to EC3 and EC4 and comparison with BS 5950 P159* • *Design of steel framed buildings without applied fire protection P186* • *Joints in Steel Construction : Moment Connections P207 ('Green Book')* • *Joints in Steel Construction : Simple Connections P212 ('Green Book')* • *Wind-moment Design of Low Rise Frames P263* • *Building Design Using Cold Formed Steel Sections: Structural Design to BS 5950-5:1998. Section Properties and Load Tables P276* • *Introduction to Steelwork Design to BS EN1993 (like P325)* • *Design Manual for Structural Stainless Steel Design P291* • *Design of stainless steel fixings and ancillary components P119* • *BSEN1993 Implementation rules - suggestion is an SCI-led group* • *Structural assessment to the Eurocodes (needs to be cross-cutting)*			• *Fire resistant design of steel structures – P080* • *Joints in Steel Construction : Moment Connections P207* • *Joints in Steel Construction : Simple Connections P212* • *Building Design Using Cold Formed Steel Sections: Structural Design to BS 5950-5:1998. Section Properties and Load Tables P276* • *Design Manual for Structural Stainless Steel Design P291* • *Design of stainless steel fixings and ancillary components P119* • *BSEN1993 Implementation rules - suggestion is an SCI-led group* • *Structural assessment to the Eurocodes (needs to be cross-cutting)*	• *Flow charts for component design (cladding rails, purlins and sheeting)*	

Table 3.3 EN 1993: Design of steel structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Commentary	• Guide to the major amendments in BS EN1993 (like P304**)** • A number of introductory books are in preparation (e.g. Nethercot and Gardner)			• Guide to the major amendments in BS EN1993 (like P304)	• Guide to the major amendments in BS EN1993 (like P304)	• Guide to the major amendments in BS EN1993 (like P304)
Worked examples	• BRE-Worked examples of element design • There will be worked examples in a number of other publications listed under 'Technical Manuals' • *e-BSEN 1993 (similar to e-BS5950 mapping between EC3 and BS 5950 with hyperlinked commentary)*					
Software	• *Online software tool for stainless steel design to EC3* • Element design spreadsheets by SCI from SEFIE STEEL • *Individual modules for element design (scope is elements/forms of construction as for Technical Manuals, see above)* • *Integrated analysis/design packages* • *e-BSEN 1993 (similar to e-BS5950 mapping between EC3 and BS 5950 with hyperlinked commentary)*				• Element design spreadsheets by SCI from SEFIE STEEL	

Table 3.3 EN 1993: Design of steel structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Teaching materials - students	• IStructE Manual		• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	
Teaching materials - practitioners	• 'Introduction to BSEN1993' TTL • SSEDTA from Uni of Sheff (ENV) • NAFTEC from Uni of Sheffield (ENV) • Introduction to Design to the Eurocodes (Arya) • SCI STEELCAL adjusted to EN • Element design spreadsheets by SCI from SEFIE STEEL • SCI Course Portfolio • Introduction to Steelwork Design to BS EN1993 (like P325) • *Course Threats and opportunities for engineers - SCI*					
Other	• *Guide to NCCI in EN1993 – SCI?*		• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	

Table 3.4a EN 1994-1-1: Design of composite steel and concrete structures - General - Common rules and rules for buildings

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents	• Implementation of the Structural Eurocodes in the UK	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators
Technical manuals	• Designers' Guide to EN 1994-1-1 • IStructE Manual • BSI Student Guide • *Updates of at least the following SCI Publications:* ▪ *Composite beam design to Eurocode 4 (to include limiting spans for simple beams)* ▪ *Web openings* ▪ *Design of composite and non-composite cellular beams* ▪ *Composite column design to Eurocode 4 (to include resistances of standard sections)* ▪ *Design of composite beams using precast concrete slabs* ▪ *Publications on slim floors and Slimdek and use of precast units* ▪ *Green book on composite connections* ▪ *Steel designers manual*		• As Designers and regulators	• *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications* ▪ *Best practice in composite floor construction* ▪ *Green book on composite connections*	• Designers' Guide to EN 1994-1-1 • IStructE Manual • *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications:* ▪ Web openings ▪ *Design of composite and non-composite cellular beams* ▪ *Publications on Slimdek* ▪ *Green book on composite connections*	• Designers' Guide to EN 1994-1-1 • *Updates of at least the following SCI Publications:* ▪ ***Web openings*** ▪ *Design of composite and non-composite cellular beams* ▪ *Design of composite beams using precast concrete slabs* ▪ *Publications on slim floors and Slimdek and use of precast units* ▪ *Green book on composite connections*

Table 3.4a EN 1994-1-1: Design of composite steel and concrete structures - General - Common rules and rules for buildings (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Technical manuals (cont.)	• *Manufacturers' handbooks for composite slabs*					
Commentary	• Designers' Guide to EN 1994-1-1 • Johnson textbook • BRE Companion • Special edition ProcICE on Eurocodes • *Modelling of steel and composite building structures for analysis* • *Calibration examples* • *See also updated SCI Publications, above*	• BRE Companion	• As Designers and regulators	• BRE Companion? • Special edition ICE Proc on Eurocodes • *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications* ▪ *Best practice in composite floor construction* ▪ *Green book on composite connections*	• Designers' Guide to EN 1994-1-1 • Johnson textbook • BRE Companion • *Updated SCI Publications:* ▪ Web openings ▪ *Design of composite and non-composite cellular beams* ▪ *Publications on Slimdek* ▪ *Green book on composite connections*	• Designers' Guide to EN 1994-1-1 • *Modelling of steel and composite building structures for analysis* • *Calibration examples* • *See also updated SCI Publications, above*
Worked examples	• Designers' Guide to EN 1994-1-1 • Johnson textbook • BRE Examples • *Modelling of steel and composite building structures for analysis* • *See also updated SCI Publications, above*		• As Designers and regulators	• *Case studies*	• Designers' Guide to EN 1994-1-1 • Johnson textbook • BRE Examples? • *Updated SCI Publications:* ▪ Web openings ▪ *Design of composite and non-composite cellular beams* ▪ *Publications on Slimdek*	• Designers' Guide to EN 1994-1-1 • BRE Examples • *Modelling of steel and composite building structures for analysis* • *See also updated SCI Publications, above*

Table 3.4a EN 1994-1-1: Design of composite steel and concrete structures - General - Common rules and rules for buildings (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Software	• *Individual modules for element design (scope is elements/forms of construction as for Technical Manuals, see above)* • *Integrated analysis/design packages* • Web-based information source • *Web-based tutor*		• ***As Designers and regulators***	• Web-based information source	• *Element design (but provided in-house?)* • Web-based information source .	
Teaching materials - students	• IStructE Manual • BRE Examples • BSI Student Guide • *See also updated SCI Publications, above* • *Updated steelwork textbooks (eg Trahair et al, Nethercot, Morris and Plum) to include simple composite beams* • *See Software, above* • *Modelling of steel and composite building structures for analysis*		• As Designers and regulators	• *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications on best practice in composite floor construction Green book on composite connections* • *Case studies?*	• BRE Examples • *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications:* ▪ Web openings ▪ *Design of composite and non-composite cellular beams* ▪ *Publications on Slimdek* ▪ *Green book on composite connections* • *See Software, above*	

Table 3.4a EN 1994-1-1: Design of composite steel and concrete structures - General - Common rules and rules for buildings (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Teaching materials - practitioners	• IStructE Manual • BRE Companion • BRE Examples • BSI Student Guide • *See also updated SCI Publications, above* • *Manufacturers' handbooks for composite slabs* • *Modelling of steel and composite building structures for analysis* • *Calibration examples* • *See Software, above* • *Training courses (eg Eurocodes Expert, SCI, IStructE)*		• As Designers and regulators	• BRE Companion • *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications* ▪ *Best practice in composite floor construction* ▪ *Green book on composite connections* • *Case studies*	• BRE Companion • BRE Examples • *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications:* ▪ Web openings ▪ *Design of composite and non-composite cellular beams* ▪ *Publications on Slimdek* ▪ *Green book on composite connections* • *Training courses (provided by in-house staff)*	
Other						

Table 3.4b EN 1994-1-2: Design of composite steel and concrete structures - General - Structural fire design

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents	• Implementation of the Structural Eurocodes in the UK	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators
Technical manuals	• Designers' Guide to EN 1994-1-1 • *Updates of at least the following SCI Publications:* ▪ *Structural fire design to EC3 & EC4, and comparison with BS 5950* ▪ *Guidance on the use of Intumescent coatings for the Fire Protection of Beams with Web Openings* ▪ *Fire safe design: A new approach to multi-storey steel-framed buildings* ▪ *The fire resistance of concrete filled tubes to Eurocode 4* ▪ *Design of steel framed buildings without applied fire protection* ▪ *Publications on Slimdek* ▪ *Steel designers manual* • *Manufacturers'handbooksfor composite slabs*		• As Designers and regulators	• *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications on best practice in composite floor construction* ▪ *Guidance on the use of Intumescent coatings for the Fire Protection of Beams with Web Openings,* ▪ *Fire protection for structural steel in buildings Design of steel framed buildings without applied fire protection*	• Designers' Guide to EN 1994-1-1 • *Manufacturers handbooksfor composite slabs* • *Updated SCI Publications:* ▪ *Guidance on the use of Intumescent coatings for the Fire Protection of Beams with Web Openings,* ▪ *Fire protection for structural steel in buildings Publications on Slimdek* • *Manufacturers' data sheets for protective systems*	• Designers' Guide to EN 1994-1-1 • *Updates of at least the following SCI Publications:* ▪ *Structural fire design to EC3 & EC4, and comparison with BS 5950* ▪ *Guidance on the use of Intumescent coatings for the Fire Protection of Beams with Web Openings* ▪ *Fire safe design: A new approach to multi-storey steel-framed buildings* ▪ *The fire resistance of concrete filled tubes to Eurocode 4* ▪ *Design of steel framed buildings without applied fire protection* ▪ *Publications on Slimdek* ▪ *Steel designers manual*

Table 3.4b EN 1994-1-2: Design of composite steel and concrete structures - General - Structural fire design (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Commentary	• Designers' Guide to EN 1994-1-1 • BRE Companion • Special edition ProcICE on Eurocodes • *Calibration examples* • *Updated SCI Publications, above*	• BRE Companion	• As Designers and regulators	• BRE Companion • Special edition ProcICE on Eurocodes • *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications, above*	• Designers' Guide to EN 1994-1-1 • BRE Companion • *Updated SCI Publications, above*	• As Designers and regulators
Worked examples	• Designers' Guide to EN 1994-1-1 • BRE Examples		• As Designers and regulators	• *Case studies*	• As Designers and regulators • *Updated SCI Publication: Guidance on the use of Intumescent coatings for the Fire Protection of Beams with Web Opening* • *Examples provided by supplier*	• As Designers and regulators
Software	• *Integrated analysis/design packages (with capability for separate use of individual modules)* • *Web-based information source* • *Web-based tutor*		• As Designers and regulators	• *Integrated analysis/design packages (with capability for separate use of individual modules)?* • *Web-based information source*	• *Element design (provided by supplier)* • *Web-based information source*	

Table 3.4b EN 1994-1-2: Design of composite steel and concrete structures - General - Structural fire design (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Teaching materials - students	• BRE Examples • *See also updated SCI Publications, above* • *Updated textbooks* • *See Software, above*		• As Designers and regulators	• *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications, above* • *Manufacturers' data sheets for protective systems* • *Case studies?*	• As Designers and regulators • *Manufacturers' handbooks for composite slabs* • *Manufacturers' data sheets for protective systems* • *Examples provided by supplier*	
Teaching materials - practitioners	• BRE Companion • BRE Examples • *See also updated SCI Publications, above* • *Manufacturers' handbooks for composite slabs* • *Calibration examples* • *See Software, above* • *Training courses (eg Eurocodes Expert, SCI, IStructE)*		• As Designers and regulators	• BRE Companion • *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications above* • *Manufacturers' data sheets for protective systems* • *Case studies?*	• BRE Companion • BRE Examples • *Manufacturers' handbooks for composite slabs* • *Updated SCI Publications* • *Manufacturers' data sheets for protective systems* • *Examples provided by supplier* • *Training courses (provided by supplier)*	
Other						

Table 3.4c EN 1994-2: Design of composite steel and concrete structures - Bridges

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents	• Implementation of the Structural Eurocodes in the UK	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators
Technical manuals	• Designers' Guide to EN 1994-2 • *Updates of at least the following SCI Publications:* ▪ *Design guide for Composite Highway Bridges: General guidance* ▪ *Integral steel bridges: Design guidance* ▪ *Design guide for simply supported composite bridges* ▪ *Design guide for continuous composite bridges* ▪ *Design guide for composite box girder bridges* • *Fatigue verification using EC2, EC3 and EC4* • *Joints in composite bridges*	• Technical needs of owners and clients for bridge works are as for other stakeholders • Non-technical needs: not applicable	• As Designers and regulators	• *Updates of at least the following SCI Publications:* • *Guidance notes on best practice in steel bridge construction*	• Designers' Guide to EN 1994-2	• As Designers and regulators

Table 3.4c EN 1994-2: Design of composite steel and concrete structures - Bridges (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
	• *Residual standard covering shear connectors other than headed studs, shear studs with uplift, treatment of settlement at ULS, fully encased filler beams, design iutilising formwork other than precast concrete* • Updated HA Design Manual for Roads and Bridges (DMRB)					
Commentary	• Designers' Guide to EN 1994-2 • Revised textbook (eg Johnson and Buckby) • *Modelling steel and composite bridges for analysis* • *Calibration examples* • *See also updated SCI Publications, above* • *Fatigue verification using EC2, EC3 and EC4* • *Joints in composite bridges* • DMRB, as above	• Technical needs of owners and clients for bridge works are as for other stakeholders • Non-technical needs: • ODPM Implementation • Document Feb 03	• As Designers and regulators		• Designers' Guide to EN 1994-2	• Designers' Guide to EN 1994-2 • *Modelling steel and composite bridges for analysis* • *Calibration examples* • *See also updated SCI Publications, above* • *Fatigue verification using EC2, EC3 and EC4* • *Joints in composite bridges* • DMRB, as above

Table 3.4c EN 1994-2: Design of composite steel and concrete structures - Bridges (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Worked examples	• Designers' Guide to EN 1994-2 • *Modelling steel and composite bridges for analysis* • *See also updated SCI Publications above and:* ▪ *Design guide for Composite Highway Bridges: Worked examples* ▪ *Integral steel bridges: Design of a multi-span bridge - Worked example* • *Fatigue verification* • *Joints*	• Technical needs of owners and clients for bridge works are as for other stakeholders • Non-technical needs: not applicable	• As Designers and regulators	• *Case studies*	• Designers' Guide to EN 1994-2	• As Designers and regulators
Software	• *Integrated design/detail packages (with capability for separate use of individual modules)* • Web-based information source • *Web-based tutor*	• Technical needs of owners and clients for bridge works are as for other stakeholders • Non-technical needs: not applicable	• As Designers and regulators	• *Integrated analysis/design packages (with capability for separate use of individual modules)?* • Web-based information source	• *Element design (but provided in-house?)* • Web-based information source	
Teaching materials - students	• *As above for Manuals, Commentary, Worked Examples and Software*	• Technical needs of owners and clients for bridge works are as for other stakeholders • Non-technical needs: not applicable	• *As above for Manuals, Commentary, Worked Examples and Software*	• *Case studies*		

Table 3.4c EN 1994-2: Design of composite steel and concrete structures - Bridges (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Teaching materials - practitioners	• *As above for Manuals, Commentary, Worked Examples and Software 2.Training courses (eg Eurocodes Expert, SCI, IStructE)*	• Technical needs of owners and clients for bridge works are as for other stakeholders • Non-technical needs: not applicable	• *As above for Manuals, Commentary, Worked Examples and Software 2.Training courses (eg Eurocodes Expert, SCI, IStructE)*	• *Case studies*	• *Training courses (provided by in-house staff)*	
Other						

Table 3.5 EN 1995: Design of timber structures

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents	• *Clear and up to date timelines for code development progress & publication of supporting material – delivered via Institutions, RA's & Eurocodes Expert.* • *Documents to give clear guidance on status of Eurocodes & cross reference to Building Regulations, to facilitate approval process*	• *Outline basic understanding of the implications and benefits of Eurocodes on purchasing, specifications, design process, marketing advantage etc.*	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators
Technical manuals	• Essential resources to outline logical progression through the design process rather than follow EC5 format. Include EC0 & EC1 essential guidance eg IStructE Manual**.** • *Include flow charts to assist with broad or early design decisions.*					• As Designers and regulators
Commentary	• *Full or abridged contents of EC5, drawing-in essential citations from EC0 and EC1, supported by annotations and commentary. Cross-references to other guidance in preparation.* • BSI Guidance & Interpretation PD (Published Document)		• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators

Table 3.5 EN 1995: Design of timber structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Worked examples	• *Paper and electronic (web delivered) examples for practising engineers to cover common and also more complex design problems eg updated TRADA EC5 Worked Examples* • *Opportunity to illustrate intricate design problems and showcase innovative methods & materials where appropriate. Dissemination to the timber industry by TRADA Dissemination to general practitioners, alongside other Eurocode material, by Institutions, BRE and Eurocodes Expert*		• As Designers and regulators but with *additional lecturer resources.*	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators
Software	• *Stand alone (affordable) software tools to deal with common 'element' design problems eg joists/beams, studs/columns, composites, connections etc.* • *Plus, modules for inclusion in industry standard packages e.g. TEDDS.*		• *Intranet teaching resources.*			*A central resource for technical verification of software should be considered in light of the potential for varying interpretation of Eurocodes.*

Table 3.5 EN 1995: Design of timber structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Teaching materials - students			• *Teaching materials with a "Eurocodes safety format" background, suitable for delivery through Universities, as part of mainstream Civil/Structural Engineering degree* courses. *CTE has the beginnings of an EC5 core teaching resource linked to online learning.* • *Enhance & distribute TRADA Timber Design Knowledge teaching resource*			
Teaching materials - practitioners	• *CPD events complimented with longer training courses, workshops and online learning resources.* • *Dissemination routes as for Worked Examples.* • *Regulatory bodies need to be equipped with knowledge & information to enable them to review, comment on and approve Eurocode-based design submissions.*	• *Similar range of delivery mechanisms but focus on benefits of adoption, specification advice, safety issues, competitiveness, approval process, timelines for introduction etc.*				

Table 3.5 EN 1995: Design of timber structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Other	*Tabular "look-up" information for common design problemseg updated TRADA Design Aids & Guidance Documents*		• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators

Table 3.6 EN 1996: Design of Masonry Structures

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents	• *Advisory line* • *Web based directory of what is available and where to get it cross referenced to EC6 FAQ's*	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	
Technical manuals	• IStructE Manual • Designers' Guide to EN 1996 • BRE Handbook • *Update of BDA design manuals* • *Update of Granada / Curtin design publications*	• *Workmanship Guide to EN1996-2*	• IStructE Manual • Designers' Guide to EN 1996 • BRE Handbook • *Update of BDA design manuals* • *Update of Granada / Curtin design publications* • *Workmanship Guide to EN1996-2*	• As Designers and regulators • *Workmanship Guide to EN1996-2*	• *Workmanship Guide to EN1996-2*	• As Designers and regulators
Commentary	• Designers' Guide to EN 1996 • BRE Companion • *Update of BMS ENV guidance document*	• BRE Companion	• As Designers and regulators	• As Designers and regulators		• As Designers and regulators
Worked examples	• *Update of BMS ENV guidance document* • *Case study sheets for typical design situations*		• As Designers and regulators	• As Designers and regulators	• Case study sheets	• As Designers and regulators
Software	• *Commercial packages for EN 1996-1-1*					

Table 3.6 EN 1996: Design of Masonry Structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Teaching materials - students	• IStructE Manual • BSI Student guide		• IStructE Manual • BSI Student Guide			
Teaching materials - practitioners	• IStructE Manual • *Seminars/Workshops* • *Distance learning packages*		• As Designers and regulators			
Other	• *Advisory line* • *Web based directory of what is available and where to get it cross referenced to EC6 FAQs*	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	• As Designers and regulators	

Table 3.7 EN 1997: Geotechnical design

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents		• Implementation of the Structural Eurocodes in the UK				
Technical manuals	• Designers' Guide to EN 1997 • BRE Simple design guide (to BS EN 1997) • EC7: Differences from current practice		• Designers' Guide to EN 1997 • BRE Simple design guide (to BS EN 1997) • BSI Student Guide	• As Designers and regulators		
Commentary	• Designers' Guide to EN 1997 • EC7: Differences from current practice		• Designers' Guide to EN 1997 • BSI Student Guide	• As Designers and regulators		
Worked examples	• Designers' Guide to EN 1997 • BRE Simple design guide (to BS EN 1997) • EC7: Differences from current practice • *Updates of standard textbooks (e.g. Tomlinson)*		• BSI Student Guide • Designers' Guide to EN 1997 • BRE Simple design guide (to BS EN 1997) • EC7: Differences from current practice *Updates of standard textbooks (e.g. Tomlinson)*			

Table 3.7 EN 1997: Geotechnical design (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Software	*Updates of entire range of geotechnical design software including advanced numerical analysis*					
Teaching materials - students			• BSI Student Guide • IStructE Training Courses • Updated University courses			
Teaching materials - practitioners	• BSI Student Guide • BRE practical design guide • *IStructE Training Courses*		• BSI Student Guide • Designers' Guide to EN 1997 • BRE practical design guide • EC7: Differences from current practice • *IStructE Training Courses*			
Other						

Table 3.8 EN 1998: Design provisions for earthquake resistance of structures

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Non-technical documents	• *This will depend on the content of the National Foreword; if as anticipated, this makes the application of seismic design in the UK for normal buildings a discretionary matter, presumably no guidance is required.*	• *Explanation of circumstances where seismic design might be advisable in the UK*				
Technical manuals	• *IStructE manual on EC8 Parts 1 & 5*				• *Manufacturers of seismic isolation bearings may develop material*	
Commentary	• Designers' Guide to EN 1998-1, 1998-3, 1998-5 • *Commentary material on Part 2-Bridges and Part 6- Towers and masts*					
Worked examples	• These may be included as part of the Designers' Guide to EN 1998-1, 1998-3, 1998-5 commentary, and perhaps also elsewhere					

Table 3.8 EN 1998: Design provisions for earthquake resistance of structures (continued)

	Stakeholders					
	Designers and regulators	**Non-Technical eg owners, clients**	**Teachers of design**	**Construction (Engineers/Technical)**	**Product suppliers**	**Software Developers**
Software	• *Regular users of EC8 may well develop their own software, possibly in the form of macros. Software houses will probably want to develop add-ons for dynamic analysis packages to carry out verifications to EC8, but normal commercial forces should take care of this.*					
Teaching materials - students	• *Universities may develop their own teaching materials related to EC8 in the context of their existing seismic courses as they see necessary.*					
Teaching materials - practitioners	• *IStructE, ICE, SECED are likely to offer training and guidance related to EC8.*				• *Manufacturers of seismic isolation bearings may develop material*	
Other						

Specific points relating to either particular Eurocodes or the needs of some of the different users are discussed below.

3.4.1 Issues related to particular Eurocodes or individual parts

3.4.1.1 ENs 1990 and 1991

EN 1990 (Basis of design) and EN 1991 (Actions on structures) will be used in conjunction with all the other Eurocodes and guidance on their application will be a crucial part of implementation of the entire suite of Eurocodes. However, they are not 'owned' by a particular sector of the industry as are the Eurocodes dealing with particular materials. Consequently, there is no natural focus for provision of what is required and it is understood that ODPM accepts that much of the funding for this work will have to fall on government.

It should be noted that unlike the current British Standards the load combinations to be adopted in design do not appear in the codes for different materials so this information from EN 1990 will need to be incorporated into handbooks and other documents.

EN 1991 is perceived as being complicated to apply and therefore difficulties with its implementation are envisaged.

3.4.1.2 EN 1992

In general, EN 1992 (Design of concrete structures), used in conjunction with the National Annex, will not be particularly different from BS8110. For building structures, it gives similar answers to BS8110. It will give designers the opportunity to derive benefit from the considerable advances in concrete technology over recent years. It is less easy to make comparisons for other types of structure.

There are several issues of concern that need to be addressed. These include:

- 'Materials and workmanship' is in a separate standard yet to be finalised
- the many individual standards for materials are in various states of preparation
- There is debate as to what is the most appropriate value for α_{cc} (the coefficient accounting for long-term load effects)
- for building structures, the simplified load combinations need to be permitted via the UK National Annex
- Detailing will be affected. For instance, more and smaller bars are likely, unless crack widths are checked
- new fire engineering methods are available
- the variable strut inclination method (aka 'strut and tie' method) is used for shear design: this is new to UK designers. Where required, shear reinforcement for beams is determined ignoring the contribution from the concrete
- EN 1992 is less prescriptive than its British Standard counterparts and will therefore need more guidance.
- non-linear analysis for serviceability limit state

- treatment of unbonded tendons with respect to shear reinforcement

3.4.1.3 EN 1993

EN 1993 (Design of steel structures) covers several topics including:

- strength and stability of shells
- selection of steel for fracture toughness and through thickness properties
- design of structures with tension components

not previously dealt with explicitly by British Standards.

It also distributes material traditionally found in a single British Standard between several Parts, making the location and usage of the rules necessary for the conduct of an actual design more troublesome. Because the tradition within British Steelwork Codes of giving detailed procedures for common tasks has not been replicated – a more scientific approach is adopted in EN 1993 that requires more from the user in terms of implementation – UK designers will expect and require guidance on use. Finally, several topics typically covered in significant detail in British Standards have been omitted so that the provision of supplementary technical information is essential.

3.4.1.4 EN 1994

EN 1994 (Design of composite steel and concrete structures) requires much more careful consideration of shrinkage, second order and thermal effects than BS5950-3 and these differences need to be highlighted to designers.

Manufacturers of profiled metal sheeting will need to reassess their test results for composite slabs and reinterpret them for use with EN 1994. In some cases additional tests may need to be carried out.

3.4.1.5 EN 1995

Unlike the other Eurocodes relating to materials, the introduction of EN 1995 (Design of timber structures) brings with it a change from permissible stress to limit state design. Whilst this will no doubt be welcomed by those who are familiar with limit state design in other materials and use timber only occasionally, many designers in timber are specialists without experience of limit state methods. Implementation of EN 1995 is therefore a particularly substantial task and it is essential that guidance material is made available in a timely manner.

3.4.1.6 EN 1996

When designing in masonry workmanship and choice of material are of particular importance so whilst not strictly structural matters guidance on these issues will be required to enable the successful implementation of EN 1996 (Design of masonry structures).

3.4.1.7 EN 1997

To date within the UK the extent to which geotechnical design has been codified has been much less than in other sectors. Consequently the introduction of EN 1997 (Geotechnical design) will represent a marked change in UK practice and the needs of geotechnical designers in order to permit them to adapt to the change will be significant.

Whilst the National Annex for EN 1997 will stipulate that Design Approach 1 should be used in the UK, guidance on all three design approaches permitted by the code will be required in order to enable UK based engineers to work in other countries.

EN 1997-2 will represent a change in the way in which geotechnical parameters for design are developed from testing. Guidance will be needed on the derivation and application of characteristic values based on EN 1997-2 and how these fit with the EN 1997-1 framework of design approaches, partial factors and limit and serviceability state design.

Guidance on the design of temporary works will also be required.

There is no coherent geotechnical industry to fund the production of guidance.

3.4.1.8 EN 1998

It is not yet known whether or not EN 1998 (Design of structures for earthquake resistance) will be mandatory in the UK, and UK needs depend to some extent on the outcome of this decision. However, a likely outcome is that the UK national foreword may use wording similar to that employed for the ENV version of the code: 'Within the UK, application of EN 1998 should not be necessary, unless the client or user of the works assesses that the associated seismic risk is such that it needs to be addressed'. If a similar form of words is used, then it is important that guidance material should be available, for both non-technical stakeholders (owners, clients etc) as well as professional users of the code, addressing the circumstances in which seismic risk needs to be addressed in UK buildings, bridges and possibly other forms of civil engineering construction included within the scope of EN 1998. Financial support for the preparation of this guidance will be needed.

Quite separately, technical guidance on the use of EN 1998 will be needed for designers working in seismic areas of Europe and (most likely) other seismically active parts of the world. UK expertise in this area gives a significant competitive advantage and is an important source of foreign earnings. For over 25 years, an active seismic engineering skills group has existed in the UK, focused around the technical societies SECED (hosted by the Institution of Civil Engineers) and EEFIT (hosted by the Institution of Structural Engineers). In addition, there are long established and well recognised centres of academic excellence in earthquake engineering in a number of UK universities. This seismic skills group has already started to become involved in producing training and guidance material, at both university education and CPD levels, and this process is likely to continue. The skills group has excellent contacts with European counterparts, and preparation of guidance material in conjunction with

them may well be appropriate. Funding will be needed if the proposed IStructE/SECED manual on EN 1998 is to be realised.

3.4.1.9 EN 1999

Aluminium is used infrequently in comparison to other materials and hence EN 1999 (Design of aluminium structures) is likely to receive limited use. Whilst it is difficult to justify any significant expenditure solely within the UK there is scope for any necessary guidance material to be produced collaboratively across Europe.

3.4.1.10 Annex A2 of EN 1990 Parts 2 of ENs 1991, 1992, 1993, 1994, 1995, and 1998

Historically in the UK the design of bridges has been codified separately from buildings and other structures. However, within the Eurocodes the specific provisions for their design are presented in part 2 of each of the appropriate codes (and Annex A2 of EN 1990). In each case part 2 must be read in conjunction with the associated part 1 rather than being a stand alone document. Consequently it is important that the impact on bridge design of decisions being reached in respect of the National Annexes for Part 1, largely from the perspective of buildings, are considered in some detail.

Within the UK much of the input to the bridge parts of the Eurocodes has been provided by the Highways Agency and other major clients such as Network Rail. The Highways Agency is actively involved in the development of the relevant National Annexes and it also has work in hand to update its own guidance documentation over the next few years to bring it into line with the requirements of the Eurocodes.

Specific guidance will be required on:

- Concrete bridges
  - early thermal effects
  - design of integral bridges
- Steel bridges
  - distortional effects of bridge girders
  - the treatment of lateral torsional buckling for cantilevers or when the end supports are flexible
  - design of stiffeners in deck plates
  - design of load bearing diaphragms
- Composite bridges
  - shear studs subject to uplift
  - lateral buckling with flexible restraints
  - global and local load combinations
  - fully encased filler beams
  - permanent formwork other than pre-cast concrete
  - how to apply the capacity equation for composite beam and slab construction

3.4.2 Needs of specific user groups

3.4.2.1 Non-technical users

Some guidance on the process and effect of implementation of the Eurocodes will need to be provided to enable designers and others to explain the transition to non-technical users such as clients and insurers. In addition to general information of this type a handbook to EN 1990 setting down the philosophy and basis of the Eurocodes, written specifically for clients to ensure that they are aware of the implied safety provisions in the Eurocodes, such as reliability levels, is required.

3.4.2.2 Designers and regulators

In order for them to be able to prepare for the transition to the Eurocodes, designers will need access to a clear jargon free programme with dates of:

- publication of the Eurocodes
- publication of the National Annexes
- availability of guidance documents
- availability of design aids
- withdrawal of British Standards

As it is inevitable that some of these dates will change the programme will need to be updated on a regular basis. They also require timely provision of appropriate guidance material including worked examples, software and cost effective training. A helpdesk to provide assistance with interpretation or other difficulties in using the codes is also deemed to be essential.

For those designers involved in projects outside the UK it is also desirable for the National Annexes and associated NCCI from other member states to be available in English.

The Committee received some input from Building Control Officers through the District Surveyors Association. From this it would appear that their needs are virtually identical to those of designers.

3.4.2.3 Academia and those providing training

Academics have particular requirements which can be summarised as follows:

- Teaching notes to minimise the effort required to update their current notes
- Access to a concise version of the Eurocodes. A single document with extracts from the material and loading Eurocodes would be particularly useful (it is understood that the document of this type being prepared by BSI contains much material drawn from draft versions of the codes and so it will be of limited use).
- Textbooks to Eurocodes
- Background information to the Eurocodes so that the principles behind design methods can be explained

In addition to the various guidance documents identified in the relevant sections of tables 3.2 to 3.8, those who will be required to teach courses on design to the Eurocodes, both within universities and as continuing professional development for practitioners, will themselves require training. The number of people within the UK who currently have the expertise to enable them to provide such training is limited to a few individuals for each Eurocode and in many cases they are the same individuals who will be heavily involved in preparing guidance documents.

3.4.2.4 Software producers

Most analysis and design calculations undertaken by structural engineers are carried out using one form of software or another. The wide range of application of software from all vendors and the equally wide range of structural Eurocodes means that virtually all current software will require to be rewritten. This is equally true of software that is written in-house by designers, including spreadsheets, and of software that is provided by product suppliers e.g. purlin/side rail manufacturers.

This is a substantial task, for example one software house estimates that the effort to update their full product portfolio is of the order of 20-25 man/years. It is believed that the provision of software to the Eurocodes in certain sectors i.e. concrete, steel and composite design is absolutely key to the successful implementation and acceptance of the Eurocodes. The size of the task is such that it will not be possible to produce the software required all at once.

Whilst there is a wide range of software, the scope and extent of the systems associated with the different material sectors is perceived to be different. The whole range of software applications that needs to be considered includes concept, estimate design, visualization, 3D modelling, analysis, design and detailing. For the timber and masonry sectors, the implementation of the Eurocodes at element level might be adequate. Whilst this is also important for the concrete and steelwork sectors, the nature of the industry in these sectors requires software for whole building design including global structural requirements e.g. stability and integrity. This affects analysis as well as design.

Experience suggests that when any structural code or design guide is implemented into software, many clarification and interpretation issues, omissions and even errors within such design documents need to be resolved. This experience is based on implementing well established, UK sourced documents. Such issues are likely to be more in both number and severity with the Eurocodes. A mechanism for solving these is seen as particularly important from the points of view of timing, consistency and safety.

Assuming that the individual Eurocodes and their associated National Annexes are published in a timely manner, the most important requirements are the identification and publication of Residual Standards and other NCCI. These are likely to contain so much information that is essential for day-to-day design that design guides and software are likely to be seriously deficient without them.

The engineering specification of a software development project can only be undertaken effectively when the final version of the appropriate Eurocode(s), National

Annex(es), Residual Standards and other NCCI is accessible (although not necessarily published) and all interpretation issues resolved. For commercial software houses, this engineering specification represents about 30% of the whole software development project. Hence, after the right information is available and incorporated there is still 70% of the job left for the software developer to complete.

From the software user's point of view, the timely publication of benchmark examples and/or worked examples would help to provide them with confidence that the software is performing correctly. Designers are likely to have to spend much resource (time and money) on learning to work to the Eurocodes and so the publication of such examples would alleviate the additional costs of satisfying themselves of the validity of what will be completely new software.

3.5 Other issues

During the course of this study the Committee identified some issues which fell outside its remit but which will either have an impact on the implementation of the structural Eurocodes or be affected by their introduction. Each of these is discussed briefly in the sections that follow.

3.5.1 Execution, product and testing standards

The structural Eurocodes will not operate in isolation as their practical application will require the use of European execution, product and testing standards. The issues related to the implementation of these standards are similar to those for the structural Eurocodes and it is recommended that a similar exercise is conducted to establish what needs to be done to facilitate their introduction in the UK.

The publication of European product standards, and subsequent withdrawal of the corresponding British Standards, will require a number of the current British Standards that will eventually be replaced by the structural Eurocodes to be revised and reissued for use in the intervening time. Whilst work to do this is well advanced in some areas, a consistent policy covering all the existing British Standards is required. The necessary work should not be underestimated and failure to provide resources to allow revised standards to be published in a timely manner will result in considerable confusion within the industry.

3.5.2 British Standards for specialist structures not covered by the Eurocodes

Whilst the structural Eurocodes will become the primary design standards for buildings and many civil engineering structures, they do not include provisions for certain types of specialised structures such as maritime and reinforced earth structures. The relevant British Standards will therefore be retained but, as they make reference to other British Standards that will be withdrawn, they will need to be revised to make them compatible with the Eurocodes.

3.5.3 Future care and maintenance

The mechanism by which both errors in the Eurocodes and their future updating is to be handled needs to be clarified. It is understood that CEN is considering forming

maintenance groups but that no further European funding for the Eurocodes will be provided until the end of the coexistence period. It is essential that the UK engage in whatever process is put in place and that adequate funding is provided to those involved.

4 Recommendations

4.1 Introduction

The Committee's recommendations, including some issues that require urgent resolution and proposals for future development of the strategy, are presented in the sections that follow.

4.2 Urgent issues

A number of issues that require resolution if the implementation of the structural Eurocodes in the UK is to be accomplished in a timely and efficient manner have been identified, these are:

- The strategy for calibration of the National Annexes
- Copyright policy with regard to the Eurocodes, the National Annexes and information currently available in British Standards that will be needed beyond the withdrawal of these standards
- Identification of the requirements for residual standards, resources required and a programme for their production

The responsibility for all of these points lies primarily within the remit of Committee B/525 (Building and Civil Engineering Structures) at BSI and BSI is urged to make sure they are addressed as a matter of urgency. Failure to do so will seriously affect the ability of other organisations to provide guidance material of the type necessary to the timescales required.

4.3 Specific needs identified

The specific needs identified, the resources required to provide them and potential facilitators are discussed in the sections that follow.

4.3.1 Information sources

4.3.1.1 Programme

The availability of up-to-date information on the anticipated programme for publication of:

- Eurocode Parts
- National Annexes
- residual standards
- NCCI
- other guidance material
- updated British Standards

and the eventual withdrawal of British Standards, will be essential for all user groups throughout the transition. It is essential that this information is available free of charge and presented in plain English without reference to CEN jargon. A dedicated web site,

updated regularly, would appear to be the most appropriate means of delivery. One possibility would be for this to become part of the existing 'Eurocode Expert' (see Section 3.1) site.

4.3.1.2 Helpdesk

A technical helpdesk able to assist users of the Eurocodes in resolving queries and sourcing guidance material will be essential, particularly to designers. It is recommended that a central facility, offering a single point of contact for users, which can then channel any detailed queries to sources of specific expertise, such as the helpdesks already provided by several of the sector-specific research and development associations, be established. The helpdesk might either be associated with the web site proposed above (see Section 4.3.1.1) or run by one of the existing helpdesks on behalf of the whole industry.

It is recommended that the helpdesk be put in place by no later than mid 2005. The resources required will depend critically on the way in which it is established, particularly the extent to which it is able to incorporate existing facilities in different sectors.

4.3.2 Documents

The key documents that it is believed will be required together with an indication of which organisations might take the lead in facilitating them (it should be noted that this does not signify a commitment on the part of these organisations to produce these items) and, where possible, the resources required are presented in Appendix E. By way of illustration of the reasoning behind the recommendations made, the justification for the inclusion of the items identified in table 3.4a (see section 3.4) are presented in table 4.1.

In the time available to the Committee it was not possible to prepare detailed estimates of the resources required for each individual item; where figures are given in Appendix E these are rough estimates based on records of the preparation of similar documents in the past. Taking the figures for those items where it has been possible to provide an estimate to be representative of the other items in the list it is estimated that the total resource required is of the order of 27 man years (or £5 million if a rate of £100 per hour is assumed). It must also be appreciated that the number of individuals who have the expertise necessary to enable them to undertake much of this work is limited, particularly as many of those who have been involved with the drafting of the Eurocodes have already retired or are planning to retire in the next few years.

Guidance material related to Eurocodes 0 and 1 is essential and, in the absence of an associated industry sector, government funding will be required to facilitate its provision. It is estimated that £0.85 million will be required.

Whilst the sums indicated above are considerable, they should be viewed against the potential costs to the UK if the construction industry is not adequately supported during the transition. By way of illustration it has been estimated [4] that a ten per cent

Table 4.1 Justifications for requirements identified for EN 1994-1-1

Output	Stakeholders (indicate with tick)						Justification
	Designers and regulators	Non-technical	Teachers of design	Construction (Engineers/Technical)	Product supliers	Software developers	
ODPM Implementation Document Feb 03	√	√	√	√	√	√	Explains introduction of the Eurocodes and how they will be used
Thomas Telford Designers' Guide	√		√		√	√	Provides background to the provisions of EN 1994-1-1, interpretation and worked examples
IStructE Manual	√		√		√		To present provisions for common structural elements within the context of the overall design process for building structures
BSI Student Guide	√		√				To present information for the design of common composite elements, in a single volume including elements in other materials
SCI Publications:							
Composite beam design to Eurocode 4 (to include limiting spans for simple beams)	√		√				High priority; will give in a single volume the provisions from EN 1993-1-1 for un-propped construction and from EN 1994-1-1 for the composite stage; also tables for design of composite beams
Web openings	√		√		√	√	High priority; will provide background for the design of cellular beams, in common use but not covered by EN 1994
Design of composite and non-composite cellular beams	√		√		√	√	High priority; will provide provisions for the design of cellular beams, in common use but not covered by EN 1994
Composite column design to Eurocode 4 (to include resistances of standard sections)	√		√				Low priority; resistances need to be tabulated to reduce time in manual calculation, but at present composite columns are not common in the UK
Design of composite beams using precast concrete slabs	√		√		√	√	High priority; will provide background and design provisions for a useful form of construction not covered by EN 1994-1-1
Publications on slim floors and Slimdek and use of precast units	√		√		√	√	High priority; will provide background and design provisions for useful forms of construction not covered by EN 1994-1-1
Green book on composite connections	√		√	√	√	√	Low priority; tabulate properties to reduce time in manual calculation, but at present composite joints are not common

Output	**Stakeholders** (indicate with tick)						Justification
	Des. and reg.	**Non-tech.**	**Teachers**	**Consrt.**	**Prod. supl.**	**Software**	
Steel designers manual	√		√				High priority; provides an overview of steelwork and composite construction and worked examples; good for students
Best practice in composite floor construction				√			Low priority; construction practice is not expected to change significantly as a result of use of EN 1994-1-1
Manufacturers' handbooks for composite slabs	√		√	√	√	√	High priority; manufacturers need to reassess test results and recalculate design tables based on new definition of k; further tests may be needed; for ductile behaviour, EN 1994 introduces partial shear connection as an alternative to the m-k method
Johnson textbook	√		√		√		Presents background and shows how EN 1994-1-1 may be used; appropriate for MEng/MSc students and practising engineers
Other updated textbooks	√		√				Undergraduate test books on steelwork commonly include simple composite beams; appropriate for BEng students
BRE Companion	√	√	√	√	√		To give an overview of the impact of the Eurocodes on UK practice, including issues related to best value and environment
BRE Examples	√		√		√	√	To demonstrate calculation methods and procedures
Special edition ProcICE on Eurocodes	√		√	√	√		Provides an overview of the whole suite of Eurocodes, outlining technical content
Modelling of steel and composite building structures for analysis	√		√				High priority; guidance is needed on: simple construction; second-order analysis; member imperfections; effects of temperature difference and shrinkage of concrete; semi-continuous joints
Calibration examples	√		√			√	High priority; practitioners and regulatory authorities are naturally interested in changes resulting from use of the Eurocodes
Individual software modules for element design	√		√		√		Software is essential to efficient design practice, both for stand-alone design of elements and for an integrated approach to modelling, analysis, design and detailing
Integrated analysis/design software packages	√		√				
Web-based information source	√		√	√	√		Web-based information and tutoring are essential resources for efficient implementation and learning by practitioners and students
Web-based tutor	√		√				
Training courses	√		√		√	√	Courses will be needed at a variety of different levels, typically one-day events introducing a particular Eurocode and more extended courses to develop competence in use of a particular Eurocode Part. The Eurocodes Expert Roadshow already provides a half-day introduction to the Eurocodes as a whole. Because of variety in curriculum, it is assumed that courses for undergraduates (including Foundation degrees) will be developed by the lecturers concerned from other available resources

loss in efficiency of directly code-related design activity in the UK steel construction industry would equate to a loss of £10 million per annum.

4.3.3 Software

The impact on the industry of introducing the Eurocodes from the software vendors' viewpoint is described in Section 3.4.2.4. In summary, rewriting all of the software for Eurocodes is an enormous task that cannot be completed all at once. Yet the main material sectors (steel and concrete) are heavily reliant on software to execute the design phase of building projects. To be able to support industry in such a fundamental manner software vendors will need to be able to:

- establish a commercial case for the large investment needed to rewrite the software
- access a reasonably accurate programme for publication of the Eurocodes, National Annexes, residual standards and NCCI so that the software development process can be worked backwards from these dates
- establish which of the many individual programs and integrated packages should be addressed first and prioritise the others
- have access to interpretation and expert knowledge of the various Eurocodes and supporting documentation

To assist the software vendors in their endeavour and thereby assist the industry's take-up of Eurocodes a number of recommendations are made. These generally coincide with other suggested initiatives to support other stakeholders.

The first bullet point above is purely a commercial issue for the software vendors but not in the sense of 'if' they should rewrite the software but 'when'.

The second bullet point is addressed by the website proposed in section 4.3.1.1.

In parallel with a reasonably accurate programme, the industry could make it known which types of project they believe will be the subject of full or parallel design to the appropriate Eurocode and when. This would also assist the producers of design guidance and training courses where there is a similar problem of not being able to update all guidance at one time. Whilst this would satisfy the third bullet point, it is perhaps an over-expectation. However, as the first projects likely to be designed using Eurocodes are those under the Public Procurement Directive [3], the situation regarding the use of mixed materials and hence Eurocodes needs to be clarified (see Section 2.3).

The final bullet point is probably best approached on a sector by sector basis particularly as the interpretation issues are more complex in some sectors eg steel than in others eg masonry. For example, there is a fledgling initiative from the SCI to gather the software vendors together and to agree with industry experts the interpretation issues. This is only likely to succeed:

- at an element level
- providing the 'members' attend on a quid pro quo basis

- there is adequate independent funding for the experts from one or more of the main beneficiaries ie designers, software houses, government or the main material sector sponsors.

Although this could not address the global design issues referred to in Section 3.4.2.4, this would be an important initiative to resolve some of the basic issues. This is unlikely to address all of the technical input that is required to rewrite software. A substantial portion of this information will be contained in supporting documentation that currently refers to UK codes. This will need to be updated and made available to the software vendors eg the SCI publication on web openings in beams which is a subject that is not dealt with at all in EN 1993 and EN 1994.

4.3.4 Training

Training on the use of the Eurocodes will be required at a number of different levels including:

- General awareness
- Undergraduate and postgraduate
- Continuing professional development

During the lead up to the publication of the Eurocodes and throughout the coexistance period there will be a need for members of all the user groups within the UK to keep up to date with the programme for their introduction. Whilst some of this general awareness can be achieved by the provision of a web site (see section 4.3.1.1) and the publication of journal articles, it is suggested that a programme of short presentations at various locations around the country would be beneficial. It is recommended that it would be appropriate for these to be coordinated by the professional institutions though their network of local branches and associations.

The design approaches used in the Eurocodes should not change the teaching of fundamental engineering principles which are already well established within undergraduate and postgraduate courses. In terms of detail, academics will need guidance on the timetable for switching to the Eurocodes and industry's views on exposing students to both Eurocodes and British Standards in the interim period.

With the time pressures that members of the industry will be under it is essential that a number of different mechanisms including both traditional courses and distance learning and web based packages are exploited for providing the necessary training. Increased use of software packages for design across the industry means that training material should concentrate on developing an understanding of the overall objectives of the codes and their differences from current British Standards rather than teaching a step by step approach to design.

Whilst there is the opportunity for organisations providing training material and courses to derive some income from sales and fees, it should be recognised that the potential for this is limited and some additional resources will be required in order to provide what will be necessary.

4.4 Other issues

As noted in section 3.5 there are a number of other issues that will have an effect on the implementation of the Eurocodes, it is therefore recommended that:

- An exercise be conducted to establish the needs of industry in respect of the implementation of the European execution, product and testing standards (see Section 3.5.1)
- BSI develop a programme for the updating of British Standards for specialist structures not covered by the Eurocodes (see Section 3.5.2)
- The mechanism by which the Eurocodes are to be maintained in the future be established and appropriate mechanisms for UK input into the process be established (see Section 3.5.3)

4.5 Future development

This report presents the perceived needs of the UK construction industry in respect of design guidance to support implementation of the structural Eurocodes at the time that it was written. It has also attempted to identify the level of resource necessary. This is an inexact process but combining the figure for documentation (see Section 4.3.2) with some estimates of what will be required to provide web based information, a help desk, support for software production and training resources would indicate a total in the region of £10 million. This investment should, for example, be seen against the background of an annual Government spend on construction of £40 billion.

Whilst it is unlikely that the overarching issues will change, it is probable that many of the more detailed needs may change over time particularly as the programme of the transition is itself likely to be subject to change. In addition, as noted above, the provision of design guidance is only one element of what will be required to ensure successful implementation of the Eurocodes. It is therefore recommended that a group with a similar constitution to that assembled for this study be established to monitor all aspects of the process of implementation and advise on changes to the strategy that become necessary as the process progresses. With appropriate funding, the Institution of Structural Engineers would be willing to facilitate such a group on behalf of ODPM.

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Appendix A – ODPM Specification

NATIONAL STRATEGY FOR IMPLEMENTATION OF THE STRUCTURAL EUROCODES

1. You are invited to submit a proposal for the development of a National Strategy for Implementation of the Structural Eurocodes. The need for such a strategy is becoming urgent now that the Eurocodes have started to be published by BSI, albeit without their National Annexes at the present time.

INTRODUCTION

2. It is commonly considered that many engineers here in the UK will postpone adoption of the suite of Eurocodes until such time as the handbooks, guides and software etc., become available. This is to be expected in view of the formidable burden presented by the 56 Eurocode parts; many of which are relatively complex and incorporate different approaches to current UK practice. Moreover, many engineers will no doubt only wish to adopt the new Codes if they should become mandatory. However, whilst the Eurcodes are not mandatory (except in the case of public works), they will become the *de facto* UK design Codes when our national Codes are withdrawn.

3. As the coexistence period (when both our current national Codes and the Eurocodes are available for use), is likely to extend effectively for only a 3 to 5 year period, the various aids and guidance documents need to be in place as soon as possible in order to encourage engineers to exploit the coexistence period to their advantage. The timescale is even more urgent in the case of public works.

OBJECTIVE

4. The aim of this invitation is to produce within a 3 month period an overarching co-ordinated strategy to inform ODPM and other involved stakeholders of the guidance material and training aids etc., required to ensure the successful implementation of the Eurocodes. The strategy shall be delivered to ODPM in the form of a report (ie. both a hard copy and an electronic "word" version) outlining:

- the range of guidance documents, software, training and dissemination resources needed,
- the guides etc., already available or currently being prepared,
- the additional guides etc., required to achieve the above-mentioned objective,
- the preferred authors/publishers and facilitators,
- the estimated costs involved, including industrial contributions in the case of collaborative projects/ventures,
- the proposed funding arrangements, and
- the timescales involved.

METHODOLOGY

5. The strategy shall be devised by a committee of representatives from the engineering institutions, the prime sectors of the construction industry, practising consultants, BSI, BRE, the Highways Agency, ODPM, academia, software houses and publishers. A suggested constitution of the Strategy Committee is attached at **Annex A**.

6. The strategy committee shall liase with all stakeholders taking full account of all those guidance documents currently being produced by the authoritative organisations as well any training initiatives that are currently being devised.

7. The ODPM Project Manager for this contract will be:

Mr Geoff Harding
18/A Portland House
Stag Place
London SW1E 5LP
Tel: 020 7944 5762
Fax: 020 7944 5739
Email: geoff.harding@odpm.gsi.gov.uk

to whom all technical queries on this Contract should be directed. All procedural and/or contractual queries should be directed to:

Mr Nilesh Patel
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Stag Place
London SW1E 5LP
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ANNEX A

STRATEGY COMMITTEE - SUGGESTED CONSTITUTION

Chairman - Professor David Nethercot, President of the Institution of Structural Engineers

The Institution of Civil Engineers

The Steel Construction Institute

CORUS

The Concrete Centre

British Cement Association

British Masonry Society

Brick Development Association

Timber Research and Development Association

UK Timber Engineering Group

Building Research Establishment

British Standards Institution

Eurocodes Expert/Thomas Telford Ltd

Highways Agency

ODPM

Practitioner - Large Consulting Practice

Practitioner - Small Consulting Practice

Academia -

Software producer -

Appendix B – Membership of the Committee

Professor D A Nethercot, FREng BSc(Eng) PhD DSc FCGI CEng FIStructE FICE, President IStructE, *Chairman*

Professor D Anderson, BSc(Eng) PhD CEng FIStructE FICE, *representing the Institution of Structural Engineers*

Dr A J Bond, MA MSc PhD CEng MICE, *representing the Institution of Civil Engineers*

E D Booth, MA(Cantab) CEng FIStructE FICE

S M Brown, BSc CEng MIStructE

S Chakrabarti, OBE BE MSc DIC CEng FIStructE MICE, *representing the Highways Agency*

Dr P S Chana, BSc(Eng) PhD CEng FIStructE MICE, *representing the British Cement Association*

Professor L A Clark, OBE FREng BEng PhD CEng FIStructE FICE

S Edwards, *representing TRADA Technology Ltd*

C H Goodchild, BSc CEng MIStructE MCIOB, *representing The Concrete Centre*

M Greenley, BTech, *representing the British Standards Institution*

G T Harding, DIC CEng FIStructE MICE, *representing the Office of the Deputy Prime Minister*

B A Haseltine, FREng BSc(Eng) DIC CEng FIStructE FICE, *representing the British Masonry Society*

Dr D B Moore, BTech PhD CEng MIStructE, *representing the Building Research Establishment*

Dr G W Owens, FREng MSc PhD CEng FIStructE MICE MWeldI, *representing the Steel Construction Institute*

A J Rathbone, BEng CEng MICE

J L Redmond, BSc CEng MIStructE MICE MaPS

B W Smith, FREng BA(Cantab) MS CEng FIStructE FICE FASCE

P J Steer, BSc(Eng) CEng MIStructE MIMgt, *representing the UK Timber Engineering Group*

Dr H P J Taylor, FREng BScTech PhD CEng FIStructE FICE

R Thawrani, *representing Eurocode Expert/Thomas Telford Ltd*

A J Todd, BSc CEng MIStructE, *representing CORUS*

P Watt, BSc(Eng), *representing the Brick Development Association*

D B Williams, *representing the British Standards Institution*

Secretary to the Committee

Dr S M Doran, BSc(Eng) AKC PhD CEng MICE ACIS, *the Institution of Structural Engineers*

Appendix C – The structural Eurocodes, their packages and withdrawal of British Standards

C.1 Eurocode Parts

Part	Title	Final text released to BSI by CEN	Published by BSI with National Annex
EN 1990	**Basis of structural design**	Apr 2002	Apr 2004
	Annex A2: Applications for bridges	Nov 2004	Nov 2006
EN 1991	**Actions on structures**		
EN 1991-1-1	General actions - Densities, self weight and imposed loads	Apr 2002	Apr 2004
EN 1991-1-2	General actions - Actions on structures exposed to fire	Nov 2002	Nov 2004
EN 1991-1-3	General actions - Snow loads	Jul 2003	Dec 2004
EN 1991-1-4	General actions - Wind actions	May 2004	May 2006
EN 1991-1-5	General actions - Thermal actions	Oct 2003	Oct 2005
EN 1991-1-6	General actions - Actions during execution	Sep 2004	Sep 2006
EN 1991-1-7	General actions - Accidental actions	Jun 2005	Dec 2007
EN 1991-2	Traffic loads on bridges	Sep 2003	Sep 2005
EN 1991-3	Actions induced by cranes and machinery	Oct 2004	Oct 2006
EN 1991-4	Silos and tanks	Sep 2004	Sep 2006
EN 1992	**Design of concrete structures**		
EN 1992-1-1	General rules and rules for buildings	Jun 2004	Apr 2005
EN 1992-1-2	General rules - Structural fire design	Sep 2004	Apr 2005
EN 1992-2	Bridges	Feb 2005	Feb 2007
EN 1992-3	Liquid retaining and containment structures	Feb 2005	Feb 2007
EN 1993	**Design of steel structures**		
EN 1993-1-1	General rules and rules for buildings	Jun 2004	Jun 2006
EN 1993-1-2	General rules - Structural fire design	Jun 2004	Jun 2006
EN 1993-1-3	General rules – Supplementary rules for cold-formed thin gauge members and sheeting	delayed	?
EN 1993-1-4	General rules – Supplementary rules for stainless steel	delayed	?
EN 1993-1-5	Plated structural elements	Dec 2004	Dec 2006
EN 1993-1-6	General - Strength and stability of shell structures	Sep 2004	Sep 2006
EN 1993-1-7	General - Strength of planar plated structures loaded transversally	Will not be produced	
EN 1993-1-8	Design of joints	Oct 2003	Oct 2005
EN 1993-1-9	Fatigue strength of steel structures	Oct 2003	Oct 2005
EN 1993-1-10	Material toughness and through-thickness properties	Oct 2003	Oct 2005

Part	Title	Final text released to BSI by CEN	Published by BSI with National Annex
EN 1993-1-11	Design of structures with prefabricated tension components	Dec 2004	Dec 2006
EN 1993-1-12	Additional rules for the extension of EN 1993 to grades S500 to S690	?	?
EN 1993-2	Steel bridges	Feb 2005	Feb 2007
EN 1993-3-1	Towers, masts and chimneys - towers and masts	Sep 2004	Sep 2006
EN 1993-3-2	Towers, masts and chimneys - chimneys	Sep 2004	Sep 2006
EN 1993-4-1	Silos, tanks and pipelines - Silos	Dec 2004	Dec 2006
EN 1993-4-2	Silos, tanks and pipelines - Tanks	Dec 2004	Dec 2006
EN 1993-4-3	Silos, tanks and pipelines - Pipelines	Dec 2004	Dec 2006
EN 1993-5	Piling	Jun 2004	Jun 2006
EN 1993-6	Crane supporting structures	Jul 2004	Jul 2006
EN 1994	**Design of composite steel and concrete structures**		
EN 1994-1-1	General rules and rules for buildings	Jun 2004	May 2006
EN 1994-1-2	Structural rules - Structural fire design	Feb 2005	May 2006
EN 1994-2	Bridges	June 2005	June 2007
EN 1995	**Design of timber structures**		
EN 1995-1-1	Common rules and rules for buildings	Jun 2004	May 2006
EN 1995-1-2	General - Structural fire design	Jun 2004	May 2006
EN 1995-2	Bridges	Sep 2004	Sep 2006
EN 1996	**Design of masonry structures**		
EN 1996-1-1	Rules for reinforced and unreinforced masonry	Jun 2004	Jun 2006
EN 1996-1-2	General rules - Structural fire design	Jun 2004	Jun 2006
EN 1996-2	Design, selection of materials and execution of masonry	Mar 2005	?
EN 1996-3	Simplified calculation methods and simple rules	Mar 2005	?
EN 1997	**Geotechnical design**		
EN 1997-1	General rules	Jun 2004	Jun 2006
EN 1997-2	Ground investigation and testing	Dec 2004	Dec 2006
EN 1998	**Design of structures for earthquake resistance**		
EN 1998-1	General rules, seismic actions and rules for buildings	Spring 2004	2005
EN 1998-2	Bridges	July 2004	July 2006
EN 1998-3	Assessment and retrofitting of buildings	Spring 2005	2005
EN 1998-4	Silos, tanks and pipelines	Autumn 2005	2006
EN 1998-5	Foundations, retaining structures and geotechnical aspects	Spring 2004	2005

Part	Title	Final text released to BSI by CEN	Published by BSI with National Annex
EN 1998-6	Towers, masts and chimneys	Autumn 2005	2006
EN 1999	**Design of aluminium structures**		
EN 1999-1-1	General rules	Dec 2004	Dec 2006
EN 1999-1-2	General - Structural fire design	Dec 2004	Dec 2006
EN 1999-1-3	Additional rules for structures susceptible to fatigue	Dec 2004	Dec 2006
EN 1999-1-4	Supplementary rules for trapezoidal sheeting	Dec 2004	Dec 2006
EN 1999-1-5	Supplementary rules for shell structures	Jun 2005	?

C.2 Packages of Eurocode Parts

Package	Content	Date
EN 1992 – Design of concrete structures		
2/1	Building and civil engineering structures, excluding bridges and liquid retaining and containment structures.	May 2006
2/2	Bridges.	Feb 2007
2/3	Liquid retaining and containment structures	Feb 2007
EN 1993 – Design of steel structures		
3/1	Building and civil engineering structures, excluding bridges, silos, tanks and pipelines, steel piling, crane supporting structures, and towers and masts.	Dec 2006?
3/2	Bridges.	Feb 2007
3/3	Silos, tanks and pipelines.	Dec 2006
3/4	Steel piling.	Jun 2006
3/5	Crane supporting structures.	Jul 2006
3/6	Towers, masts and chimneys.	Sep 2006
EN 1994 – Design of composite steel and concrete structures		
4/1	Building and civil engineering structures, excluding bridges.	May 2006
4/2	Bridges.	Jun 2007
EN 1995 – Design of timber structures		
5/1	Building and civil engineering structures, excluding bridges.	May 2006
5/2	Bridges.	Sep 2006
EN 1996 - Design of masonry structures		
6	Building and civil engineering structures, excluding bridges.	?
EN 1999 – Design of aluminium structures		
9/1	All without fatigue.	Dec 2006
9/2	All with fatigue	Dec 2006
Note: Eurocode Parts from EN 1990, EN 1991, EN 1997 and EN 1998 do not feature as separate ‘packages’ but are incorporated into the various material packages.		

C.3 British Standards to be withdrawn

Eurocode Part	British Standards to be withdrawn
EN 1990	BS 5400-1
EN 1991	
EN 1991 –1-1	BS 6399-1, BS 678
EN 1991 –1-2	
EN 1991 –1-3	BS 6399-3, BS 5400-2
EN 1991 –1-4	BS 6399-2, BS 5400-2
EN 1991 –1-5	BS 5400-2
EN 1991 –1-6	
EN 1991 –1-7	BS 5400-2
EN 1991-2	BS 5400-1 & 2
EN 1991-3	
EN 1991-4	
EN 1992	
EN 1992-1-1	BS 8110-1, 2, & 3, BS 5400-4, 7, & 8
EN 1992-1-2	
EN 1992-2	BS 5400-4, 7 & 8
EN 1993	
EN 1993-1-1	BS 5950-1, 5, 6, 8 & 9, BS 5400-3
EN 1993-1-2	BS 5950-1, 5, 6, 8 & 9
EN 1993-1-3	BS 5950-1, 5, 6, 8 & 9
EN 1993-1-4	BS 5950-1, 5, 6, 8 & 9
EN 1993-1-5	BS 5950-1, 5, 6, 8 & 9, BS 5400-3
EN 1993-1-6	BS 5950-1, 5, 6, 8 & 9
EN 1993-1-7	BS 5950-1, 5, 6, 8 & 9, BS 5400-3
EN 1993-1-8	BS 5950-1, 5, 6, 8 & 9, BS 5400-2
EN 1993-1-9	BS 5950-1, 5, 6, 8 & 9, BS 5400-10
EN 1993-1-10	BS 5950-1, 5, 6, 8 & 9, BS 5400-3
EN 1993-1-11	BS 5950-1, 5, 6, 8 & 9
EN 1993-1-12	BS 5950-1, 5, 6, 8 & 9
EN 1993-2	BS 5400-3, 6 & 10
EN 1993-3-1	BS 8100-1, 2, 3 & 4
EN 1993-3-2	BS 4076
EN 1993-4-1	BS 5950-1, 5, 6, 8 & 9
EN 1993-4-2	BS 5950-1, 5, 6, 8 & 9
EN 1993-4-3	BS 5950-1, 5, 6, 8 & 9
EN 1993-5	BS 5950-1, 5, 6, 8 & 9
EN 1993-6	BS 5950-1, 5, 6, 8 & 9
EN 1994	
EN 1994-1-1	BS 5950-3 & 4, BS 5400-5
EN 1994-1-2	
EN 1994-2	BS 5400-5
EN 1995	
EN 1995-1-1	BS 5268-2, 3, 6 & 7
EN 1995-1-2	BS 5268-4
EN 1995-2	

EN 1996	
EN 1996-1-1	BS 5628-1, 2 & 3
EN 1996-1-2	
EN 1996-2	
EN 1996-3	
EN 1997	
EN 1997-1	BS 8000-1 & 2, BS 8004
EN 1997-2	
EN 1998	
EN 1998-1	None
EN 1998-2	
EN 1998-3	
EN 1998-4	
EN 1998-5	
EN 1998-6	
EN 1999	
EN 1999-1-1	BS 8118-1 &-2
EN 1999-1-2	
EN 1999-1-3	
EN 1999-1-4	
EN 1999-1-5	

Appendix D – Guidance material already available or in preparation.

Title/Description	Publisher	Date	Format	Comment/Scope
General				
Implementation of Structural Eurocodes in the UK	ODPM	Feb 2003	Paper/pdf	Available from www.safety.odpm.gov.uk/bregs/index.htm Describes the introduction of the Eurocodes and how they will be used nationally.
Eurocodes – Special issue, Proceedings of the ICE, Civil Engineering	ICE	Nov 2001	Paper	
Student Guide	BSI	Aug 2004	Paper	Extracts from all of the structural Eurocodes (some will be from the ENV's).
Eurocodes news	Eurocodes Expert	Bi-annual	Paper/pdf	Available from www.eurocodes.co.uk Provides an update on Eurocodes, new industry initiatives, FAQ's and guidance on implementation. Articles are authored y a range of experts
EN 1990 – Basis of structural design				
Designers' Guide to EN 1990.	Thomas Telford	Jun 2002	Paper	Covers the background to EN 1990 and its relationship to the other Eurocodes. Commentary/Explanatory.
EN 1991 – Actions on structures				
Manual for Eurocode 1	IStructE	TBA	Paper	The majority of typical building structures. Precise scope under development. Project in association with BRE. **Funding not yet in place.**
Handbook	BRE	Apr 2005	Paper	Covers interpretation of basis of design in relation to load combinations, wind actions and accidental actions. Project within ODPM Structural integrity framework agreement.
Designers' Guide to EN 1991-1.1, 1991-1.3, 1991-1.5 to 1.7.	Thomas Telford	Aug 2005	Paper	Covers general rules and actions on buildings (except wind). Commentary/Explanatory.
Designers' Guide to EN 1991-1.4	Thomas Telford	Oct 2004	Paper	Covers wind actions. Commentary/Explanatory.

Title/Description	Publisher	Date	Format	Comment/Scope
Designers' Guide to EN1991-2, 1991-1.1, 1991-1.3 and 1991-1.5 to 1.7	Thomas Telford	Mar 2005	Paper	Covers traffic loads and other actions on bridges. Commentary/Explanatory.
EN 1992 – Design of concrete structures				
Manual for Eurocode 2	IStructE	Summer 2005	Paper	The majority of typical building structures. Project in association with The Concrete Centre, BCA and the Concrete Society.
Companion document	BRE	Mar 2005	Paper	Describes the coverage of EN 1992-1-1, and its National Annex, together with a comparison between it and BS8110. Project within ODPM Structural integrity framework agreement.
Handbook for EN 1992-1.2	BRE	Mar 2005	Paper	Covers the process of fire design of concrete structures. Project within ODPM Structural integrity framework agreement.
Designers' Guide to EN 1992-1.1	Thomas Telford	Oct 2004	Paper	Covers common rules for building and Civil Engineering structures. Commentary/Explanatory
Designers' Guide to EN 1992-2	Thomas Telford	Jan 2005	Paper	Covers concrete bridges. Commentary/Explanatory.
Concise EC2	BCA/The Concrete Centre	Dec 2004	Paper	Provides rules for the design of reinforced and prestressed building structures. Intended to help users familiarise themselves with EC2, clauses are cross-referenced to EN 1992 and other relevant European Standards. With UK National Annex values, the publication is intended to enable UK designers to carry out designs in accordance with EC2.
Standard Method of Detailing	IStructE	Oct 2004	Paper	Joint PII project with the Concrete Society. Update of existing report.
Precast Design Manual	BPCF	Oct 2004	Paper	Design of precast structures to EN 1992. Joint BCA/BPCF PII project.

Title/Description	Publisher	Date	Format	Comment/Scope
Worked examples to Eurocode 2	BCA/The Concrete Centre	Mar 2005	Paper	Provides examples for the design of reinforced concrete elements and structures. Intended to help users familiarise themselves with design to Eurocode 2, calculations are cross-referenced to EN 1992 and other relevant European Standards. Using UK National Annex values, the publication is intended to help UK designers to carry out designs in accordance with EC2.
How to design leaflets (core set)	BCA/The Concrete Centre	Dec 2004	Paper	A series of 4 to 8 page leaflets introducing EC2 and describing the design of common elements including beams, solid slabs, columns and walls, flat slabs, foundations and deflections.
Design tool – Spreadsheets (core set)	The Concrete Centre	Dec 2004	Software	An update of the RCC *Spreadsheets for Concrete Design to BS8110 and EC2* includes revsions to the spreadsheets for design to BS8110 and new spreadsheets for the design of elements to EC2.
Update of National Structural Concrete Specification	BRE	Dec 2004	Paper	Update of current guide.
Specification of concrete to EN 206	Concrete Society/QPA/ BCA	Dec 2003	Paper	Guidance for specifiers and producers of concrete.
CALCRETE update	The Concrete Centre	Dec 2004	Software	Learning guide for all aspects of concrete construction.
ENV to EN 1992 – Background to Eurocode 2	The Concrete Centre	Dec 2004	CD	An interactive CD-ROM with most of the documentation supporting changes from the ENV version of EC2 to the final published version of EC2 part 1-1.

Title/Description	Publisher	Date	Format	Comment/Scope
EN 1993 – Design of steel structures				
Designers' Guide to EN 1993-1.1	Thomas Telford	Nov 2004	Paper	Covers general rules for buildings. Commentary/Explanatory
Designers' Guide to EN 1993-2	Thomas Telford	Jan 2005	Paper	Covers steel bridges. Commentary/Explanatory.
Section Capacities and Member Properties	SCI		Paper	
Handbook of structural steelwork	SCI		Paper	
Guide to the Design of Medium Rise Structures	SCI		Paper	
Guide to the major amendments in BS EN 1993	SCI		Paper?	Like P304
SCI STEELCAL adjusted to EN	SCI		Software	
Element design spreadsheets by SCI from SEFIE STEEL	SCI		Software	
Course portfolio	SCI		?	
EN 1994 – Design of composite steel and concrete structures				
Designers' Guide to EN 1994-1.1	Thomas Telford	April 2004	Paper	Covers common rules. Commentary/Explanatory.
Designers' Guide to EN 1994-2	Thomas Telford	Feb 2005	Paper	Covers composite bridges. Commentary/Explanatory.
Composite structures of steel and concrete: Beams, slabs, columns and frames for buildings – 3rd Ed – R P Johnson	Blackwell	Sept 2004	Paper	

Title/Description	Publisher	Date	Format	Comment/Scope
EN 1995 – Design of timber structures				
Manual for Eurocode 5	IStructE	TBA	Paper	The majority of typical building structures. Project in association with TRADA. **Funding not yet in place.**
Companion Document	BRE	Aug 2005	Paper	Describes the coverage of EN 1995-1-1, and its National Annex, together with a comparison between it and BS5268. Project within ODPM Structural integrity framework agreement.
Practical Design Guide	BRE	Aug 2005	CD/Web	Covers EN 1995-1-1. Project within ODPM Structural integrity framework agreement.
Designers' Guide to EN 1995-1.1	Thomas Telford	Feb 2005	Paper	Covers common rules and rules for buildings. Commentary/Explanatory.
TRADA Software Toolbox	TRADA	Current and Ongoing	Software	Fast calculations of section sizes for domestic members and load carrying capacities of dowel-type fasteners.
CPD events for Construction Professionals	TRADA	Ongoing	Slide shows	Ultimate Limit States, Serviceability Limit States, Connections Design, Conservation and Repairs, Timber Bridges. Some slide shows contain lecturers' notes.
Wood Information Sheets	TRADA	Various	Paper/CD/ On-line	Extensive information resource, including references to supporting standards, introduction to Eurocode 5, serviceability limit states for timber buildings and vibration performance of timber floors.
Timber Engineering Online	Napier University & Partners	?	Web	Modular training resources from HND to MSc level

Title/Description	Publisher	Date	Format	Comment/Scope
EN 1996 – Design of masonry structures				
Manual for Eurocode 6	IStructE	Late 2005	Paper	The majority of typical building structures. Project in association with BDA, CBA and AACPA . Funding in place and project about to start.
Companion document	BRE	Nov 2004	Paper	Describes the coverage of EN 1996-1-1 and selected parts of EN 1996-1-2, and their National Annexes, together with a comparison between these and BS5628. Project within ODPM Structural integrity framework agreement.
Handbook	BRE	Nov 2004	Paper	Covers EN1996-1-1 and selected parts of EN 1996-1-2. Project within ODPM Structural integrity framework agreement.
Designers' Guide to EN 1996	Thomas Telford	Oct 2004	Paper	Covers all of Eurocode 6? Commentary/Explanatory.
EN 1997 – Geotechnical design				
Simple design guide (to BS EN 1997)	BRE	Jan 2005	Online	Supplement to EN 1997 rather than an alternative. Project within ODPM Structural integrity framework agreement.
Designers' Guide to EN 1997	Thomas Telford	Sept 2004	Paper	Covers Eurocode 7-1 Commentary/Explanatory.
Eurocode 7: Differences from current practice	CIRIA	Apr 2005	Paper	Best practice guidance to clarify the differences between Eurocode 7 and current UK design practice. PII project.
Geotechnical design to Eurocode 7 – Orr and Farrell	Springer	?	Paper	Explanation with examples aimed at students and practising engineers. ENV version to be revised for EN

Title/Description	Publisher	Date	Format	Comment/Scope
EN 1998 – Design of structures for earthquake resistance				
Manual for Eurocode 8	IStructE	TBA	Paper	Possible project in association with SECED – discussions at an early stage. Scope to be developed but likely to cover simple low to medium rise engineered buildings in reinforced concrete, steel and masonry, which have simple form and are designed for a moderate level of ductility in areas of moderate to high seismicity. **Funding not yet in place.**
Designers' Guide to EN 1998-1, 1998-3, 1998-5	Thomas Telford	Feb 2005	Paper	Covers general rules, seismic actions and rules for buildings. Commentary/Explanatory.
EN 1999 – Design of aluminium structures				
Update of 'The practical design of structural elements in aluminium'	Avebury Technical?	?	Paper	John Bull has commenced drafting.
Cross Eurocode guidance				
EN 1993 – Design of steel structures and EN 1994 – Design of composite steel and concrete structures				
Manual for Eurocode 3 and composite beams to Eurocode 4	IStructE	TBA	Paper	The majority of typical building structures. Project in association with SCI and BCSA**. Funding not yet in place.**
Companion document	BRE	Aug 2005	Paper	Aimed at senior designers. Overview of the impact Eurocodes will have in the UK, major technical differences, roadmap for the design of buildings, best value issues and environmental issues. Project within ODPM Structural integrity framework agreement.

Title/Description	Publisher	Date	Format	Comment/Scope
Worked examples	BRE	Aug 2005	Paper	Comprehensive set of worked examples covering EN 1993-1-1, 1-2, 1-8, 1-10 and EN 1994-1-1 and 1-2. Commentary/Explanatory.
Training materials	Sheffield University and European partners	?	CD	Lecture notes, Powerpoint presentations and worked examples. Information available from www.ssedta.com . Being developed into a web-based distance learning system.
Fire				
Designers' Guide to EN 1991-1.2, 1993-1.2 and EN 1994-1.2.	Thomas Telford	Oct 2004	Paper	Covers Fire Engineering (Actions on steel and composite structures). Commentary/Explanatory.
Bridges				
Eurocode Implementation News Letters	Hihways Agency	Bi-annual	Paper/pdf	Available from www.highways.gov.uk/contracts/reports/eurocodes/index.htm Provides an update on Eurocodes including progress on HA's implementation strategy for bridges.
Update of Manual for Roads and Bridges	Highways Agency	2007?	Paper	Covers all aspects of Bridge Design?

Appendix E – Additional guidance material required

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
General					These items may not all be equally applicable to all sectors but they have been grouped together for convenience
Calibration examples	Paper	BRE and Highways Agency	One year before date for Eurocode with National Annex?	?	Practitioners and regulators are interested in changes resulting from use of the Eurocodes; such examples would also be useful to those preparing software
Individual software modules for element design; integrated analysis/design software packages	CD	Software Houses	As soon as possible after Date for Eurocode with National Annex	Many man years for each software house	Software is essential to efficient design practice, both for stand-alone design of elements and for an integrated approach to modelling, analysis, design and detailing (see also section 4.3.3)
Training courses; web-based tutors	Paper and CD; WWW	European Commission, 'Eurocode Expert', BCA, BDA, SCI, TRADA, IStructE, HA, Software Houses	One year before date for Eurocode with National Annex?	?	Courses will be needed at different levels, typically one-day events introducing a particular Eurocode and more extended courses to develop competence in use of a particular Eurocode Part, including use of software; some organisations will wish to provide their own in-house training; resources are needed for self-study
Web-based information source	WWW	BCA, BDA, SCI, TRADA, HA, 'Eurocode Expert',	Date for Eurocode with National Annex	?	Web-based information is essential for efficiency and for correct implementation (see section 4.3.1.1)
Help desk	WWW telephone	ODPM, BCA, BDA, SCI, TRADA, HA, BSI, 'Eurocode Expert'	June 2005	?	Central facility linked to helpdesks for each sector (see section 4.3.1.2)

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
Guidance on continued use of British Standards	Paper	BSI	Jan 2005	?	Report/ revision to standards. Common issue for all materials. For BS8110 say 0.5 m yr
Non technical guidance to outline basic understanding of the implications of Eurocodes on purchasing, specifications, design process, marketing advantage etc.	Paper & online	ODPM	ASAP		Deliver via ODPM, Eurocodes Expert, TRADA, BRE etc.
Building Control guidance on status of Eurocodes & cross-reference to Building Regulations, to facilitate approval process.	Handbook style	ODPM	2005/6		
EN 1990 – Basis of structural design					
Handbook for clients	Paper				Guidance on implied safety provisions etc (see Section 3.4.2.1)
EN 1991 – Actions on structures					
Guidance for domestic buildings	Paper/electronic			825 hours	Assumes all building guidance documents produced together
Guidance for public buildings	Paper/electronic			900 hours	Assumes all building guidance documents produced together
Guidance for industrial buildings	Paper/electronic			450 hours	Assumes all building guidance documents produced together
Guidance for special buildings (eg canopies, grandstands, towers, shell roofs, cable supported)	Paper/electronic			1500 hours	Assumes all building guidance documents produced together
Guidance for beam bridges	Paper/electronic			1350 hours	
Guidance for cable supported bridges	Paper/electronic			1125 hours	Assumes beam bridge documents produced first
Guidance for special bridges (eg arched)	Paper/electronic			375 hours	
Guidance for lattice towers	Paper/electronic			300 hours	
Guidance for chimneys	Paper/electronic			300 hours	
Guidance for cranes	Paper/electronic			375 hours	
Guidance for pipelines	Paper/electronic			300 hours	
Guidance for water tanks	Paper/electronic			190 hours	

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
EN 1992 – Design of concrete structures					
Fire design of concrete structures	Paper	BRE/UMIST	Jan 2005	340 hours	How to design leaflet. This will be a succinct user friendly version of the Concrete Fire Design Manual currently being produced by BRE.
EN 1992 Interpretation Document	Paper	Consultants to include EN 1992 project team members	Mar 2005	850 hours	Technical Publication. To include background documentation and guidance on interpretation of EN 1992 clauses.
EN 1992 website	Website	Concrete Sector	Apr 2004	340 hours	
Guidance on Bridge Design	Various	Various	June 2005	?	In association with Highways Agency. Can build on the technical guidance being produced for buildings.
Guidance on Design of liquid retaining structures	Various	Various	Dec 2005	?	Can build on technical guidance being produced for buildings.
EN 1993 – Design of steel structures					
National structural steelwork specification for building construction	Paper/electronic	BCSA	Dec 2005	280 hours	
Steelwork Design Guide to BSEN 1993:Part 1.1	Paper/electronic	SCI	June 2005	1400 hours	
Plastic Design of Single Storey Pitched Roof Portal Frames to Eurocode 3	Paper/electronic	SCI	Dec 2005	430 hours	
Design of Steel Portal Frames for Europe	Paper/electronic	SCI	Dec 2005	715 hours	
Fire resistant design of steel structures to the Eurocodes	Paper/electronic	SCI	June 2005	265 hours	
Modelling of Steel Structures for Computer Analysis	Paper/electronic	SCI	June 2005	225 hours	
Structural fire design to EC3 and EC4 and comparison with BS 5950	Paper/electronic	SCI	June 2005	435 hours	

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
Design of steel framed buildings without applied fire protection	Paper/electronic	SCI	June 2005	565 hours	
Joints in Steel Construction: Moment Connections	Paper/electronic	SCI	Dec 2005	715 hours	
Joints in Steel Construction: Simple Connections	Paper/electronic	SCI	June 2005	1000 hours	
Wind-moment Design of Low Rise Frames	Paper/electronic	SCI	Dec 2005	510 hours	
Building Design Using Cold Formed Steel Sections: Structural Design to the Eurocodes	Paper/electronic	SCI	June 2006	715 hours	
Design Manual for Structural Stainless Steel Design	Paper/electronic	SCI	June 2006	1200 hours	
In-plane stability of portal frames	Paper/electronic	SCI			
Residual standard for BS 5950-1	Paper/electronic	BSI			
Extras					
(1) Spreadsheets for calculating specific NCCI	Web delivered software	SCI	June 2005	750 hours	
(2) Active worked example to illustrate element and connection design	Web delivered software	SCI/BRE	Dec 2005	1875 hours	
EN 1994 – Design of composite steel and concrete structures					
Composite beam design to Eurocode 4	Paper	SCI	Sept. 2006	300 hours	Update of P121 to EN; includes design tables
Design of composite beams using precast concrete slabs	Paper	SCI	Sept. 2006	200 hours	Update of P287; provides background and design provisions for a useful form of construction not covered by EN 1994
Slim floor design & construction	Paper	SCI	Sept. 2006	350 hours	Update of P110; provides background and design provisions for a useful form of construction not covered by EN 1994

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
Design of Slimflor beams	Paper	SCI	Sept. 2006	700 hours	Updates of P169, P175, P248; provides background and design provisions for a useful form of construction not covered by EN 1994
Composite column design to Eurocode 4	Paper	SCI	Dec. 2006	450 hours	Update of P142 to EN; includes design tables but at present composite columns are not common in the UK
Green book on composite connections	Paper	SCI	Dec. 2006	450 hours	Update of P213; includes design tables; presently composite connections are not common in UK
Composite slabs and beams using steel decking: Best practice for design and construction	Paper	SCI	Depends on EN 1993-1-3	200 hours	Update of P300 but construction practice is not expected to change significantly
Manufacturers' handbooks for composite slabs	Paper and CD	Those who manufacture steel decking	Depends on EN 1993-1-3	?	Manufacturers need to reassess test results and recalculate design tables; research is in progress to minimise the need for further tests
EN 1995 – Design of timber structures					
Residual Standards – elements of BS5268-2, 3, 4.1, 4.2, 6.1, 6.2 & 7 – including conversion to limit state format	British Standards	BSI	Coincide with withdrawal of conflicting National Standards	750 hours	Adequate resources via BSI will be required to ensure timely delivery. Alternatively all NCCI, including residual standards content should be produced by expert bodies such as TRADA & BRE, supported by industry. Release of copyright from BSI will be required.
Full or abridged contents of EC5, drawing-in essential citations from EC0 and EC1, supported by annotations and commentary.	Paper & electronic with hypertext links	TRADA/BRE	2005/6	270 hours	Copyright issues regarding reproduction of Eurocode text will require resolution.
Teaching modules on timber design suitable for delivery through Universities, as part of Civil/Structural Engineering degree courses.		Napier University CTE	ASAP	525 hours	Napier CTE are scoping this resource

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
Enhanced TRADA Timber Design Knowledge teaching resource		TRADA	ASAP	525 hours	Existing electronic lecturer & student resource to be enhanced and widely distributed. Link with Napier CTE work on teaching modules.
Update TRADA DDENV Worked Examples	Paper & electronic with hypertext links	TRADA	2005/6	300 hours	Update & enhance via electronic delivery.
Update TRADA DDENV Design Aids & Guidance Documents.	Paper & electronic with hypertext links	TRADA	2005/6	490 hours	Update & enhance via electronic delivery.
Guide to supporting product standards & referenced documents	Online?	BSI?	2005/6		Support information including flowchart navigation to identify essential information to support EC5 design.
Standard clauses to allow easy specification of elements designed using Eurocode 5 and its support standards.	Paper & Online	TRADA	2006	225 hours	Standard "cut & paste" specification clauses.
EN 1996 – Design of masonry structures					
Workmanship Guide to EN 1996-2	Paper		2008		To cover brick and block masonry construction workmanship/execution aspects.
Update of BDA, industry design/guides manuals	Paper/Electronic		2008/9		Various sector guides and information sheets to ideally be updated to EC6.
Update of Granada/Curtin publications	Paper		2008		Copyright publications to ideally be revised by commercial interests holding copyright.
Update of BMS ENV guidance document	Paper		2008		BMS initiative and copyright. Could be absorbed into other identified guidance such as BRE guides.
Case study sheets of typical design situations	Paper/Electronic		2006/7		Important initiating information to serve as fill-in information before main guides become available. Will need to be sector specific in most cases (ie BDA, CBA, AACPA etc.)

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
EN 1997 – Geotechnical Design					
Updates of standard textbooks (eg Tomlinson)	Paper				
Calibration examples and examples relating to more complex problems					
Guidance on temporary works design					
Guidance on the use of advanced numerical analysis					
EN 1998 – Design of structures for earthquake resistance					
Manual for Eurocode 8 Parts 1 & 5	Paper	IStructE/SECED/ European counterparts	2006	850 hours	Typical building structures for construction in areas of medium to high seismicity (ie not for low seismicity areas such as the UK)
Training course for professionals	1 to 2 day courses	IStructE/SECED/Imperial College	2004		SECED and Imperial College are organising a 2 day course based around Eurocode 8 in September 2004. The course will cover the use of EC8 in areas of medium to high seismicity.
Guidance on seismic considerations for structures in the UK	Paper, www	IStructE/SECED	Summer 2005	850 hours	Guidance is required on the circumstances in which structures (other than critical facilities such as those connected with nuclear and other high risk industries) might need to account explicitly for the low to very low levels of seismicity in the UK. The guidance should be written both for clients/owners and for design professionals. It will need to address any issues raised by the UK National Foreword to EC8.
EN 1999 – Design of aluminium structures					
Refer to section 3.4.1.7					

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
Cross Eurocode guidance					
EN 1993 and EN 1994					
Design for openings in the webs of composite beams	Paper	SCI	June 2006	200 hours	Update of P068; applicable also to steel beams; beams with web openings are in common use but not covered by the Eurocodes
Design of composite and non-composite cellular beams	Paper	SCI	June 2006	200 hours	Update of P100; applicable also to steel beams; cellular beams are in common use but not covered by the Eurocodes
Steel designers manual	Paper	SCI	June 2007	3000 hours	
Modelling of steel and composite building structures for analysis	Paper	SCI	June 2006	600 hours	Update and extension of P148; guidance is needed on: simple construction; second-order analysis; member imperfections; effects of temperature difference and shrinkage of concrete; semi-continuous joints
Undergraduate textbooks	Paper	Individual authors	June 2006	500 hours per book	Composite beams and slabs are usually included in books on structural steelwork. Many are available but will need updating to the Eurocodes
Fire					
Consistency of fire loading across all material codes	Paper	BRE	Jan 2005	425 hours	Project Report. Part of a 'calibration' study.
Structural fire design to EC3 & EC4, and comparison with BS 5950	Paper	SCI	Depends on EN 1993-1-3?	1100 hours	Update of P159 to ENs; includes design tables
Structural fire design: Offsite applied thin film intumescent coatings	Paper	SCI	June 2006	150 hours	Update of P160 to complement Eurocode provisions
Fire safe design: A new approach to multi-storey steel-framed buildings	Paper	SCI	Depends on EN 1993-1-3?	300 hours	Update of P288 to complement Eurocode provisions
The fire resistance of concrete filled tubes to Eurocode 4	Paper	SCI	Dec. 2006	100 hours	Update of P258 to EN; includes design tables

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
Design of steel framed buildings without applied fire protection	Paper	SCI	Depends on EN 1993-1-3?	200 hours	Update of P186 to complement Eurocode provisions
Fire protection for structural steel in buildings	Paper	SCI	Depends on EN 1993-1-3?	350 hours	Update of P013 to complement Eurocode provisions
Bridges					
Design of composite highway bridges: General guidance	Paper	SCI and HA	Dec. 2006	600 hours	Update of SCI Publication P289
Design of composite highway bridges: Worked examples	Paper	SCI and HA	Dec. 2006	900 hours	Update of SCI Publication P290
Design guide for composite box girder bridges	Paper	SCI and HA	Dec 2007?	750 hours	Update of SCI Publication P140
Integral steel bridges: Design guidance	Paper	SCI and HA	Dec. 2006	600 hours	Update of SCI Publication P163
Integral steel bridges: Design of a single-span bridge	Paper	SCI and HA	Dec. 2006	400 hours	Update of SCI Publication P180
Integral steel bridges: Design of a multi-span bridge	Paper	SCI and HA	Dec. 2006	500 hours	Update of SCI Publication P250
Precast concrete decks for bridges	Paper	SCI,BCA,HA	Dec. 2006	750 hours	Update of SCI Publication P316
Guidance notes on best practice in steel bridge construction	Paper	SCI and HA	Dec 2007?	?	Update of SCI Publication P185
Fatigue verification using EC2, EC3 and EC4	Paper	BCA, SCI and HA	Dec. 2006	900 hours	EN 1994 makes extensive reference to EN 1992 and EN 1993; this document is to present in a single volume the fatigue verification procedures of EN 1994, EN 1993 and EN 1992
Modelling steel and composite bridges for analysis	Paper	SCI and HA	Dec. 2006	600 hours	Guidance is needed on modelling of joints; second-order analysis; member imperfections; effects of temperature difference and shrinkage of concrete
Joints in composite bridges	Paper	SCI and HA	Dec. 2006	900 hours	EN 1994 gives no guidance on the design of composite joints for bridges

Title/Description	Format	Possible Facilitator	Required by	Resources required	Comment/Scope
Residual standard covering shear connectors other than headed studs, shear studs with uplift, treatment of settlement at ULS, fully encased filler beams, design utilising formwork other than precast concrete	Paper	BSI	Dec 2007?	600 hours	EN 1994 gives no guidance on these topics relevant to bridges
Revised textbook (eg Johnson and Buckby)	Paper	At present Johnson has no co-author	Dec. 2006	1600 hours	To present background theory and to show how EN 1994 may be used; for MEng/MSc students and practising engineers