



Department for
Communities and
Local Government

Changes to Parts A and C of the Building Regulations - Referencing of British Standards Based on Eurocodes

Impact Assessment

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Title: Changes to Parts A and C of the Building Regulations - Referencing of British Standards Based on Eurocodes IA No: DCLG/0076 Lead department or agency: Department for Communities And Local Government (DCLG) Other departments or agencies:	Impact Assessment (IA)				
	Date: 12/03/2013				
	Stage: Final				
	Source of intervention: EU				
	Type of measure: Other				
Contact for enquiries: Shayne Coulson					

Summary: Intervention and Options	RPC Opinion: GREEN
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Cost of Preferred (or more likely) Option					
Total Net Present Value	Business Net Present	Net cost to business per year (EANCB on	In scope of One-In, One-Out?	Measure qualifies as	
-£50.5m	-£50.5m	£4.9m	No	NA	

What is the problem under consideration? Why is government intervention necessary?
 On 1 April 2010 the British Standards referenced in the current Approved Document A (and to a lesser extent Approved document C) were withdrawn by the British Standards Institution (BSi) and replaced with new British Standards based on a pan-EU harmonised approach to structural design (the "Eurocodes"). The withdrawn standards will no longer be maintained and will become increasingly out-of-date with time with a corresponding risk to structural safety. In addition, there is a risk that the UK could face legal challenge if we do not reference the Standards based on Eurocodes in the Approved Documents as it may be seen as putting up barriers to trade.

What are the policy objectives and the intended effects?
 To continue to provide a regulatory framework into the future that ensures buildings are structurally safe for people in or around them in a way that complies with European requirements in the most cost-effective manner. Doing so will in turn support the aims for which the Eurocodes were developed - to eliminate technical barriers to trade in goods and services created by Member States all having different design methodologies, to boost the internal market and aid growth and exports.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)
 The two policy options considered in this Impact Assessment are 0) do nothing and 1) update guidance to reference the British Standards based on Eurocodes. The "do nothing" option is not preferred because the withdrawn Standards will become increasingly out-of-date as industry practice and construction techniques move further away from the withdrawn Standards currently referenced. There is also a significant risk of successful legal challenge if we were not to update the Standards currently referenced in the Approved Documents to the British Standards based on Eurocodes. Option 1 is preferred to avoid the adverse impacts set out under the "do nothing" option. In addition, incorporation of British Standards based on Eurocodes should promote enhanced competition at a European level through standardisation - removing technical barriers to trade, fostering improvements in quality and innovation and ultimately creating job opportunities.

Will the policy be reviewed? It will be reviewed. If applicable, set review date: 10/2018					
Does implementation go beyond minimum EU requirements?			No		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	Micro Yes	< 20 Yes	Small Yes	Medium Yes	Large Yes

What is the CO₂ equivalent change in greenhouse gas emissions?
(Million tonnes CO₂ equivalent)

Traded:

Non-traded:

I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) that the benefits justify the costs.

Signed by the responsible Minister:



Date: 24.04.2013

Summary: Analysis & Evidence

Policy Option 1

Description: Update guidance to reference the British Standards based on Eurocodes

FULL ECONOMIC ASSESSMENT

Price Base Year 2012	PV Base Year 2013	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -28.0	High: -72.4	Best Estimate: -50.5

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	30.0	N/A	28.0
High	77.4	N/A	72.4
Best Estimate	54.0	N/A	50.5

Description and scale of key monetised costs by 'main affected groups'

There are two components which make up the transition costs of this policy. The first component assumes 250 firms (range 200-300) have not yet adopted Eurocodes so these firms will incur the full transition costs. The transition costs are based on two firm sizes and equate to £20k per 2 person firm and £94k per 16 person firm (we have assumed 80% of firms are 2 person firms). Assuming an even distribution adoption of Eurocodes over each of the 5 years results in a total PV cost of £8.2m (range £6.5m - £9.8m). The second component of the transition cost is for the 3,450 firms (range 3,400 – 3,500) who have purchased some Eurocodes products but have not fully incurred all of the costs of adopting Eurocodes. We have assumed that 50% of firms (range 25% - 75%) still have to incur 75% of the transition costs associated with incorporating Eurocodes. Evenly distributing the number of firms incurring the transition costs over 5 years results in a total PV cost of £42.3m (range £21.5m - £62.5m). Combining the two components results in a total PV cost of £50.5m (range £28.0m - £72.4m).

Other key non-monetised costs by 'main affected groups'

N/A

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low			
High			
Best Estimate	N/A	N/A	N/A

Description and scale of key monetised benefits by 'main affected groups'

We have been unable to monetise the benefits of this policy

Other key non-monetised benefits by 'main affected groups'

Although it is not possible to monetise the benefits (or rather costs avoided), updating the referenced Standards will continue to ensure that buildings are constructed using up-to-date and supported Standards and thereby avoid potential health and safety-related costs. In addition, through standardisation, Eurocodes-based Standards should promote enhanced competition at a European level - removing technical barriers to trade, fostering improvements in quality and innovation and ultimately creating job opportunities. Evidence suggests that increased standardisation leads to increased labour productivity, in the period 1948-2002 growth in standards in the UK contributed about 13% of the growth in UK labour productivity. Standardisation contributed about 0.25% to growth every year over the period 1948-2002 when growth averaged 2.5% per year, which suggests establishing common standards play an important role in growth.

Key assumptions/sensitivities/risks**Discount rate**

3.5

Key assumptions about the scale of transition costs include: the proportion of firms that are small and medium-sized; certain individual elements of the total costings - such as on productivity and familiarisation; the additional cost that will be incurred on those firms moving voluntarily towards Standards based on Eurocodes; and that large firms will already have implemented Eurocodes voluntarily by 2013. We have assumed that 80% of firms are small 2 person firms and the remaining 20% are medium 16 person firms.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of	Measure
Costs: 4.9	Benefits: 0	Net: -4.9	No	NA

Evidence Base (for summary sheets)

Problem under consideration

Background on the Building Regulations

- 1) The Building Regulations 2010 control certain building work - principally to protect the health, safety and welfare of people in or around buildings. Part A of Schedule 1 to the Regulations relates to structural aspects of building design and construction. Approved Document A contains statutory guidance that demonstrates how the provisions can be complied with.
- 2) The Regulations themselves are expressed in “functional” terms and do not dictate how the desired level of structural safety *must* be achieved. However, for the benefit of both industry and building control bodies, advice on how the requirements of the Building Regulations *may* be met are contained in guidance approved by the Secretary of State (the Approved Documents). This covers some of the more common building situations, but there may well be alternative ways of achieving compliance with the provisions. However, if followed, the guidance may be relied upon in any proceedings as tending to indicate compliance with the Building Regulations.
- 3) In a comparable way to other Approved Documents, the existing guidance in Approved Document A (last updated in 2004), references a number of British Standards relating to structural design which it states, if followed, will demonstrate compliance. These design standards provide a baseline set of technical performance requirements which relate to safety and serviceability for structural design, but do not prevent other options being used to show compliance.

The Eurocodes and British Standards

- 4) In 1975, the European Commission decided on action, based on Article 95 of the Treaty of Rome, with the objective of the elimination of technical obstacles to trade and the harmonisation of technical specifications. This included the initiative to establish a set of harmonised technical rules for the structural design of construction works – known as “the Eurocodes”.
- 5) The Eurocodes have been developed over a number of decades by the European Union (EU) Commission and the European standards body, CEN, (involving the British Standards Institution (BSi) for the UK), to remove barriers to trade created by different national design approaches across the EU. The Commission has outlined expectations that EU Member States will support this harmonisation and market liberalisation by ensuring national regulations refer to British Standards based upon the Eurocodes. For the Building Regulations this would be achieved by aligning references and associated guidance in the Approved Documents with the British Standards based on Eurocodes. Other Member States and the Devolved Administrations are making, or have already made, similar changes.

- 6) In addition, under the Public Procurement Directive (European Directive 2004/18/EC), the Eurocodes are the mandatory standard design specification for publicly funded projects. This means that parts of the construction industry are already required to use them for aspects of their work. Whilst this will be particularly true for larger-scale, publicly funded building, civil engineering and housing supply work, this requirement has already meant many firms have already moved over, either partially or completely, to this new design approach. ONS¹ construction data reveals that in 2011 (the most recent year for this detailed analysis) the value of all new construction work totalled £78 billion, of which public sector work accounted for £27.7 billion. This equates to the proportion of total new construction work being for the public sector of 30%. The construction data can also inform us of the value of work being carried out based on the size of firm, inferred by the number of employees. The data reveals that 63% commercial buildings construction is carried out by firms with more than 35 employees based on the value of work. When the number of employees is greater than 115 the value of commercial building construction is 46%. This shows that the majority of the work within the commercial buildings sector is carried out by larger firms in terms of the value of the work.
- 7) As stated previously, Approved Document A makes extensive reference to British Standards to establish what a reasonable level of structural safety in design is. These cover standards relating to loadings, foundations/geotechnics and specific design standards to reflect different materials and methods of construction (for example, timber, masonry, concrete, steel, aluminium). The standards currently referenced are those that were in place in 2004 when Approved Document A was last updated.

The Problem

- 8) On 1 April 2010 BSi withdrew the Standards which are listed in the current Approved Document and issued a new set of British Standards for structural design. These reflect the state-of-the-art and follow a different design methodology from the Standards they replaced. The old British Standards will no longer be maintained by BSi and will become increasingly out-of-date with time. The most up-to-date British Standards for structural design are now, therefore, those based on the Eurocodes. It has been normal policy to update the Approved Documents to reflect the latest principal design approaches and Standards developed by BSi with industry.
- 9) Alongside the routine updating that has been undertaken by BSi and its industry partners to reflect technological advancement etc., a key change in the new set of British Standards is the adoption of a pan-EU harmonised design approach, developed by the European Commission with the standards bodies and engineers from Member States over 20 years and commonly referred to as “the Eurocodes”.

¹Construction Statistics Annual Tables, 2012: <http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcn%3A77-265604>

- 10) In addition to the currency of the referenced Standards, there is a risk that the UK could face legal challenge from the European Commission, an EU Member State or industry if we do not align the Approved Documents with the new British Standards based on Eurocodes. If we were to continue to reference only the withdrawn British Standards, we may be seen as providing barriers to trade which prevent or restrict designers based in other EU States practising in England, thus breaching EU Treaty obligations; or which potentially hinder the use in England of structural products CE marked under the EU Construction Products legislation (which is a separate requirement). The UK is obliged to recognise that buildings designed to the Eurocodes meet the requirements of national regulations. Therefore, maintaining references to currently-referenced British Standards carries the potential risk of infraction and imposition from the European Court of Justice of financial sanctions on the UK (potentially a one off sum in excess of €9m and a possible substantial daily fine of thousands of pounds for continuing non-compliance).
- 11) Although Eurocodes will predominantly impact on the guidance contained in Approved Document A, there are also a small number of consequential changes to guidance and to references and text in Approved Document C (Site preparation and resistance to contaminants and moisture). For the sake of clarity, drafting in the Impact Assessment primarily refers to the changes to be made to Approved Document A (although paragraph 110 contains information on the other consequential changes).

Rationale for intervention

- 12) Building Regulations apply to “building work” as defined (typically the erection, extension, alteration or conversion of a building) and seek to ensure buildings meet certain standards for minimum health, safety, welfare and sustainability. Part A seeks to ensure that a building’s structure is structurally safe and robust to resist the actions expected to be imposed upon them, for example, from occupants and their operation, wind and ground movement.
- 13) As the legislative provision is “functional”, statutory guidance contained in the Approved Documents sets some of the ways, for the more common buildings, of ensuring basic minimum health, safety etc standards are achieved when constructing buildings. This provides clarity for building control bodies and industry alike as it sets out what is sufficient (whilst allowing flexibility to provide alternative building approaches where beneficial). Importantly, it also ensures that a proper cost/benefit assessment and consultation with industry has been undertaken by Government to assess what reasonable minimum standards are appropriate (and avoids the risk of unnecessarily onerous and costly standards being imposed on industry).

- 14) DCLG undertook an exercise in the latter half of 2010 to determine what changes were necessary to the Building Regulations to ensure they remained fit-for-purpose, with a particular emphasis on identifying measures to reduce the cost of regulation to business and any other “must do” regulatory changes. There were 248 responses from our external partners to this exercise. As noted in the summary and analysis of responses²:
- “Few responses questioned the principle of regulations setting national standards that ensure buildings are built to baseline standards, although there was some comment that they were on firmest grounds in relation to health and safety rather than wider sustainability objectives. Many specifically recognised the positive role Building Regulations played and welcomed the fact that there was a nationally applied set of minimum requirements.”
- 15) The exercise demonstrated, therefore, that the general approach to regulating through the Building Regulations (functional requirements supported by guidance as to how to comply) was supported by external partners. In relation to Part A, those that responded did not question the existing regulations’ approach to delivering structural safety. However, whilst it was indicated that they were largely content with the technical content of the guidance, there was some concern expressed that technical references had not been updated to reflect the Eurocodes.
- 16) Although the approaches outlined in the Approved Documents provide only a way of demonstrating compliance, they do provide assurance that if they are followed that they can be relied upon as tending to indicate compliance with the Building Regulations. Because of that, the approach set out in the Approved Documents is often viewed as the default design approach. It is important, therefore, that the approaches and references deliver the safety outcomes intended and that is why, where referenced Standards evolve to respond to changes in practice and construction techniques, there is a strong case for considering updating them.
- 17) In addition, in this instance there is a further driver – namely to align the referenced Standards with the pan-Europe structural design approach represented through the Eurocodes. This was developed by the European Commission with the standards bodies and engineers from Member States over 20 years. As the objective of this harmonisation was to eliminate technical barriers to trade in goods and services created by Member States all having different design methodologies, failing to reference the revised British Standards may lead to a successful legal challenge.

Policy Objective

- 18) To continue to provide a regulatory framework into the future that ensures buildings are structurally safe for people in or around them in a way that complies with European requirements and does so in the most cost-effective manner. In so doing, to allow for greater standardisation of design standards across European Member States with associated economy and growth benefits.

² Future changes to the Building regulation – next steps. Published by DCLG in December 2010. Available at www.gov.uk/government/policies/providing-effective-building-regulations-so-that-new-and-altered-buildings-are-safe-accessible-and-efficient/supporting-pages/review-of-building-regulations%20

The options considered

- 19) Two options are considered in detail in this Impact Assessment:
- i) Option 0 - do nothing.
 - ii) Option 1 - update references to the newer British Standards based on Eurocodes, with measures to ease transitional burdens.
- 20) There are significant adverse impacts of a 'do nothing' approach which have led to Option 1 being selected:
- given the currently-referenced Standards will not be maintained, there is an ever-increasing risk that, as industry practice and construction techniques continue to progress, they become increasingly out-of-date and potentially less safe, and
 - there is a significant risk of successful legal challenge if we do not reference the British Standards based on Eurocodes as Government would be seen as perpetuating a barrier to trade.
- 21) Option 1 will help to avoid the adverse impacts set out under the "do nothing" option above. However, in addition there are a number of consequential benefits that accrue, principally, in relation to delivering the benefits sought through the introduction of Eurocodes. In particular, Eurocodes have been designed with the following beneficial aims in mind:
- to provide a common approach for the design of buildings and other civil engineering works leading to enhanced competition at a European level
 - to boost business in the sector by removing technical barriers to trade within Europe
 - to foster improvements in quality and innovation, and
 - to create job opportunities in the sector.
- 22) It is recognised, however, that updating references will impose some additional, one-off costs on industry – principally to engineering firms that feel compelled by the change to move their design approach to one based on Eurocode-based British Standards. We believe that the current, highly competitive nature of the construction industry and the fact that design fees are often determined as a percentage of the project cost means that any additional costs will be borne (and not passed-on to clients) by the structural design firms.
- 23) Conversely, in the longer-term, it is likely that these businesses may benefit from the development of the more up-to-date British Standards both because of the potential for greater European and global trade and also because the Standards are better attuned to more modern construction techniques (which, in turn, are often driven by efficiencies).
- 24) To ease the potential burden on business, we aim to mitigate the impact in two main ways:
- changes to Approved Document A will come into force in October 2013, but to allow firms time to make that transition over a longer period, guidance will be provided to make clear we would expect that the withdrawn Standards should be viewed as also demonstrating compliance with the Building Regulations until at least 2018

- the guidance will also provide assurance that, for certain firms, it may be unnecessary to move to the new British Standards even beyond that date if, in their professional judgment, the previous British Standards remain satisfactory for the types of work their businesses are responsible for. We intend to clarify that building control bodies should accept such an approach where a designer is able to demonstrate it is appropriate for the particular structure proposed. Such an approach is likely to be more appropriate for smaller-scale and lower-risk work, and where engineers have appropriate skills and competencies.
- 25) We believe, therefore, that the updating to Eurocodes has been done in such a way as to minimise the cost to business, that is, there is no “gold-plating” involved with the implementation of this policy and efforts have been made to minimise the associated impact.
- 26) More information on the costs and benefits is contained below.

Response to the Consultation

- 27) Building on the earlier “call for ideas” referred to in paragraph 14 above, the Department published a consultation paper³ in January 2012 that included proposals to update the references in Approved Document A to the new British Standards based on Eurocodes. A summary of the consultation responses was published in December 2012⁴.
- 28) The consultation sought views on whether the current structural design standards referenced in Approved Document A should be replaced by the newer British Standards based on the Eurocodes. We received 84 responses on this element of the proposals and 80% of respondents agreed with the need for the updating. Many respondents who agreed with our approach commented that they considered the adoption of the most up-to-date technical Standards to be a necessary and inevitable result of progress (even though it was generally accepted this would also be accompanied by transitional costs for some).
- 29) Of those who disagreed, a number felt that such a change was unnecessary as the withdrawn British Standards were still safe and reliable and/or that the proposals would impose unnecessary costs.
- 30) There was, however, an across the board call to allow industry a practical transitional period of about five years to adjust to the changes in the Approved Documents.

³ [2012 consultation on changes to the building regulations in England: section 1 - introduction to the consultation package and proposals](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/8392/2077831.pdf)
www.gov.uk/government/uploads/system/uploads/attachment_data/file/8392/2077831.pdf

⁴ [2012 consultation on changes to the Building Regulations in England: summary of responses](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/38700/2012_BR_SOR.pdf)
www.gov.uk/government/uploads/system/uploads/attachment_data/file/38700/2012_BR_SOR.pdf

- 31) A number of questions were asked in the consultation paper on the consultation stage Impact Assessment. Less than a half of respondents expressed views and overall responses were fairly evenly split on whether consultees agreed or not with the assessments of the impact on construction and transitional costs. However, comments were generally not detailed or supported by evidence. A further breakdown of comments accompanies the more detailed cost considerations below.

Additional Research Conducted since the Consultation

- 32) To support further development of the evidence base around the proposal, the Department contracted EC Harris to gather the views of a sample of structural engineering firms on the costs and benefits associated with referencing the British Standards based on Eurocodes. A summary of the findings can be found on the Department's website⁵. However, it proved difficult to find firms willing to participate in the exercise and the fact that only 43 of around 600 firms approached participated means that results are not statistically significant. Therefore, while the findings of the work are interesting at a higher level, they are not necessarily robust enough on their own to call into question figures and assumption in this and the consultation stage Impact Assessment. However, where relevant, key findings from the work are referenced to provide a wider context to the analysis below.

Costs and Benefits

- 33) In developing the consultation Impact Assessment the Department drew upon earlier work carried out in Scotland and published in February 2010 looking at the costs and benefits of incorporating Eurocodes into the Building Regulations there⁶. That work in itself draws upon earlier work carried out in 2004 by the Institution of Structural Engineers (ISE) for the then Office of the Deputy Prime Minister (ODPM) on the transition to a design approach based on the Eurocodes⁷. These costs and benefits have been further informed and tested through the consultation process. The costs and benefits detailed below are all expressed in 2013 prices.

Option 0 – Do Nothing

- 34) Understanding the counterfactual is important for any consideration of policy. For the changes considered in this Impact Assessment, available information on the voluntary take-up of Eurocodes so far provides a useful basis for not only establishing the current state of the market, but also making some estimates about future take-up if the Department was to do nothing.

⁵ Further economic and analytical support for proposals to amend the Building Regulations in 2013, http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/39434/ec_harris_report.pdf

⁶ Final Regulatory Impact Assessment on the Review of Section 1: Structure of the Technical Handbooks for Ways of Complying with the Building (Scotland) Regulations 2004 (as amended), February 2010. Available at <http://www.scotland.gov.uk/Resource/Doc/917/0098818.pdf>

⁷ 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. April 2004. Available at: <http://shop.istructe.org/national-strategy-for-implementation-of-structural-eurocodes-2004-66.html>

Costs – Option 0 – Do Nothing

- 35) There are no costs imposed directly, for example, in the way there are for Option 1. However, there are other, less easily monetised, outcomes should no action be taken to update the British Standards referenced. These are principally the foregone benefits of Option 1, but also potentially the costs that might accrue if buildings were to become less structurally sound.
- 36) These costs arise through the nature of the guidance provided by the Approved Documents and, in particular, how that guidance impacts on market behaviour. While the functional nature of the Building Regulations means that guidance contained in the Approved Documents does not need to be followed, in practice much of industry generally sees it as setting the industry standard for proper design – not least because following the approach will demonstrate compliance with the Building Regulations.
- 37) Following the approach is likely to represent an adequate defence against any claim by a client against someone who had carried out a structural design. Consequently, providers of professional indemnity insurance are influenced by what appears in the statutory guidance. The ability to obtain insurance, and at what price, is likely, therefore, to provide a further factor in driving industry to adopt whatever standard is referenced.
- 38) In practice, therefore, parts of industry have delayed adopting a design approach based on Eurocodes in the absence of them being referenced in Approved Document A – as confirmed by the response to the consultation from the ISE below:
- “The Eurocodes-based British Standards must be referenced in AD A at the earliest possible moment - continuing not to do so is having a significant impact on their adoption.”
- 39) The impact of this delay is to undermine or diminish the benefits associated with a Eurocodes-based approach to structural design. As they have been developed in the light of advances in science and engineering or materials data improvements, not to reference them potentially stifles innovation, growth contributions from standardisation and exports and ultimately competitiveness. The British Standards based on Eurocodes are also based upon loadings criteria (wind and snow) that are derived from more recent data banks that are starting to be influenced by climate change realities and ensures designs better consider likely weather and climatic structural challenges.
- 40) In the longer-term, the currently-referenced British Standards will no longer be technically maintained and DCLG would have increasing unease with continuing to reference these. However, it is not possible to anticipate how future industry design and construction techniques will continue to evolve and the adequacy, therefore, of currently referenced standards in terms of structural safety into the future (or to try and estimate the exact nature or scale of these costs).
- 41) In addition, maintaining references to currently-referenced British Standards carries the potential risk of infraction and imposition from the European Court of Justice of financial

sanctions on the UK. Payment of any fines levied on the UK will have to be absorbed in their entirety by the UK Government. It is difficult to predict with any degree of certainty the amount of fine that may be imposed by the European Court of Justice in any individual case, but the likely level might be significant with a minimum lump sum of about €9.666m⁸ and a possible substantial daily fine of thousands of pounds for continuing non-compliance.

Benefits – Option 0 – Do Nothing

42) There are no benefits associated with this option as it is the counterfactual.

Costs – Option 1 – Reference British Standards Based on Eurocodes

- 43) In assessing the costs of updating the referenced British Standards it is necessary to examine both the ongoing costs of constructing to these new Standards and the one-off, transitional costs associated with the change.
- 44) Although referencing the British Standards based on Eurocodes will provide the construction industry with an alternative, up-to-date, technical solution for meeting regulatory requirements, the functional nature of the Building Regulations means that alternative approaches are acceptable if they provide equivalent outcomes. However, in practice, and as stated previously, many in industry simply adopt the approach referenced in the guidance which thereby becomes the industry norm. It is for that reason that Impact Assessments on the Building Regulations provide costs and benefits based on the approaches set out in the Approved Documents.

Costs of Construction

- 45) An analysis⁹ of the impact on the **cost of construction** of the change to the referenced British Standards was undertaken for the Department as part of an initial assessment of possible costs. This looked at four types of notional building:
- a two-storey detached house with masonry walls, timber floors and traditional timber rafter roof
 - a single-storey office block, constructed similarly to the above house
 - a seven-storey office building, constructed of reinforced concrete
 - a seven-storey office building similar to the concrete building, but now of steel and steel-concrete composite construction.

⁸ In accordance with guidance set out in its Communication SEC (2005)1658 as amended by SEC (2010) 923, the Commission will recommend to the European Court of Justice (ECJ) a lump sum payment as a penalty for failing to comply with the first ECJ judgment up to the date of the second ECJ judgment and a penalty payment as a daily fine continuing from the date of the second judgment until compliance. The lump sum payment will be the minimum level set for the UK at €9,666,000. In the event that the Commission formula for calculating the lump sum payment exceeds the minimum, the higher amount will be recommended.

⁹ Europe Economics summary of analysis performed by Scott Wilson, Consultation Stage Impact Assessment of the Adoption of the Eurocodes: Evidence Base, March 2010

46) The estimated build cost of these types of buildings is summarised in **Table 1** below.

Table 1: estimated change in cost by type of building

Building type	Construction costs using withdrawn British Standards (£)	Construction costs using Eurocodes- based British Standards (£)	Change (£)	Change (%)
<ul style="list-style-type: none"> Two storey detached house (masonry) 	40,621	40,505	-116	-0.3
Single storey office	47,179	47,179	0	0
Seven storey concrete office building	1,806,688	1,801,081	-5,607	-0.3
Seven storey steel office building	1,682,105	1,689,455	7,350	0.4

47) This modelling illustrates that there may be between a -0.3% to 0.4% change in the cost of construction as a result of a move to referencing the British Standards based on Eurocodes for these notional building types. This suggests that there is not a significant change in the net cost to industry - to be expected given that the implementation of Eurocodes through the British Standard sought to deliver approximately the same result, for example, on factors of safety in design, as the previous, currently referenced, Standards.

48) The further work undertaken by EC Harris for the Department during the consultation period also considered further the cost of construction and broadly supported what the modelling showed. Seven of the principal structural engineering trade bodies were contacted to test the assumption that build costs would not increase. The evidence available led the report's findings to state:

“A few trade bodies have undertaken build cost comparisons between sample designs based on Eurocodes and British Standards. The general conclusion corresponds with DCLG's assumption that the use of Eurocodes has minimal impact on the build costs”.

49) Based on the estimated costs set out in Table 1 above, the earlier analysis made an estimate as to how these costs and benefits translated into a total cost to construction (based on the number, type and construction method) from the notional building types. This suggested a net benefit in the region of £3m per year. Given this figure represents a saving of less than 0.1% of the total build costs we believe for the purposes of this Impact Assessment that the change should be considered to be cost neutral.

- 50) The consultation also specifically sought views on this assumption. Only 29 of the 100 respondents answered this question. Of those 16 disagreed and 13 agreed. A common comment was that it was too early to say definitively. Others were of the opinion that certain forms of construction might involve an increased cost – the main difference was whether this would be offset (or more) by savings from other elements.
- 51) Overall, therefore, we have not seen sufficient evidence to suggest that Eurocodes will increase the overall cost of constructing buildings – indeed modelling suggests a small net benefit. Certain aspects of certain types of building may become more or less commercially attractive. However, the extent to which any estimated differences persist over time is uncertain and is likely to be much less significant than changes in construction practice and the cost of raw materials.
- 52) More fundamentally, however, we believe that it would not be correct for this Impact Assessment to claim ongoing net benefits (or costs) because of the functional nature of the Building Regulations. This means that designers are able to choose the “best” (which may well be the most cost-effective) method of designing a building subject to it meeting the requirement to be structurally safe. Therefore, if a certain type of building is cheaper to design using a design approach different to that set out in the British Standards based on Eurocodes they are free to do so.

Transitional Costs – Costs per firm

- 53) The major cost of Option 1 relates to the transitional, one-off costs associated with a change to the referenced Standards. Responses to the consultation and engagement with industry and particularly BSi means that we know that some firms have already incurred costs associated with a move over to a design approach based on Eurocodes. This will be for a variety of reasons, but most likely because they see commercial benefit in doing so, that they have taken a professional decision to utilise the most up-to-date structural design tools or because they have been compelled to because they wish to undertake work that is publicly funded (and therefore requires a Eurocodes-based approach to be used).
- 54) These firms will have purchased the new British Standards, undertaken training, changed specifications etc and have incurred some (or all) of the associated costs already. However, there remains a significant part of the sector that has yet to incur these costs. To develop a robust estimate as to the scale of the costs, it is necessary to first understand what the component transitional costs are (for example, training, buying Standards etc) and the extent to which firms have already incurred these voluntarily.
- 55) The analysis carried out by the Scottish Government¹⁰ in 2010 built on the earlier work done by the Institution of Structural Engineers. Both provide a detailed breakdown of the component elements of the cost to business. The Scottish assessment updates some of the earlier costings and refines assumptions.

¹⁰ <http://www.scotland.gov.uk/Resource/Doc/217736/0122580.pdf>

- 56) Both of these pieces of work looked at the cost to a notional firm of a move to Eurocodes – using a consultancy with 16 fee-earning technical staff as being typical of a firm affected. A cost per structural engineer is then arrived at and then a total figure calculated by multiplying this by the number of structural engineers operating in Scotland. The Impact Assessment published by the Scottish Government identified a transition cost of around £11,000 for each of their 1500 engineers.
- 57) This Impact Assessment uses these Scottish costings as a starting point, but refines them further (as did the consultation stage Impact Assessment). The costings have been further developed in three main ways:
- the individual costs and underlying assumptions have been refined
 - the costs of a very small (two-man) engineering consultancy as well as the notional 16 man firm have been considered
 - information provided by BSi on the market for the British Standards based on Eurocodes has been used as a basis for estimating the total costs yet to be incurred by industry.
- 58) The consultation paper specifically asked whether consultees agreed with the estimate of the transitional costs to business of this change. Only 43 of the 100 respondents answered this question. Of those 22 agreed with the costs and 21 did not with most responses lacking detailed comments. Where more detail was given this has been included in the consideration of the individual cost elements below.
- 59) It should be noted that while the ISE believes that “adoption of the Euro-code based standards is industry critical” it also believes “that the estimates provided [in the consultation Impact Assessment] underestimate the costs to SME's”. However, more detailed evidence was not provided and, in effect, the response maintains the ISE’s previous estimation of the costs carried out for the then Office of the Deputy Prime Minister in 2004 - something that this Impact Assessment seeks to refine (as did the earlier Scottish assessment).
- 60) The further EC Harris work also sought information on costs through their survey of firms, however, as their report noted, the number of firms who responded, the nature of those responses and the size of the firm responding means that the evidence is insufficiently robust to provide anything other than fairly high-level conclusions to be drawn.
- 61) The transitional costs identified in this Impact Assessment are both direct ones (in terms of purchase of standards and education/training costs) and more indirect ones (such as reduced productivity during a period of familiarisation). As a starting point we have examined the costs on two types of firm - a very small one with only two structural engineers and a more medium-sized one with 16 engineers. The costs for these two types of firm are set out below. A short explanation of the basis for the costings and any comment from consultees on that is set out below for the individual cost elements. All the costs are presented in current prices.

Purchasing the New British Standards Based on Eurocodes

- 62) The first cost is the need for firms to buy the new British Standards based on Eurocode. This cost can be arrived at by identifying the core set of Standards that a structural engineer is likely to purchase. A 50% discount for BSi members on the cost of buying British Standards means that it is cost-effective for firms to purchase membership. The cost of membership for two man firm is £215 and for a 16 man firm £280¹¹. Purchasing the core set¹² of Eurocodes-based British Standards would cost £1,852. This means that the total cost for a two man firm is £2,067 and for a 16 man firm £2,132. Only 4 respondents to the EC Harris survey provided an estimate of the cost of purchasing the British Standards with figures ranging from £500 to £5,000.

Purchasing Accompanying Guidance

- 63) In addition, firms are likely to also purchase supporting technical design aids to help them understand the practical use of the standards which we expect to cost £340 (range £200 - £480). We believe previous assessments of a cost of £700 - £1,000 is a significant over-estimate because it was based upon the assumption that all firms/engineers would be required to have all of the new Eurocodes suite of Standards which is not the case - particularly for small firms who are more likely to specialise. We have quantified the cost of guidance documents at £50 (range £40 - £60) per version, based on information sourced from the British Standards Institute online shop¹³. Each version of guidance covers a type of material used in construction (masonry, steel, concrete etc). It will only be necessary for firms to purchase versions of guidance which are relevant to the types of material they typically construct with - on that basis typically a firm will purchase between 5 and 8 guidance documents.
- 64) Respondents to EC Harris's survey showed a wide range of estimates from £225 to £5,000. However, despite that range, two of the firms reported spending £50 per document (with total expenditure of £200 and £300) with five firms reporting expenditure of £500. Neither did consultation provide any significantly differing evidence. On that basis, we believe that our estimated range of £200 to £480 is reasonable.

¹¹ shop.bsigroup.com/en/Navigate-by/Membership/Join-BSI-today/Membership-types/

¹² The Standards (all with the National Annexes) would be made up of: BS EN 1991-1-1:2002; BS EN 1991-1-3; BS EN 1991-1-4; BS EN 1991-1-7; BS EN 1992-1-1:2004; BS EN 1993-1-1:2005; BS EN 1993-1-8:2005; BS EN 1995-1-1:2004; BS EN 1996-1-1:2005; BS EN 1997-1:2004; BS EN 1997-2:2007

¹³ <http://shop.bsigroup.com/Navigate-by/Books/Books-LP/book-homepage/Buildingconstruction-books/>

Cost of New Software

- 65) In relation to the cost of updating software to reflect the different design approach set out in Eurocodes, engagement with software suppliers indicates that commonly-used software packages for basic building types might be available for £2,750 (with each additional license costing £2,100). Information provided by a supplier of commonly-used industry software indicated the cost of a basic package for a two engineer firm is approximately £2,750. A 16 engineer firm is expected to purchase an additional five licenses (at £2,100 each) meaning the total software cost amounts to £13,250 (we believe the consultation stage Impact Assessment incorrectly overlooked the need for these larger firms to purchase additional licenses).
- 66) However, many software packages come with the option of a maintenance and update package which provides, for an annual fee, free updates of the sort considered above (ie a move to a design approach based on the British Standards based on Eurocodes). Discussions with industry suggest that a significant number of firms take up this option and would not, therefore, incur additional software costs as a result of the change. However, for the basis of this Impact Assessment we propose a cautious approach to reducing this element of cost and have therefore assumed that only the 16 man firms would benefit from having entered into this arrangement (ie all two man firms would incur the full software costs). For the larger 16 man firms we have assumed that a half of these firms would not incur software costs. In turn this means that the average cost to a 16 man firm is £6,625.
- 67) Only four respondents to the EC Harris survey offered estimates of software costs with these ranging from £300 to £20,000. Neither did we get detailed responses from the consultation on this aspect of the Impact Assessment.

Training, Productivity and Familiarisation

- 68) There will also be education and training requirements associated with a move towards a Eurocodes-based approach to structural design. Research has indicated that courses covering loading and the principal structural materials are available for between £280 and £310 in the London region. We have used the higher cost of £310 per engineer attending a training course. For a 16 person firm we believe four members of staff will each attend a relevant course (and then feed back information and knowledge to colleagues). For the smaller firm we believe that both engineers would train separately, because size of firm would make this the more practical option. This results in the cost of training for a 2 person firm totalling £620 and the total cost for a 16 person firm totalling £1,240.

- 69) We have also costed the lost hours as attendance at such a course based on losing a days work (7.5 hours at £37.29 per hour per attendee) at a cost per attendee of £280 (range £184-£375). The £37.29 per hour wage rate and a 7.5 hour day is also used for other relevant calculations below. The hourly wage rate used is the midpoint of two datasets. The high hourly wage rate used a £50 charge out rate which was sourced from the ISE and verified by other industry sources. The low rate uses ASHE¹⁴ figures which estimated the hourly wage rate of an engineer at £24.58, giving a best estimate hourly wage rate of £37.29. These figures are used as a proportionate approach to calculating these costs to business. With both engineers assumed to attend we calculate the cost to a 2 person firm would total £559 (range £369-£750). The loss of earnings of 4 engineers from a 16 person firm attending a conference would total £1,119 (range £737-£1500).
- 70) The EC Harris survey provided varying estimates of the cost of training – varying from £300 to £15,000. This upper figure was for a very large firm which employs 111 people – which is a much larger firm than we are quantifying the costs for. Of the 11 firms that employed 12 people or fewer, responses ranged from £500 to £1,200. We believe, therefore, that the estimates of the cost of training remain reasonable.
- 71) More generally, assessing the earlier work done on training, loss of productivity and familiarisation, we believe there remains an element of double-counting within the individual elements (the Scottish assessment reduced a previous 10% loss of productivity to 5% because of this). Whilst we do not at this stage question that 5% assumption (and neither our own or the earlier Scottish consultation provided evidence to suggest using a different figure) we do believe that an additional cost of 12 man days per person for familiarisation in addition to loss of productivity and training is an over-estimate¹⁵. Familiarisation covers the time that engineers will need to spend acquainting themselves with the new British Standards. Given that we are already factoring in training and loss of productivity we believe a better estimate of this cost would be in the region of seven days.
- 72) While this was tested at consultation, there was little comment on this aspect of costs. We believe it will take each engineer 7 days to become familiar with Eurocodes at a cost per engineer of £1,958 (range £1,291 - £2,625) using an hourly wage rate of £37.29 (range £24.58 - £50) and assuming a working day of 7.5 hours. This results in a familiarisation cost for the 2 person firm totalling £3,916 (range £2,581 - £5,250) and £31,325 for a 16 person firm (range £20,650 - £42,000).
- 73) In relation to loss of productivity, we anticipate an engineer losing 5% productivity at a working year of 1,600 hours and an hourly wage rate of £37.29. For a 2 person firm the loss of productivity would cost £5,967 (range £3,933 - £8,000), and for the 16 person firm the loss of productivity would cost the firm £47,733 (range £31,466 - £64,000).

¹⁴ Annual Survey of Hours and Earnings (2012): Wage rate for Design and development engineers plus 30% in line with Standard Cost Model methodology = £18.91 * 1.3 = £24.58. <http://www.ons.gov.uk/ons/rel/ashe/annual-survey-of-hours-and-earnings/2012-provisional-results/index.html>

¹⁵ In the original ISE estimate of the costs of Eurocodes 12 man days were assumed to be lost, in addition to the 10% loss in productivity.

74) Again the EC Harris survey showed a wide range of views as to how much longer tasks would take as a result of this change. Of the 23 firms that expressed a view, eight believed the additional time would be less than 20%, with nine estimating this cost at between 20% and 30%, four between 50% and 100% and two that thought tasks would take three times longer. However, as stated earlier, and despite the Department specifically asking about the impact on productivity, the wider public consultation was less clear. Only 43 of the 100 respondents gave a view as to whether they agreed or not with the assessment of the transitional costs and of those 22 agreed and 21 did not. However, there were few comments about the productivity element of the costing (statements tending to relate to the overall costs rather than the individual elements) and little additional evidence. On that basis, this Impact Assessment continues to use a 5% loss of productivity.

Alteration to In-house Specifications

75) Separate and in addition to the productivity-related costs are the costs that firms will incur as a result of the need to revise their in-house specifications to reflect the move to a design approach based on the British Standards based on Eurocodes. The initial work undertaken by the Institution of Structural Engineers for the then ODPM estimated that firms would have on average 14 such specifications and that each one will take one man day to update (subsequent analysis and consultation has not suggested this figure is incorrect). This results in one-off costs to each firm of £3,916 (range £2,581 - £5,250) based on an hourly wage rate of £37.29 (range £24.58 - £50) and assuming a working day of 7.5 hours.

76) The individual costings above allow us then to make an estimate of the total potential cost for two notional firm sizes – a small one employing two engineers carrying out structural design work and a larger one employing 16 engineers. A breakdown of the costs is in the two tables below.

Table 2: Midpoint transition cost for a 2 Person Firm

Item	Cost (£)
Cost of purchasing Eurocodes	£2,067
Cost of buying guidance documents	£340
Cost of updating software	£2,750
Attendance at technical seminars (fee)	£620
Attendance at technical seminars (lost hours)	£559
Familiarisation	£3,916
Alteration to in-house specification	£3,916
Loss of productivity in first year	£5,967
Total	£20,134

Table 3: Midpoint transition cost for a 16 Person Firm

Item	Cost (£)
Cost of purchasing Eurocodes	£2,132
Cost of buying guidance documents	£340
Cost of updating software	£6,625
Attendance at technical seminars (fee)	£1,240
Attendance at technical seminars (lost hours)	£1,119
Familiarisation	£31,325
Alteration to in-house specification	£3,916
Loss of productivity in first year	£47,733
Total	£94,429

Transitional Costs – Overall costs

- 77) The next stage is to use these figures to establish the **total cost to industry of Eurocodes**. As stated above, the Scottish assessment used similar estimates (of a cost to a notional firm) to establish a cost per structural engineer and arrived at a total cost by multiplying it by an estimate of the total number of structural engineers. However, as illustrated above, such an approach is significantly influenced by the assumption of size of firm that a “typical” engineer works in (the average transition cost per engineer is approximately £6,000 and £10,000 for a 16 person and 2 person firm respectively). We therefore propose to use the cost for both types of firm set out above as a starting point for calculations.
- 78) Such an approach is dependent on two main factors – the actual costs per firm (and principally the size of firms chosen) and the number of firms these costs apply to.
- 79) The construction industry is characterised by small and medium-sized enterprises and we believe this is primarily where the main costs of Eurocodes implementation will fall (there are a small number of larger British-based firms in this sector, but these will operate internationally and will, we assume, have already encompassed the use of Eurocodes, and the associated costs, voluntarily). Responses to the consultation demonstrated that there was significant consensus that changing the referenced British Standards would impact particularly on small structural engineering firms.
- 80) This Impact Assessment assumes, therefore, that costs principally fall on very small firms (two structural engineers) and more medium-sized enterprises (sixteen structural engineers). For the calculations in this Impact Assessment we have assumed that of those firms affected, 80% will be smaller firms and 20% will be medium-sized firms. Figures from the Office of National Statistics¹⁶ back up our 80:20 estimate as their data shows that 80% of firms operating in the construction industry have between 0 and 4 employees.

¹⁶ UK Business: Activity, Size and Location, 2012: <http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tc%3A77-254601>

- 81) In estimating the number of firms that might be affected, work carried out on DCLG's behalf by BSi has provided valuable evidence about the specific part of the industry that would be affected by this proposal. The work was carried out in mid-2011 originally to support the consultation stage Impact assessment. While the Department did request an update of these figures for this Assessment, unfortunately BSi has not found it possible to extract comparable data. This final Impact Assessment, therefore, continues to use the earlier evidence as a basis for estimating costs.
- 82) The analysis of the sales records of the currently referenced, withdrawn Standards shows there were approximately 4,000 individual firms that had purchased them in the years before they were withdrawn (with some of the Standards dating back to the 1990s). It is reasonable to assume, therefore, that the potential market for Standards based on Eurocodes would be very similar.
- 83) BSi then looked at the sales of the new British Standards based on Eurocodes. This showed that 3,000 of those 4,000 firms had already purchased Eurocodes-based Standards in the years from 2005 to 2011. This suggests that industry is, to a significant extent, moving towards these new Standards voluntarily (whether it be because they see benefits in terms of using standards that allow them to compete outside of the UK or because they have taken a professional decision to use the most up-to-date British Standards as a basis for their design and construction work).
- 84) However, average expenditure on the purchase of the actual standards was only around £470 per firm by June 2011. This means that on average these firms had spent only around 25% of the £2,000 cost of purchasing the standards necessary. This suggests that some firms may be simply purchasing limited numbers of design standards to assess their potential implication, that some firms are perhaps choosing to move over gradually and/or some specialised firms would only have a limited standards requirement.
- 85) Analysis by BSi of the sales figures also revealed that 235 firms had bought Eurocodes for the first time in the 12 months to June 2011. If this new rate of sales continued we would anticipate that around an additional 550 firms would purchase for the first time British Standards based on Eurocodes in the two years and four months up to October 2013. However, we recognise that the lack of more recent figures makes this figure less certain and, therefore, have taken a cautious approach by assuming that an additional 400-500 firms would have purchased voluntarily some Eurocode products by October 2013. Conversely, this means that we have also assumed that there would remain 500-600 firms that have not purchased any Eurocodes. Table 4 summarises the number of firms we expect will have purchased some Eurocodes (and need to need to incur more costs) by October 2013.

Table 4 - Number of firms which will have purchased some Eurocodes by October 2013

Description	Lower	Mid	Upper
Number of firms which have already purchased Eurocodes	3,000	3,000	3,000
Number of firms we anticipate will purchase Eurocodes between June 2011 and October 2013	400	450	500
Total number of firms that will have purchased some Eurocodes by 2013	3,400	3,450	3,500

86) Further, the functional nature of the Building Regulations means that Eurocodes need not necessarily be used even if guidance in Approved Document A were updated to reference them. Instead engineers would be able to set out to a building control body why the alternative design approach they have taken satisfactorily addresses the safety provisions in the regulations. We believe that such an approach is likely only to be appropriate for the smaller-sized firms (and perhaps some of the medium-sized firms) whose work is of a nature that will mean currently referenced (withdrawn) standards remain robust for continued use. We tested at consultation the assumption that around 300 firms would continue to build to currently referenced standards in the longer-term and thereby not incur any of the cost of this. There was little specific comment on this. However, a significant number of responses argued that it would be appropriate for firms carrying out smaller-scale, lower-risk work to continue to use the withdrawn British Standards. As the Department will be issuing advice to building control bodies and industry that such an approach may be satisfactory, we continue to believe a significant number of firms will not incur Eurocodes-related costs.

87) Therefore, if we assume 300 firms will not move over this means that only approximately 200-300 firms will have not committed to Eurocodes at all and are still to incur **all** of the costs associated with this change. For the purposes of establishing a total cost we assume that 160-240 of these firms will be the smaller 2 person firms, and 40-60 firms will be the larger 16 person firms (see paragraph 80 above). Table 5 presents the number of firms we expect will not have purchased any Eurocodes and will purchase Eurocodes and incur costs.

Table 5 – Number of firms which we expect to have purchased no Eurocodes by October 2013, and the number of firms incurring all the transition costs

Description	Lower	Mid	Upper
Total number of firms in the market	4,000	4,000	4,000
Number of firms which will have purchase some Eurocodes by October 2013 - taken from table 4	3,400	3,450	3,500
Number of firms which will have purchased NO Eurocodes by October 2013	600	550	500
Number of firms not expecting to adopt Eurocodes	300	300	300
Number of firms who we have not purchased any Eurocodes but will purchase Eurocodes	300	250	200

- 88) The advice the Department intends to issue alongside these changes to Approved Documents will also set out that withdrawn British Standards will continue to be generally acceptable for a period of around five years. We expect, therefore, that firms will choose to incur the cost of moving to the new British Standards over that period and have assumed an even distribution of cost over each year of that period. When applying the transition cost (£20,000 for small firms and £94,000 for medium firms) to the number of firms adopting Eurocodes in each year results in a total present value cost of £8.2m¹⁷ (range £6.5m - £9.8m) for the 250 (200-300) firms incurring all of the cost of moving over to Eurocodes.
- 89) However, there remain the 3,000 firms that as of now have incurred around 25% of the potential expenditure (paragraph 84) and the further 400-500 firms that we expect to have incurred Eurocodes-related costs by 2013 voluntarily (paragraph 85). Again the total costs are heavily dependent on the assumptions about how far these firms would move voluntarily towards British Standards based on Eurocodes in the absence of Option 1 being taken forward. If we were to assume all of these firms are voluntarily already on their way towards adoption then there is no additional cost. Or, if we were to assume that all of these firms would actually still have on average 75% of the cost to incur (and we use the 80/20 split for the type of firm) then there would be an additional cost of £84.6m on top of that set out at in the paragraph above.
- 90) Neither of these assumptions appears realistic, given anecdotal evidence of a mixed picture of firms already adopting the British Standards based on Eurocodes. Therefore we have assumed 50% of the 3,400-3,500 firms will incur costs of extra purchases of Eurocodes products (this number excludes the 200-300 firms who will incur 100% of the costs, and the 300 firms we do not think will move over at all). Based on BSi sales data (paragraph 84) we expect these firms to still incur 75% of the costs of implementing this change we calculated for a two man and 16 man firm in tables 2 and 3. Using the 80/20 split of the size of firm, and assuming an even migration over to Eurocodes in each of the 5 years, results in a total present value cost over 5 years of £42.3m¹⁸ for firms incurring

¹⁷ £3.8m total PV cost to smaller 2 man firm and £4.4m total PV cost to larger 16 man firm.

¹⁸ £19.5m total PV cost to smaller 2 person firms and £22.8m total PV cost to the larger 16 person firms.

additional costs of moving over to a Eurocodes-based approach. Our assumption that these firms will incur 75% of the costs may be an overestimate given that this data was collected in 2011. This is because we would expect more firms to have progressed in their migration over to Eurocodes meaning that industry has incurred more than 25% of the total cost, but in the absence of more up to date data we have used the data from 2011.

- 91) We have carried out some sensitivity testing around the percentage of firms which still need to purchase more Eurocodes. If we assumed that 25% of firms still need to incur the Eurocodes-related costs, and that they are yet to incur 75% of the costs this results in a total PV midpoint cost over 5 years of £21.5m. If we assume that 75% of firms incur 75% of the cost of Eurocodes this results in a total PV midpoint cost of £62.5m.
- 92) The figures and assumptions set out above are summarised in the table below.

Table 6: Total transition cost of Eurocodes

Item/Assumption	Number of firms	Average cost per year – over 5 years (constant prices)	Total cost over 5 Years Discounted
Potential market for the Eurocodes (number of firms)	4,000		
Minus the 3,000 firms that have already purchased some Eurocodes	1,000		
Minus 450 we anticipate will voluntarily purchase some Eurocodes by 2013	550		
Minus the 300 firms that we assume will continue to use currently referenced standards	250		
Total number of firms that have not purchased any Eurocodes by 2013	250		
20% (50 firms) incurring the cost of a 16 man firm of £94k		£0.9m	£4.4m
80% (200 firms) incurring the cost of a 4 man firm of £20k		£0.8m	£3.8m
Total cost to firms that have not purchased Eurocodes		£1.7m	£8.2m
Number of firms that by 2013 will have purchased some Eurocodes	3,450		
Central estimate of the additional cost relating to (50% of) the 3,450 firms purchasing more Eurocodes		£9.1m	£42.3m
Total Cost – Central Estimate		£10.8m	£50.5m
High Estimate - Additional cost if 75% of these 3,400 firms still have 75% of the costs to incur		£13.4m	£62.5m
Low Estimate - Additional cost if 25% of these 3,500 firms still have 75% of the costs to incur		£4.6m	£21.5m
Total Cost Range		£6.0m - £15.4m	£28.0 - £72.4m

93) Further, to illustrate how assumptions affect the overall estimated cost of Option 1, we have also applied a sensitivity test around the size of firms that would incur additional costs. We have considered what would happen if 70% of firms were of a smaller size and 30% of firms were of a larger size. The central estimate would be £61.2 million - a 21% increase difference between costs in a central case in both scenarios.

94) However, we believe that an assumption of an 80/20 split is a reasonable one to make. On that basis, we estimate that the total cost of regulation would be approximately £54.0m in constant prices. We assume adoption of Eurocodes this happens equally over five years resulting in a net present cost of £50.5m.

Other Costs

95) The building control function is carried out by both local authorities and private sector Approved Inspectors. It will be up to the building control body to determine how they satisfy themselves that the provisions in the regulations and guidance have been complied with. Changes to the Building Regulations generally incur costs for building control bodies, however, where they select to check the structural design, this work will generally be carried out by a structural engineer (either employed directly or by buying-in this expertise). As such, the costs to building control bodies is accounted for in the assessment of the cost to the structural engineering sector set out above.

Benefits – Option 1

96) As stated above (paragraph 49), for smaller-scale development the actual cost of construction may be marginally lower using the Eurocodes-based standards than those currently referenced in Approved Document A. However, savings are relatively modest and may be largely offset by very small increases in the cost of constructing certain types of larger-scale building. In addition, the functional nature of the Building Regulations would allow the new British Standards to be used on a project even if the change to the referenced Standards was not made. For that reason we are not claiming any benefit in terms of reduced costs of construction of moving to Eurocodes in this Impact Assessment. Further evidence submitted to the consultation has been presented for both sides of the argument although none of the estimated impacts is large.

97) Although it is not possible to quantify the benefits (or rather costs avoided), updating the standards referenced will continue to ensure that buildings are constructed using up-to-date and supported standards which ensure adequate minimum safety standards are maintained).

98) In addition, Eurocodes will lead to a wide range of benefits to industry, these include:

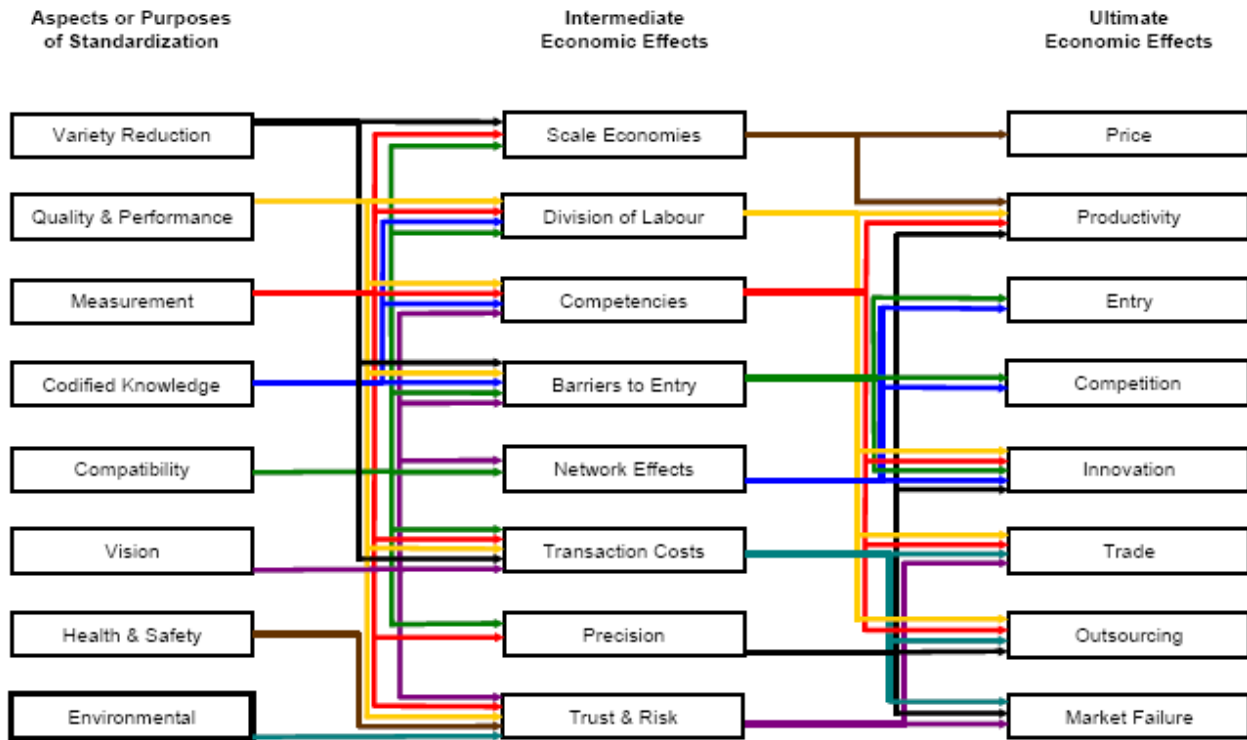
- providing a common design criteria and methods of meeting necessary requirements for mechanical resistance, stability and resistance to fire, including aspects of serviceability, durability and economy
- providing a common understanding and usage regarding the design of structures between owners, operators and users, designers, contractors and manufacturers of construction products
- facilitating the exchange of construction services between Member States
- facilitating the marketing and use of structural components and kits in Member States
- facilitating the marketing and use of materials and constituent products, the properties of which enter into design calculations as a common basis for research and development, in the construction industry

- allowing the preparation of common design aids and software
 - increasing the competitiveness of UK and European structural and civil engineering firms, contractors, designers and product manufacturers in their world-wide activities; other countries, some with standards based on existing national standards of EU member states or that perceive Eurocodes will offer a good competitive basis are also interested in adopting Eurocodes, making them even more powerful and accepted worldwide and therefore driving further benefits to UK firms operating internationally.
 - provide a common basis for research and development activities in civil engineering and building research
 - provide a more uniform level of construction safety in the different European regions
- 99) There is a wide economic literature on the benefits of standardisation. Many studies have established a clear connection at a macroeconomic level between standardisation in the economy, productivity growth and overall economic growth. These have been carried out in the UK, Germany, France, Canada and Australia. Estimates vary somewhat from study to study, but overall, the growth of the standards catalogue accounts for between one eighth and one quarter of productivity growth.
- 100) Work by DTI (2005¹⁹) suggested that an increase in the volume of standards has been found to increase labour productivity. The report estimated that a 1% increase in the standards catalogue is associated with a 0.05% increase in labour productivity. This increase in labour productivity contributed to a 13% of the growth in labour productivity in the UK in the period 1948 to 2002. Over the period 1948 – 2002 the UK's average annual growth rate was 2.5% per year, technological change accounted for 1% of the growth and it is estimated that standards were associated with over a quarter of this figure.
- 101) Standardisation helps to build focus, cohesion and critical mass in the formative stages of a market. Standardisation of measurements allows innovative producers to demonstrate to the satisfaction of the customer that products are as innovative as they claim to be. Standardisation codifies and diffuses state of the art technology and best practice. Open standards are desirable to enable a competitive process of innovation-led growth. In short, standardisation is an essential part of the microeconomic infrastructure: it enables innovation and acts as a barrier to undesirable outcomes.
- 102) Standards enable the diffusion of innovation into the market place and the innovation development of products and services by setting out ground rules, common terminology development methods and measurement techniques, such as biometrics.
- 103) Standards can help to propagate innovations, and hence to enable economic benefit to be derived from them. They do so by spreading acceptability of an innovation in the market, and by enabling other suppliers to incorporate the innovation in their own products. The former effect benefits innovators directly whereas the latter can only do so indirectly (purchasers benefit from both effects).

¹⁹ DTI economics paper number 12: The Empirical Economics of Standards, 2005, <http://www.sis.se/upload/632555702720125533.pdf>

- 104) Estimates made of the contribution of standardisation to economic growth suggest that the effect is hugely significant, with standards estimated to account for between 9% and 27% of GDP growth in various studies²⁰ that have analysed impacts over time and in different countries, with a UK specific estimate of 11%.
- 105) Swann (2010)²¹ identified the eight purposes of standards and eight important ways in which they drive economic benefits:

Figure 2
Model of Economic Effects of Standardization



Source: Swann (2010)

- 106) On the basis of the approach above, some of the anticipated benefits of adopting a Eurocodes-based design approach might include:
- sending a clear signal to buyers that products deliver equivalent standards of quality and performance and thereby boosting trade
 - reducing variation and thereby helping firms bid for work on the basis that they can apply the same techniques, approaches and products from existing projects. A common standard also reduces a barrier to entry in terms of export services, as understanding of separate standards is not required, and
 - increasing interoperability and compatibility, thereby reducing the price of components as producers benefit from further economies of scale and division of labour as the market expands. The benefits would be manifest, ultimately, in lower prices.

²⁰ For summary see Source: AFNOR, The Economic Impact of Standardization, 2009, available at: www.sis.se/pdf/Economic_impact_of_standardization_France.pdf

²¹ Swann, The Economics of Standardization: An Update, 2010, <http://www.bis.gov.uk/policies/innovation/standardisation/economic-benefits>

- 107) The Eurocodes are only one component of the stock of standards so it is not possible to isolate the benefits to industry. However, as discussed above, Eurocodes will contribute to the macroeconomic benefits that standardisation brings and will contribute to the diffusion of innovation which will contribute to economic growth.
- 108) Eurocodes have been adopted across the European Union and this harmonised market will make it easier for UK firms to compete for more work throughout the EU. Consumers in the UK will also benefit from Eurocodes due to the harmonisation of standards across the EU. This is because a harmonised EU construction sector will lead a wider pool of firms being able to operate across borders, this should, in theory lead to additional competition which should make the construction sector more competitive resulting in greater innovation and potentially lower prices, which will benefit the consumer.
- 109) Eurocodes are also being adopted outside of the EU, demonstrating the strength of a large harmonised trading bloc. For example, Singapore has incorporated Eurocodes into their regulations this year, and countries like Malaysia and Vietnam have started the adoption process. Russia is also advanced in their adoption of Eurocodes. This suggests that other countries see the strength in a harmonised approach as it leads to increased trade and increased export opportunities for their construction firms.^{22 23}

Other Consequential Changes

- 110) In addition to the principal changes to Approved Document A, there are a small number of other changes to both Approved Documents A and also C (Site preparation and resistance to contaminants and moisture) to reflect the updating of the currently referenced standards to ones based on Eurocodes. These consequential changes are:

Approved Document A

- updating of wind speed map and associated texts for small residential buildings design guidance under A1/2 to reflect Eurocodes loading standards, and
- updating of robustness guidance under A3 to reflect Eurocodes disproportionate collapse/robustness standards.

Approved Document C

- updating of site investigation techniques under Section 1 to reflect Eurocodes geotechnical standards.

- 111) As with the main changes above we do not believe there to be any net increase in the cost of construction as a result of this updating. Also, as these changes affect the same people in industry as the principal changes to Approved Document A, we do not believe there to be any additional transitional costs to those firms. Similarly, the benefits to accrue are as for those non-monetised ones set out above.

²² <http://www.link2portal.com/most-significant-change-construction-standards-ever>

²³ <http://www.nzweek.com/world/singapores-building-authority-to-introduce-eurocodes-56345/>

Risks and Assumptions

- 112) The assumptions used in arriving at the costs of pursuing Option 1 are set out clearly as part of the explanation as to how costs and benefits have been estimated. These were tested at consultation and views were specifically requested. Key assumptions are:
- costs/savings associated with the cost of construction are on the whole neutral
 - the estimates on the individual elements of the cost on firms – in particular software, other design aids, productivity and familiarisation costs
 - that large firms would have incurred the costs of moving to Eurocodes voluntarily
 - that the make-up of those firms that will incur additional cost is 80:20 in favour of the smallest firms
 - the number of firms that will not move over to Eurocodes within the 2015 timescale or at all
 - that approximately a half of firms that will have purchased Eurocodes have yet to incur 75% of their costs.
- 113) Where consultation and/or the additional EC Harris work provided insight into these assumptions, this has been reported on in the relevant, preceding paragraphs.
- 114) A key risk is that cost of constructing to British Standards based on Eurocodes is significantly greater than the cost of constructing to existing British Standards. However, available evidence suggests that this will not be the case.
- 115) We have considered the risk in terms of the adverse effects this policy might have on small business and described how these might be mitigated in the Small Firms Impact Test below.

Wider impacts

Equalities Impact Test

- 116) A screening of the policy has been carried out which determined that a full equalities impact test was not required as the proposal does not adversely affect any minority groups.

Competition Assessment

- 117) The proposed policy updates the standards that buildings should generally be constructed to. As such it does not make any significant change to how the UK market will operate, although the aims of Eurocodes are to improve competition and trade at the European level by the removal of technical barriers. Our assessment indicates, therefore, that the policy proposal will not directly or indirectly limit the number or range of suppliers, limit the ability of suppliers to compete or reduce suppliers' incentives to compete vigorously.

Small Firms Impact Test

- 118) There will be costs to many small and medium enterprises resulting from the referencing of the British Standards based on Eurocodes, in terms of training staff, in purchasing the Standards (and supporting design aids) and in some initial reduction in productivity. Smaller firms are also less likely to have already incurred the cost of switching voluntarily to Eurocodes, partly because of the reason above, but principally because they are less likely to be able to realise the benefits that Eurocodes potentially provide in terms of competing for work outside of the UK.
- 119) We have thought carefully about how the impact on micro-businesses of these changes might be reduced. Given the changes are necessitated by Europe it would not be possible to exempt micro-businesses. However, more generally, changes to the Building Regulations have not exempted such firms largely because of the make up of the construction sector, approximately 90% of which is made up of micro-businesses. This would present significant practical difficulties in exempting these firms given a micro-business could be one of a number of entities involved in a development project: the owner of the building who commissioned the project; the tenant; the developer/contractor and/or sub contractors involved in specific aspects of the work. There could be instances where on one development where some firms will be caught and others exempt which would potentially increase complexity and undermine safety outcomes.
- 120) For these reasons we have focused on how costs might be minimised for such firms. Although, as previously stated, the Building Regulations are functional in nature and following the guidance represents only one way of complying, many in industry view the Approved Documents as rules that must be followed. Therefore the changes to the Standards referenced do not necessarily bite immediately or indeed, for some, at all. In order to ensure this flexibility is properly understood by business and building control bodies, the consultation proposed to supplement guidance in the Approved Document with additional advice that clarifies that: Our consultation made clear, therefore, that to seek to minimise the cost to industry we would provide supporting guidance that would do two things:
- it would make clear that existing Standards would remain acceptable until some time after 2015 which would provide industry with a number of years to adapt to the change.
 - it would provide reassurance for some firms, typically smaller ones whose work is focused on smaller, less complex structures, that the existing standards could continue to be used beyond that, thereby avoiding the additional costs at all.

There was widespread support for this proposed approach and with the idea that the replaced Standards would remain generally acceptable for a period of time – five years was most commonly suggested. In the light of consultation, we intend to adopt this longer period which we believe will further assist a practical and orderly transition that minimises the impact on business. Therefore our proposed approach is to make clear to business and building control bodies that:

- the use of withdrawn British Standards would be generally acceptable for a period of around five years referenced standards would demonstrate compliance with the Building Regulations

- beyond 2018 the use of these standards may still be acceptable for routine designs - particularly likely to be appropriate for smaller-scale development.

121) This will assist business, and small firms in particular, in two ways:

- it will provide at least an additional five years for firms to prepare for, and spread the costs over, the switch to a regime based on Eurocodes.
- it will also allow certain types of firm, principally those very small firms whose work is made up of smaller-scale buildings in the domestic sector, to continue to use the currently referenced British Standards into the future, thereby avoiding the additional costs associated with a switch to Eurocodes at all.

122) Such flexibility would be at the discretion of the building control body concerned. This goes beyond the original proposals in the consultation therefore in the light of further consideration and a widespread call from industry (including the majority who are supportive of the change to the referenced Standards) to allow greater time for transition and certainty about the ongoing use of withdrawn Standards beyond that.

123) On that basis, it is considered that the proposals to change the guidance in the Approved Documents will be implemented in a proportionate and equitable way. As the changes are necessary to provide a regulatory framework into the future that complies with European requirements the Department for Business, Innovation and Skills has confirmed that the change is not within the scope of the moratorium on regulations affecting micro-businesses.

Environmental Impact Tests

124) It has been determined that this policy will not result in additional greenhouse gasses being emitted and have no impact on the wider environment.

Social Impact Tests

125) We do not expect the proposal to have any social implications.

Sustainable Development

126) We do not expect the proposal to have any sustainable development implications other than the non-monetised climate change resilience benefits (identified above) that come from industry using state of the art design approaches which reflect the most up-to-date knowledge of loadings including those from wind, snow and ground movement.

Summary and preferred option with description of implementation plan

- 127) Option 1 is preferred as it provides a regulatory framework into the future that continues to ensure buildings are structurally safe for people using them or circulating around them whilst complying with European requirements.
- 128) The Eurocodes will be introduced into Approved Document A from October 2013. Withdrawn British Standards will continue to be acceptable for demonstrating compliance with the Building Regulations until at least 2018 and beyond that for routine building work.