A commentary on routes to competence in the construction sector

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The health and safety record of the UK construction sector is a prime focus of the Health and Safety Executive (HSE), combining as it does high fatality and injury rates with relatively high rates of work-related ill-health. Persuasive proof of the link between competence and health and safety is difficult to demonstrate but, nevertheless, ‘competence’ has been central to improving the sector’s health and safety performance since the late 1980s.

The key questions of this research are whether current routes to competence - qualifications (both work-based and college-based), short courses, safety passport courses, competent person development, as well as on-the-job mentoring and general experience - are adequate for the sector, and whether our understanding of what makes a construction worker ‘competent’, in the deepest health and safety sense, remains sufficiently robust for current-day needs.

Competence is evidenced directly by competence-based qualifications or indirectly by a plethora of card and passport schemes.

The research highlights other safety-critical industries that require ‘job competence’, enhanced health and safety awareness, and, critically, ‘human factors’. It concludes that the industry’s current understanding of ‘competence’ may warrant extension to develop an ‘industry-specific’ definition and broadening to encompass both situational awareness and the sustaining of appropriate behaviours.

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Main Messages

1. Rates of construction worker fatalities have continued to follow a downward trend over the past decade. In that timeframe, there can be no doubt that the construction industry has responded extremely positively to the call in 2001 to actively improve its health and safety record. The industry has invested in this goal in a variety of ways including taking up the challenge to train and qualify even greater proportions of its workforce.

2. Health & safety education in the UK construction industry is underpinned by two main conceptual approaches: a systems and regulatory approach (since the mid-1960s) and a "competence" approach (since about the late 1980s). Both have made very significant contributions to these improvements in the industry’s health & safety record. Building on these underpinning approaches, the construction industry developed a system of regulations, qualifications, courses, skills cards, safety passports and competent person schemes. More by accident than by design, the system so developed has turned out to be complex and fragmented. This research has shown that there are in existence 300 cards from over 40 certification schemes, a number of which have inconsistent and incompatible requirements and meanings. Added to this picture, whilst take-up of the industry’s NVQs/SVQs has increased substantially over the last ten years, a significant proportion remains without such a qualification. This situation may be having counter-productive impacts including hidden costs, and creating, for many employers, the semblance of "competence" where it may not exist.

3. The slope of the downward trendline measuring industry fatalities appears to have become slightly shallower over the last ten years in comparison to previous decades; most likely the natural result of a downward trend reaching such low rates that any further improvement becomes commensurately harder to achieve. It is acknowledged however that there is yet still more that can be done to improve the industry’s workplace health performance.

4. A number of other comparable, high-risk, safety-critical industries demand from their workforce not only ‘job competence’ and (above-basic) health & safety awareness, but a third strand, that of ‘human factors’. This research indicates that the industry's current understanding of "competence" now perhaps warrants being extended and enhanced. It needs now to embrace the even bigger challenge of continuing that improvement still further by developing a bespoke ‘industry-specific’ definition of competence. The research suggests that it should consider formally broadening competence to encompass both situational awareness and the sustaining of appropriate behaviours.

5. The construction industry should move to this new phase and the ‘new competence’ approach which requires not just occupational (job) competence, but more robust general health & safety competence and behavioural/human factors implementation throughout an operative’s working life. This last is particularly critical as evidence points to at least the possibility that human factors - particularly for those aged over 50 - may be a significant cause of accidents and that a focus on human factors and on this age group may well save a significant number of lives in the sector. As is already being practised with larger contractors, this New Competence approach would require more widespread enhanced supervisor/site manager training as mentors delivering behaviours that limit health and safety risks and develop ongoing situational awareness.

6. It is impossible to distinguish and disentangle the effects of the skills cards, safety passports and competent person schemes from the ongoing impact of regulation and competence to
be able to identify a distinct causal effect on health and safety performance. However, without doubt the current status of this complexity and fragmentation suggests that a clearer system – one which requires standardising and rationalising card certification schemes to achieve a much more reliable and transparent evidencing of competence might well provide the basis for further improvement. All such cards should be based on achievement of a nationally-recognised, formal qualification to which other related-sectors’ formal qualifications are mapped, and published, to aid clarity.

7. To further aid transparency and reliability, and in support of the move to a revised standard for competence, the industry should consider establishing a single “Construction Industry Card Registration Authority” as an independent agency whereby all cards are recognised as having value commensurate with an independently researched/objective set of metrics. The Authority - which might have a very positive effect on the levels of confidence of the general public and of employers generally - would have responsibility for monitoring and accrediting card schemes and maintaining a database of card holders and their achievements.
Executive Summary

Background

The health and safety record of the UK construction sector has always been a source of concern for the Health & Safety Executive (HSE), combining, as it does, high fatality and major injury rates with relatively high rates of work-related ill-health.

The Government-led Revitalising Health and Safety initiative aimed to cut health and safety incidents by 30% in the ten years from mid-2000 to mid-2010. HSE’s Revitalising Health and Safety Strategy of June 2000 outlined how it proposed to achieve these improvements.

In 2001 a high-level Construction Health and Safety Summit explored the issues, identified appropriate courses of action, and secured commitments from stakeholders to make significant improvements and to focus on improving competence.

In parallel with these developments, the Construction (Design and Management) Regulations 2007 required employers to ensure that construction companies and their operatives were competent to perform construction work.

In addition standards and qualifications were targeted for incorporation into the major industry card schemes led by CSCS, CPCS and others.

To evaluate progress over the ten-year period the HSE decided, in 2010, to commission research into the routes to competence available to non-professional, site-based roles in the industry.

The Competence Environment

Clear or persuasive proof of the link between competence and health and safety is very difficult to demonstrate but, nevertheless “competence” has been at the centre of virtually all efforts to improve the sector’s health & safety performance since the late 1980s.

The key questions that this project has asked are whether the current routes to competence are adequate for the construction sector, and whether our fundamental understanding of what makes a construction worker “competent”, in the deepest health & safety sense, remains sufficiently robust for the needs of the current-day industry.

The standards-based approach to competence - defined as ‘the ability to do a particular activity to a prescribed standard’ originated in the development of NVQs/SVQs in the mid-1980s.

But there have been concerns documented in reports, since the very earliest days, that the approach taken by the UK to competence-based standards and to NVQs/SVQs has not been fully satisfactory – for example it has not fully or consistently taken into account behaviours, values and attitudes. There are also fears that the outcomes-based approach may have undervalued formal education, training and assessment and that underpinning theoretical input has lost out over the years in the pursuit of outcomes-based qualifications.

The new Qualifications & Credit Framework (QCF) moves towards a more transparent system based on level of difficulty and volume of achievement - denoted in terms of ‘credit’ - rather than the use of qualification ‘types’, such as NVQs. Intending to benefit employers and learners alike a unit-based approach is central to the QCF.
There is a distinct possibility that, as the QCF is populated even more fully (and the predecessor National Qualifications Framework qualifications are phased out) it will become more difficult to make direct links between QCF qualifications and statements of competence set out in national occupational standards (NOS). The units in NQF qualifications were based directly on NOS, but QCF units are (to-date) translations of NOS rather than direct replicas. However, this view depends on the outcomes and decisions taken on the completion of the OfQual consultation From Transition to Transformation- Strategic Regulation of Awarding Organisations and Qualifications post January 2011.

**Competence in the Construction Industry**

At the same time as the concept of competence became a key focus of the UK training and qualifications systems, it also became an increasingly central feature of the statutory and regulatory framework for occupational health and safety in the construction industry.

Competence in the construction industry is driven by the legislation and regulations environment and through a standards-based approach which focuses on performance and knowledge and understanding captured within NOS units.

Competence in the industry has been developed in an extremely complex organisational and regulatory environment and the national funding systems and arrangements have made certain types of qualifications and certain routes to competence either more or less viable for employers.

It can be argued that education and training system in the construction industry has defaulted, for a variety of mainly external reasons and responses, to primarily a mechanistic one, yet ‘effective competence’ in construction almost certainly should mean more than merely ‘job knowledge and skills’ plus ‘health and safety awareness’.

**Evidencing Competence**

Competence can be demonstrated in a wide variety of ways some of which are themselves very complex. They can be summed up as being either: Primary Evidence - derived directly through relevant, competence-based qualifications; and/or Secondary Evidence - card or safety-passport schemes acting as proxies for direct evidence.

Job competence and health and safety awareness and understanding are generally evidenced through work-based assessments.

According to the Labour Force Survey, in 2009/10, over 70% of the construction industry (ie professionals, manual and non-manual occupations) hold a Level 2 qualification (this includes general and taught ‘input-based’ qualifications such as GCSEs) or above. In contrast, in terms of a full NVQ/SVQ (ie the main competence based qualification for the industry) over 83% have no such NVQ/SVQ. Just 12% of the workforce hold a full NVQ/SVQ (excluding equivalents) at Level 2 or above.

In terms of secondary evidence, the current system of Skills cards, regulated schemes, safety passports and competent-person schemes is fragmented and extremely complex with many participants regarding some of them as being little more than box-ticking exercises. Another
concern revealed by the research is that employers may be seeking the easiest proxies for competence that show that they have fulfilled their statutory responsibilities.

This research identified 45 different "schemes" which, when examined further and expanded to include individual categories/occupations and levels, translated into well over 300 cards and certificates (some at professional levels that fall outside the remit of this study).

Historically, many of these cards have been available through 'industry accreditation' routes (sometimes known as 'grandfather rights').

The "card scheme" approach, as a secondary means of evidencing competence, and as currently implemented, carries a number of quite crucial weaknesses.

**Does competence matter?**

Following the reductions in fatality rates between the late 1960s and the 1980s the industry adopted a focus on competence as an additional mechanism to attempt to drive incident rates down even further.

Rates of fatalities and major injuries have improved since 1999/2000 when 81 people were killed (4.7 per 100,000 employed) to 2009/10 when there were 42 fatalities (2.2 workers per 100,000) - a 44% reduction in numbers and a 54% reduction in the rate of fatalities. As can be seen in Annex 3, the rates of fatalities and injuries in the construction sector have fallen consistently over a long period of time. The combination of regulation and systems together with the focus on competence appears to have resulted in a marked decline in the industry's rates of fatalities and injuries (although its record for workplace illness does not appear to have improved in recent years - in common with that for UK industry as a whole).

Patterns of causation of fatal and major incidents strongly indicate that worker competence does indeed matter, but they also point to a "competence-gap" in the construction workforce which is reflected in the apparent slowing down of improvements in health & safety performance and which is not being addressed by regulatory systems or current occupational competence approaches.

**Do cards matter?**

The evidence from the progress of card schemes over the past decade is mixed, and there is no clear way of demonstrating a direct link to indicate cards make a positive difference to the sector's health & safety record.

This research has shown that around 77% of all cards reviewed for this research (across a range of schemes, levels, occupations) can be obtained through multiple routes and that around 73% of them do not necessarily require a formal, nationally recognised qualification. Just 4% of all such cards can be obtained only by acquisition of a formal, nationally-recognised qualification.

In two of this study's most crucial occupational groups - supervisors and site managers - some 6% appear to have a relevant NVQ/SVQ (some 20% if this is broadened to include taught qualifications and general VRQs) while card coverage stands around 102%.
Routes to Competence

Routes to competence for the construction sector are extremely varied and complex, consisting of qualifications (both work-based and college-based), short courses, safety passport courses, competent person development, as well as on-the-job mentoring and general experience. All of which are evidenced - both well and not so well - by a plethora of card and passport schemes.

However, the vital underlying point is that we should be cautious of the word "competence".

An effective route to competence cannot end with qualifications or tests, or even with re-assessment of those qualifications and tests. In a dangerous industry like construction the term "competence" must encompass both the need for behaviours that limit risks and situational awareness.

The New Competence

In such a dangerous industry the definition of competence must be tripartite: occupational skills, deep and relevant knowledge and understanding, and ongoing evidence of appropriate behaviours and attitudes.

Our findings are that we should now be looking at strengthening the traditional definition of competence with a third strand which enhances and reinforces the other two with a robust "human factors" approach. This message is substantially supported by work already going on in this sector as evidenced in a number of research reports as well as in other high-risk sectors and by the findings of the Department of Work and Pensions (DWP) project as detailed in the case studies within Annex 5.

The New Competence would build-in appropriate behaviours and situational awareness at all levels of the organisation. It will embed deeply into every site supervisor and manager (and eventually all management layers) the attitudes and behaviours necessary to maintain human factors at the forefront of theirs and their employees’ minds.

As such it represents a sea change in the way that health and safety is regarded and implemented.

This report should be read in conjunction with the separate Annexes.
1. Background and context

The health and safety record of the UK construction sector has long been a source of significant concern for the Health & Safety Executive, combining, as it does, high fatality and major injury rates with relatively high rates of work-related ill-health. While there has been a slowing in fatality and injury rates over the past thirty years, the incidence of ill health shows no significant recent improvement (for further detail see Annex 3).

Construction accounts for a high proportion of the serious health and safety incidents that occur in UK workplaces every year.

In concert with sector partners, therefore, HSE has acted to drive improvements in the sector’s health and safety performance. This drive gained particular focus through the Government-led Revitalising Health and Safety initiative, which aimed to cut health and safety incidents by 30% in the ten years from mid-2000 to mid-2010. HSE committed itself, through the Government’s Public Service Agreement, to ensuring that this target was met. Its Revitalising Health and Safety Strategy of June 2000 outlined how it proposed to achieve these improvements.

The construction industry was then experiencing a significant deterioration in its already relatively poor health and safety performance, reaching a nadir in 2000-2001, when a total of 107 construction workers were killed in work-related accidents. As a result, a high-level Construction Health and Safety Summit explored the issues, identified appropriate courses of action, and secured commitments from stakeholders to implement those actions.

All the major stakeholders at the Summit agreed that overall employee competence was an important target for further improvement and they made concrete commitments to improving health and safety performance through improved competence.

At the industry level, the major contractors agreed to require evidence of competence from employees and subcontractors. The Major Contractors’ Group (MCG) committed to a fully competent workforce by the end of 2003; the Civil Engineering Contractors Association by 2007; and the Construction Confederation by 2010. These commitments were fully supported by ConstructionSkills (SSC), the Awarding Organisations with responsibility for the provision of competence-based qualifications, and other industry bodies.

In parallel with these developments, the Construction (Design and Management) Regulations 2007 required that any task related to a construction project must be undertaken by an organisation or individual competent to do so – with details provided in the Approved Code of Practice L144 (ACoP).

The result of these developments was that three mechanisms were adopted to promote and define competence in the construction sector:

1. Competence-based National Occupational Standards (NOS) and related qualifications (NVQs/SVQs): the uptake of which would be driven by industry commitments to recognise NVQs as the basic standard of competence;

2. The incorporation of standards and qualifications into the major industry card schemes led by CSCS and CPCS; and,

3. Regulation, in the form of CDM 2007 and the ACoP which gave employers, clients and other stakeholders a legal duty to ensure that those engaged in construction related tasks were competent to undertake them.
These mechanisms form the indispensible background to an understanding of the competence agenda in the construction industry.

Given the continuing challenges presented by health and safety in the construction sector, the role that all stakeholders give to "competence" as a key factor in meeting these challenges is of central concern, as is, equally, the general confusion that has arisen over what constitutes "competence".

The HSE decided in 2009, therefore, that it was timely to commission research into the routes to competence available to non-professionals working in site-based roles in the construction industry.

ConstructionSkills, as the Sector Skills Council with the largest employer and workforce representation in the construction industry, shared HSE’s concern with health and safety performance, and agreed to co-fund and support this research. This report brings together the main findings from that research with fuller detail in Annexes. It is recommended that the report is read in conjunction with the separate Annexes.

2. The Competence Environment

2.1 A Causal Link?

For much of the past twenty-five years there has prevailed an intuitive conception that competence and health and safety must be linked in a direct causal relationship. Clear or persuasive proof of the link has always been very difficult to demonstrate. It probably goes without question that there is some causal link between occupational competence and the safety of the individual but the extent and impact of occupational competence and health & safety knowledge are by no means clear.

Put another way; if there has been any improvement in the record of the construction industry in health and safety terms over the past decade we cannot say with any certainty how much of that improvement has come from the focus on "competence", from the requirements for individuals to obtain qualifications, or from the requirements for them to obtain and carry cards or safety passports.

Many other factors - for example, the general improvement in health and safety awareness taught to school children, the focus on health & safety in college, and the vastly enhanced awareness of employers as to their health and safety responsibilities, may well have had similar or even greater impacts.

There is some evidence that individual worker-experience is also extremely important (the statistics, for example, show that the highest period of risk is often that immediately after a new employee enters the industry or joins a new company). However, despite a combination of competence and experience, accidents do still happen.

In all likelihood, other factors, such as situational awareness and behaviours, as well as the concept of "out-of-context" risks, may also have a significant impact. This topic is further discussed in section 5.4.
2.2 The Meaning of "Competence"

The way in which the concept of "competence" has been developed since around 1985 focuses on two main elements: occupational knowledge and skills, and health & safety awareness - both of which are assessed over a limited span of time and in ways that, in some cases, remain subject to question as to their effectiveness.

From an employer’s point of view "competence" generally means the ability of an employee to do a specific job of work, together with a requirement for evidence of basic health & safety awareness.

The key questions that this project has asked are, therefore, not only whether the current routes to competence are adequate for the construction sector, but whether our fundamental understanding of what makes a construction worker "competent" in the deepest health & safety sense remains sufficiently robust for the needs of the current-day industry.

2.3 The Competence Agenda

Interest in competence-based models for standards and qualifications in the UK has, from the very beginning in the early 1980s, primarily been associated with government-sponsored initiatives to improve vocational education and training and to up-skill the wider UK workforce.

The standards-based approach to competence originated in the development of NVQs/SVQs in the mid-1980s. The task of developing NVQs/SVQs fell to the Industry Training Organisations (ITOs), and then latterly the Sector Skills Councils (SSCs), each of which work with employers from their sector(s).

Competence, defined as ‘the ability to do a particular activity to a prescribed standard’¹, was held to require:

- Skills to specified standards.
- Relevant knowledge and understanding.
- The ability to use skills and to apply knowledge.
- An understanding [of] the performance of relevant tasks.

In order to measure someone’s ability to do something reliably, clearly defined and widely accessible standards were needed, upon which the NVQs/SVQs are based. These industry-specific standards are known as National Occupational Standards (NOS). A major role of Sector Skills Councils¹ is to work with employers to define, set and regularly review and, as appropriate, refresh these standards of competence.

The key features of competence in NOS and in the related competence-based qualifications are:

- Competence is defined by outcomes rather than inputs – what people can do, rather than how they learn to do it.

- Competence is defined as performance to a specified standard with associated underpinning knowledge and understanding.

- The outcomes required to meet this standard are defined through "functional analysis".

¹
Assessment (for the purposes of completion of a competence-based qualification) is based on demonstrating competent performance to meet the standard in the full range of circumstances and environments that the occupation could normally be expected to involve, along with demonstration of the appropriate knowledge and understanding.

The standards-based approach to competence means that the NVQs/SVQs, based on these occupational standards, exhibit a number of well- aired and recognised characteristics:

- Achievement of a full NVQ ensures that a range of ‘elements of competence’ have been successfully demonstrated, giving assurance that the holder possesses basic occupational skills and the basic knowledge and understanding needed to underpin them (including occupation-ally relevant health & safety).

- By concentrating on ‘outcomes’ rather than ‘inputs’ the approach is not tied to any particular model of education or training delivery whether formal or informal learning. Assessment can take place in the workplace instead of (or in addition to) formal settings like colleges.

- The qualifications are set within a common system closely related to the occupational level the person would hold in the workplace.

- The standards upon which the qualifications are based have UK-wide applicability (ie they reflect any differentials within the UK) and are accredited by regulatory bodies.

This focus on ‘outputs’ rather than ‘inputs’, and the use of defined ‘standards’ of competence as the basis for assessing ‘performance’ in the workplace environment rather than through formal examination have become a fundamental characteristic of competence-based qualifications and assessments in the UK. However, the development of a competence-based system of standards and associated qualifications poses considerable challenges.

Since the very earliest days there were concerns with the approach taken by the UK to competence-based standards and therefore to the NVQs/SVQs. Some suggested it was difficult to define the level of detail that the standards should go into, as even close normal variations between and within workplace environments could result in significant differences to the procedures and processes that should be followed to complete the task. Others pointed to standards not fully or consistently taking into account behaviours, values and attitudes, which many practitioners feel are essential components of competence. There are, for example, several broader models of competence, such as ‘integrated competence models’ or ‘holistic models’, described in European legislation and used in the USA, but these have remained largely outside the UK standards-based approach.

Research for the Qualifications and Curriculum Development Agency in 2010 illustrates different interpretations and definitions for competence. The report points to many approaches on how the term competence is used in defining abilities needed to adequately meet the demands of jobs. ‘These range from a narrow view of competence as performance in the workplace to a broader one that included aspects of underpinning knowledge, appropriate behaviour and attitudes, and reflection, which could not be assessed from performance alone’.

Their report concludes that most people involved in the skills and qualifications sector support the view that a broader conception of competence is needed if competence based standards and qualifications really are to provide assurance of genuine competence. Many practitioners still feel behaviours, values and attitudes are essential components of competence but the problem in most occupations has been that these are relatively expensive to embed for the longer term.
A review of literature in the past decade on NVQs identified a number of fundamental criticisms of the NVQ system\(^8\) much of which centred on the “outcomes-focused” approach:

- The outcomes-based approach may undervalue formal education, training and assessment. There may be contributors to effective performance that are best acquired and assessed through formal training and assessment;
- The outcomes-based approach may lead to an unduly instrumental view of ‘knowledge and understanding’. By concentrating only on the ‘knowledge and understanding’ strictly necessary to meet the basic performance standard, it can undervalue broad theoretical understanding. This point was effectively conceded by the introduction of ‘Technical Certificates’ (taught/knowledge based qualifications) which were primarily introduced to broaden and reinforce the Apprenticeships offer and sit alongside the NVQ.

Further criticisms applied to NVQs/SVQs included views that they were overly rigid in both structure and application, and, often unnecessarily larger than the job roles they related to. This has recently been implicitly accepted and is being addressed by the Vocational Qualifications Reform Programme (VQRF) in which the more flexible Qualifications and Credit Framework (QCF) is a key component. The VQRF is UK wide, introducing significant changes to simplify the vocational qualifications landscape for the benefit of learners and employers.

### 2.4 The ‘Qualifications and Credit Framework’ (QCF)

The QCF is a new framework for creating and accrediting qualifications in England, Wales and Northern Ireland; relatively closely aligned to the Scottish Credit and Qualifications Framework\(^9\). The QCF allows achievements in units and qualifications to be recognised and recorded through the award of credit. It supports the accumulation and transfer of credits and the easy identification of each achievement’s level (from entry to level 8) and size. The total number of credits in a qualification determines whether it is an Award (1 to 12 credits), Certificate (13 to 36 credits) or a Diploma (37+). This is intended to ensure that learners are afforded flexibility and the range of opportunities available to them is maximised. Although it is running alongside the current qualifications framework known as the National Qualification Framework (NQF), from early 2011 only QCF qualifications will receive funding from the public purse.

OfQual has just closed a four month consultation *From Transition to Transformation: Strategic Regulation of Awarding Organisations and Qualifications* looking at safeguarding standards. It also considers, amongst other proposals, operating with one overarching framework for regulated qualifications encompassing both credit based qualifications and those referencing the NQF (such as GCSEs and A levels). Further changes may emanate as a result of this consultation.

A key feature of the QCF is the move towards a more transparent system based on level of difficulty and volume of achievement - denoted in terms of ‘credit’ - rather than the use of qualification ‘types’, such as NVQs. As an exception to this, ConstructionSkills have been able to retain the use of the title NVQ\(^10\) for some of its new QCF qualifications to maintain brand recognition for competence based qualifications.
In support of the QCF, the Skills Funding Agency through the Learning Records Service has developed the Learner Register which will enable all learners (including adult learners) involved in education and training to develop a lifelong record of their qualifications, awards, training and learning participation and achievements. It is based around a Unique Learner Number.

The sector skills councils, including Construction Skills, have been working very closely with awarding organisations to ensure that the necessary qualifications are migrated onto the QCF as replacement or new qualifications in readiness for the removal of the NQF. SSCs also have a major role in approving and recommending qualifications that meet employer and learner skills requirements, for accreditation and funding. Awarding Organisations play a critical role in ensuring they set out and publish, for each unit and qualification, the required knowledge, skills, understanding, learning outcomes and assessment criteria.

There is a possibility that, as the QCF is more fully populated (and NQF qualifications are phased out) it could become more difficult to make direct links between qualifications and NOS. The units in NQF qualifications were based directly on NOS, but QCF units are translations of NOS rather than direct replicas. QCF units can be developed based on any number of NOS as long as the source is referenced. However, this situation depends upon the conclusions and actions taken by OfQual as a result of their consultations.

2.5 Inputs and Outputs

There are, in fact, two linked stages to the attainment of competence as it has become defined: the first is the teaching - in whatever way - of its component skills and knowledge (input), while the second is the way in which that competence is demonstrated or evidenced to employers, inspectors and colleagues (output). Output was traditionally through examinations, but more recently through work-based assessments. The diagram below shows contributory parts of the interlocking timeline in the development of competence which, as is discussed more fully in section 7 on Routes to Competence, is not a linear process nor should it end with qualifications, assessments and tests as an individual never stops learning or developing.
The sections that follow discuss competence as it is developed and, separately, as it is demonstrated and evidenced within the construction industry.

3. Developing Competence in the Construction Industry

At the same time as the concept of competence became a key focus of the training and qualifications systems, it also became an increasingly central feature of the statutory and regulatory framework for occupational health and safety. The idea that 'occupational competence' was a major causal link in the health & safety chain has been explicitly accepted.

Central government and its responsible agencies sought to create legislation and regulations for maintaining healthy and safe workplaces without being unduly prescriptive about how those responsibilities should be fulfilled.

Consequently health and safety law does not generally prescribe processes, procedures and practices in detail, but places a duty, primarily on employers, but also on all those involved in potentially hazardous work, to ensure that such work is undertaken only by those who are 'competent' to do it.

The Construction (Design and Management) Regulations 2007\textsuperscript{12} gave "competence" an overt place in the armoury of weapons being directed against health and safety issues across the sector.

In 2009, the HSE reiterated that competence should be placed at centre stage through its ten overriding goals for health and safety development.

"Our goal is ... 

- To encourage an increase in competence, which will enable greater ownership and profiling of risk, thereby promoting sensible and proportionate risk management.\textsuperscript{13}
Truly effective health and safety management requires competency (sic) across every facet of an organisation and through each level of the workforce.\textsuperscript{14}

A review of the extensive legislative and regulatory framework (provided in more detail in Annex 10) reveals a number of underlying threads, viz:

- **Competence** - a fundamental philosophical acceptance that competence is a major (if not "the" major) factor in health and safety in the construction industry;

- **Evidencing competence** - a widely accepted principle that competence must be objectively evidenced wherever possible and that the most cost-effective way of doing so is through assessed qualifications. There is also a subsidiary acceptance that those qualifications should be based on nationally-accredited occupational standards.

- **Specificity** - that it is impossible to create generic health and safety regulations for an industry as complex as construction and that certain specialist areas therefore require specific regulation. There may also exist a subsidiary acceptance that such specific legislation and regulation should only be used where it is not possible to efficiently and effectively manage the health and safety risks through generic legislation.

- **Proportionate response to risk** - except where other applicable regulations specify otherwise, there is an underlying belief that the overall approach to risk should be closely related to the degree of danger and the likelihood of the risk being translated into accident.

The CDM 2007 regulations also prescribe an Approved Code of Practice (ACoP). In order to help the duty-holders meet their responsibilities the ACoP gives extended consideration to identifying and defining competence and provides more specific recommendations for assuring the competence of both companies and individual workers\textsuperscript{15}.

In Appendices 4 and 6 of the ACoP, there is detailed guidance on the definition and attainment of competence as the result of a process in time with two potential routes to competence: the first based on qualifications (requires the worker to register for and attain an appropriate competence-based qualification – NVQ/SVQ or similar), the second based on a combination of in-house and external training and experience. These should be followed by continued learning and development to further improve competence.

Developing competence in the construction industry is, therefore, driven 1) by the legislation and regulations environment described above and 2) a standards-based approach to competence which focuses on performance and knowledge and understanding as captured within the NOS units which underpin the units and qualifications now being developed for the QCF. It could be argued that although these are the two main drivers, risk is potentially a third critical driver. Risks cannot be centrally prescribed, as they can be task or context specific, but these are often inadequately addressed (see various references within the Annexes but specifically 3, 4 and 5).

Broadly speaking, occupational competence and health & safety competence are gained by education, training and experience. The educational aspect delivers the knowledge and awareness relevant to the job-role, training develops the craft, technical, supervisory, management skills, techniques and approaches necessary, and experience hones the knowledge and skill into what should eventually become not merely competence but expertise.
Education and training in the construction industry has, it could be argued, defaulted to primarily a mechanistic one in which competence is defined narrowly as assessed performance on specified tasks in the workplace and not, additionally, in terms of appropriate behaviours or attitudes\(^\text{16}\). The need to embed the latter, is discussed generally in this report, with the consequence of **effective competence in construction should almost certainly mean more than merely ‘job knowledge and skills’ plus ‘health and safety awareness’**.

4. Evidencing Competence in the Construction Industry

Competence can, essentially, be demonstrated in a wide variety of ways some of which are themselves very complex. They can be summed up as being either:

1. **Primary Evidence** - that is evidence of relevant, competence-based qualifications; and/or

2. **Secondary Evidence** - Card or safety-passport schemes which "evidence" a set of qualifications and other elements of required competence.

Both, as they are currently utilised, have significant areas of weakness where wider definitions of competence are concerned.

4.1 Primary Evidence

Job competence and health and safety awareness and understanding are generally evidenced through a system of examinations and/or assessments with the majority being work-based assessments. Very few 'occupational qualifications' require a "taught" element, with only a minority requiring learning beyond the precise remit of the job role.

It is important to note at this stage that most occupational standards have been developed with, and approved by, employers to assess job competence; health and safety aspects focus on the knowledge and awareness deemed necessary for a person to undertake the job safely both for themselves and others.

For most occupations this approach is entirely satisfactory but this report asks whether such a potentially narrow approach is sufficiently effective for a relatively dangerous sector such as construction. Whilst construction operatives are assessed through competence based qualifications on their health and safety knowledge and application of that knowledge to their job and its immediate working environments, an understanding of the main human causes of accidents and the application of behavioural techniques to avoid them is rarely included or required.

Competence in the construction sector is developed in an extremely complex organisational and regulatory environment (see Figure 1 diagram below) and funding arrangements can make certain types of qualifications and certain routes to competence either more or less viable for employers. The funding arrangements for colleges, training providers and employers can also vary geographically\(^\text{17}\).
Gaining a complete picture on how well qualified the sector is becoming, is equally a complex picture.

Labour Force Survey (LFS) data for 2009 on highest qualifications, including full equivalents, show that over 70% of the construction industry\(^\text{18}\) (ie all occupations) have a Level 2 qualification or above. However, this refers to all qualifications types of all purposes including general qualifications for Levels/CSEs and it includes professional occupations such as Quantity Surveyors and Architects for whom a qualification is a licence to practice.

In contrast, the same source shows that by 2009 a full NVQ/SVQ, ie the main competence based qualification for the industry and a key driver for improving the sector’s record – (see Section 1 Background and Competence), has a relative low penetration across the industry and across job levels. Over 83% manual and non-manual occupations have no NVQ/SVQ at all. Excluding ‘don’t knows’ just 12% of the workforce hold a full NVQ/SVQ (excluding equivalents)\(^\text{19}\) at Level 2 or above. This has, without doubt, improved over the last 10 years (when the equivalent figures were 93% and 4% respectively).

An alternative source of data, looked at for the purposes of this research, comes from the regulatory body for qualifications. OfQual holds certification data received directly from all awarding organisations offering relevant qualifications in England, Wales and N.Ireland. This source provides a complementary picture, although it should be noted that there are a number of limitations: a) there is no way of being sure if the learner completing the certificate was, at the time, working within the construction workforce or that the qualification was entirely relevant to their job role (for instance they may have chosen to do a vocational qualification to effect a career change), b) the qualification...
or certification data are not linked to occupations – this has been a derived activity based on those occupations for which the qualifications are primarily designed, and c) the data provided to OfQual by the awarding organisations are given on a voluntary basis. Additionally, it should be noted that one qualification does not necessarily equal one learner.

According to the Ofqual data for construction industry relevant qualifications (ie NVQs, and qualifications generally recognised as Vocational Related Qualifications for example BTECs, HNDs and other qualifications that develop an individual’s technical knowledge) around 855,500 certificates have been awarded from 2005 to 2009 inclusive across Levels 1 to 5. Including gas and electrical supply distribution, electrical and plumbing qualifications, in the same timeframe, the overall total is 1,097,000 certificates. On looking specifically at completed certificates of construction-and-related industry NVQs (coded as NVQ types not the more recent QCF qualifications with NVQ in the title) a total of at least 492,000 were awarded between the years 2005 and 2009.

Recruitment onto Construction Apprenticeships is broadly around 24,000 per year with an achievement rate rising to 70% in 2008 (ConstructionSkills).

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<td>Construction sector Apprenticeship</td>
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* First Statistical Release notes that 2009/10 is not fully comparable with previous years; and note learners can register on more than one framework.

Further detail on occupations and qualifications is provided in Annex 1.

Competence based qualifications such as NVQs/SVQs require work based evidence for assessment and successful completion. The industry has devised various means for assessment to take place in ways to suit the employer and employee/learner for achievement of qualifications and the CSCS card (see section 4.2.1). One such example is ‘On-site Assessment and Training’ (OSAT) at Level 2 which takes account of existing skills so workers only train towards gaps in skills. A main selling point of this is to ‘help (your) workers achieve vital skills so they achieve CSCS cards quickly and easily’ It also aims to make a card and qualification accessible for those who may find reading and writing difficult. Similarly, the Experienced Worker Practical Assessment (EWPA) is a fast track route for those workers with a minimum of five years experience.

### 4.2 Secondary Evidence

According to the CDM 2007 ACoP, ‘To be competent, an organisation or individual must have:

- sufficient knowledge of the specific tasks to be undertaken and the risks which the work will entail;
- sufficient experience and ability to carry out their duties in relation to the project; to recognise their limitations and take appropriate action in order to prevent harm to those carrying out construction work, or those affected by the work’.

This is relatively simple to express but employers and others find it much more problematic to reliably demonstrate that competence.
Several representatives of trade associations pointed out to us that the complexity of demonstrating competence can lead to confusing situations. The requirement of CDM 2007 to show that competence has been established for companies and individuals can often become a ‘box-ticking’ exercise of the kind that ACoP explicitly discourages. Another interviewee was concerned that there is an increasing tendency to transfer substantive responsibility for Health and Safety down the chain of contractors, where risks increase and resources for training decrease and that employers are seeking the easiest proxies for competence that show that they have fulfilled their statutory responsibilities. Another interviewee feared CDM 2007 has simply forced companies to identify concrete forms of evidence such as cards and qualifications that may not, in practice, actually evidence appropriate competence in the context of the work at hand. It was pointed out, that, as a result a card holder with few or no achievements could be accepted on site more readily in most cases than an experienced and qualified person without a card.

4.2.1 Card schemes

The construction and the related built environment industries\(^{22}\) are unique in having a comprehensive but extremely complex system of cards seeking to evidence competence. This research identified over 45 different schemes which, when examined further and expanded to include individual categories/occupations and levels, translated into well over 300 cards (some in professional levels that fall outside the remit of this study).

The major secondary methods of evidencing competence include:

- A large number of card schemes.
- Safety passport schemes.
- A plethora of training schemes and certificates, some focusing on general health and safety, some on construction specific health and safety, and others on general occupational competence.\(^{23}\)
- Registers of ‘competent persons’, developed on the pattern of the Corgi/Gas Safe register, but extended to sectors such as plumbing and electrical installation.

The various schemes are further complicated by the need for different kinds and levels of competence for different types of worker, and particularly a need to distinguish between the roles and relative levels of competence expected of trainees, supervised workers and supervisors/managers as well as experienced workers.

A detailed investigation of the cards indicated a wide selection of variables and prerequisites, including:

- Training
- Experience, either in terms of time in the industry, or in terms of logged hours worked in the relevant role
- Qualifications
- Ability to perform to acceptable standards in tests or examinations
- Ability to conform to defined standards in the workplace
- Attestation by a supervisor or manager (‘industry accreditation’)
- Appropriate behaviours i.e. ways of doing things
- A set of attitudes, aptitudes and dispositions
- Implementation of specific processes or procedures during working
Within the circa 300 cards (across schemes and levels) the research revealed a considerable disparity in terms of prerequisites. Around 77% of those cards (of which details on 180 of the 300 were verified by the card scheme organisation concerned), allow multiple routes to card achievement, ie training, a qualification, or industry accreditation and/or test (see further analysis in Annex 1).

Such card and registration schemes can be divided into three broad types:

- **Skills Cards** – seeking to evidence the holder’s skills in a certain occupation or activity.
- **Safety Passports** – very specific cards that evidence basic health and safety training and assessment applicable to a job role.
- **Regulated schemes** – implemented by the Government or Government Agencies to provide a framework of evidence for specific high risk areas.

These categories are not mutually exclusive and each contains different sub-categories.

**Skills Cards**

Skill cards are arguably the most complex category, due to the immense variety of schemes, differences in the requirements for training and qualification, and their varied relationships with official sector bodies. Essentially, they can be divided into four basic groups:

1. CSCS cards - arguably the main industry skills card scheme
2. CSCS affiliate and cognate schemes, carrying the CSCS logo but run by other organisations
3. Other recognised (non-CSCS) skills card and registration schemes
4. Proprietary skills cards and registration schemes which are outside these groups

Many of the schemes are run on a commercial or quasi-commercial basis (including CSCS itself), and in some cases privately run schemes are also developed in close cooperation with bodies such as HSE or ConstructionSkills, and are widely taken to represent the de facto standard of occupational competence for a particular skill or industry subsector.

The means of acquiring cards are very varied, but the three main ways are:

- a **competence-based, nationally-recognised qualification**, such as an NVQ (usually at Level 2 or above), or an equivalent traditional qualification (such as a City and Guilds Craft Certificate).
- ‘industry accreditation’ (sometimes referred to as ‘grandfather rights’), which usually requires the employer or a person competent to attest that the person seeking the card has occupational skills at an appropriate level;
- **Skills assessments**, such as via EWPA mentioned earlier.

In addition, most cards incorporate a health and safety element, for example by requiring holders to undergo a health and safety awareness test, or to cover health and safety legislation as part of their training and/or assessment.
The main Skills Cards are:

Construction Skills Certification Schemes (CSCS) and CSCS Joint, Cognate and Affiliate Schemes. These latter are:

- Assuring Competence in Engineering Construction (ACE),
- Certificate of Competence of Demolition Operatives (CCDO),
- Construction Industry Scaffolders Record Scheme (CISRS),
- Construction Skills Register (CSR),
- Electrotechnical Certification Scheme (ECS),
- Energy and Utility Skills Register (EUSR),
- Fall Arrest Safety Equipment Training (FASET) Safety Net Rigger CSCS card,
- Fencing Industry Skills Scheme (FISS/CSCS),
- SKILLcard,
- UK PHMES,
- Register of Land-based Operatives (ROLO), [administered by the British Association of Landscape Industries (BALI) provides an expedited route to a CSCS card, although it is not (yet) CSCS affiliated].
- The Construction Plant Certification Scheme (CPCS) carries the CSCS hologram but is not an affiliated scheme.

Construction-related SSCs recognise, administer or recommend certain types of skills training and assessment that do not fall within the CSCS scheme. Examples of these include those for rider operated Lift Truck training (with six accrediting bodies recognised by HSE) and for developing and demonstrating competence on Network Rail (the National Competence Control Agency run the register and card scheme Sentinel).

‘Sector Schemes’ include the Highways Electrical Registration Scheme (HERS). Sector Schemes often include additional minimum requirements as well as CSCS registration with which operatives need to comply, for example Sector Scheme 12 - Traffic Management requires specific Lantra training. For HERS an NVQ at Level 2 or Level 3 is compulsory for all of those working on electrical projects on highways. It also requires both company and individual registration, so combining elements of skills cards with the dual corporate and individual approach taken in schemes such as the NCCA Sentinel. Annex 2 includes a fuller description of the other skills cards.

4.2.2 Safety Passports & Regulated Schemes

A Safety Passport is a specific type of card wholly focussed on health and safety. In general they can only be obtained by undergoing a short course of health and safety training (and in some cases, environmental awareness training), usually followed by a short assessment.

The training usually combines coverage of generic health and safety issues with focused training relevant to a particular occupational or sector context. In some sectors and subsectors the use of Safety Passports is widespread, and in a few, such as engineering construction and utilities, they are close to being a prerequisite for anyone seeking employment on sector worksites. Examples of these types (usually run by SSCs) of Safety Passports include ECITB’s CCNSG scheme for the engineering construction sector, and the utility SHEA schemes coordinated by EUSkills.

Regulated Schemes are those that have been brought into existence by specific legislation or regulations to deal with areas critical to health, safety and environmental impacts. Examples of such
areas include Asbestos Building regulations (that cover Competent Persons schemes), further details are contained in Annexes 2 and 10.

4.2.3 Strengths and Weaknesses of the Skills Cards

The literature and the interview research confirm that there is an increasingly strong movement towards the Construction Skills Certification Scheme (CSCS) and associated cards. Some 1.1 million CSCS cards have been issued (as of mid 2010) and a total of 1.5m including the affiliate skills cards some of which claim higher standards than the CSCS card.

Under the CSCS scheme, it is required that candidates must take and pass an independent health and safety test. This is a touch-screen health and safety test with over 400 questions. The question bank is readily available for request prior to the test with the questions during the test being chosen at random. The test demonstrates only a basic awareness of risks, hazards and health and safety principles in construction.

There is, however, consistent, substantial scepticism in the sector about the value of this basic health and safety test. Interestingly, although the complete bank of questions is readily available, around a fifth of candidates fail it. However, the test itself is often felt to be undemanding (one interviewee reported that they had completed the test within 8½ minutes, when one hour is allowed), and importantly, it is possible to pass the test without having had any formal or informal training, or even having been anywhere near a building site. The test itself may be due for revisions and enhancements. Ideally, with such tests, they should be normalised and a decision taken over how high to raise the bar, leaving a consideration over what to provide for those that do not pass the test.

Interviewees expressed concern that CSCS was effectively a minimalist approach. Many of these cards have been sourced through ‘industry accreditation’ routes, in which the applicant’s competence is attested to by their employer. This system had the advantage of being based on actual workplace performance, but also led to concerns about the reliability and validity of attestations. It is understood that approximately 70% of those holding the CSCS card have achieved it via the industry accreditation route and do not hold the NVQ/SVQ level 2 qualification that represent the nominal standard for occupational competence.

A particular source of ambiguity was the CSCS blue card, which can either be held by an ‘experienced worker’, a NVQ/SVQ Level 2 qualified operative, or an NVQ/SVQ level 3 equivalent, with the latter route still open to ‘industry accreditation’. In order to support the competence agenda, CSCS committed to discontinuing industry accreditation routes and replacing them with qualification based routes only. However, those cards achieved via industry accreditation can still be renewed for most occupations.

A revised set of CSCS cards was introduced in 2010 bringing about a number of changes which appear simpler and more transparent although of course many of the older cards remain in circulation. There are now 4 types of red card, 2 types of blue card, 2 types of green card plus Gold, Black, Yellow, white/yellow and white/grey - thus now 13 cards where there were previously 11, relating to over 350 different, but in many cases, very similar trades/occupations. This is just one example of the complexity that employers face. This complexity is illustrated by the diagram (Figure 2) shown on page 26.

A Blue skilled card obtainable via the NVQ/SVQ ‘unit’ route replaces a previous Green card. A different Green card has been introduced aimed at Construction Site Operatives i.e those ‘employed in
general site work’. This card shows ‘the holder can carry out basic site skills and has met current CSCS health and safety requirements’. It can be issued based on a recommendation from an employer (previous or current) and is valid for five years. A clear concern is that it could provide an easy option for an unskilled worker to get a card. It may also prove popular for both competent and unskilled workers alike, given that it provides fairly easy access to sites but does not demand any more than the health and safety test.

The ‘profiling’ route is a new route that does not involve the acquisition of a relevant qualification, nor does it require specific training and nor is it time bound, and in so far as these things are the case, the use of this approach must remain questionable where the objective is to assure occupational and health and safety competence.

Data provided for this research from all Skills Card organisations collectively, show that of those occupations that permit multiple routes to achievement of the cards, around 75% have achieved a card via industry accreditation rather than via a qualification. Of all those cards, only 4% insist on a qualification for achievement of the card.

Looking at cards aimed at site based managers and supervisors it appears less than 20% have acquired them via the qualification route.

Not only is the sheer complexity of the CSCS cards, in particular, a genuine problem for employers, but the fact that in many cases the holder of such a card may only be able to show evidence of passing a ConstructionSkills Health and Safety test, is not evidence of competence.

Survey research undertaken on behalf of ConstructionSkills in 2007 found: ‘52% of construction workers have red, green or blue cards, none of which absolutely require the holder to have attained an S/NVQ at level 2 or above; another 20% ‘didn’t know’ what colour card they had; a further 20% had gold, platinum or black cards for supervisory or managerial roles’.

The Donaghy report references a number of criticisms of the CSCS cards. The stakeholder interviews undertaken for this HSE report agreed that:

- the Health and safety test is too easy,
- it should relate to carrying out the precise type of work not just an entry to work on the site,
- the level of skills on a CSCS card is often totally unrelated to the level of work carried out on site,
- CSCS is not suitable for certain specialist areas.

The Construction Plant Certification Scheme (CPCS) in comparison appears to represent a much more demanding scheme in use across construction. It requires a combination of required training, a theory test and a practical test leading to acquisition of an NVQ. Independent assessment of knowledge and independent assessment of skill on use of the machines in their full range of ability are mandatory. Logged experience is a requirement of the blue (competent-operator) card which has to be acquired within a period of 2 years. The red (trained operator) card is non renewable.

This research has revealed a clear trend towards major contractors and their representative bodies making CSCS cards virtually mandatory. The major contractors have committed themselves to this route and appear not to be taking ‘No’ for an answer from their subcontractors. One respondent reported that they will happily send someone who has worked for them for thirty years straight back home if they don’t have the ‘right card’. This is the approach being taken by the Major Homebuilders Group, which has reached an audited level of 98.2% carded workforce. The MHG are now moving to
insist on cards achieved through appropriate qualification routes only, and hope to achieve this over the next five years.

This suggests that holding a card has become the end in itself; but this approach leads to more questions — and questions beyond does the operative hold the right card appropriate to their occupation, or even hold the right level of card; but, is the operative qualified and competent (where health and safety is concerned) to carry out the work they are being asked to do at that particular point in time?

The "card scheme" approach, as a secondary means of evidencing competence and as currently implemented by many (but not all) card schemes, carries a number of quite crucial weaknesses:

- the focus is on the card rather than achievement of competence;
- cards are so varied and complex that it is virtually impossible for non-specialists (especially smaller employers) to fully comprehend what they mean;
- even where a card requires a recognised occupational qualification at a specified level this may not actually mean that the person is competent in the most appropriate sense where health and safety is concerned;
- the health and safety test is regarded, by many, as being too easy and there are instances across related sectors where it appears requirements for demonstration of H&S are being duplicated;
- most existing health and safety tests are not tests of ongoing behaviours;
- the card "level" may be unrelated to the level of work actually being undertaken on site.
Figure 2 - Skills, Competence, Certification and Registration in Construction and Related Industries (1)

NOTES:
1. For obvious reasons of clarity regulations in the sector have not been included in the diagram. However, the reader is invited to note that all health and safety regulations will have a significant impact on the structure and none less than the very detailed requirements of the CDM Regulations 2007.
2. Profiling approaches as part of Card Schemes have also not been separately shown.
3. Competence-based qualifications, as they are commonly termed to distinguish them from taught qualifications, are generally assessing outputs.
5. Does Competence Matter?

Whatever the definition of "competence" where the health & safety of construction workers (and others) is concerned there is little doubt that it matters - a great deal. The central question for this report, though, is whether the existing understanding of competence has made a difference to the sector's health and safety performance.

In order to examine this question in greater detail, in the context of the record of the construction sector, we carried out an extensive review of the existing literature and data on the subject.

5.1 Construction-related fatalities

Although the official statistics are subject to some important limitations, they indicate that both the absolute numbers and the rates of construction-related fatalities and reported major injuries have improved considerably over recent decades.

In the latest year for which confirmed statistics are available (2009/10) there were 42 fatalities, representing an unprecedentedly low rate of 2.2 workers per 100,000 - a 54% reduction since 2000.

Crude fatality figures (which do not, of course, take account of the size of the industry, general economic factors and many other considerations) tell a tale of a steady decline in overall numbers killed per year over the past two decades.

In the 1989-90 reporting year four times as many employees were killed in the industry as in 2009/10 - a reduction from more than 9 to around 2 fatalities per 100,000 workers - a drop of 78%. The latter rate includes an employee rate of 2.4 per 100,000 and a self-employed rate of 1.5.

Whatever the interpretation of the statistics of the past decade discussed below, the consistency of the longer term picture implies that there has been a secular change in risk in the construction industry, an impression reinforced by contemporaneous declines in the rate of incidents reported to HSE under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) Regulation (See Annex 3 for further detail on the above).

Over a twenty to thirty year period, therefore, the statistics tell a clear story of much reduced rates of fatalities and injuries. As can be seen from the graphs presented in Annex 3, the three-decade period divides almost evenly into three distinct sets of rate-bands. During the 1980s rates of fatality in the sector ranged between about 8 and 10 deaths per year per 100,000. During the 1990s that range fell to between 5 and 6, while, excluding only the year 2000, the range during the first ten years of this century has fallen to between 2 and 4.5.

Over the past ten years the crude reductions in fatalities and injuries in the construction sector have been:

- Fatality Rates: 63%
- Major Injury Rates: 40%
- Over-3 Day Injury Rates: 39%
5.2 Injury Rates

A detailed picture of an overall decline in injury rates over the past thirty years can be seen in Annex 3 for both major injuries and for those requiring an absence from work of more than 3 days.

5.3 Health related illnesses

Construction workers are at heightened risk of occupational disease and ill-health. The areas of principal concern are asbestos-related disease, where the single most vulnerable occupational category has, historically, been carpenters and joiners. Asbestos risk is now much more comprehensively controlled than ever before, but the risk of encountering asbestos when working on older buildings remains high.

In addition, there is evidence that construction workers are particularly vulnerable to musculo-skeletal disorders (MSD). Data from the Labour Force Survey suggests that both the construction sector as a whole, and ‘skilled construction and building trades’ had significantly higher than average incidence rates of MSD. Indeed, LFS data from 2000/2001 suggested that construction had one of the highest rates of MSD for workers working over the previous eight years. Inspectors’ reports suggest that this type of risk is poorly controlled on building sites.

HSE estimates, from the Self-reported Work-related Ill health survey (SWI 2007/08), suggest that the current overall prevalence rate of ill health is around 3,600 per 100,000 people working in the last 12 months, which equates to 88,000 suffering from work-related ill health in 2007/08 (cf 137,000 in 2001/2 but these figures are not adjusted for workforce size or economic conditions). The rates of ill-health have not improved much in the past five years but neither have they in the workforce as a whole (see also Annex 3).

5.4 Causation

As was discussed earlier, in section 2.1, the patterns of causation of fatal and major construction health and safety incidents strongly indicate that worker competence does indeed matter, and that it has an important role to play in improving industry health and safety.

But, as briefly mentioned in that earlier section, it may be that certain key aspects of the issue have yet to be fully addressed and that "competence" may need to be defined in a broader context than the industry has generally accepted over the past two decades. The broader context has to recognise that individual competence, even when supported by adequate equipment, systems and processes, must include more than merely occupational skills and knowledge and health and safety awareness, but must also fully encompass behavioural and attitudinal elements over the entire span of an individual’s work in the sector.

The evidence clearly points to a "competence-gap" in the construction workforce which is reflected in the apparent slowing down of improvements in health & safety performance and which is not being addressed by either the regulatory systems or by the occupational competence approaches.

A significant proportion of fatal and serious incidents in the construction sector occur when an operative is working outside of their normal context of work (on a roof, in a trench, near plant or moving machinery, and so on).
In the accepted sense of "competence" these bricklayers, tilers, electricians, plasterers, or whatever, are occupationally competent. However, operating in unfamiliar circumstances requires extra care and behaviours that fully encompass the additional risks.

In these cases the need for situational awareness and personal responsibility for ongoing, on-site risk assessment and management is extremely important. Whereas behaviours and attitudes are an important additional aspect of true competence in the "normal" work-role and work-situation, there is a potential need in dangerous activities such as construction for an over-arching awareness of the extra risk posed when working outside the usual context.

The research evidence would support a number of broad conclusions:

- Occupational role is by far the most important predictor of fatal or major incidents, with construction labourers and trades being among the highest risk workers in the UK;

- Accidents often occur when workers are not actually performing a construction task, suggesting that broad situational health and safety competence is at least as important as specific occupational competence.

- There appears to be a fairly clear correlation between levels of injury and exposure to certain key types of risks, most notably work at height, proximity to heavy vehicles, electricity, and collapse of foundations/excavations;

- There is prima facie evidence that those most vulnerable to these risks are non-specialists undertaking activities involving these risks – most notably work at height – and who do not possess the necessary degree of "competence" to manage those risks effectively;

- The length of time that an employee has been in one specific role has a small but measurable effect on their propensity to injury or death.

Although only from a single year and therefore not statistically robust, the HSE listings of the names and causes of those dying in work-place accidents during 2009-10 illustrate very clearly the scale of certain potentially causal issues.

Of 39 construction-related deaths capable of being analysed in these listings, three were members of the public (two aged 86 and 90 and one aged just 1 who was struck by the column of a street light). Falls from height of any kind (from ladders, scaffolding, roofs, platforms, etc) accounted for almost two thirds of all deaths (64%).

It is noteworthy, also, that 76% of those dying in falls from height were aged over 50, 56% over 55, 40% over 60, and 16% over 65 (one was aged 75 at the time of death).
An operative may be fully "competent" in terms of their skills and knowledge of the job and its safety requirements, and yet may still be open to significant risks due to other factors such as human factors - including age - or working outside his or her accustomed environment or situation ("Out of Context Risks").

It may, therefore, be more than worthwhile considering what human factors approaches could bring to situations in which regulations, systems and "competence" in their traditional senses may not be sufficient, in themselves, to save lives and injuries. One might ask, for example, what proportion of the deaths to the over-50s due to falls from height might be averted by looking not only at their equipment and competence but at specifically human factors such as eyesight, reaction time, strength and propensity to tiredness as well as their skills in situational awareness.

6. Do Cards matter?

The concept of cards as an evidence of competence in the construction workforce is not yet a decade old and the density of penetration has only recently reached significant levels - and even then only in certain occupations and areas of work.

There are currently around 2.6 million cards of all types and levels in circulation\textsuperscript{32} (for an operative workforce of perhaps around 1.5 million).

This research has shown that around 77\% of these cards have multiple routes and that 73\%\textsuperscript{33} of them do not necessarily require a formal, nationally recognised qualification\textsuperscript{34}. Only 4\% of the identified cards can be obtained only by acquisition of a formal, nationally-recognised qualification (12 of 300).

Only some 6\% of site based supervisors and managers (two of the most critical occupational roles identified by the research) have a relevant formal qualification and yet card coverage of this group appears to stand at 102\% of the current workforce (see Table 2).

Our research has, therefore, revealed a number of serious concerns relating to the use of card schemes as proxies for competence: not the least of these are the facts that formal occupational qualifications are still not essential in most of them, that card-levels do not necessarily relate to the level of work being undertaken on site, that a few cards can still be obtained simply by application and payment of a fee, and that the overall system is complex and confusing for employers and employees alike.

Furthermore there is no evidence that the card approach itself has actually delivered additional benefits to those that can be demonstrated to have derived from the legislative and standards-based qualifications approaches of previous decades. The reductions in fatalities that have taken place over the past decade might be argued to be due to further embedding of the formal qualifications systems (ie increased proportions of the workforce with such qualifications) and to general employer awareness of their duties (perhaps on the basis of the CDM regulations). It is also worthy of noting that recessions also have an impact. When in a recession where work is curtailed, such as the current one that hit in 2008, managers are often in a position to be able to cherry pick the staff they want working with them.

The evidence for occupational competence and basic health and safety awareness having an impact on the sector's health and safety performance is reasonably persuasive - primarily based on the sector's performance between around 1985 and 2000 when health and safety continued to improve steadily (with the exception of the last two years of this period). Card schemes may well have had an
impact over the last decade but it is impossible to separate their effects on the reduction in incidents from the ongoing effects of qualifications and of the CDM system.

Of course, there are derived benefits of having card systems, such as providing site managers or supervisors with a roll call ability in the event of an emergency evacuation or, putting aside matters of fraud, the means to check identities for security purposes.

However, with the specific exception of certain cards, for example those that specify one route with no alternatives (examples of which include CPCS and Achieving Competence in Engineering (ACE)), and those safety passport schemes which require very specific safety competences to be developed and tested, the conclusion from our findings, would almost certainly be that where cards do not require such specific and targeted routes and achievements they will be of limited value in health and safety terms.
### Table 1 - Qualifications and Card Penetration as at 2004

<table>
<thead>
<tr>
<th></th>
<th>Penetration 2004</th>
<th></th>
<th></th>
<th></th>
<th>Quals (%)</th>
<th>Cards (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1) 2004</td>
<td>2) To 2004</td>
<td>3) To 2004</td>
<td>4) To 2004</td>
<td>5)</td>
<td>6)</td>
</tr>
<tr>
<td>Total Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total VQs* Lev 2 &amp; above</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Managers</strong></td>
<td>236,290</td>
<td>118,440</td>
<td>52,170</td>
<td>41,098</td>
<td>448,538</td>
<td>44,205</td>
</tr>
<tr>
<td><strong>Professionals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Technicians</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site Supervisors</strong></td>
<td>295,000</td>
<td>144,850</td>
<td>115,790</td>
<td>115,790</td>
<td>39,240</td>
<td>594,880</td>
</tr>
<tr>
<td><strong>Wood Trades</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bricklayers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Painters (&amp; decorators)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Plasterers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Roofers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Floorers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Glaziers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other SB Operatives</strong></td>
<td>47,330</td>
<td>58,920</td>
<td>41,110</td>
<td>37,670</td>
<td>24,990</td>
<td>210,020</td>
</tr>
<tr>
<td><strong>Scaffolders</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance Operatives</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Plant Operatives</strong></td>
<td>24,020</td>
<td>56,470</td>
<td>30,960</td>
<td>29,190</td>
<td>577,250</td>
<td>53,245</td>
</tr>
<tr>
<td><strong>Plant Mechanics/Fitters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Road Vehicle Drivers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Steel Erectors/Structural</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other CE Operatives</strong></td>
<td>258,890</td>
<td>24,699</td>
<td>24,699</td>
<td>194,576</td>
<td>108,340</td>
<td>11411</td>
</tr>
<tr>
<td><strong>General Operatives</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electricians</strong></td>
<td>183,870</td>
<td>152,610</td>
<td>336,480</td>
<td>22,180</td>
<td>108,340</td>
<td>11411</td>
</tr>
<tr>
<td><strong>Plumbers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Health &amp; Safety Schemes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (*)</strong></td>
<td>2,096,430</td>
<td>2,096,430</td>
<td>148,299</td>
<td>450,231</td>
<td>2,096,430</td>
<td>2,096,430</td>
</tr>
</tbody>
</table>

Source: Courtesy of HSE; Inspectors’ Guide, Gordon Crick, 2006
Table 2 - Qualifications and Card Penetration as at 2009

The table below is not directly comparable to Table 1. Table 2 relates to approximate workforce figures, NVQs (and where applicable SVQs) ie not all VQs allocated to occupations and all cards where data was provided for the purposes of this research (not just CSCS cards) and where they can be assigned to an occupation.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Workforce figures – derived from LFS data</th>
<th>Sub-total per category</th>
<th>Total NVQs Level 2 &amp; above (all) valid cards as at 2009</th>
<th>Penetration 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Construction) Managers</td>
<td>206,000</td>
<td>14,275</td>
<td>256,000</td>
<td>6</td>
</tr>
<tr>
<td>Site Supervisors</td>
<td>45,000</td>
<td>489,000</td>
<td></td>
<td>102</td>
</tr>
<tr>
<td>Other construction and technical staff</td>
<td>238,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood Trades</td>
<td>260,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bricklayers</td>
<td>82,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Painters (&amp; decorators)</td>
<td>128,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasterers</td>
<td>40,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roofers</td>
<td>40,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floorers</td>
<td>36,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glaziers</td>
<td>40,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other SB Operatives</td>
<td>55,000</td>
<td>223,090</td>
<td>508,290</td>
<td>44</td>
</tr>
<tr>
<td>Scaffolders</td>
<td>20,000</td>
<td>514,000</td>
<td></td>
<td>98</td>
</tr>
<tr>
<td>Maintenance Operatives</td>
<td>33,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant Operatives</td>
<td>46,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant Mechanics/Fitters</td>
<td>32,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road Vehicle Drivers</td>
<td>31,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel Erectors/Structural</td>
<td>27,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other CE Operatives</td>
<td>51,000</td>
<td>149,320</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Operatives</td>
<td>103,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health &amp; Safety Schemes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cards not allocated to occupations ^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>+1,849,480</td>
<td>**362,564</td>
<td>***1,763,087</td>
<td></td>
</tr>
</tbody>
</table>


Notes:  
Col. 7 (*) this does not represent the total Construction workforce – as it does not include architects, surveyors, electricians or plumbers and other non-construction operatives, technical/office based staff, civil engineers, other construction professionals. The total construction workforce is estimated to be circa 2.3m  
Col 8 (**) this figure relates to certificates issued for NVQs/SVQs between 2005 and 2009 - data sourced from OfQual and SQA. It does not total all NVQs/SVQs data as some of the qualifications included in the 492,000 (see earlier) have not been allocated to those occupations looked at in the above table. Col 9 (***) this figure relates to cards valid as at 2009.  
^ - these are cards which cannot be directly assigned to any one specific occupation.
7. Routes to Competence

Defining and classifying routes to competence is by no means as straightforward as the words may imply. A "route" to achieving competence consists of the stages through which an individual will proceed in order to gain that end but an essential precursor is an understanding of the meaning of "competence".

The "route" is best seen as the overall way in which competence is acquired - ie from school, perhaps through college, and then into the workplace where mentoring creates a finished, basic occupational competence. In the past - and up to the 1980s- the construction industry developed operator competence through either the college route (supporting lengthy apprenticeships with their workplace experience and mentoring), or through schools (where basic craft/hand-skills and techniques were taught) direct to the workplace where mentoring completed this process. In a great many cases short courses are used to fill in gaps in the route.

Since the 1980s "occupational competence" has been more precisely defined and recorded in the form of standards (NOS) and these have become the basis of assessing competence regardless of the way in which it was first learned.

However, even today, "competence" in the construction industry is developed in a myriad of ways and via many different routes: through traditional college courses, on-the-job learning and mentoring, three year apprenticeships, and formal, standards-based workplace assessments.

There are clearly gaps within qualifications in the complex networks of routes to competence across the construction sector but it has to be remembered that these are gaps surrounding qualifications not necessarily in competence. The most obvious gaps exist at the level of general labourers and within existing qualifications for site supervisors and managers relating to their understanding of behaviours to limit risk.

Health & safety competence is usually developed in similar ways - through standards-based extensions to the occupational competences but with the possible addition of health & safety tests to obtain Skills cards or safety passports.

The picture is a complex mix of traditional college and short-courses, work-based assessments, and on-the-job mentoring but the idea of what actually constitutes "competence" in the construction context is absolutely crucial.

Competence is not a simple binary concept - ie one that is either achieved or not achieved. Instead it is an iterative process, through a series of mainly employer-defined levels, developed over an entire lifetime (albeit with the basic skills and knowledge being developed mainly at the beginning of a career). Put simply, competence could be defined in any or all of the following ways:

- when an individual has sufficient job/health and safety skills and knowledge to be able to perform a specific task (task competence);
- the point at which the person has occupational skills and knowledge in most tasks across a greater range of situations (functional or job competence);
- the point at which the individual has gained the skills and knowledge to undertake jobs and tasks quicker and with greater accuracy or even flair (expert competence).
None of this is about what the UK usually calls "levels of competence" - i.e., levels 1, 2, 3, and so on - but about the degree of skill and ability exhibited within a given job role.

Over the past twenty-five years, the UK has developed a complex system of "occupational standards" to attempt to assess competence in the workplace.

College training and "courses" are effectively input-based routes to competence. The philosophy being that teaching and practical training of a sufficient quality together with traditional tests and examinations ensure that the employee is appropriately "competent" when entering the workforce. Experience and on-the-job mentoring then adds the lifelong learning element. Although lacking work-based experience, input-based routes to competence offer the advantage of delivering a much wider theoretical and practical background.

Output-based approaches rely on assessment alone to know whether someone is "competent" or not. There is no requirement for any given input method. Skills (and to a certain extent knowledge) are assessed in the workplace, usually over a limited period of time, in order to ensure occupational competence. The approach possesses the theoretical advantage of testing competence in a work-environment.

Within the construction industry, elements of all routes can still be seen. The traditional City & Guilds college courses and qualifications remain (somewhat amended by their having to comply with new approaches). Electricians, for example, still undertake what is effectively the traditional college-based inputting of competence while undergoing an apprenticeship. Their competence is tested and assessed in knowledge tests, in practical tests, and in assessment of their work in the workplace.

Apprenticeships and qualifications are now available for almost every occupation in the sector. Some are based on formal college (or training provider) courses while others are mainly output-assessed.

In addition, in almost all routes to competence, there are short-courses that are not part of the national qualifications framework. These are provided to meet specific demands in specialist fields and particularly for specialist elements of health and safety. Many supervisor courses, training to underpin safety passports or develop newly promoted managers, or supervisors, such as the Site Management Safety Training Scheme - SMSTS or Site Supervisor Safety Training Scheme - SSSTS, and specialist craft courses (for example, courses related to the maintenance and repair of heritage buildings) are delivered on this basis.

Much of what an operative learns and practises in this way is not recorded or recognised by the national competence-based qualifications system (or by the card schemes in the construction sector).

Similarly, the industry also uses less formal routes to competence such as on-the-job training (usually company-specific), short, non-certificated, off-the-job courses of instruction, and informal mentoring (an oft under-estimated aspect of the development of long term competence).

Any given individual in the industry can follow a wide variety of routes to competence and, what is more important, will rarely only follow a single route.
We should therefore be wary of the word "competence" in that it can easily be assumed that once "competence" has been assessed and assured at a particular level or for a specific qualification, nothing else remains for the company or the individual to do. Effective competence is, of course, nothing like this.

While different aspects of competence can be achieved and measured - usually at a basic level - the individual never stops learning and developing even in relatively low-level occupations. The concept of competence might best be seen as a "timeline to expertise" - one develops varying levels of competence in a wide variety of things as one travels through a career, but there is no end to the road and the development should always be regarded as continuous.

Furthermore, an effective route to competence cannot end with qualifications or tests, or even with re-assessment of those qualifications and tests. In a dangerous industry like construction the term "competence" must fully encompass the need for human factors considerations and for situational awareness at all times. It is at this point that corporate and individual competence overlap. In order for operatives to be competent in a behavioural sense the organisation itself, probably in the shape of the site supervisors and managers, must be capable of delivering sustained mentoring and supervision of its operatives' situational awareness, competence in immediate risk management, and their safety behaviours.
8. Summary of Findings

1. The penetration of competence-based qualifications into key construction occupations remains incomplete. It is particularly low in some key risk areas – notably, unskilled workers and site supervisory and managerial occupations.

2. The system of card/safety passport schemes used for “evidencing” competence remains confused, fragmented and complex. It is based on varying and sometimes incompatible criteria, may be very expensive to sustain, and may well incur additional costs of duplication. Examples of existing routes to competence that exhibit strengths and good practice could include IRATA and the CPCS scheme. The EUSkills Register database appears to be a comprehensive and easy to use system coordinating all the main utility industry training, certification and safety passport schemes in a single register.

3. The plethora of card schemes is of extremely doubtful and inconsistent value in helping the industry’s companies to judge competence. While some cards and safety passport schemes reflect and evidence a good standard of job and H&S competence (and some even require and evidence behavioural ability as well) it is extremely difficult for employers to be fully aware, retain and monitor the competence-related strengths and weakness of all cards and passports.

4. The NOS and NVQ-based system of qualifications with its very highly specified sets of criteria, while reflecting basic occupational competence and health and safety knowledge, is insufficiently broad to meet the needs identified in this report for extensive behavioural and attitudinal knowledge and skills.

5. The skill and knowledge aspects of competence in the industry may have been constrained by the NVQ approach which essentially does not have the current ability to test these important attitudinal and situational skills. With the exception of certain taught courses there is nothing at present available for the industry which develops these skills on an ongoing basis. From the point of view of cost-effectiveness, the report concludes that only extensive training and mentoring by site supervisors and managers will achieve this.

6. Under the existing system of NOS, health and safety is approached as a "skill with underpinning knowledge" that, once evidenced for the award of a specific qualification, need never be re-evidenced. Primarily because, at the moment, there is no established understanding of how competence can be regularly re-assessed except through some sort of "licence to practise" system.

7. A major aspect, although by no means the only one, in behavioural and attitudinal awareness, is the concept of ‘out of context’ skills. The greatest levels of risk are associated with employees working outside their “occupational” area of competence (for example a labourer asked to undertake work on a roof, or a bricklayer suddenly transferred to a different site). As this report shows a large proportion of fatal and serious incidents in the construction sector occur when an operative is working outside of their normal context of work. In these cases the need for situational awareness and personal responsibility for risk assessment and management is extremely important.
8. Emerging and recent evidence that considerations of behaviours to limit risks underpinning a safety culture is a necessary way forward, major contractors are using this with success to effect significant reductions in incidents: for example the DWP case study (see Annex 5).

9. The report clearly shows that the greatest areas of risk in the construction industry at present are to those, working at height and working with, and in the environment of, construction plant, especially vehicles. The industry is also having to focus more and more on its incidence of ill-health. Consideration should therefore be given to introducing specialist qualifications for the ‘health and safety’ aspects (including situational awareness) of working at height, working with and around construction plant and working to prevent ill health.

10. The existing understanding of "competence" as being occupational knowledge and skill plus health and safety awareness should now be extended as quickly as possible to include ongoing development of operative's situational awareness and immediate risk assessment and management capabilities. We have termed this the "New Competence" but its precepts are already being applied by many organisations in the sector.

11. Embedding the New Competence requires a step-change in the sector's understanding of what competence is and how it is developed; a move from a "once and for all" approach to one of "continuous competence development" (applying to both occupational and behavioural competences). This can only cost-effectively be achieved by developing and mandating appropriate qualifications and training for supervisory and site manager roles which focus on human factors mentoring and supervision.

9. The New Competence

9.1 The Importance of Behaviour

In order to understand the kind of competence of most value for promoting health and safety in the construction industry, it is important to consider the types of errors that lead to increased health and safety risks.

There are three basic categories of dangerous error\(^{25}\): mistakes, slips and lapses, and violations (for definitions see Annex 4).

These can be represented diagrammatically as follows:

```
Error
   /\  Intentional
  /   \
Error of omission (lapse)
 /     \
√
 /     \
Error of execution (slip)
```

```
Error
   \  Unintentional
  \   \
Known to be inappropriate (violation)
 /     \
Not known to be inappropriate (mistake)
```

30 | P a g e
Each of the three sources of error derive in different ways from aspects of the competence model:

- Skill
- Knowledge & Understanding, and
- Behaviour and Attitude

In almost all high risk situations, such as flight safety, the nuclear industry, and medicine, it is taken for granted that securing competence requires the systematic development of and selection for all three ‘input’ components of competence in order to reduce the probability of error.

This holistic approach to competence includes not only skills, knowledge and understanding, but also behaviour and innate and acquired values and attitudes.

In almost all high-risk environments the employers rely on high quality, input-based education and training to establish the theoretical and skills base. This is then supported by mentoring and work-based skills training and by behavioural tools to ensure appropriate attitudes and values. Very often all three elements are reinforced and re-assessed at regular intervals.

This strongly implies that an ‘inputs’ focus is an important part of assuring the levels of performance needed to work safely in high risk situations. This has important implications in relation to the current approach to vocational qualifications in the construction sector. An outcomes-based approach tends to de-emphasise formal inculcation and testing of the inputs of competence.

In a 2006 analysis of the significant factors in fatal and major injuries in construction in Scotland, the HSE identified - in order of precedence - situational awareness, competence, and planning. The report went on to say:

‘Although the work environment factor is a specific issue in construction, otherwise there seemed to be a pattern emerging common to all industry sectors. There appears to be a tripartite relationship between situational awareness, individual competence and deficiencies in planning. There is a high frequency of poor situational awareness coupled with poor competence (in the form of ‘inappropriate actions being chosen/applied’) and poor planning in the form of deficient risk assessments and/or method statements’.
There has been a marked underachievement in the moves towards qualifying the construction workforce and developing an efficient and transparent system of evidencing competence across the construction sector. It is impossible to know whether this underachievement is significant but, by its own measures and targets, the industry has a substantial way to go before its workforce reaches the goal of being not only "competent" but also independently assessed as competent whether through formal qualifications or some other means.

At the same time, however, it is important to consider the effectiveness and appropriateness of the industry’s chosen routes to competence, in order to ensure that it does, in fact, represent the optimal means of realising its ambitions to improve health and safety performance. It is especially timely to consider such issues given that the transition to the QCF, which is currently taking place, provides an important opportunity to rethink relevant aspects of skills development and qualifications.

At this point it may be worthwhile to review the broad strategies by which the industry has sought to address health & safety issues.

The HSE and the Construction Industry have successfully pursued two main strategies in the war on death, injury and ill-health. These represent the over-arching route to competence in the context of this study:

- Since the earliest days of the Health & Safety Executive the core thrust has been systems-focused, using legislation, regulation and guidance to improve the physical elements of safety in the industry;
• From about the early 1990s an additional strategy has focused on achieving widespread occupational and health & safety competence in the workforce.

The evidence clearly illustrates that both strategies have been successful to an extent – however three considerations lead to the need for a fundamental questioning of the existing route to competence for the sector:

• In recent years the rate of decline in incidents, accidents and fatalities has been slowing (see graph and trend-line in Annex 3);

• The need to re-focus on workplace health is now increasingly important as the relative lack of progress in this area becomes more evident against the relative successes in limiting death and injury, and,

• All stakeholders are agreed that much more needs to be done to continue to improve the sector’s health & safety performance.

Further improvement is likely to require a more comprehensive approach to worker competence than that which can be gained purely through the existing strategies and from competence measured by NOS-based qualifications and standards.

Our findings on the causation of fatal and major construction injuries indicate not only the commonly accepted predominance of general operatives and labourers as being at high risk but, crucially, that the greatest levels of risk are now associated with employees working outside their area of competence.

Systems-based approaches create frameworks of laws and rules within which construction work is performed while occupational competence ensures that trained and/or qualified personnel have the knowledge and skills to theoretically operate effectively and safely within their occupational role. There is convincing evidence though, that, in order to improve health and safety performance, the construction sector will need to consider different and additional mechanisms. As will be seen from the discussion below, very few of the possible avenues are novel, almost all have been developed and many are already being implemented either by individual companies/organisations or by sub-sectors.

There is considerable evidence that properly-designed and conducted “human factors” approaches (including Situational Awareness and Natural Decision-Making) are capable of reducing incident rates by very substantial amounts. The majority of the effort put into these schemes is directed at enhancing individual responsibility and involvement and teaching and reinforcing the skills and attitudes necessary for effective situational awareness.

9.2 Extended Competence

It is clearly theoretically possible for one to be seen as competent or even expert in a specific occupation and yet still lack the health and safety knowledge and awareness necessary to remain free of illness and injury (particularly so in contexts different to those in which one was trained). It is also only too possible for there to be a significant gap between the inputs and outcomes of education and training such that crucial elements of the health and safety mix are indistinct or even absent from an individual’s skills/knowledge portfolio.
To develop a comprehensive model of competence for health and safety purposes, then, we need a way of bridging the gap between inputs and outcomes while taking due account of the main sources of error behind most accidents and ill-health and understanding the potential for harm of contexts that are unusual for a given individual.

The most promising areas for beginning to achieve these objectives would seem to be found in *Situation Awareness* and *Naturalistic Decision Making* – which are concerned with how people use the basic ‘inputs’ of competence to make decisions about how they interact with the world around them.

**Situation Awareness (SA) and Natural Decision Making (NDM)**

The concept of *Situation Awareness* originated in US military research into the effectiveness of flight crews, developed rapidly in the 1980s and early 1990s, and was synthesised into its most widely used form by Mica Endsley in two classic papers of 1995. The idea is variously defined, but the most widely used definition is:

> ‘the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future.’

Further understanding can be drawn from recent research into Naturalistic Decision Making (NDM), again developed originally in the context of decision making under stress, primarily in military situations. NDM also helps shed light on what is involved in decision making under realistic conditions.

Analyses of expert decision-making strongly suggest that decisions are not based on systematic analysis of the situation, followed by the development and evaluation of competing possible courses of action. Instead, most decisions are made instantaneously on the basis of classifying the situation using pattern recognition; a single solution is then identified and where appropriate mentally rehearsed to identify possible inadequacies; if problems emerge the first reaction is generally to modify the selected approach, and only if this is not likely to lead to the appropriate result will the agent seek to identify other solutions.

This suggests that most decision making is driven by schemata – simplified, pattern-based models of the surrounding environment. Expert decision making appears to be distinguished by the possession of, and ability to select and modify, schemata that are appropriate to the agent’s situation. The schematic representation then seemingly acts to structure experience, directing attention towards specific aspects of the environment and enabling others to be ignored. The schemata function as patterns which can rapidly be matched against the environment; once selected, an appropriate schema enables the agent to direct attention to the most salient features of the environment relative to the goals they are pursuing. This helps explain why research has consistently found that expert decision-making appears to be far more rapid and selective than inexpert decision-making, while also, paradoxically, far more ‘data-driven’, i.e. directly responsive to the context.

The concepts of SA and NDM help us to conceptualise the nature of competence for health and safety purposes and to appreciate, at least in basic terms, how it can best be developed. This can only be achieved tentatively here, but may help direct attention to appropriate approaches.
Decision-making in low-risk environments conforms just as closely to the NDM model as do decisions in high risk occupations but, obviously, a bad decision in the latter can have much more significant health & safety implications.

The first clear point is that successful deployment of appropriate skills and behaviours is dependent not just on ‘knowledge and understanding’ or values and attitudes, but on being able to draw on appropriate schemata for the circumstances. The development of competence and expertise is essentially a matter of being able to transform the major ‘inputs’ of competence and experience into the underlying schemata that form the basis of adequate SA, which in its turn forms the foundation of effective, safe decision-making

The key question, then, is how to most effectively support the acquisition, development, and assessment of the ability to develop, access and deploy appropriate schemata for safe work.

9.3 The Third Strand

On the basis of these findings (which are substantially supported by work already going on in the sector in the larger organisations and by the findings of the DWP project - see Annex 5) we should now be looking at strengthening the traditional definition of competence with a third strand which enhances and reinforces the other two with a distinctly "human factors" approach. One could even argue that a fourth strand might be added - the corporate competence to manage this process by the company and its managers and supervisors.

There is at least a prima facie case for the "third strand":

- Occupational skills & knowledge
- Occupationally-relevant health & safety awareness
- Human factors/situational awareness skills

The "New Competence" for the construction sector would add the third strand to existing layers and strategies (subject to any changes agreed upon as a result of the detailed recommendations from this study). This would not so much be a new route to competence as an enhanced route to competence.
The evidence of the Job Centre Plus program suggests that fairly basic, consistent, situationally and behaviourally-oriented training and related risk management tools can have enormous impacts. Such training and assessment could, in turn, provide the foundation for safety passport schemes that move beyond the very basic health and safety awareness tested by the ConstructionSkills touch-screen tests.

It would also appear to be essential that any new qualifications be awarded for limited periods of time before needing to be re-trained, re-assessed and renewed.

More generally, there is a need for the development of training and assessment tools for site managers and supervisors that specifically focus on developing their ability to mentor and support a human factors approach to health & safety on site.

The new competence will build in health and safety schemata at all levels of the organisation and over the lifetimes of the individuals and organisations involved. It will embed deeply into every construction company’s managers and supervisors the attitudes and behaviours necessary to maintain human factors at the forefront of theirs and their employees’ minds.

The new competence as such represents a sea change in the way that health and safety is regarded and implemented. One of its major advantages would be to enable human factors education and training to be thoroughly embedded in small and medium sized enterprises in the short and medium term.
Endnotes

1 Convened by the then Deputy Prime Minister, John Prescott, on 27 February 2001


3 Working Group on Vocational Qualifications, 1986

4 For more information on SSCs and their role see UKCES website [www.ukces.org.uk/sector-skills-councils/about-sscs/](http://www.ukces.org.uk/sector-skills-councils/about-sscs/)

5 ‘Standards are not attempts to describe the totality of human experience. They have a limited purpose which is to describe the expectations of employment – the outcomes. Standards are descriptions of what people are expected to achieve, not what they are like. Personal competence models or any descriptions of personal characteristics are not standards’. See for example ‘Towards a Competent Workforce’, Mansfield and Mitchell (1996), p.89.

6 *Combining Knowledge and Skills in Competence based Vocational Qualifications*, QCDA, January 2010

7 According to the NOS Quality Criteria, NOS may also specify that certain specified skills, behaviours or attitudes may be necessary to meet the specific performance standard; whether these are appropriate is left to the SSC in conjunction with its employers.


10 As of 2010 it appears there only exist voluntary arrangements for NVQs in the QCF, ie there is no back up through the mandatory, recognised, NVQ Code of Practice that applied to the previous NQF qualifications


15 For companies, this comprises a two-stage process of first checking the health and safety systems and processes in place and then checking experience and track record. For individuals, a similar process of first checking ‘task knowledge’ and then checking experience and track record is recommended. In both cases, there is an emphasis in the ACOP on avoiding unnecessary paperwork and concentrating on the underlying competence requirements and whether they are being fulfilled.

16 Some occupational standards do attempt to define and measure behaviours but it must be noted that, even where this is done, those behaviours are not or very rarely measured over any substantial period of time, or reinforced by systems external to the qualification (eg formal mentoring or teaching systems within the workplace).

17 A consultation during mid 2010 by the Government department responsible for Business, Innovation and Skills (BIS) is considering approaches to simplify the Further Education and skills funding system. The consultation requests responses to a proposed ‘streamlined FE system based on principles of a marketplace with empowered informed customers, trusted colleges and training organisations, a focus on outcomes and a minimal role for Government intervention’. 

Highest level of full NVQ/SVQ held (excluding equivalents), UK: 2000-2009, Four quarter averages, Spring of each year. All non-manual & manual occupations, ConstructionSkills definition.

This figure of 492,000 forms part of the total of 1,097,000 being ONLY NVQ qualifications as opposed to the larger figure which includes taught qualifications (eg BTEC) and the newer QCF qualifications (ie awards, certificates and diplomas).

See http://www.cskills.org/workinconstr/onsite/osat/

This phrase to also include for the purposes of this research – the engineering-construction industry.

Diagram courtesy of Construction Skills.

Note: there is apparently no mechanism to determine if the employer attestation is either genuine or made by a person competent to do so.

Donaghy Report, One death is too many, 2009 page 49

Yet, even if cards were all based on relevant qualifications and if the qualifications all represented a genuine measure of occupational competence, there are still the issues of work often being carried out at a level higher than that of the card, and that of the health & safety awareness evidenced by the card being essentially elementary, mechanistic and assessed only once.

The basic sources of statistical information for the sector is the statistical information compiled by HSE, most of it drawn from its own RIDDOR reporting network; health and safety modules in large scale surveys undertaken by the Office for National Statistics (ONS), and other government departments; and records submitted through medical reporting mechanisms. There are, in addition, a variety of smaller scale surveys which are used to supplement the official statistics where appropriate.

Discussed in more detail in Appendix 3

HSE (2008), Construction Intelligence Report, p. 18.

The relationship between competence and the injury and fatality statistics is difficult to establish in any meaningful way but the superficial evidence of reduced rates over the past twenty years since competence became a major focus of the health & safety effort is de facto confirmation that competence matters.

HSE Updated 25/7/2010; SIC Code 45250

Of this figure some 1.5 million are CSCS cards and cards from affiliated organisations.

Statistics relate to all cards and all levels.

These cards can be acquired through either a qualification, or a short course or test, or industry accreditation (ie attestation of competence by an employer).

See particularly Human Error; James Reason

An analysis of the significant causes of fatal and major injuries in construction in Scotland (Factors influencing Scottish construction accidents - FISCA). Prepared by BOMEL Limited, Glasgow Caledonian University & The Institute for Employment Research for the Health and Safety Executive 2006 - HSE Research Report p.443


40 One of the most illuminating discussion of schemata in relation to expert practice is to be found in relation to art, in Ernst Gombrich (1960; 1977) *Art and Illusion: A Study in the psychology of pictorial representation*.

41 The concept of NDM resonates particularly strongly when set alongside some of the key facts of accident rates in the UK construction industry - such as the disproportionate rates of accident to those who have been in the industry for a brief period of time (thereby lacking the opportunity to develop and test schema
A commentary on routes to competence in the construction sector

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Annex 1 – Analysis of Qualifications and Card Schemes

The analysis that follows relates purely to those card schemes examined for the purposes of this research. A list of organisations contacted as part of the research is included in Annex 9.

A. Typology of cards across occupations, levels and grades:

Routes to achieving the cards:

<table>
<thead>
<tr>
<th>Prerequisite typologies and numbers of cards (numbers)</th>
<th>No pre-requisites or none stated</th>
<th>A variety of routes are available (±)</th>
<th>Industry accreditation only</th>
<th>Qualification only</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cards – details confirmed by card organisations*</td>
<td>24</td>
<td>142</td>
<td>5</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Other cards - details from website but not confirmed **</td>
<td>47</td>
<td>61</td>
<td>10</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

*base = 183 / ** base = 130 ± the majority of routes encompasses qualifications or industry/ business accreditation.

How H&S is dealt with by the cards:

<table>
<thead>
<tr>
<th>Prerequisite typologies and numbers of cards (numbers)</th>
<th>Nothing stated</th>
<th>H&amp;S is dealt with in the qualification</th>
<th>Special activity or consideration required eg Safety passport or test</th>
<th>No special activity required eg prior knowledge is okay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cards – details confirmed by card organisations*</td>
<td>19</td>
<td>5</td>
<td>72</td>
<td>87</td>
</tr>
</tbody>
</table>

*base = 183

How long the cards across schemes/ levels remain valid

<table>
<thead>
<tr>
<th>Validity of card (numbers)</th>
<th>Nothing stated</th>
<th>&lt;1 yr</th>
<th>1 to 3 yr</th>
<th>3 yr +</th>
<th>Life time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cards – details confirmed by card organisations*</td>
<td>5</td>
<td>0</td>
<td>95</td>
<td>83</td>
<td>0</td>
</tr>
<tr>
<td>Other cards - details from website but not confirmed **</td>
<td>68</td>
<td>1</td>
<td>28</td>
<td>33</td>
<td>0</td>
</tr>
</tbody>
</table>

*base = 183 / ** base = 130
Renewal requirements for the cards

<table>
<thead>
<tr>
<th>(numbers)</th>
<th>Card Renewal Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nothing stated/none</td>
</tr>
<tr>
<td>Cards – details confirmed by card organisations*</td>
<td>32</td>
</tr>
<tr>
<td>Other cards - details from website but not confirmed **</td>
<td>104</td>
</tr>
</tbody>
</table>

*base = 183 / ** base = 130

How card scheme organisations ensure skills and knowledge remain current:

<table>
<thead>
<tr>
<th>(numbers)</th>
<th>Nothing stated</th>
<th>*Activity required to demonstrate cardholder’s skills and knowledge are current (see below)</th>
<th>No activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cards – details confirmed by card organisations*</td>
<td>21</td>
<td>104</td>
<td>58</td>
</tr>
</tbody>
</table>

*base = 183

*Types of activities required to demonstrate currency of cardholder’s skills and knowledge:

<table>
<thead>
<tr>
<th>(numbers)</th>
<th>Refresher Course</th>
<th>Job related CPD activities</th>
<th>Health and safety course</th>
<th>Redo test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cards – details confirmed by card organisations*</td>
<td>13</td>
<td>67</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>

*base = 140/
A. Qualification Details relating to specific occupations

(Notes: the data below are based on only NVQs/SVQs and those which can be attributable to specific occupations – allocated by the researchers so data should be treated with some caution)

<table>
<thead>
<tr>
<th>Wood Trades, Bricklayers/Masons, Painters, Plasterers</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVQs/SVQs: (OfQual and SQA data on certifications numbers – July 2010)</td>
<td>9,962</td>
<td>16,219</td>
<td>29,632</td>
<td>35,407</td>
<td>33,979</td>
</tr>
<tr>
<td>Totals</td>
<td>125,199</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Roofers / Floorers /Glaziers / Other SB Operatives/ General Operatives</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVQs/SVQs: (OfQual and SQA data on certifications numbers – July 2010)</td>
<td>21,284</td>
<td>25,048</td>
<td>44,895</td>
<td>63,883</td>
<td>67,980</td>
</tr>
<tr>
<td>Totals</td>
<td>223,090</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site based supervisors and managers</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVQs/SVQs: (OfQual and SQA data on certifications numbers – July 2010)</td>
<td>349</td>
<td>784</td>
<td>1,938</td>
<td>4,105</td>
<td>7,099</td>
</tr>
<tr>
<td>Totals</td>
<td>14,275</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electricians</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVQs: (OfQual data only – does not include SQA data - certifications numbers – July 10)</td>
<td>1,443</td>
<td>2,993</td>
<td>5,217</td>
<td>5,858</td>
<td>6,010</td>
</tr>
<tr>
<td>Totals</td>
<td>21,521</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plumbers</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVQs: (OfQual data only – does not include SQA data - July 2010)</td>
<td>1,559</td>
<td>4,782</td>
<td>7,094</td>
<td>7,735</td>
<td>7,750</td>
</tr>
<tr>
<td>Totals</td>
<td>28,920</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*This lower figure for 2009 will reflect the changeover of qualifications and transition between the two qualifications frameworks QCF and NQF
Example occupations and qualifications (all VQs) data sourced from OfQual and SQA (allocated to occupations internally by the researchers – so data should be treated with some caution).

<table>
<thead>
<tr>
<th>All VQs - Bricklayers (all levels)</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 84,283</td>
<td>9,057</td>
<td>13,658</td>
<td>18,211</td>
<td>19,911</td>
<td>23,446</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>71,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All VQs - Carpenter and Joinery</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 58,567</td>
<td>1,033</td>
<td>4,901</td>
<td>13,844</td>
<td>16,390</td>
<td>22,399</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>259,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All VQs - Painters and Decorators</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 19,618</td>
<td>291</td>
<td>2,043</td>
<td>3,946</td>
<td>5,774</td>
<td>7,564</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>144,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All VQs - Roofers</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 10,211</td>
<td>1,867</td>
<td>1,531</td>
<td>1,865</td>
<td>2,520</td>
<td>2,428</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All VQs - Supervisors</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 25,788</td>
<td>3,445</td>
<td>4,145</td>
<td>5,579</td>
<td>6,115</td>
<td>6,504</td>
</tr>
<tr>
<td>(Est) Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>244,000*</td>
</tr>
</tbody>
</table>

*Combined with managers in construction as supervisor is a role that is not standalone but amalgamated with managers within LFS and SOC codes.

<table>
<thead>
<tr>
<th>All VQs - Electricians</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 142,515</td>
<td>28,307</td>
<td>26,102</td>
<td>15,188</td>
<td>38,518</td>
<td>34,400</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>251,000</td>
</tr>
<tr>
<td>----------------------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Grand Total = 13,353</td>
<td>1,526</td>
<td>2,200</td>
<td>2,629</td>
<td>3,138</td>
<td>3,860</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VQs - Plant Operative</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 95,808</td>
<td>1107</td>
<td>5366</td>
<td>19568</td>
<td>21228</td>
<td>22899</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>46,000*</td>
</tr>
</tbody>
</table>

* sourced via ConstructionSkills and Office of National Statistics

<table>
<thead>
<tr>
<th>VQs - Plumber</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 91,578</td>
<td>7,462</td>
<td>16,586</td>
<td>21,228</td>
<td>22,899</td>
<td>23,403</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>200,000*</td>
</tr>
</tbody>
</table>

* includes heating and ventilating engineers

<table>
<thead>
<tr>
<th>VQs - Manager</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 7,898</td>
<td>604</td>
<td>950</td>
<td>1,288</td>
<td>2,082</td>
<td>2,974</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>244,000*</td>
</tr>
</tbody>
</table>

* includes supervisors

<table>
<thead>
<tr>
<th>VQs - Steel Erector</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total = 5,280</td>
<td>1,040</td>
<td>1,043</td>
<td>1,166</td>
<td>1,063</td>
<td>968</td>
</tr>
<tr>
<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12,000</td>
</tr>
</tbody>
</table>
B. Numbers of NOS that appear to relate to specific occupations

Bricklayer NOS (variety of sources including UK Standards directory early 2010)

Heritage Skills (Construction) (ConstructionSkills )
Associated Industrial Services Occupations (Construction) (ConstructionSkills )
Senior Crafts (ConstructionSkills )
Trowel Occupations (Construction) (ConstructionSkills )
Refractory Installations (Construction) (ConstructionSkills )
Construction Operations (Construction) (ConstructionSkills )
Chimney Engineering (Construction) (ConstructionSkills )

Carpenter NOS (variety of sources including UK Standards directory early 2010)

Structured Wood Products (UK Woodchain )
Senior Crafts (ConstructionSkills )
Wood Occupations (Construction) (ConstructionSkills )
Senior Crafts (ConstructionSkills )
Set Crafts (Skillset)

Electrician NOS (variety of sources including UK Standards directory early 2010)

Electrical & Electronic Servicing (Summit Skills)
Electrical Systems in Petrol Stations (Summit Skills)
Electrotechnical Services (Summit Skills)
Electrotechnical Services - Approved Electrician Status (Summit Skills)
Electrotechnical Services - Electrical Machine Rewind & Repair (Summit Skills)
Electrotechnical Services - Electrotechnical Panel Building (Summit Skills)
Electrotechnical Services - Electrotechnical Technology & Project Management (Summit Skills)
Electrotechnical Services - Highway Electrical (Summit Skills)
Electrotechnical Services - Installation (Buildings & Structures) (Summit Skills)
Electrotechnical Services - Instrumentation (Summit Skills)
Electrotechnical Services - Maintenance (Summit Skills)
Electrotechnical Services - Structured Cabling (Summit Skills)
Ensuring the Compliance of Electrical Installation Work in Dwellings with the Building Regulations (England & Wales) (Summit Skills)
Installing and Maintaining Audio Systems; Installing and Maintaining Audio Visual Systems (Summit Skills)
Integrated Systems Engineering (Summit Skills)
Mechanical Engineering Services (Summit Skills)
Installing and Commissioning Electrotechnical Systems and Equipment (Plant) (ECITB)
Maintaining Plant & Systems - Electrical (Summit Skills)
Electricity Network Control Engineer
Electricity Power Utilities (Summit Skills)
Electricity Smart Metering (Summit Skills)
Highways Maintenance NOS (variety of sources including UK Standards directory early 2010)

Construction Site Management (ConstructionSkills)
Construction Site Supervision (ConstructionSkills)
Highways Maintenance (Construction) (ConstructionSkills)

Painting and Decorating NOS (variety of sources including UK Standards directory early 2010)

Decorative Finishing and Industrial Painting Occupations (Construction) (ConstructionSkills)
Maintenance Operations (Construction) (ConstructionSkills)
Innovative/Modern Methods of Construction (ConstructionSkills)
Heritage Skills (Construction) (ConstructionSkills)

Plant Operative NOS (variety of sources including UK Standards directory early 2010)

Plant Installation (Construction) (ConstructionSkills)
Plant Maintenance (Construction) (ConstructionSkills)
Plant Operations (Construction) (ConstructionSkills)
Supervising Hire and Rental Operations (Equipment, Plant and Tools) (ConstructionSkills)
Installing and Commissioning Electrotechnical Systems and Equipment (Plant) (ECITB)
Installing Plant & Systems - Instrument Pipefitting (ECITB)
Installing Plant & Systems - Mechanical (ECITB)
Maintaining Plant & Systems - Electrical (ECITB)
Plant Operations (Extractives) (ProSkills)

Plumber NOS (variety of sources including UK Standards directory early 2010)

Plumbing (MES) (Summit Skills)
Integrated Systems Engineering (SummitSkills)
Maintenance Operations (Construction) (ConstructionSkills)
Innovative/Modern Methods of Construction (ConstructionSkills)
Fitted Interiors (Construction) (ConstructionSkills)
Mechanical Engineering Services (SummitSkills)

Roofer NOS (variety of sources including UK Standards directory early 2010)

Applied Waterproof Membranes (Construction) (ConstructionSkills)
Cladding Occupations (Construction) (ConstructionSkills)
Roofing Occupations (Construction) (ConstructionSkills)
Supervisor NOS (variety of sources including UK Standards directory early 2010)

Occupational Work Supervision (Construction) (ConstructionSkills)
Construction Site Supervision (ConstructionSkills)
Supervising Hire and Rental Operations (Equipment, Plant and Tools) (ConstructionSkills)
Property and Caretaking Supervision (ConstructionSkills CIC)

Steel Erector NOS (variety of sources including UK Standards directory early 2010)

Steelfixing Occupations (Construction) (ConstructionSkills)
Constructing Capital Plant Steel Structures - Erecting (ECITB)
Fabricating Steel Structures (ECITB)

C. Potential range of cards relevant to specific occupations- the lists that follow serve to demonstrate the range of cards for consideration by a worker in any one of these occupations

Cards relevant to Bricklayers, Painters, Decorators and Carpenters

CSCS Red Card
CSCS Green Card
CSCS Blue Card
CSCS Gold Card
CSR Red Card
CSR Blue Card
CSR Gold Card
CCNSG National Course
IOSH Safely Working
CSkills Health & safety Awareness
CSSkills ABC

Cards relevant to Electricians

ECA Level A (full scope)
ECA Level B - (Defined Scope)
ECA Lighting
ECA Electrical Heating
ECA Controls
ECITB - ACE - Electrician (inc Maintenance)
EUSR Utility SHEA (Electricity)
EUSR Basic Electrical Safety Competence (BESC): Substations
EUSR (BESC) Basic Electrical Safety Competence: Overhead Lines
EUSR (BESC) Basic Electrical Safety Competence: Underground Cables
EUSR National Grid Person (Substation and OHL)
EUSR National Grid Competent Person (Substation and OHL)
EUSR National Grid Person Authorised Person
HERS -Highway Electrical Registration Scheme
ECS Electrical Site Manager
ECS Contracts Manager
ECS Electrical Fitter
ECS Electrical Winder
ECS Instruments Mechanic
ECS Radio/Television Electrician
ECS Maintenance Electrician
ECS Installation Electrician
ECS Household Appliances Electrician
ECS Telecommunications Fitter
ECS Distribution Networks Electrician
ECS Office Machines Mechanic
ECS Auto Electrician
ECS Marine Electrician
ECS Wireman/Panel Builder
ECS Building Controls Engineer
Datacomms- Trainee Datacomms Specialist
Datacomms- Datacomms Specialist
Datacomms- Advanced Datacomms Specialist
Datacomms- Datacomms Technician
Datacomms- Datacomms Engineer
Emergency and Security Systems- Apprentice
Emergency and Security Systems- Trainee
Emergency and Security Systems- Installer skilled
Emergency and Security Systems- Installer unskilled
Emergency and Security Systems- Maintenance skilled
Emergency and Security Systems- Maintenance unskilled
Emergency and Security Systems- Commissioning
Emergency and Security Systems- Surveyor
Fire Detection and Alarm Systems- Apprentice
Fire Detection and Alarm Systems- Trainee
Fire Detection and Alarm Systems- Designer skilled
Fire Detection and Alarm Systems- Designer unskilled
Fire Detection and Alarm Systems- Installer skilled
Fire Detection and Alarm Systems- Installer unskilled
Fire Detection and Alarm Systems- Commissioning skilled
Fire Detection and Alarm Systems- Commissioning unskilled
Fire Detection and Alarm Systems- Maintenance unskilled
ECS Related Discipline, e.g. Sound and Light engineer
ECS Site visitor
ECS Adult Trainee or Senior Graded Electrical Trainee- Trainee electrician (Stage 1)
ECS Adult Trainee or Senior Graded Electrical Trainee- Trainee electrician (Stage 2)
ECS Adult Trainee or Senior Graded Electrical Trainee- Trainee electrician (Stage 3)
ECS Apprentice
NAPIT- Electrical Scheme- Level A - Full Scope Electrician
NAPIT- Electrical Scheme- Level B - Defined Scope Installer
NAPIT Approved Contractor Scheme
NICEIC Domestic Installer Scheme (Part P) - Full Scope
NICEIC Domestic Installer Scheme (Part P) - Defined Scope
NICEIC Jersey Notification
NICEIC Hazardous Areas
NICEIC Building Regulations
NICEIC Scottish Building Regulations
NICEIC Periodic Inspection Reporting Scheme (DPIR)
NICEIC Pat Testing Scheme
SWQR Card (Street Works Qual Reg)- Operative
SWQR Card (Street Works Qual Reg)- Supervisor
SPA Construction Passport
SPA Core Passport
CCNSG National Course
IOSH Safely Working
CSkills Health & safety Awareness
CSkills ABC
CSR Green Card

Cards relevant to **Highways Maintenance**

SPA Construction Passport
SPA Core Passport
CCNSG National Course
IOSH Safely Working
CSkills Health & safety Awareness
CSkills ABC
CSR Green Card
Cskills Essential Electrics Certificate

Cards relevant to **Plant Operatives**

CSR Plant Operative Scheme
AITT Registration Scheme Registered Instructor
AITT Registration Scheme Accredited Operator Training Organisation
AITT Registration Scheme Accredited Instructor & Operator Training Organisation
AITT Registration Scheme Registered Tutor
AITT Registration Scheme Examiner
AITT Registration Scheme Instructor Site Safety Awareness Register
ALLMI Operator Training
ALLMI Slinger / Signaller Training
CPCS Trained Operator - Red
CPCS Competent Operator - Blue
MPQC Plant Operator Scheme
MPQC Plant Operator Training
MPQC Instructor Training
MPQC Assessor Training
NPORS Operator Card
SPA Construction Passport
SPA Core Passport
CCNSG National Course
IOSH Safely Working
CSkills Health & safety Awareness
CSkills ABC
Cskills PMSTS Certificate

Cards relevant to **Plumbers**

- AHPC CPS
- CIPHE Registered Plumbing Professional Trainee
- CIPHE Registered Plumbing Professional Affiliate
- CIPHE Registered Plumbing Professional Associate
- CIPHE Registered Plumbing Professional Member
- CIPHE Registered Plumbing Professional Fellow
- CIPHE Registered Plumbing Professional Companion
- UK-PHMES CSCS Card Plumber - Blue
- UK-PHMES CSCS Card Plumber - Gold
- UK-PHMES CSCS Card Heating Fitter - Blue
- UK-PHMES CSCS Card Heating Fitter - Gold
- UK-PHMES CSCS Card Mechanical Fitter - Blue
- UK-PHMES CSCS Card Mechanical Fitter - Gold
- UK-PHMES CSCS Card Gas Service Fitter - Blue
- UK-PHMES CSCS Card Gas Service Engineer - Gold
- UK-PHMES CSCS Card Plumbing Related Occ - White
- UK-PHMES CSCS Card Plumbing Related Occ - White - Gas
- UK-PHMES CSCS Card Plumbing Employee - Green
- UK-PHMES CSCS Card Plumbing Apprentice/Trainee (NonJTL) - Red
- UK-PHMES CSCS Card Supervisor - Gold
- UK-PHMES CSCS Card Manager - Platinum
- UK-PHMES CSCS Card Visitor - Yellow
- UK-PHMES CSCS Card Student - JIB PMES Student Card
- NAPIT Plumbing Scheme
- SPA Construction Passport
- SPA Core Passport
- CCNSG National Course
- IOSH Safely Working
- CSSkills Health & safety Awareness
- CSSkills ABC
- CSR Green Card
- Cskills ACS Certificate
- Cskills UHWSS Certificate

Cards relevant to **Supervisors**

- SPA Site Supervisor
- SPA Construction Passport
- SPA Core Passport
- CCNSG National Course
- CCNSG Supervising Safety Course
IOSH Safely Working
IOSH Managing Safely
CSkills Health & safety Awareness
CSkills ABC
CSkills SSSTS
CSkills SSSTS Refresher Course
CSCS Gold Card
CSR Gold Card

Cards relevant to **Steel Erectors**

ECITB ACE Steel Erector
CSCS Red Card
CSCS Blue Card
CSCS Gold Card
CSR Red Card
CSR Blue Card
CSR Gold Card
CSSkills Health & safety Awareness
CSSkills ABC
IOSH Safely Working
SPA Core Passport Scheme
SPA Construction Passport Scheme
CCNSG National Course
Annex 2 – Descriptions of Skills cards, Safety Passport, Competent Person & Regulated Schemes

Skills Cards

CSCS Card:

A smart card, a chip-based card was introduced in January 2010. This provides access to database information on the card holder via a card reader. Hand held card readers are available and once acquired provide employers with a secure source of information from the CSCS register. The chip also offers a potential means of holding more information on training and certification than can presently be included on the physical card itself, and also promises to offer an economical and instantaneous way of updating the card with new certifications and endorsements.

At the same time, the card scheme was also simplified to bring greater clarity and transparency to the types of cards and the routes through which they are obtained. Since January 2010 there have been eight basic card types, indicated by the colours used on the card. At the heart of the card system is a hierarchy of five core card types:

- **Red** (trainee – currently unqualified but working towards an appropriate qualification)
- **Green** (NVQ Level 1 or equivalent) – basic operative level
- **Blue** (NVQ Level 2 or equivalent) – skilled worker
- **Gold** (NVQ Level 3 or equivalent) – advanced craft and supervisory
- **Black** (S/NVQ Level 4 or 5 or equivalent) – managerial

This core colour system has been adopted or adapted by many of the CSCS affiliate schemes, such as the CSCS affiliates within the Energy and Utility Skills Register (EUSR – see Annex 8). Red cards are those that now uniformly indicate that the holder has yet to achieve an S/NVQ or equivalent competence-based qualification, because they fall into one of the following categories:

- a new entrant to the industry who has been taken on as a trainee, who is registered for an appropriate S/NVQ;
- an experienced worker with a temporary industry accreditation held while they pursue an S/NVQ Level 2;
- an experienced high level craft operative, supervisor, or manager, working towards S/NVQ Level 3 or above;
- a new graduate working towards membership of a professional body, who would be expected to move onto a PQP white/yellow card (see below) once they had achieved that membership.
Of the other major categories of card, the blue, black and gold cards all indicate competent workers, and, with very few exceptions, new cards in these categories can now be obtained only by workers who have obtained an appropriate S/NVQ or equivalent qualification at either Level 2, 3, 4 or 5, or, where a full S/NVQ is not available, have completed appropriate S/NVQ units.

For the blue card only, there are still industry accreditation routes available for a small number of heritage related craft occupations, but these routes will also be closed from September 2010.

The main card type where there is still likely to be significant numbers of card holders without independent attestation of their competence is the Green operative’s card, which continues to indicate only a relatively low level of skill (NVQ Level 1), and is still available through ‘industry accreditation’ routes. The continuing availability of non-qualification routes to the Green card is of particular significance for this research, as operative and general labourer roles appear to be the occupational category within construction that is at the highest risk of injury, fatality and ill-health.

In addition to the five core card types, there are a series of additional categories used to ensure that the CSCS system can include all relevant types of person liable to work on, or visit, construction sites:

- **Yellow** – Frequent site visitor;
- **White/yellow** – Professionally Qualified Person (PQP);
- **White/grey** – Construction Related Occupation (CRO)

The white/grey CRO card is almost always indicative of industry accreditation, because these cards exist specifically for occupations where qualification based routes are not currently available.

A white/yellow card does not require possession of an S/NVQ, but does indicate that the holder has competence assessed membership of a construction related professional body, and has in addition passed a high level health and safety touch screen test.

Although the current system is substantially simpler and more transparent than the one it replaces, many older cards remain in circulation. Before January 2010 the system included additional card types (for example, platinum and white cards) and less clear cut boundaries between the requirements of the various card types.

Profiling route is a new route which is not time bound. It does not involve the acquisition of a relevant qualification, nor does it require specific training and in so far as these things are the case the use of this approach must remain questionable where the objective is to assure occupational and health and safety competence.

**CSCS Joint, Cognate and Affiliate Schemes**

In addition to the main CSCS scheme, there are a number of joint cognate and affiliate schemes, some or all of whose cards are recognised by CSCS as meeting (or in some cases exceeding) their standards and which are bear the CSCS logo.
These schemes comprise:

**Assuring Competence in Engineering Construction (ACE),** run by ECITB to help engineering construction workers achieve and demonstrate an S/NVQ for their occupational specialism. This card always requires a Level 3 ECITB S/NVQ – to recognise the fulfilment of the health and safety awareness requirements of CSCS, and therefore exempt holders from the ConstructionSkills touchscreen health and safety test. Within the engineering construction sector, however, possession of an ACE card is a substitute for the sector’s CCNSG safety passport.

**Certificate of Competence of Demolition Operatives (CCDO),** run by the National Demolition Training Group (NDTG) as a more demanding equivalent of CSCS specially constructed for workers in the demolition sector. Demolition is recognised to pose particularly high risk to its works, so this card requires a special health and safety focusing on ‘demolition’ or ‘demolition and plant’ and asbestos awareness training, in addition to an appropriate S/NVQ. An S/NVQ is not required for the Green, Red or Experienced Worker card.

**Construction Industry Scaffolders Record Scheme (CISRS).** S/NVQ or EWPA (two day practical assessment) is required for competence, except for the scaffolding labourer, for which industry accreditation remains available. There is a red (trainee), blue (competent) and gold (advanced) card system. It requires specific training, an S/NVQ and specified experience. The Labourer remains as the main gap, even when clearly endorsed with ‘Limited Site Skills Only’. All must complete the ConstructionSkills H&S test.

**Construction Skills Register (CSR), the Northern Irish equivalent to CSCS,** run by the Construction Employers Federation (CEF). This scheme requires actual health and safety training and competence assessment even for the green card. However, there is availability of blue skilled operative card on a similar basis. For all other blue cards, there is a requirement for S/NVQ (compulsory for scaffold’s card) or completion of an assessment. It continues to use the platinum manager’s card. CSR plant scheme mimics that of CPCS’s prior to the update of the CPCS in 2008, but with a one day course as well as the H&S test. CSR acts as both a skills card and a safety passport.

**Electrotechnical Certification Scheme (ECS)** – since 2003 this is only renewed for those who have passed H&S test and have S/NVQ or a recognised exemption. However, there is a brown labourer card for untrained/unskilled operatives in addition to the red trainee card and gold skilled operative cards; there is also separate qualified supervisor endorsement. Industry accreditation routes appear to remain available for those in fire services or data protection industries.

**Energy and Utility Skills Register (EUSR);** (see Annex 8) this is an umbrella registration scheme conceived and administered by EUSkills to bring together all the main qualification, safety passport and training routes for the utilities sector together in a single overarching scheme with a unified database. These are varied schemes within the EUSR and not all have CSCS recognition. Of those that do, some do not always require an S/NVQ; however, a coloured stripe on the card indicates the S/NVQ level of the card holder, and no stripe means that no S/NVQ is held.
Fall Arrest Safety Equipment Training (FASET) Safety Net Rigger CSCS card. Trainee (non-S/NVQ); skilled (NVQ Level 2); Skilled (trained and experienced, and FASET assessed instead of having an NVQ).

Fencing Industry Skills Scheme (FISS/CSCS). This is for people working in the fencing industry, jointly run by LANTRA Awards and CSCS. This uses the standards CSCS hierarchy of Green (operative), Red (trainee), blue (skilled installers) and gold (supervisors) cards. Since August 2005, the full card has been available only to those who have achieved an appropriate NVQ. They must also attend a one-day health, safety and environmental awareness course in addition to passing the relevant CSCS touchscreen H&S test.

SKILLcard, run by Welplan, is the equivalent of CSCS for the building services engineering sector (covering heating, ventilation, air-conditioning etc); SKILLcard continues to use the CSCS colour codes from the pre-January 2010 scheme, and includes platinum and dark green cards. A number of ‘industry accreditation’ routes remain open for gold, black, and platinum supervisory and managerial cards (closing in October 2010), as well as for all dark green operative cards (no specified closing date). In addition, blue cards remain available for those who are experienced but have registered for an S/NVQ and undergone an S/NVQ profile with an assessor.

UK PHMES unites two previously separate registers, both of which are CSCS affiliated and use the same basic card colours as CSCS:

JIB-PMES Plumbers in England and Wales. This uses broadly the same card colours as CSCS – Green card for industry accredited operatives; white card for industry accredited plumbing and electrical related occupations; blue and gold cards for competent workers; but it also retains Platinum manager’s card. S/NVQs at Level 2 and above or equivalents must be obtained for Blue and Gold cards. An initial ConstructionSkills H&S test is not required by those who have taken S/NVQ within the last two years, because the S/NVQ H&S module is believed to be sufficient to indicate appropriate H&S awareness. However, the ConstructionSkills test must be taken for card renewals.

SNIJIB provides registration for plumbers in Scotland and Northern Ireland. An S/NVQ Level 3 must be obtained, and at least 3 years experience gained through a formal apprenticeship to be registered as a qualified plumber. In addition, a paper based health and safety test must be completed before a JIB SNI card will be issued. Papers can be taken at approved test centres or administered by a designated and approved staff member in a member company.

The JIB UK system is not easy to understand. The UK PHMES appears to be aimed at uniting the two registers with a single card system and unified grading requirements, but Scotland and Northern Ireland seem to continue to have much higher standards than the rest of the UK. Conversations with a number of employers revealed that even to those closely concerned, the relationship between JIB-PMES/SNIJIB and UK PHMES is not completely clear.

In addition, the Register of Land-based Operatives (ROLO) administered by the British Association of Landscape Industries (BALI), provides an expedited route to a CSCS card,

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2. [http://www.skillcard.org.uk/occ.html](http://www.skillcard.org.uk/occ.html) last accessed 31/05/2010
although it is not (yet) CSCS affiliated. Trainee cards are available for those who are registered for a relevant S/NVQ at Level 2. Blue cards are for those who have attained S/NVQ Level 2 or who have industry accreditation, and attended a one day ROLO health and safety course. A gold card is for those who have an S/NVQ at Level 3, and, if they achieved their NVQ more than two years ago, and have also attended a one day ROLO health and safety course.

Although the card bears the CSCS hologram, the Construction Plant Certification Scheme (CPCS) - see Annex 8 - is not a CSCS affiliate scheme. In brief there are four CPCS cards available; the Trained Operator Card, the Competent Operator Card, the Tester Card and the Trainer Card. The Trained Operator Card (red) is a two year non renewable card. Within two years of gaining the Card the cardholder must gain an S/NVQ to be eligible to upgrade to the Competent Operator (blue) Card. However, there are two exceptions; if the Card has expired less than 12 months ago the cardholder may apply to get a year’s extension as long as they register for an S/NVQ.

Recognised Non CSCS Affiliated Schemes

Construction related SSCs recognise, administer or recommend certain types of skills training and assessment that does not fall within the CSCS scheme. Of these examples include Lift Truck training and for developing and demonstrating competence on Network Rail (NCCA Sentinel - see below).

In addition there are at least two skills schemes that are very similar in structure and intent to CSCS: the ConstructionSkills Building Engineering Services cards, and the National Association of Shopfitters SICCS scheme.

NCCA Sentinel

The National Competence Control Agency (NCCA) runs the Sentinel register and card scheme for those involved in working in certain safety critical functions on the railway network. It is compulsory for all companies and contractors who access Network Rail controlled infrastructure. The NCCA itself is primarily concerned with keeping a register of training and qualifications, and issuing cards to evidence them, for personnel in this sector. Registered individuals must also undergo regular medical and drug and alcohol testing – are subject to period testing, and in addition there is a regime of random testing.

Although registrations are of individual workers, each registration must be sponsored and supported by a company that has first been approved by or on behalf of the NCCA, usually by its contractor Achilles Information Limited. Achilles also approves and audits all providers of training and testing related to the scheme.

This is a comprehensive training, skills and competence scheme, but one which is highly specific to railway infrastructure.

ConstructionSkills Building Engineering Services (BES) Cards

ConstructionSkills runs its own scheme for recognising competence in occupations in the Building Engineering Services sector through its Building Engineering Services (BES) division.
There are cards for gas (this provides Accredited Certification Scheme certificates for work on gas appliances, and is a route into the GasSafe Register, a Regulations-based Competent Person Scheme – see below), water (card showing one of three categories of competence to deal with Unvented Hot Water Storage Systems (UHWSS)), refrigerants (ConstructionSkills BES Card) and electrics (Essential Electrics Card).

National Association of Shopfitters (NAS)/ Shopfitting and Interior Contracting Competence Scheme (SICCS)

This is a new scheme developed by the National Association of Shopfitters and is a qualification-based scheme which takes a relevant S/NVQ at Level 3 as its basic standard of competence.

An initial trainee card is available to those registered for an S/NVQ; this card expires after four years and is non-renewable. The full card for experienced operative requires applicants to have an NVQ Level 3 and to have passed the ConstructionSkills health and safety test; applicants are also expected to watch a Health and Safety DVD oriented to the specific requirements of the shopfitting and interior contracting sector. In order to gain the Supervisor & Manager’s card it is necessary to have an appropriate qualification, to have passed the ConstructionSkills Management and Professional Health and Safety test, and to have attended a three day Site Safety Plus for Shopfitters and Interior Contractors training programme.

Finally, for the Director card it is necessary to have an appropriate qualification, to have passed the ConstructionSkills Management and Professional Health and Safety test, and to have attended a one day Site Safety Plus Directors’ Responsibilities course. Taken together, these possible represent one of the most demanding standards of the industry card schemes.

Highways Sector Schemes

The Highways Agency, responsible for operating, maintaining and improving the strategic road network in England, is also responsible for quality management and ensuring that operatives working on highway construction projects are competent. The National Highways Sector Schemes (NHSS) have been developed from ISO 9001:2000 quality standards, establishing a benchmark for minimum industry standards and raising the quality above that required by ISO 9001:2000 for each sector. There are 19 NHSS in sectors such as traffic management and fencing.

The individual Schemes are partnerships, owned and managed by the individual technical advisory committees and overseen by the Highways Sector Scheme Liaison Group. The Schemes are developed by technical advisory committees, compromising of industry stakeholders including, clients, suppliers, trade associations, certification bodies, training organisations and Highways Agency organisations.

The Schemes are supported by the Highways Agency, Transport Scotland, Welsh Assemble Government, Northern Ireland Roads Service, the County Surveyors Society, many relevant trade associations, UKAS and Certification Bodies. Additionally, all of these organisations have contributed to the development of the Schemes. Each technical advisory committee interprets ISO 9001:2000 and sets minimum standards depending on the requirements of the particular sector.
The Highways Agency’s intention is that all contractors on its site have a properly trained, qualified and registered workforce. Therefore, the Highways Agency requires any supplier of services covered by NHSS and working on Highways Agency Roads to be registered to the appropriate Sector Scheme(s) (unless it specifies in the contracts otherwise). This requirement is specified in the Specification of Highways Works (SHW).

All Highways Agency suppliers’ operatives are required to carry recognised skill/registration cards whilst on site, such as Construction Skills Certification Scheme (CSCS). The details of training requirements and which skills cards are necessary are specified in each Sector Schemes’ documents. Sector Schemes often include additional minimum requirements as well as CSCS registration, which operatives need to comply with e.g. Sector Scheme 12 concerning Traffic Management requires persons to have Lantra training. Mandatory contractual requirements that contractors operatives are trained and registered have been in place since 1986 and competency based NVQs were incorporated into these requirements in 1995.

The Sector Schemes have resolved previous issues arising from certification bodies developing their own interpretations of the ISO 9001:2000 standard, which lead to a variation in standards. Some Sector Schemes have been significant in the development of training and competency qualifications and in some Schemes there are particular qualifications, such as fencing, that are deemed to be part of the scheme e.g. the NVQ and SVQ in Fencing at Levels 2, 3 and 4 are central to the FISS/CSCS. Under Sector Scheme 2A, 2B and 2C, registration to FISS/CSCS is obligatory for general fencing contractors working to a Highways Agency contract.

The **Sector Schemes for Highways Electrical Works** (8, 9B and 10) were introduced to cover the installation and maintenance of highway electrical equipment. It ensures that persons working on their network are competent when carrying out work to do with the installation and maintenance of Highway Electrical Equipment. It is a mandatory requirement to register all persons who work on site with the Highway Electrical Industry Scheme (HERS) for the Registration of Authorised Persons and for all persons to carry a card to confirm this. The Highways Electrical Registration Scheme includes an explicit focus on developing skills to NVQ Level 2 or 3 standard, and is compulsory for all of those working on electrical projects on highways. It requires both company and individual registration, and therefore combines elements of the qualification based skills cards with the dual corporate and individual approach taken in schemes such as the NCCA Sentinel. There are two routes to entry to this scheme and unusually for Sector Schemes the scope allows organisations who are not quality assured and/or not involved in the trunk road and motor network to gain registration for the scheme, which in effect is the competency scheme for the industry.

**Proprietary Schemes**

In addition to card and certification schemes that originate in, or are explicitly recognised by, official bodies, there are a number of privately run schemes.

**Association of Lorry Loader Manufacturers and Importers (ALLMI).** There is now an agreement in place between ALLMI and CPCS through which holders of certain ALLMI Cards can obtain a red ‘trainee’ CPCS card if they have passed the Construction Skills Health and Safety Test; they are then expected to register for, and achieve, the relevant S/NVQ to enable them to move onto a Blue CPCS card within the two year lifespan of the Red card.
Industrial Rope Access Trade Association (IRATA). This organisation runs a comprehensive registration and certification scheme for both companies and individuals who use rope access techniques. This scheme is described in more detail in Annex 8.

Other Schemes

International Powered Access Federation (IPAF). IPAF provides specialist training in the use of mobile elevated work platforms (MEWPs) (including the types popularly known as ‘cherry pickers’ and ‘scissor lifts’) and Mast Climbing Work Platforms (MCPWs). IPAF provides two basic schemes: the Powered Access Licence (PAL) card, which is evidence of training to operate a specific types of MEWP or MCPW (or other type of machine for which IPAF training is available); and the Competent Assessed Person (CAP) card for engineers who carry out examinations and maintenance on powered access machinery. IPAF’s training is independently accredited as meeting the relevant international standards, ISO 18878:2004 Mobile elevating work platforms – Operator (driver) training. Those who successfully complete the training and assessment receive an IPAF PAL card and a logbook to record their MEWP/MCWP experience. The logbook must be kept up to date in order to take a shorter renewal course; otherwise they must retake the training to remain registered.

Mineral Products Qualification Council (MPQC) (Previously EPIC). MPQC offers a number of routes to evidence competence in the operation of mobile plant, primarily aimed at the mining and quarries sector. They offer a training based certificate to prepare future plant operators, and an assessment based skills card for skilled operators.

Prefabricated Access Suppliers and Manufacturers Association (PASMA). PASMA runs training for assemblers and users of prefabricated access towers through its network of Registered Training Centres. It also provides advanced training for using specialist tower equipment. People who have successfully completed training and assessment receive a PASMA card.

Storage Equipment Installers Registration Scheme (SEIRS). This is run by the Storage Equipment Manufacturers Association (SEMA) to promote the safe installation of storage equipment and systems. Temporary pass cards are available to trainees whose company attests that they have had adequate induction training and will be appropriately supervised. For full registration and ID card, installers must attend a SEIRS ‘Category A’ safety course and follow SEMA guidelines. There are six Category A courses, and installers are expected to progress from an initial general skills course, through refresher or advanced courses which are taken when the card is renewed, and after prescribed amounts of professional experience. The specific training taken by the installer is detailed on the card. A parallel system of corporate registration is also being developed.

Safety Passports

The safety passport is based on the principle that health and safety awareness can be developed apart from the development of occupational competence through specific training. Our interview research strongly suggested that the adoption of Safety Passports is usually driven by clients rather than contractors.

They are particularly common in sectors where the commercial risks associated with safety failures are particularly high, notably in the engineering construction and utilities sectors.
The advantages cited for using Safety Passports include:

- Development of a clearly defined common foundation of basic training and awareness for all workers;
- Enhancement of site inductions, which can be more specific and shorter, because of reduced need to cover generic issues already dealt with by the Safety Passport training;
- Broad evidence (but not controlled studies) that suggests that their introduction leads to significantly reduced health and safety incident rates and incident severity.

**Client Contractor National Safety Group Safety Passport (CCNSG)**

In the engineering construction sector, there is a skills card scheme (ACE) designed to help unqualified members of the workforce gain an NVQ as efficiently as possible. However, this is not viewed as a substitute for the CCNSG safety passport, which is demanded by almost all major clients and contractors working the sector.

The Safety Passport is issued after a two day training programme covering:

- Safe Behaviour at Work
- Safe Place of Work
- Safe Systems of Work
- Safety Problems and Safe Solutions

There is a clearly defined approach to the training based on discussion and active involvement, rather than passive absorption of information. There is also an additional day’s training for supervisors in order to emphasise their important role in safety training.

Systematic data on the effectiveness of the Safety Passport is not available; however, the Engineering Construction sector reports a RIDDOR incident rate around quarter of that of mainstream construction. This in spite of the high risk nature of the work undertaken, which is often more complex than that of mainstream construction.

**EUSkills Utility Schemes**

Safety Passports are also widely used in the utilities sector, where the safety critical nature of the work being undertaken (and the potential impact of failures on public welfare) has led to a strong focus on developing appropriate health and safety training.

The main schemes are the utility Health Safety and Environmental Awareness (SHEA) schemes. The core scheme consists of seven modules:

- You and the law (health and safety law and the responsibilities of employees and employers)
- You and hazards to your health (Types of hazard, risk assessments, and source of information)
Protecting you (Risk assessments and the use of Personal Protective Equipment)

The working environment (basic workplace hazards and risk management procedures)

Our environment (human impact on the environment and associated legislation)

Incident procedures (general incident procedures, incident reporting, fire safety)

In addition to the core scheme there are series of specialised SHEA passports specially designed for the Water, Gas, Electricity and Waste Management industries.

There are also two further specialised safety passports. The National Water Hygiene safety passport is concerned with avoiding biological or chemical contamination of the water supply, and includes coverage of all the basic procedures and processes used to assure this. The Cross Country Pipelines Health and Safety Passport (CCPHSE) designed for all people involved in the construction of large diameter gas pipelines, from site visitors, through labourers, operatives, supervisors and managers. This is a thirteen module training course that builds on the Utility SHEA for the gas industry, and is designed to ensure that all people working on such projects have an appropriate degree of health, safety and environmental awareness.

Safety Passport Alliance (SPA)

The Safety Passport Alliance has developed a series of Safety Passport schemes for construction and related sectors. These are built around a core scheme which requires one day of health and safety training dealing with issues applicable to any workplace context, followed in many cases by a second day of sector specific training.

The specialist Passports relevant to construction include:

- Construction
- Building maintenance
- Industrial utilities
- Renewable energy
- Quarry products, mineral processing and extractives

In addition there is a special passport scheme for those in supervisory roles.

SPA has reported significant improvements in health and safety performance following the introduction of passport schemes in particular companies. These include reported reductions in health and safety incident rates of 32% (Leicester City Council), 75% (Metronet), and 68% (contractors working for Nestlé UK)3.

Such statistics must be treated with some caution, as the introduction of safety passports is rarely a standalone innovation, and is instead more usually part of a wider attempt to improve health and safety standards. Nevertheless, they do at least suggest that introducing this type of training can play a significant role in improving health and safety performance.

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Regulated Schemes

There are a small number of schemes that have been brought into existence by specific legislation or regulations to deal with areas that are particularly critical in terms of their health, safety and environmental impacts.


Asbestos: the Asbestos regulations require that workers who come into contact with asbestos should be competent to do so safely, and require that this should be assured by specialist training and certification. A number of organisations define standards and provide certification for this training, such as ACAD, ARCA etc.

Building Regulations: various ‘Competent Person Self-Certification Schemes’ permit individual companies or workers to ‘self-certify’ that their work reaches the standard required by the relevant regulations; such certifications would normally be carried by Building Inspectors, so the Competent Person Schemes save the cost and bureaucratic burden such inspections would entail.

Rider operated lift trucks: HSE has explicitly recognised six ‘Accrediting Bodies’ to define and accredit high quality training for the use of lift trucks. Although this is not, in the strictest sense, a regulated training and assessment area (use of accredited training is strictly voluntary), the Accrediting Bodies do represent an officially sanctioned standard.

There are a number of construction related schemes that exist with a framework defined by specific legislation or regulations.

Asbestos Regulations 2006 and Approved Code of Practice

The Asbestos Regulations 2006 require mandatory training for any person liable to be exposed to asbestos in the course of their work. The training needed depends on the kind of work and exposure being undertaken, with three basic types of training:

‘Asbestos Awareness’ is basic training for those who will simply encounter asbestos in the course of their work;

‘Non-licensed’ training is for relatively low risk work

‘Licensed’ training is for the operative, supervisors and management of companies that hold an HSE license to undertake high risk work with asbestos, such as asbestos removal. This type of training must be comprehensive and externally audited to ensure compliance with the Regulations.

In order to evidence the fulfilment of these requirements, a number of sector bodies run skills training and certification schemes: Asbestos Control and Abatement Division (ACAD), the Asbestos Removal Contractors Association (ARCA) and the UK Asbestos Training Association (UKATA).
The New Roads and Street Works Act 1991

This is a qualifications based scheme for people undertaking construction works on highways in order to meet the competence requirement of the New Roads and Street Works Act 1991.

There is a prescribed set of units and qualifications for Operators and Supervisors, available for a range of activities. Once the qualifications are achieved through one of the three Awarding Bodies involved (CABWI, SQA, City and Guilds), the achievement is notified to the Street Works Qualifications Register (SWQR), who can then issue an appropriate card at either Operative or Supervisor level detailing the applicant’s qualifications.

Competent Persons Schemes

Competent person schemes grew out of the CORGI register for gas fitters. The primary concern that underlay the establishment of CORGI was a desire to ensure that there was a register that could provide clients with assurance that work on gas installations would be done safely. Membership of the CORGI register was originally a voluntary, but registration of gas installers became compulsory in 1991; after a public tender process the compulsory scheme was transferred from CORGI to the Gas Safe Register in 2009.

Since then, a series of voluntary registration and competence schemes based on the CORGI/Gas Safe model have been developed by the government to reduce bureaucracy and increase efficiency in a series of construction related work areas whose standards are governed by the Building Regulations (2000) (as amended). The Building Regulations require various important areas of construction work and building testing to be completed to specific standards.

In normal circumstances, the regulated work would be certified by a local authority building inspector as meeting the standards required by the Building Regulations. However, for certain types of work companies whose corporate and individual competence has been assessed and certified to meet the requirements of a relevant Competent Person Scheme are permitted to ‘self-certify’ that their work meets the appropriate standards, saving both company and client time and money and reducing the burden on local authority inspectors.

The areas in which Competent Person Schemes are available comprise:

- Air pressure testing of buildings
- Electrical installations
- Gas- and oil-fired combustion appliances
- Heating and hot water systems
- Mechanical ventilation and air-conditioning systems
- Plumbing
- Replacement doors and windows in existing dwellings

The actual process of auditing and registering scheme members is undertaken by a number (currently thirteen) of independent organisations with appropriate specialist expertise. Although these organisations are mostly private companies (often affiliated with industry representative bodies or federations), their schemes, and the standards they work to, must have been approved by the Government’s Department for Communities and Local Government.
In most cases, these standards require potential scheme members and their staff to have appropriate qualifications and to give appropriate consideration to health and safety issues, but the precise requirements are flexible in order to meet the varying needs of the different occupations and sectors covered by the scheme. This means that there are no explicit, common standards for the various schemes in relation either to health and safety requirements or vocational qualifications.

In addition, a recent evaluation of the Competent Person Schemes undertaken for Communities and Local Government identified some issues with their functioning. There was evidence that significant numbers of installations did not meet the required standards, that many members were reporting very small numbers of notifiable installations, and that in addition some of the schemes had extremely low levels of penetration in their sectors.

Accrediting Bodies for Rider Operated Lift Truck Training

Rider operated lift trucks include any form of plant that the operator sits or stands on during operation, and includes various types of fork lift trucks and telehandlers. These have long been recognised as a high risk form of equipment that has consistently been associated with a large number of serious injuries and fatalities.

In order to promote quality and consistency in the training of lift truck operators, HSE recognises six Accrediting Bodies who have the right to train, assess and accredit individual trainers or training organisations as an Accredited Training Provider (ATP), Accredited Instructor (AI) or Registered Instructor (RI). The Accrediting Bodies also develop standardised syllabi, training materials, guidelines and assessments.

ATPs and AIs must use these materials, and are also subject to regular audits. RIs, although trained, assessed and accredited in the same way, are independent and can use their own techniques and materials.

Apart from ConstructionSkills (which manages plant training through its CPCS scheme, described under CSCS Affiliated Schemes) and Lantra Awards (both of which, as an SSC and an SSC’s wholly owned Awarding Body, are effectively official bodies), these Bodies include four privately run organisations:

**Association of Industrial Truck Trainers (AITT).** AITT is an independent not-for-profit organisation that provides accreditation to trainers and training organisations who provide industrial truck training.

**Independent Training Standards Scheme and Register (ITSSAR).** ITSSAR is a not-for-profit self-financing organisation that establishes standards for, and monitors the provision, of truck training. It has a comprehensive membership and registration scheme with categories for tutors and instructors, training organisations, examiners, operators and management/supervisors, as well as an additional Site Safety Awareness category for operators.

**National Plant Operators Registrations Scheme (NPORS).** This is a skills card for operators of plant. It is based on an assessment carried out through an NPORS Accredited Training Provider, who will also give the applicant tailored training if necessary.

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**RTITB (formely Road Transport Industry Training Board).** This organisation claims to be the largest organisation accrediting truck training in the UK. It runs two registration schemes, National Operator Registration Scheme (NORS) and Master Driver Registration Scheme (MDRS). NORS acts as the central registration and validation service for all RTITB accredited training. MDRS is specifically designed to meet the requirement, introduced by European Union Directive 2003/59, that professional truck, bus and coach drivers should have a Certificate of Professional Competence (CPC).

It should be noted that most of these organisations accredit training on types of plant other than lift trucks, but that this is technically outside of the scope of their operations as HSE Accredited Bodies (including, for example RTITB’s MDRS).

Lift Trucks are the only category of plant for which there are specific Accredited Bodies to provide and/or assure training standards. However, it is not obligatory for employers to use these bodies. The only legal duty on employers is to ensure that operators are competent: how they do this is up to them.
Annex 3 – Further Detail on Fatality, Injury and Health Statistics

Except where otherwise stated the following sections on Context and Fatalities have been taken from the HSE 2010 Statistics as reported on the website.

(See the following and links from the same page http://www.hse.gov.uk/statistics/industry/construction/injuries.htm)

The website reports:

In 2009/10 construction accounted for 4% of the employees in Britain, 7% of reported injuries to employees (27% fatalities, 10% major and 6% of over-3-day injuries). The Labour Force Survey (LFS) estimates that around 12% of all non-fatal injuries occurred in Construction in 2008/09 (three-year average).

It should be noted however that a straight comparison of employee proportions with proportions of incidents does not take into account that construction is among the most inherently dangerous occupations.

Trends

Fatal injury rates to workers and smoothed trend estimate

Source: HSE, 2010

There has been a reduction of almost three quarters (72%) in the fatality rate over a period of 30 years and 63% since 2000. The chart also suggests that there has been progress for most of the last 30 years.
Similarly the smoothed trend-line for major rates indicates that there has been a reduction of 40% since 1996 or 34% since 2000.

There has also been a reduction of 52% in the Over-3-day rate since 1996 and 42% since 2000 (53% and 40% according to the raw data.)
Estimated prevalence rates of self-reported illness caused or made worse by the current or most recent job, per 100,000 people working in the last 12 months

Source: HSE, 2010

In terms of comparison with the rates for all UK industry the construction rate of work-related illness does not seem to be greatly higher and neither the construction performance nor the UK national one seems to be improving.

RIDDOR rates of reportable injuries in construction 2000/01-2009/10p

<table>
<thead>
<tr>
<th></th>
<th>00/01</th>
<th>01/02</th>
<th>02/03</th>
<th>03/04</th>
<th>04/05</th>
<th>05/06</th>
<th>06/07</th>
<th>07/08</th>
<th>08/09</th>
<th>09/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal</td>
<td>5.9</td>
<td>4.4</td>
<td>3.9</td>
<td>3.7</td>
<td>3.5</td>
<td>3.0</td>
<td>3.8</td>
<td>3.4</td>
<td>2.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Major</td>
<td>380.9</td>
<td>350.7</td>
<td>359.3</td>
<td>349.8</td>
<td>322.7</td>
<td>305.8</td>
<td>299.1</td>
<td>266.7</td>
<td>230.1</td>
<td>230.0</td>
</tr>
<tr>
<td>Over-3-day</td>
<td>829.2</td>
<td>787.0</td>
<td>797.7</td>
<td>726.0</td>
<td>645.8</td>
<td>623.4</td>
<td>574.2</td>
<td>597.3</td>
<td>549.5</td>
<td>502.9</td>
</tr>
</tbody>
</table>

Source: HSE, 2010

Rate of Decline in Fatality Incidence over the past 10 years
Crude reductions over 10 year period:

- Fatality Rates 63%
- Major Injury Rates 40%
- Over-3 Day Injury Rates 39%

**2010 Statistics**

Statistics on fatal injuries in the workplace 2009/10 (published June 2010 by HSE)

The figures for 2009/10 are provisional and relate to accidents that are covered by the provisions of RIDDOR (Reporting of Injuries Diseases and Dangerous Occurrences Regulations, 1995).

Provisional statistics for workplace fatal injuries in 2009/10

Numbers of fatal injuries (by sector 1/04/2009 to 31/03/2010).

<table>
<thead>
<tr>
<th>Main industry:</th>
<th>Agriculture</th>
<th>Extractive &amp; utility supply</th>
<th>Manufacturing</th>
<th>Construction</th>
<th>Services¹</th>
<th>All Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees</td>
<td>17</td>
<td>6</td>
<td>22</td>
<td>30</td>
<td>35</td>
<td>109</td>
</tr>
<tr>
<td>Self employed</td>
<td>21</td>
<td>-</td>
<td>2</td>
<td>12</td>
<td>7</td>
<td>42</td>
</tr>
<tr>
<td>Workers*</td>
<td>38</td>
<td>6</td>
<td>24</td>
<td>42</td>
<td>42</td>
<td>151</td>
</tr>
<tr>
<td>Members of the public</td>
<td>7</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>381</td>
<td>393</td>
</tr>
<tr>
<td>Total fatalities</td>
<td>45</td>
<td>7</td>
<td>24</td>
<td>46</td>
<td>423</td>
<td>544</td>
</tr>
</tbody>
</table>

Source: HSE, 2010

¹ Provisional

*The term 'workers' includes employees and the self-employed combined.

The figures for services include railway incidents reported to the Office of Rail Regulation (ORR). Of the member of the public figures for services (381), 323 were deaths of members of the public in incidents on the railways, including suicides or trespass. These railway-related incidents come within scope of RIDDOR.

Rates of fatal injury by sector (per 100 000)

<table>
<thead>
<tr>
<th>Main industry:</th>
<th>Agriculture</th>
<th>Extractive &amp; utility supply</th>
<th>Manufacturing</th>
<th>Construction</th>
<th>Services¹</th>
<th>All Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees</td>
<td>7.3</td>
<td>3.5</td>
<td>0.9</td>
<td>2.4</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Self employed</td>
<td>9.1</td>
<td>-</td>
<td>0.9</td>
<td>1.5</td>
<td>0.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Workers*</td>
<td>8.2</td>
<td>3.2</td>
<td>0.9</td>
<td>2.2</td>
<td>0.2</td>
<td>0.5</td>
</tr>
</tbody>
</table>

HSE Commentary

Fatal injuries at work are thankfully rare events. As a consequence, basic statistical principles dictate that the annual count is highly subject to chance variation. Moreover, the effect of this chance variation can be estimated to give an indication of the amount the figure would fluctuate if the inherent dangerousness of work conditions were to stay unchanged from one year to the next. For example, it can be estimated that this year’s count of 151 could have been anywhere between 128 and 177 based on chance alone.
Therefore it is best to analyse data over a number of years and examine the overall trend.

**Fatal injury rates to workers showing smoothed trend estimate of underlying risk**

![Graph showing trend of fatal injury rates](image)

**Number of workplace fatal injuries - first three months of 2010/11p**

Notifications to HSE and local authorities 1 April-30 June 2010

<table>
<thead>
<tr>
<th>Employment status</th>
<th>Standard Industrial Classification (SIC)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agric, hunting, forestry and fishing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extractive and utility supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Services</td>
<td></td>
</tr>
<tr>
<td>Employees</td>
<td>3 1 6 10 11</td>
<td>31</td>
</tr>
<tr>
<td>Self employed</td>
<td>6</td>
<td>- 2 -</td>
</tr>
<tr>
<td>Workers*</td>
<td>9 1 6 12 11</td>
<td>39</td>
</tr>
<tr>
<td>Members of the public</td>
<td>2</td>
<td>- 1 11</td>
</tr>
<tr>
<td>Total fatalities</td>
<td>11 1 7 13 22</td>
<td>54</td>
</tr>
</tbody>
</table>

**Notes**
- Provisional
- The term Workers includes employees and the self-employed combined.
- These “in-year” figures for services exclude railway incidents reported to the Office of Rail Regulation (ORR).
- Source: The Reporting of Injuries, Diseases & Dangerous Occurrences Regulations 1995 (RIDDOR)
Proximate Causes of Construction Fatalities and Major Incidents

The major immediate causes of construction fatalities and major incidents are fairly well-defined: falls from height, accidents involving transport equipment, and being struck by objects.

Figure 1 - Causes of Construction Fatalities, All Incidents April 1997 to March 2008

The HSE Construction Intelligence Report (2008) also charts the change in the causes of injuries and illustrates very clearly the progress made over the past ten years in reducing the incidence of falls-from-height accidents. It also shows how numbers of incidents related to slips and trips and to lifting and carrying have increased.

By far the greatest proportion of incidents result from falls from height, which consistently account for approximately half of all construction fatalities. After falls from height, the most significant cause of fatalities is transport, principally pedestrians being struck by moving vehicles.

Reported injuries are largely caused by handling problems and by slips and trips, which accounted for 29% and 22% of injuries respectively (figures broadly in common with "all industry" averages). This was followed by falls from height, which accounted for 17% of construction injuries, a significantly higher incidence than in other industries (cf an all industry average of 8%).

The type of work undertaken also has a significant relationship with the incidence of fatalities. Certain activities, notably roofing work and painting/decorating, are responsible for significantly higher proportions of fatal incidents than other tasks.
Roofing and painting and decorating emerge clearly as the two most hazardous work activities. This is likely to reflect frequent exposure to work at height in these types of activity. The prominence of falls as a cause of fatalities and major injuries has resulted in considerable analysis of this category of injuries. This research suggests that by far the most important factors in this type of fatality are use of ladders and falls through fragile roofing materials, followed at some distance by scaffolding accidents. Roofers stand out as the group most vulnerable to falls (20% of fatal falls), and the group most likely to experience fatality due to a fall through ‘fragile materials’ (e.g. a roof or skylight) or from an edge or opening. Accidents with ladders occur predominantly to painters and decorators, and with scaffolding to scaffolders and general builders.

The 2005 Warwick study for HSE found that construction labourers have a propensity to workplace injury that is four times as great as is average for the UK workforce, and that construction operatives are three times as likely to be injured as the average UK worker.

It is striking that although roofing and painting and decorating appear to be the highest risk activities in construction, neither roofers nor painters and decorators experience particularly high levels or rates of occupational injury. The groups who experience overwhelmingly the highest levels of injury are those classed as construction labourers and operatives.

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The large number of carpenters and joiners experiencing fatal and major injuries is also of interest. Equally striking are the numbers of electricians who continue to experience serious injury, presumably from contact with electricity. This should be of some concern, because in general it is assumed that levels of occupational competence among electricians are high. Although there is no immediate mechanism by which this can be proved, it may be that risks to electricians are not those of a lack of occupational skill and knowledge but, perhaps, more to do with situational awareness.

The impression given by these data that occupational role is a significant predictor of fatality and injury has been confirmed by Analysis of Variance Analysis (ANOVA) undertaken on HSE statistics by Warwick University’s Institute for Employment Research. That research found that occupational role alone accounts for nearly 40% of the observed variance in injury rates – with all other variables accounting for less than 5% each. This analysis has further confirmed the *prima facie* impression that within construction occupations, construction labourers/general operatives, and carpenters and joiners experience the largest rates of fatal and major injuries. Indeed, construction labourers, and metal, wood and construction trades represent two of the five highest risk occupational groupings in the UK. When potential confounding factors are taken into account, construction labourers represent the single most vulnerable occupational category, with approximately 2.3 times the average risk of serious occupational injury, closely followed by construction trades at nearly 1.9 times the average risk.

Certain construction occupations, therefore, involve high risk activities. It is notable that it is the kind of high risk activities to which a particular occupation exposes a worker, combined with the effectiveness of mitigating measures customarily taken within that occupation – rather than the occupation *per se* - which explains the different levels of risk associated with a particular occupation. Although imprecision in the data classifications make it difficult to draw definitive conclusions, the implication would appear to be that general labourers and operatives are experiencing accident and

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injury because they are undertaking hazardous tasks of which they do not have the necessary complete understanding to carry out successfully and safely. There are no readily available data to cross-reference for this purpose but it would be interesting to test this assumption by comparing rates of injury due to falls from height among general labourers and roofers.

This final point is, we feel, a vital one. An operative may be "competent" in terms of an understanding of skills, and in terms of knowledge of the job, and yet may still be open to risks due to other factors such as working outside his or her accustomed environment or situation (see "Out of Context Risks").

There is also some evidence that length of tenure in any given job, and that worker age, have a discernable impact on a person's propensity to experiencing an accident. Job tenure appears to have a strong effect, with the Warwick IER research concluding that:

"The risk of workplace injury declines rapidly as employment tenure increases. The increased risks associated with tenure are particularly apparent during the first four months within a new job".

Indeed, it appears that, during their first month in the role, employees are approximately four times more likely to experience workplace injury than those with twenty or more years of employment in their current job. The impact of job tenure would appear to be particularly pronounced in the construction sector, where injury rates fall off rapidly after six months on the job, before stabilising after around a year.

- The high churn of employees, with high recruitment of new entrants to the industry (pronounced during the expansionary periods of the economic cycle); and,
- The relatively short-tenure nature of an individual's familiarity with a particular job-location (due to movement to different sites).

Warwick IER’s ANOVA analysis suggests that job tenure in itself is of far less significance than occupational role as a predictor of injury rates, accounting for less than 5% of observed variance.

As a result of an extensive literature review ... The overall findings of the HSE review identified the most frequently cited causative factors at four levels within the construction process and tabulated them as follows:

- Environment
- Corporate Systems
- Delivery Systems
- Output from delivery systems

Recent analysis undertaken for the Donaghy Inquiry has given some insight to the underlying causation of fatal construction incidents. Issues directly related to competence and training figure prominently. At the output level, that is the level at which the construction work is actually being undertaken, ‘competence and suitability’ of workers emerged as a key factor, along with ‘planning and risk assessment’. Both are factors that relate at least in part to the competence of site personnel, particularly site supervisors and managers. At the delivery systems level, ‘competence: selection, training, information’ was a key factor; of the other three factors identified, all are arguably likely to reflect, or at least be exacerbated by, deficiencies in basic competence among site managers, supervisors and operatives.

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7 Warwick IER (2005), Trends and context to rates of workplace injury. ibid.
8 Warwick IER (2005), Trends and context to rates of workplace injury. p.57.
Research by UMIST and Loughborough into the causation of non-fatal construction accidents also identified causative factors at every stage of the design and construction process. Issues frequently associated with accidents included the following:

- Poor risk assessment and risk control measures on site, with risk assessment and method statements often treated as a paper exercise;
- Problems arising from workers or the work team, especially worker actions or behaviour and worker capabilities, which were judged to have contributed to over two thirds (70%) of the accidents;
- Poor housekeeping, with poorly arranged, restricted and/or untidy workplaces being an important factor in the causation of nearly half the accidents;
- Lack of training of workers, or training that is inadequate and/or insufficiently relevant to real workplace conditions;
- Most accidents involved ‘commonplace hazards and activities’ that are intrinsic to the construction process, most notably work at heights, particularly when using ladders⁹.

A large majority of those working in construction, both on and off site, were said to have only a superficial appreciation of health and safety considerations. Overall, the research findings pointed to ‘failings in education, training and safety culture in the industry’¹⁰.

Examined in totality, the research into patterns and causation of accidents exhibits a consensus on a number of important points:

- Construction-related accidents are overwhelmingly related to a small number of generic causes across occupational roles and impacting almost equally, eg falls from height, slips and trips and so on;
- These reflect basic hazards intrinsic to the construction process;
- Many of these causes can and should be controlled, but are not, generally due to poor risk assessment and risk management or a number of human factors;
- This may reflect failures in education, training and safety culture in the industry, resulting in workers with inadequate levels of competence to deal with the health and safety issues intrinsic to the construction workplace.

There is considerable evidence to suggest that construction workers are not only at heightened risk of fatality or injury, but also of occupational disease and ill-health. The areas of principal concern are asbestos-related disease, where the single most vulnerable occupational category has, historically, been carpenters and joiners. Asbestos risk is now much more comprehensively controlled than ever before, but the risk of encountering asbestos when working on older buildings remains high.

In addition, there is significant evidence that construction workers are particularly vulnerable to musculo-skeletal disorders (MSD). Data from the Labour Force Survey suggests that both the construction sector as a whole, and ‘skilled construction and building trades’ had significantly higher

¹⁰ Ibid. p. 93.
than average incidence rates of MSD. Indeed, LFS data from 2000/2001 suggested that construction had one of the highest prevalence rates of MSD for workers working over the previous eight years. Inspectors’ reports suggest that this type of risk is poorly controlled on building sites\textsuperscript{11}.

**Figure 3 - Occupational Disease - Construction & All Industries Compared**

**Annual average incidence rates of occupational diseases seen by disease specialist doctors in the THOR surveillance schemes; 2005-2007**

HSE estimates from the Self-reported Work-related Ill health survey (SWI 2007/08) suggest that the current overall prevalence rate of ill health is 3600 per 100,000 people working in the last 12 months, which equates to 88,000 suffering from work-related ill health in 2007/08 (137,000 in 2001/2).

Overall, then, it seems that, while improvements in construction health and safety have been considerable over the past decade, they continue to lag behind the industry target rates. No less significantly, there have been substantial improvements in other sectors, with the result that construction remains a significant underperformer relative to the all industry average.

The all industry incident rate has fallen from 1.3 to 0.5 workers per 100,000 between 1999/2000 and 2008/09. Thus the fatality rate in construction is even now some five times higher than average for all sectors\textsuperscript{12}. However, this crude comparison may be slightly misleading. In terms of major injuries construction suffers higher numbers than agriculture, manufacturing and the extractive industries but its rate of fatalities is half that of agriculture and the same as in the extractive sector.

\textsuperscript{11} HSE (2008), Construction Intelligence Report, p. 18.
\textsuperscript{12} It should be noted however that rate of death and injury in Britain are consistently lower than in comparable European economies (even when the road traffic statistics during working hours are largely removed from the latter.
Annex 4 – Further discussion on inputs, outputs and integrated competence model

These additional notes align to and underpin section 9 in the main report regarding the New Competence and the importance of behaviour. In order to understand the kind of competence of most value for promoting health and safety, it is important to consider the human factors underlying the emergence of potentially dangerous errors that lead to increased health and safety risks.

Since the publication of James Reason’s highly influential book Human Error, errors have often been broken down into three basic categories: mistakes, slips and lapses, and violations. The following derives from these basic categories (although it somewhat modifies their original form and relationship in order to make it more directly applicable to this research).

These different types of sources of error can be related to the various contributory components of competent action in an integrated competence model that includes skills, knowledge and understanding, and behaviours:

- **Slips and lapses** can be seen as the result of a deficiency of skill, due to intrinsic lack of capacity to acquire the necessary skills, lack of appropriate training or experience, or transient incapacity due for example to tiredness or inebriation or sheer chance.

- **Mistakes** can be seen as the result of a deficiency of theoretical knowledge and understanding, either of the specific operation being undertaken or the wider context in which work is taking place.

- **Violations** result from deliberate prioritisation of something other than following accepted safe procedure, such as speed, economy, personal excitement etc. They can therefore be seen as a deficiency in values, disposition and attitudes.

Each of the three sources of error is therefore associated with a specific input from the competence model.
The ‘inputs’ of competence are clearly important for this. Formally inculcated theory can at least potentially provide ‘building-blocks’ to assemble the schemata needed to negotiate the varied environments encountered in real-life situations. In addition, appropriate skills are needed if decisions are to be transformed into efficiently executed actions. In order to construct such schemata and achieve a specified standard of competence, however, some intrinsic capacity and suitability is likely to be necessary, along with active interaction with real or simulated environments. The greater the range of experience undergone, the more embedded and varied the schemata are likely to become (in the non-academic world this is usually summed up in the term "experience").

Because of this very fact, however, care needs to be taken to ensure that more experienced workers do not develop schemata which are generally functionally effective but which entail
significant underlying risks. Finally, there are implications that extend beyond individual levels of competence to wider environments. A safe environment must support and facilitate the development of the level of Situational Awareness needed for safe working (for more on SA please see Annex 6). This will include consideration of the design and deployment of appropriate systems, processes and equipment, and the maintenance of good working conditions, as well as the selection for, and development of, appropriate capacities, skills, knowledge and understanding.

This can best be illustrated by using the example of falls-from-height; the variable accounting for almost half of all construction industry injuries and deaths. Occupationally, however, the rate of injury and death for the occupational category "roofers" is considerably lower than that for the above-named occupations or for carpenters and joiners.

Although the statistics are not sufficiently refined it must be the case that falls from height account for a disproportionate number of accidents to trades other than roofers. Similarly, accidents due to slips, transport vehicles, etc., indicate what we term incidents due to Out-of-Context Risks.

An "out-of-context risk" (OCR) can be said to exist where an otherwise competent worker is operating outside his or her accustomed work-context - for example a carpenter or bricklayer working on a roof, or perhaps a general labourer working in a part of the site with which they are not familiar.

This is not to argue that addressing OCR alone might resolve the issue of further reducing incident rates in the sector; merely that the potential for such accidents clearly illustrates the limitations of existing strategies which, while extremely successful, have been focused first on the mechanical aspects and systems relating to safety, and then on achieving occupational and health & safety competence in the workforce.

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13 It is primarily for this reason that aviation authorities demand that pilots are reviewed in their work-environment (usually called base-tests) at regular intervals. The Inspector is required to spot and correct any inappropriate schemata that become evident in the pilot's operational decisions.
Annex 5 – Case Studies: including DWP, JobCentre Plus

The DWP’s JobCentre Plus project was a £100 million construction project to construct or redevelop a network of one-stop advice centres for job seekers and benefit claimants. Significant problems with accident and injury rates in the first year of the project led to reconsideration of the entire project design, procurement and construction process to support optimal health and safety performance.

Best practice for procurement and contracting was identified on the basis of a review of existing best practice across all industries:

- Risk assessments were carried out throughout the design process to ensure that the construction could be carried out safely;
- Contractor procurement placed increased stress on health and safety issues, notably safety systems and processes, in accordance with the Office of Government Commerce guidance on construction procurement;
- An Environmental, Health and Safety Code of Practice was introduced;
- Regular environmental, health and safety audits to check adherence to the Code of Practice were carried out by the contractors, by specially appointed Regional Environment, Health and Safety Coordinators, and by HSE inspectors;
- All contractors were required to use a comprehensive (and audited) reporting system for RIDDOR major and over-three-day incidents, other injuries, and near misses;
- Contracts were renewable annually on the basis of meeting performance standards;
- A standardised safety training course was compulsory for all people accessing work sites;
- A safety passport scheme was introduced to verify the completion of training;
- Standardised risk assessments were used at the beginning of all work assessments.

The training programme, ABC (Achieving Behavioural Change), was a departure from traditional "Health & Safety Courses" and was designed specifically to promote safe behaviours. It was partially based on approaches developed for the Channel Tunnel project, and the DuPont STOP system. In addition to basic coverage of rights, responsibilities, and concepts related to health and safety, the training and assessment materials developed for the programme specifically addressed broader kinds of situational risk.

The training materials focused primarily on a series of common risk situations: untidy workplaces; work at height; loose or hidden electrical cables, and so on. A presentation was supplemented by exercises and video clips, to ensure that learning was active, vivid and memorable.
A written assessment was used to ensure that the key issues had been covered properly and that the principles were understood. At the end of training and after passing the written assessment, workers were issued with an ID card (Safety Passport) and a STAARR (Stop, Think, Assess, Act, Report and Review) Risk Assessment booklet. No one was allowed on site without the Safety Passport.

The principles covered in the training were used as the basis for a formal risk assessment tool, the ‘TASK’ (Think first, Act safe, Stop if hazardous, Keep safe) card. Significantly, the card required both the supervisor and the work team to sign when they were satisfied that all hazards had been appropriately controlled before work began.

Thus it involved the empowerment of workers by giving them the right to refuse to work if they felt that hazards and risks had not adequately been addressed.

The audit system covered fourteen categories and 135 specific points, with detailed risk areas to occupational health and safety, work at height, lifting operations, site excavations, use of plant and the public interface all having double weighting.

The combination of training and procedures introduced under the programme led to a dramatic reduction in accidents and substantial improvements on the construction industry’s average health and safety performance.

Within two years the accident frequency rate had been reduced by more than 80%, and, over the last two years of the project an accident rate of a sixth of the industry average was experienced.\(^\text{14}\)

Other benefits included:

- Over 900 projects completed without one claim and/or trade dispute
- Exemplary standards of worker engagement measured by rigorous audit and reporting regime encouraging continuous improvement
- Over 10,000 operatives, supervisors, and managers trained on the ABC Passport Training Course
- Cost savings of 24% over the 2003 projections
- An accident incident rate down to a sixth of the industry average in the last two years of the programme\(^\text{15}\).


For many years it was considered sufficient for airline pilots to be trained to fly and navigate aircraft (skill) and to possess a deep and thorough knowledge of aircraft and engines, of meteorology, and of avionics and associated subjects (knowledge & understanding). A competent pilot, in other words, was generally considered to be one whose flying skills in the relevant type of aircraft were of a very high standard and who supported those skills with extensive, related knowledge.

It was not really until the 1970s that first the military and then the civil aviation authorities and airlines began to perceive that these things, alone, were insufficient to be able to improve aviation safety from its already largely excellent level. Having, in other words, established the systems and regulations to support safety and having also ensured occupational competence with rigorous tests and examinations (and with regular re-tests), it became apparent that “human factors” were at work for a significant proportion of accidents.

Most airlines since then have introduced human factors training for their pilots which focuses on attitudes, behaviours, the social environment within the cockpit and on psychological barriers to safety (such as a co-pilot’s natural inclination to defer to the Captain, or the results on efficiency of an argument between the two flying pilots).

The importance of Human Factors to flight safety was officially recognized by the International Civil Aviation Organization (ICAO) in 1986 when the 26th Assembly adopted Resolution A26-9.

The application of the human factors approach is now applied to all roles having a direct impact on flight safety - particular aircraft maintenance engineers. A full description of the requirements for human factors training for these staff was issued by the Civil Aviation Authority as CAP 716 in 2003 from which the following extracts will serve to illustrate the fundamental direction of their thinking.

A good appreciation of the practical application of human factors can only be obtained by training, ideally within the context of the organisation within which the people work.

Furthermore an examination in isolation cannot really assess certain aspects such as “skill” and above all “attitude”, which are two of the training objectives discussed above.

Training in human factors is, therefore, important in order not only to help people understand what the issues are, but how to adopt good human factors practice in all aspects of work. Such training is appropriate for all staff who have an impact upon safety and airworthiness, not just for engineers or certifying staff.

Training will not be successful in the long term unless what it teaches is supported within the organisation on a day-to-day basis. Therefore the human factors training requirement within Part-145 should not be considered in isolation. The training should be a part of the total package of measures within a Part-145 approved organisation to assure safety and airworthiness.
“To work together under a common purpose by developing a cohesive and pragmatic approach to behavioural change and worker engagement that will evolve through best practice and learning across industry with a view to changing the way we lead, plan, procure and manage work activities. With the collective goal of reducing the incidents that result in harm and personal suffering.”

The study was based on a comprehensive literature review and evaluation of evidence followed by a qualitative study and a detailed analysis and consideration of the findings.

Worker engagement is a target that has many benefits including staff retention, project management, health and safety and business-related ones. From the Health & Safety point of view the benefits have been identified around a number of factors - for example, work sites with union safety representatives or safety committees have fewer injuries and incidents of ill health than those without. By encouraging employees to think innovatively beyond their role prescriptions, they become focused on improving processes and creating better products and services

One of the key points made in this report was that "ownership" of improvements and safety-related changes creates a sense of empowerment and involvement which should ensure that hazards are removed faster and more effectively, as the decision to act can be made quickly, rather than sending the ‘hazard identified’ information up the chain of command, and waiting for the ‘eliminate hazard’ decision to come back down, before any actual hazard elimination activity takes place.

From this perspective it is worthwhile reproducing extracts from the report’s case study of the AMEC VOICE system:

**Case Study - Views of Operatives In the Construction Environment (VOICE)**

The aim of VOICE is to secure involvement of all individuals on site by improving communication lines and using hazard observation techniques to monitor and underpin safe working. The workforce was encouraged to put forward their views on health and safety issues, and actively monitor safe working.

The organisation recognised that effective communication was a key element of the strategy. A communications coordinator was appointed specifically to improve, coordinate and effectively manage the passage of communication from the project centre, out to the various sites and workforce. This included a standard, user-friendly way to display statutory notices and health and safety information in site welfare cabins.

A VOICE team involves a champion and nine members involving at least one in ten workers. The team meets monthly to discuss safety issues. Issues are dealt with on both a reactive and proactive basis as necessary. The team format helps to break down barriers between workers and managers. Workers on the team feedback information and advice to the workforce, and also relay the concerns of the workforce back to management.

The benefits were seen as being: Shared commitment, goal setting, forward thinking, identification of safety needs, highlighting gaps in the system, identification of training needs, non-policing, behaviour change.

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17 Ibid.
The approach of the BCWE study was to examine both the concepts and the practice behind worker engagement and behavioural change from the definitions upwards. The team looked at a good many examples of behavioural change in particular and from a variety of industries and contexts but picked out a few examples for detailed examination and comment. Specifically, SUSA:

**Case Study: SUSA (Safe and Unsafe Acts)**

This is a structured process of one-to-one observation and feedback in the workplace designed to reinforce safe behaviours and discourage unsafe behaviours.

The key stages of the observation and discussion process are: asking about the job, praising what is done safely, asking about the injuries that could occur, asking about any unsafe acts, asking how the job could be done safer, and convincing the individual to change their behaviour if necessary. The emphasis is on face-to-face discussion and positive feedback at the time of observation.

JOMC Consultancy recommend that 25% of employees (including all supervisors and managers) be trained to be competent in using the SUSA technique.

The study also gives specific mention to the use of the SLAM system by the global mining group Xstrata to encourage and develop situational awareness - a topic discussed in more detail below. Xstrata explained to the BCWE study that the SLAM process helped by encouraging operatives to undertake "mini-risk assessments".

From the stand-point of our own work on routes to competence in the construction sector, the SLAM system possesses not only the benefit of being targeted at the general operative but also of being straightforward and simple to implement. The acronym stands for 18:

- **STOP** engage your mind before your hands.
- **LOOK** at the work place and find the hazards (which then should be reported to the supervisor).
- **ASSESS** the effects that the hazards have on people, property and the environment.
- **MANAGE** with effective controls and advise others.

However, the BCWE report also highlights a number of barriers to behavioural change including:

- Lack of Senior Management commitment
- Client receptiveness
- Transience (workforce, work site, working conditions)
- Diversity
- Competency assurance processes.
- Results Driven Industry
- Approach Applicability (should be tailored to the audience)
- Specific Attitudes and Supervisor Bottle Neck

The report contains a number of detailed case studies and discussions from companies such as Magnox Electric; Bovis Lend Lease; Carillion; Kier; and Laing O’Rourke.

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18 Ibid
Annex 6 – Situational Awareness and Naturalistic Decision Making

Situation Awareness is usually conceived of as a mental model of the external world that is used as the basis for decision making. It is the accuracy and salience of the agent’s model of external reality which enables them to utilise their background knowledge and skills to take appropriate actions.

Situational Awareness (SA) has been divided into three levels:

- Perception: the level at which information is taken in from the environment
- Comprehension: the level at which the significance of the information is understood
- Projection: the level at which comprehension enables accurate conceptions of the probable future state of the situation to be developed, and appropriate decisions made

SA is conceived of as a dynamic process which constantly draws on an individual’s innate capacities and dispositions, their acquired skills and abilities, knowledge and understanding, and their immediate perception of their environment, without being directly reducible to any or all of these components. Instead, SA concerns the way in which the individual is able draw on and make use of different kinds of knowledge and understanding to develop a more or less accurate and salient picture of their environment. This picture therefore represents a critically important intermediate stage between background capacities, knowledge, understanding, dispositions and values, and instantaneous perception, and the decision to apply specific skills.

The concept of SA is therefore of value in focusing on the immediate state of consciousness from which emerge the decisions that lead to appropriate or inappropriate actions. In an important sense, it can be seen as one potential for the role of ‘missing link’ between the ‘inputs’ and the ‘outcomes’ of competence, or at least as an important pointer towards such a missing link. It can also be seen as a similar missing link between the individual and their wider context. In theory, risks can only be assessed reliably and accurately when the situation is correctly understood.

Our findings confirm that occupational competence is an important element of safe working. However, at the moment and unlike the aviation industry in which qualifications and tests form clear evidence of competence, efforts towards developing and evidencing competence in the construction workforce are problematic for the following reasons:

- The penetration of competence-based qualifications remains incomplete in many segments of the workforce, and is particularly low in some key risk areas – notably, unskilled workers and site supervisory and managerial occupations.
- The system of cards used for evidencing competence remains confused and complex, is based on widely varying criteria, may be relatively-speaking expensive for the industry to sustain, and may well incur the additional costs of some duplication
- The NOS and NVQ based system of qualifications, while assuring basic occupational competence, is intrinsically unsuited to developing and assuring the kind of competence needed to provide solid evidence for the broader kind of competence needed for safe working.  

Primarily because, at the moment, there is not established understanding of how competence can be regularly reassessed except through some sort of “licence to practice” system.
• It can be argued that the input-based competence approach has suffered significantly since the introduction of NVQs and that this may have undermined the need to assure the industry of a solid basis of general theoretical knowledge and understanding (as opposed to merely job-related knowledge and understanding).

• It might also be possible to argue that even the skill-aspects of competence in the industry may have been constrained by the NVQ approach - which essentially does not test wider skills but only those for which the assessor requires evidence from a specific job at hand at the time of assessment.

• Under the existing application of NOS (and possibly once the system is fully translated to the QCF) health and safety is approached as a "skill with underpinning knowledge" that, once evidenced for the award of a specific qualification, need never be evidenced again.
Annex 7 – The Education and Training Environment

As has been shown in sections 3 and 4 in the main report - competence in the construction sector is developed in an extremely complex organisational and regulatory environment. The diagram in the report (page 16 of the report) shows the many organisations involved in the pursuit of competence, in particular mainly the ‘educational’ organisations.

A simplified structure has been put forward in response to the consultation run by BIS (Summer 2010) by the sector skills council, ConstructionSkills. This diagram below is provided courtesy of the SSC.

The diagram below refers to the Government agencies that were operating in June 2010 (such as the Skills Funding Agency – SFA and Young People’s Learning Agency –YPLA).
The diagram below captures and categorises those mainly educational organisations in a single dimensional framework and adds other organisations involved in the Health and Safety systems and regulatory outputs to give a further idea of the complexity of the environment in which companies operate.

A Complex Environment
Annex 8 – Exemplar Arrangements/Schemes

**Construction Plant Competence Scheme (CPCS)**

CPCS was launched in 2003, at the request of employers to help them comply with industry regulations and requirements. CPCS replaced its founder scheme the Certificate of Training Achievement (CTA). The Scheme provides certification for plant operators in the UK construction and allied industries and covers over 60 categories of plant and machinery. CPCS aims to improve health and safety awareness in the industry, keep a record of the individuals who have achieved a recognised level of operating ability and competence and encourage employers to use carded skilled workers.

CPCS is owned by the Construction Industry Training Board. The CPCS Management Committee, which includes a range of plant and equipment industry organisations, develops the Schemes’ policy and strategy. Membership of the Management Committee includes the Association of Lorry Loader Manufacturers and Importers (ALLMI), the Civil Engineering Contractors Association (CECA), the Construction Plant-hire Association (CPA), the Federation of Piling Specialists (FPS), HM Forces, LANTRA the Sector Skills Council for land-based and environmental industries, the Mineral Products Qualifications Council (MPQC), the National Federation of Demolition Contractors (NFDC), the Scottish Plant Owners Association (SPOA), the Union of Construction, Allied Trades and Technicians (UCATT), the UK Contractors Group (UKCG) and the trade union UNITE. Non voting members include the Federation of Master Builders (FMB), the Health and Safety Executive (HSE), the CITB-ConstructionSkills the Sector Skills Council and CITB-ConstructionSkills Northern Ireland.

In August 2008 a new version of the Scheme was introduced. The main changes namely; the new CPCS Technical Test, the new CPCS Competent Operator Card renewal scheme and also the delivery of CPCS card holders’ qualifications through CPCS Test Centres. Remaining Cards issued before January 2009 will remain valid until they are due for renewal.

In total there are four CPCS cards available; the Trained Operator Card, the Competent Operator Card, the Tester Card and the Trainer Card. The Trained Operator Card (red) is a two year non renewable card. Within two years of gaining the Card the cardholder must gain an S/NVQ to be eligible to upgrade to the Competent Operator (blue) Card. However there are two exceptions; if the Card has been expired less than 12 months the cardholder may apply to get a year’s extension as long as they register for an S/NVQ. Secondly, introduced in 2009 there is also the return to work route. The cardholder must notify CPCS that they are out of work and on commencement of a new job if the new employer submits a form to CPCS to evidence that the cardholder is working again the cardholder may be given a six months temporary card. If the Card has been expired over 12 months, the cardholder needs to reapply for the Trained Operator Card and pass the practical and theory test again.

The Competent Operator Card (blue) is a five year renewable card. There are four stages of progression to gain the Card. The individual may be working towards a Trained Operator Card.
or moving from a Trained Operator Card to a Competent Operator Card. The individual may be working directly towards a Competent Operator card or renewing a Competent Operator card. To renew the Competent Operator Card cardholders must record 300 operating hours in the logbook or pass a CPCS Practical Test (delivered through a CPCS Test Centre with a CPCS Tester, either at the centre or in the workplace as a On Site Assessment) and record all on going training including health and safety refreshers or manufacturers updates in the logbook.

The fundamental difference between the Trained Operator Card and the Competent Operator Card is whether the vocational qualification has been achieved. To gain a card the applicant must pass the ConstructionSkills Health and Safety Test before any testing or training begins (if it has not been passed in the last two years). The following core elements are used to demonstrate the skills, competence and qualifications that determine eligibility for Scheme membership; Training, Health and Safety Test, CPCS Theory Test, CPCS Practical Test, S/NVQ, Logbook, On-Site Assessment and CPCS Renewal Theory Test. Since 2010, the S/NVQ must be in the family grouping of the category of card the individual is applying for.

There is a CPCS technical test for each category and all CPCS Technical Tests (Practical & Theory) are undertaken through registered CPCS Test Centres. CPCS have monitors around the UK who carry out random checks and audits on centres. All Tests are recorded and have to be notified to CPCS a minimum of two full working days in advance of the test and these are open to monitoring visits. All new applicants, and those adding a category or renewing a CPCS Card, must hold a ConstructionSkills Health and Safety Test Pass that has been completed within the last two years.

There is no industry accredited route available. The Scheme supports the principle of lifelong learning and therefore requires evidence on going competence and operating ability through health and safety awareness and up-to-date knowledge and understanding at the point of renewal. This is also evident in the fact that (as Annex 1 shows and below) the take up of qualifications for plant operatives is greater than the workforce population. It appears to be the only occupation and qualification grouping, looked at for the purposes of this research, where this is the case.

<table>
<thead>
<tr>
<th>All VQs – Plant Operative</th>
<th>Sum of 2005</th>
<th>Sum of 2006</th>
<th>Sum of 2007</th>
<th>Sum of 2008</th>
<th>Sum of 2009</th>
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<tr>
<td>Grand Total = 95,808</td>
<td>1107</td>
<td>5366</td>
<td>19568</td>
<td>21228</td>
<td>22899</td>
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<td>Workforce figures (2009)</td>
<td></td>
<td></td>
<td></td>
<td>46,000*</td>
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</tbody>
</table>

* sourced via ConstructionSkills and Office of National Statistics

**IRATA**

Perhaps one of the most demanding registration and certification scheme is that run by the Industrial Rope Access Trade Association (IRATA). It is privately owned and run- and maintains exceptionally rigorous standards in all aspects of its work.
This scheme operates purely for rope access, a method for reaching otherwise inaccessible places using techniques similar to those used in recreational climbing and abseiling. The scheme was initially established to promote the use of such techniques to the repair and maintenance of North Sea oil platforms, where conventional access methods such as ladders and scaffolding would have been impossible or unsafe to use. Since then, rope access has been used on a wide range of demanding structures, especially very tall structures such as Big Ben and the London Eye.

IRATA is unique in coordinating a variety of different approaches to ensuring safe work into a single scheme: individual technician training and registration; corporate audit and registration, which includes a requirement to return data on health and safety incidents; and the establishment of standards, procedures and processes to provide reference guidance for members, with the major document being the new IRATA Code of Practice. Individual certification for IRATA technicians consists of three graded levels, progression through which is based on completing specified training, passing an independent assessment, and completing a defined number of hours of active rope work. This provides assurance of individual skills, knowledge, and understanding, and appropriate levels of experience. Level 3 technicians must be capable of being wholly responsible for projects must also hold first aid certification.

In addition, companies wishing to use the IRATA trademark must also be registered corporately, and agree to use the standard procedures and techniques in the official IRATA Requirements and Guidelines as their basic reference standard. These provide information all relevant health and safety law and regulation; provide exhaustive technical guidance; and set out procedures for selecting and supervising appropriate technicians, including consideration of issues such as personal health, personality and behaviours. Basic requirements for safe working are set out; for example, solo rope access work is not permitted in any discrete working area (not just on a particular work site) and all teams must have at least one member who is fully qualified Level 3 technician.

IRATA companies are also required to submit quarterly data on occupational injury and ill-health. This data is then used as the basis for annual reviews by an independent analyst to assess health and safety performance and identify any emergent risk areas that need addressing. The findings are published in the IRATA Work and Safety analysis, and these are available to all interested parties from the IRATA website.

It should be noted that IRATA has reported no work-related fatal incidents in its twenty-one years of existence, in spite of the intrinsically high risks associated with this type of work. This high performance is especially striking when compared to the number of fatal accidents occurring during rope access work in the USA, where in the period between 2003 and 2009, the activity experienced a total of 70 fatalities\(^20\).

Perhaps more significantly, the overall incident rate appears to be remarkably low, with the IRATA health and safety audit suggest that major incidents occur at a rate comparable to the reported all industry average, and minor injuries at a rate considerably less than half the all industry average, and dramatically better than the construction industry as a whole. Given that it unlikely that IRATA reporting is less accurate than general RIDDOR data (and may well be of better quality given the known high levels of underreporting for these types of accident), this is a remarkable performance.

It is difficult to know whether IRATA’s high performance reflects the effect of the individual training, defined standards for work, or the use of corporate membership and audit, or a combination of all of these aspects of the scheme.

**The Energy and Utility Skills Register (EUSR)**

The EUSR is not in itself a certification scheme; it is instead a way of providing a straightforward and comprehensible interface that links numerous sector schemes into a unified structure and a single database of registrations and certifications, thus avoiding duplication of cards and simplifying administration for all involved.

The EUSR is a comprehensive and easy to use system that coordinates all the main utility industry training, certification and safety passport schemes in a single register. All information is available through a single web-based portal [http://www.eusr.co.uk/](http://www.eusr.co.uk/) which includes a list of all the training and certification schemes covered by the register. The schemes covered fall into three categories; safety passports, specific specialist skills based certifications and company schemes. The list itself has basic information, and each listed scheme links through to more comprehensive information. In addition, there are entry points for each industry covered, and clicking on these links brings up a list of all the schemes relevant to that industry.

The website also acts as a portal to the register database. Every person on the register is issued with an identity card bearing the cardholders name, photograph and a unique ID number. The card itself carries a listing of endorsements and certifications, but in addition any employer wishing to verify a cardholder’s details simply needs to enter two of the following into the portal; their ID number, surname, date of birth or National Insurance number. The registry details will then be returned with all current details. The EUSR database also allows employers in relevant industries to record the training skills and competency of their employees, known as the Company Scheme.

An individual may apply for a skills based card if they have satisfied the criteria required for recognition of skills in a particular role. Currently, there are three types of skills based card in issue for registration on the EUSR; EUSR/Utility card, National Water Hygiene (blue) card and Scottish Water DOMS Card. To gain registration, evidence of meeting the criteria of the particular scheme must be provided, for example in many cases the achievement of a specific S/NVQ or recognised equivalent is required.

In addition to the above two there are a number of other schemes, primarily safety passport schemes that exhibit most of the strong characteristics alluded to in the matrix above. The safety passport schemes usually cover health, safety and environment awareness. Registration is gained upon successful completion of the particular course, which includes knowledge based input and assessment. All EUSR passport schemes are developed by EU Skills using the support and guidance of industry representatives and have been developed in line with Health and Safety Executive best practice guidelines. All trainers delivering the passport schemes have suitable industry experience, a training/teaching background and have been trained, assessed
and approved by EU Skills. Each prospective trainer must attend a Train the Trainer Course, which compromises of three stages.

Firstly the potential trainer must meet the criteria for each particular scheme they would like to train for. They must then attend the day long Train the Trainer course, which covers the development of training skills, the scheme content and the delivery methodology and the trainer must sign a Trainer Code of Practice. Finally, the prospective trainer must gain field approval where a EUSR Approver observes one of their training sessions and offers feedback based on the delivery technique. If successful the trainer may carry on training and is issued with an Approved Trainer EUSR card.
Annex 9 – Abbreviations and List of Organisations covered by this research

Abbreviations used in the report

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACoP</td>
<td>Approved Code of Practice</td>
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<tr>
<td>CDM</td>
<td>Construction (Design and Management) Regulations 2007</td>
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<tr>
<td>CPCS</td>
<td>Construction Plant Certification Scheme</td>
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<td>CSCS</td>
<td>Construction Skills Certification Scheme</td>
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<tr>
<td>DWP</td>
<td>Department for Work and Pensions</td>
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<td>EWPA</td>
<td>Experienced Worker Practical Assessment</td>
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<td>LFS</td>
<td>Labour Force Survey</td>
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<td>NOS</td>
<td>National Occupational Standards</td>
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<td>NQF</td>
<td>National Qualifications Framework</td>
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<td>NVQs</td>
<td>National Vocational Qualifications</td>
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<tr>
<td>OSAT</td>
<td>On-site Assessment and Training</td>
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<td>QCF</td>
<td>Qualifications &amp; Credit Framework</td>
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<tr>
<td>SSC</td>
<td>Sector Skills Council</td>
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<tr>
<td>SVQs</td>
<td>Scottish Vocational Qualifications</td>
</tr>
<tr>
<td>VQs/ VRQs</td>
<td>Vocational Qualifications / Vocational Related Qualifications</td>
</tr>
</tbody>
</table>
## Organisations contacted during the research

<table>
<thead>
<tr>
<th>Organisation</th>
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<tbody>
<tr>
<td>Asbestos Control and Abatement Division (ACAD)*</td>
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<tr>
<td>Asbestos Removal Contractors Association (ARCA)*</td>
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<tr>
<td>Association of Industrial Truck Trainers (AITT)*</td>
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<tr>
<td>Association of Lorry Loader Manufactures and Importers (ALLMI)</td>
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<tr>
<td>Association of Plumbing and Heating Contractors (APHC)*</td>
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<tr>
<td>Awarding Body for the Built Environment (ABBE)</td>
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<tr>
<td>British Association of Landscape Industries (BALI)</td>
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<tr>
<td>Building Engineering Services Training (BEST)</td>
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<tr>
<td>British Institute of Non-Destructive Testing (BINDT)*</td>
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<tr>
<td>CELL UK</td>
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<tr>
<td>Chartered Institute of Plumbing and Heating Engineering (CIPHE)</td>
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<tr>
<td>CIOB - Chartered Institute of Building and Joint Awarding Body (JAB) CASL Management Development Limited (CASL)</td>
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<tr>
<td>City &amp; Guilds**</td>
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<tr>
<td>Construction Employers Federation (CEF)*</td>
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<tr>
<td>Construction Industry Scaffolders Record Scheme (CISRS)</td>
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<tr>
<td>Construction Skills Certificate Scheme Ltd (CSCS)</td>
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<tr>
<td>ConstructionSkills(SSC)</td>
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<tr>
<td>Cskills Awards/Construction Skills Alliance</td>
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<tr>
<td>Edexcel &amp; Joint Awarding Body (JAB)</td>
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<tr>
<td>Electrical Contractors’ Association (ECA)**</td>
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<tr>
<td>Engineering Construction Industry Association (ECIA)</td>
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<tr>
<td>EMTA Awards Limited (EAL)**</td>
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<tr>
<td>Energy &amp; Utility Skills (EUskills)**</td>
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<tr>
<td>Engineering Construction Industry Training Board (ECITB)</td>
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<td>Engineering Council</td>
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<tr>
<td>Fall Arrest Safety Equipment (FASET)*</td>
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<td>GasSafe</td>
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<td>Glass Qualification Authority (GQA)</td>
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<tr>
<td>Heating Equipment Testing and Approval Scheme (HETAS)**</td>
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<tr>
<td>Heating and Ventilating Contractors’ Association (HVCA)</td>
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<td>Highways Agency</td>
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<tr>
<td>Highway Electrical Academy (HEA)</td>
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<td>Industrial Rope Access Trade Association (IRATA)</td>
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<tr>
<td>Institution of Occupational Health and Safety (IOSH)**</td>
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<tr>
<td>International Powered Access Federation (IPAF)</td>
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<tr>
<td>Joint Industrial Board- Electrotechnical Certification Scheme (JIB-ECS)</td>
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<tr>
<td>Joint Industrial Board for the Plumbing Industry in England and Wales (JIB-PMES)*</td>
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<tr>
<td>Lantra (SSC)</td>
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<tr>
<td>Lantra Awards</td>
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<tr>
<td>Major Homebuilders Group (Independent Consultant)</td>
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<tr>
<td>Mineral Products Qualifications Council (MPQC)</td>
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<tr>
<td>National Access &amp; Scaffolding Confederation (NASC)</td>
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<tr>
<td>National Association for Professional Inspectors and Testers (NAPIT)</td>
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<td>National Association of Shopfitters (NAS)</td>
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<td>National Examination Board in Occupational Safety and Health (NEBOSH)</td>
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<td>National Forum for Transportation Skills (NFTS)*</td>
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<tr>
<td>National Inspection Council for Electrical Installation Contracting (NICEIC)</td>
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<td>National Open College Network (NOCN)*</td>
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<tr>
<td>National Plant Awards Limited (NPAL)</td>
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<td>Organisation</td>
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<tr>
<td>National Plant Operators Registration Scheme (NPORS)*</td>
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<tr>
<td>Network Rail Sentinel Card Scheme</td>
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<tr>
<td>National Inspection Council for Electrical Installation Contracting (NICEIC)</td>
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<tr>
<td>Oil Firing Technical Association (OFTEC)</td>
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<tr>
<td>Open University Awarding Body</td>
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<tr>
<td>Prefabricated Access Suppliers’ and Manufactures’ Association (PASMA)**</td>
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<tr>
<td>ProSkills</td>
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<tr>
<td>RTITB (Formerly Road Transport Industry Training Board )*</td>
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<tr>
<td>Safety Pass Alliance (SPA)</td>
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<tr>
<td>Scottish Qualifications Authority (SQA)</td>
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<tr>
<td>SEMTA SSC</td>
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<tr>
<td>SummitSkills SSC</td>
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<tr>
<td>Storage Equipment Manufacturers’ Association (SEMA)*</td>
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<tr>
<td>United Kingdom Asbestos Training Association (UKATA)</td>
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<tr>
<td>Welplan (BESCA and ESS)</td>
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<tr>
<td>WJEC (Previously Welsh Joint Education Committee)</td>
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</table>

* Were written to but chose, for whatever reason, not to respond to the data request.

** Were written to but chose, for whatever reason, not to respond to the data request but did participate in an interview or helped in other ways.

**Notes**

A number of awarding organisations were unable to participate as at the time of the interview they were not yet being delivered construction related qualifications, this included CELL UK, WJEC and OU. For information NPAL no longer exists. However, they remain as a training provider (NPVSL).
Annex 10 – The Structure of Health and Safety Regulation

Health and safety law recognises a number of different layers with differing degrees of legal authority. At the top of the hierarchy is primary legislation, the statute law which defines the basic framework of statutory health and safety responsibilities. The principal legislation at this level is the Health and Safety at Work Act 1974. This piece of legislation creates powers for the appropriate responsible authority, the Health and Safety Executive, to create regulations to deal with specific aspects of the law.

For the purposes of analysis, it is helpful to consider the legislation most relevant to construction in a series of categories:

1. General health and safety laws and regulations applicable to all industries;
2. General health and safety laws and regulations with particular relevance to the construction industry;
3. Specific Health and safety laws for the construction industry;
4. Specific Health and Safety regulations for the construction industry.

There is a deep repository of health and safety regulation of which the most important are:

Health and Safety at Work Act 1974 (HASWA): which fundamental piece of legislation places general duties on all employers. This is followed in the hierarchy by two sets of regulations

Management of Health and Safety at Work Regulations (1999): of which the main requirement on employers is to carry out a risk assessment. Employers with five or more employees need to record the significant findings of the risk assessment

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR): The RIDDOR 1995 regulations place a legal duty on employers, the self-employed, and those in control of premises to report:

- Work-related deaths
- Major injuries
- Injuries resulting in an absence of more than three days (O3D)
- Work-related diseases
- Dangerous occurrences (near misses)

Workplace (Health, Safety and Welfare) Regulations 1992, although applicable to almost all workplaces, they specifically except construction work, as well as certain other high risk industries or work environments, from its provisions, as these have their own regulations.

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In addition to general health and safety regulation applicable to all workplaces, there is a substantial body of regulations and guidance which deal with specific hazards. These can, for the sake of clarity, broadly be divided into three types: common physical hazards; hazardous substances; and regulations for using specific types of equipment.

Regulation dealing with common physical hazards that are especially common in construction include the following:

**Work at Height Regulations 2005 (as amended 2007)**

The Regulations require duty-holders to ensure:

- all work at height is properly planned and organised;
- all work at height takes account of weather conditions that could endanger health and safety; those involved in work at height are trained and competent;
- the place where work at height is done is safe;
- equipment for work at height is appropriately inspected;
- the risks from fragile surfaces are properly controlled; and the risks from falling objects are properly controlled.

**Manual Handling Operations Regulations 1992**

These cover the moving of objects by hand or bodily force.

**Electricity at Work Regulations 1989**

These require people in control of electrical systems to ensure they are safe to use and that they are maintained in a safe condition.

**Control of Noise at Work Regulations 2005**

This places duties on employers to monitor and mitigate the effects of noise in the workplace.

Construction is also characterised by frequent exposure to hazardous substances, notably lead (in roofing and occasionally in plumbing), asbestos, and in some circumstances, gas. More generally, many construction materials incorporate or make use of potentially dangerous chemicals (for example, resins and fillers). Such regulations include:

- Control of Substances Hazardous to Health Regulations 2002 (COSHH)
- The Control of Lead at Work Regulations 2002
- The Control of Asbestos Regulations 2006
- Gas Safety (Installation and Use) Regulations 1998

And, finally, there exists a body of legislations pertaining to the use and maintenance of equipment, a great deal of which can be found on construction sites. Legislation in this area
includes:

- Personal Protective Equipment at Work Regulations 1992
- Provision and Use of Work Equipment Regulations 1998 (PUWER)
- Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)

‘Generally, the Regulations require that lifting equipment provided for use at work is: strong and stable enough for the particular use and marked to indicate safe working loads; positioned and installed to minimise any risks; used safely, ie the work is planned, organised and performed by competent people; and subject to ongoing thorough examination and, where appropriate, inspection by competent people.’\(^\text{22}\)

**Construction Specific Regulation**

As a high risk industry, construction has been given specific legislative and regulatory attention; perhaps the most important of which (and, currently undergoing a review) is:

**Construction (Design and Management) Regulations 2007 (CDM 2007)**

These regulations replace CDM 1994 (rev. 2001); and Construction (Health, Safety and Welfare) Regulations 1996. These regulations also benefit from an Approved Code of Practice \(^\text{23}\).

The CDM 2007 Regulations focus strongly on the idea of competence which is emphasised in the Approved Code of Practice (ACoP).

To be competent, an organisation or individual must have:

- sufficient knowledge of the specific tasks to be undertaken and the risks which the work will entail;
- sufficient experience and ability to carry out their duties in relation to the project; to recognise their limitations and take appropriate action in order to prevent harm to those carrying out construction work, or those affected by the work.

The ACoP goes on to associate competence with either formal or on-the-job training and experience; it also emphasises the importance of induction and refresher training for operatives and supervisors, and CPD for those in managerial or professional roles.

It provides specific recommendations for assuring the competence of companies and individual workers. For companies, this comprises a two-stage process of first checking the health and safety systems and processes in place and then checking its experience and track record.

For individuals, a similar process of first checking ‘task knowledge’ and then checking experience and track record is recommended. In both cases, there is an emphasis in the ACoP on avoiding unnecessary paperwork and concentrating on the underlying competence requirements and whether they are being fulfilled.


\(^{23}\) CDM 2007 Approved Code of Practice (ACoP): Managing health and safety in construction.
Further construction-related legislation and regulation includes:

- The Construction (Head Protection) Regulations 1989

**Definitions of Competence in Health and Safety Regulation**

It is extremely clear that the concept of competence forms an important element in health and safety legislation, regulations and guidance. However, like many such "self-evident" concepts, it is not always defined with consistency or precision. The following definitions appear in current Acts and regulations:

- The Borehole Sites and Operations Regulations 1995: ‘sufficient training and experience or knowledge and other qualities properly to perform or assist in performing the work which that person is required to do’

- The Management of Health and Safety at Work Regulations 1999: ‘sufficient training and experience or knowledge and other qualities’

- The Quarries Regulations 1999: ‘sufficient training, experience, knowledge and other qualities to enable him properly to undertake the duties assigned to him, and “competence” shall be construed accordingly’

- CDM Regulations 2007: there is no explicit definition of competence in these regulations; it is simply required that all those involved in the construction process should either be, or be under the supervision of someone, competent to undertake the duties assigned to them. The duty to ensure competence applies not only to construction companies, to direct employees, and self-employed sub-contractors, but also to designers. It should be noted that competence is required at both personal and corporate levels.

- The Gas Safety (Installation and Use) Regulations 1998 prohibit anyone from carrying out relevant work unless they are "competent" and places the responsibility upon the employer to ensure that this is the case. These regulations do not define competence as such but state clearly that no-one shall carry out such work unless they are a "member of a class of persons approved for the time being by the Health and Safety Executive for the purposes of this paragraph".

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24 Statutory Instrument 1995 No. 2038;
25 Statutory Instrument 1999 No. 3242;
26 Statutory Instrument 1999 No. 2024;
A commentary on routes to competence in the construction sector

The health and safety record of the UK construction sector is a prime focus of the Health and Safety Executive (HSE), combining as it does high fatality and injury rates with relatively high rates of work-related ill-health. Persuasive proof of the link between competence and health and safety is difficult to demonstrate but, nevertheless, ‘competence’ has been central to improving the sector’s health and safety performance since the late 1980s.

The key questions of this research are whether current routes to competence - qualifications (both work-based and college-based), short courses, safety passport courses, competent person development, as well as on-the-job mentoring and general experience - are adequate for the sector, and whether our understanding of what makes a construction worker ‘competent’, in the deepest health and safety sense, remains sufficiently robust for current-day needs.

Competence is evidenced directly by competence-based qualifications or indirectly by a plethora of card and passport schemes.

The research highlights other safety-critical industries that require ‘job competence’, enhanced health and safety awareness, and, critically, ‘human factors’. It concludes that the industry’s current understanding of ‘competence’ may warrant extension to develop an ‘industry-specific’ definition and broadening to encompass both situational awareness and the sustaining of appropriate behaviours.

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