Identification and management of risk in undergraduate construction courses

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Identification and management of risk in undergraduate construction courses

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This report describes research into the current provision of health and safety teaching in construction related undergraduate courses (covering architecture, building, engineering and surveying). The study is made against a growing awareness of the importance of health and safety as part of project risk management, and the need for graduates to be aware of this philosophy as a key influence in the drive to reduce ill health and accidents.

The study shows that the current provision of health and safety teaching is generally poor. It also demonstrates however that academia cannot be expected to deliver alone on this issue; inconsistency between elements of the industry and a lack of guidance and clarity hinder the efforts that are being made.

The study sets out a clear set of recommendations relating to Government, Accreditation Bodies, Industry, and Academia itself.

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This report is especially welcome at this time as the construction industry is developing the action plans which were presented at the Construction Summit on 27 February 2001. The report, which covers the first phase of a two year study, is the most significant and detailed study of the integration of health and safety into higher education construction courses. Its findings should awaken the industry to the lack of any real progress on this issue, but the report does give some hope for the future. In particular, it cites examples of good practice which show that the teaching of risk management in universities is entirely possible, given the right material, enthusiasm of the teaching staff and support from their departments and the industry as a whole.

When the HSE held its “Teaming up for Education” conference with the CIC over two years ago, the need to ensure the proper health and safety education of our future designers and managers in the industry was not in doubt, but the extent to which this was catered for in academic circles and the means of securing its delivery were uncertain. This report gives us the background and knowledge that the industry and academia need to move forward on this issue, which contributes in no small way to Action Point 34 of the Revitalising Health and Safety strategy. The report echoes many of the action points which arose from the conference, including the need for industry and university “champions”; it is encouraging that these already exist in some cases. Clearly, however, more needs to be done to ensure that risk management teaching is universally incorporated into undergraduate professional education. This is not simply a matter for university departments to solve alone; the report provides detailed recommendations on how all of government, industry and academia can contribute to the success of this undertaking. HSE will be looking closely at how it can contribute in line with the report’s recommendations and will report on progress. I hope that all those who read this report will also find that they are able to contribute in some way, however small.

This is an important opportunity which should not be wasted; it is vital for the future health and safety of the industry.

Kevin Myers
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EXECUTIVE SUMMARY

Recent statistics for accidents and fatalities in construction indicate a serious and worrying decline in the health and safety performance of the industry.

In this respect, the Safety Summit (Turning Concern into Action) called by the Deputy Prime Minister in February 2001, laid down a clear marker to the construction industry that it needs to drastically improve its health and safety performance and image. It was also made clear, although this should have been apparent, that all those involved in the construction industry in its widest sense have a role to play in this respect.

One element of the industry's response to this challenge concerns the education of aspiring architects, engineers, surveyors and builders who will eventually manage and lead this necessary change. Consequently, when they enter the world of work as the industry’s future professionals, construction undergraduates need to be equipped with not only a basic appreciation of health and safety management but also a fundamental understanding of its essential ethos and role in the overall management of risk.

The need for this educational underpinning is specifically stipulated in the joint Government/Health and Safety Commission Strategy Statement ‘Revitalising Health and Safety’ (DETR 2000a) which requires ‘safety critical professionals’ to have an ‘adequate education in risk management’. This initiative is further emphasised by the Corporate Governance Group of the Institute of Chartered Accountants (‘Implementing Turnbull’), which identifies the important role of risk management, and the health and safety element in particular, in the strategic management of business.

The academic phase in professional education is crucial in all of this and the contribution and support of Academia is vitally important. It is at the formative Educational Base that attitudes and perceptions are developed and the necessary analytical and critical abilities are inculcated enabling currently accepted industry practices to be challenged and reformed.

This report therefore describes a study into the current provision of health and safety teaching within undergraduate construction courses, and also touches upon the part played by Government, accreditation bodies, institutions, and industry organisations in the educational framework. The study covers all the major construction disciplines - architecture, building, engineering and surveying.

During the study, a total of thirty one Higher Education Centres were visited in order to meet both teaching staff and students, and these visits revealed that:

- There are some excellent examples of good practice and endeavour, and individuals who are making significant contributions. However, these individuals tend to be few in number.
- There is a significant number of Centres where the inclusion of health and safety into the curriculum is not actively supported by the head of department.
- Generally there is a willingness by staff to encompass health and safety risk management within courses but assistance is needed in respect of teaching aids and industrial input.
• Health and safety risk management is not yet widely recognised as an intellectual subject with a central role in construction risk management.

• Health and safety risk issues are generally not well integrated into the curriculum and undergraduates are not adequately assessed in this particular area of study.

• The management and provision of professional development opportunities for teaching staff in health and safety risk management topics is at best poor and generally non-existent.

As a consequence of these findings the report recommends that Academia:

• Embraces health and safety risk management as an integral and intellectual component part of the curriculum equivalent in all respects to the study of other risk management aspects of the construction process.

• Actively promotes the concept of a ‘health and safety champion’ within their staff complement who will initiate and lead the integration of health and safety risk management within all construction courses.

• Provides appropriate professional development for all construction professional staff to enable them to deliver the input required and provide active support for the ‘champion’.

• Works to maximise the links with Industry in order to develop intellectual exchange and learning opportunities for staff, students and practitioners alike, and in order to instil the business case for health and safety risk management in construction courses.

• Considers the concept of ‘health and safety awareness’ days to supplement the above.

The study also found, however, that the difficulties faced by Academia are exacerbated by the fact that accreditation bodies have widely varying, and mostly inadequate, requirements in respect of health and safety curriculum content. It also concludes that other influential bodies such as Government, professional institutions and industry organisations are not giving this subject the attention deserved.

The report therefore also recommends that:

• Government and Funding Agencies use their position to raise the profile of health and safety in the Higher Education sector.

• Those accreditation bodies that currently have minimal reference to health and safety review their requirements, and that all accreditation bodies actively work towards a pan industry approach.

• Health and safety be presented and taught as integral to the topic of construction risk management.

• Those institutions involved in the built environment work to significantly raise the profile of health and safety within their area of influence, particularly in respect of its relationship to the Education Base.
• An industry umbrella body such as the Construction Industry Council leads in developing a pan industry, standard curriculum template for health and safety risk management delivery in Undergraduate construction courses.

• Industry and Academia work together to maximise each other’s skills and experience.

• That consideration is given to the introduction of a ‘health and safety passport’ for Undergraduates such that all those entering the industry have a common and adequate level of understanding that has been appropriately assessed.

In summary, therefore, all parties need to make a concerted and unified effort to actively develop and promote health and safety risk management as integral to the education of future construction professionals. This report strongly concludes that this can only be achieved by the joint endeavours of Academia and the wider construction industry working together with unity of purpose and a genuine desire to bring about the improvements demanded at the Safety Summit.

It is hoped that this report will act as a catalyst to this end as well as a useful reference document for all those involved in this important area.
1. INTRODUCTION

1.1 BACKGROUND

Risk management is an ongoing process for identifying, evaluating and managing significant risks and is now recognised as an essential part of good business practice. It is also well established that evidence of the effective management of risk must be apparent in the way the affairs of a business are conducted and this was particularly emphasised in the Turnbull Report (ICA 1999a) on internal company controls. The associated publication, Implementing Turnbull: A Boardroom Briefing (ICA 1999b), furthermore identifies risk assessment as central to this process to the extent that the significant internal and external operational, financial, compliance and other risks should be identified and assessed on an ongoing basis.

These significant risks include health and safety risks.

The requirement to consider risk as an element of corporate governance is not a legal requirement but ‘Turnbull’ is a clear indication of the obligations expected of those managing companies and running businesses. Indeed, compliance with the recommendations of the Turnbull Report will be a condition of Stock Exchange listing from January 2001.

Taking responsibility for risk is further emphasised in the Revitalising Health and Safety Strategy Statement (DETR 2000a) and implied from the proposed change to the law on involuntary manslaughter (Law Commission 1996).

Although health and safety is but one thread in this consideration of overall risk, it is nevertheless a vital component, given the cost of accidents and ill health to industry which is estimated at £18 billion (DETR2000a). This is emphasised by events such as the Heathrow tunnel collapse (HSE 2000a) and the collapse of the walkway at the Port of Ramsgate (HSE 2000b) which give practical examples of the vital need for a fundamental understanding of health and safety risk and its management, and also give emphasis to the legal obligation to do so.

In ‘Rethinking Construction’ (DETR 1998), the Report of the Construction Task Force chaired by Sir John Egan, it is stated that:

- “The UK construction industry at its best is excellent” and that “Its capability to deliver the most difficult and innovative projects matches that of any other construction industry in the world”.

- “Nonetheless, there is deep concern that the industry as a whole is under-achieving. It has low profitability and invests too little in capital, research and development and training. Too many of the industry’s clients are dissatisfied with its overall performance.”

(emphasis added)

The report went on to emphasise that “commitment to people” is a fundamental driver of change and that:

- “this means not only decent site conditions, fair wages and care for the health and safety of the work force. It means commitment to training and development of committed and highly capable managers and supervisors. It also means respect for
The health, safety and welfare of people is of paramount importance in the reversal of the current position, as is the associated cost of incidents and it is the responsibility of all of us in the construction industry to recognise this and to play a part, no matter how small, in its improvement. Inadequate health and safety standards are in no small way responsible for the industry’s poor image (DETR 1998) and action is needed to redress the balance. An industry that contributes some 8% of GDP (NAO 2001) should not be allowed to languish in this position any longer.

There are positive contributions being made however. The Movement for Innovation (M4I) launched its ‘Commitment to People’ in November 2000 (DETR 2000b) which is heavily biased towards health, safety and welfare issues. Nonetheless it is reported that the Construction Best Practice Initiative has only reached some 9% of those working in the industry (NAO 2001).

There is a strong need therefore for construction practitioners to be educated in their chosen professions, with a quality approach to the management of projects such that health and safety considerations become a natural part of their professional skill and judgement.

This is emphasised in the Approved Code of Practice to the Construction (Design and Management) Regulations 1994(CDM)(HSE 1995) which states that:

“It is important that all those who can contribute to the health and safety of a construction project, particularly clients, their agents and designers, understand what they and others need to do under the Regulations and discharge their responsibilities accordingly. This will require a radical change in culture for many of the new duty holders as well as training and education in the practical steps and procedures to be taken to comply with the Regulations” (emphasis added).

The difference between training and education is subtle but nevertheless important, because if we want to influence the culture of the industry we have to realise that this is synonymous with education but not training.

Therefore, consideration needs to be given to how construction professionals can prepare themselves in order to undergo the change in professional attitudes necessary to ensure that the health and safety aspects of projects feature equivalently amongst all the other considerations and advice expected by clients.

The duties imposed by the CDM Regulations on all participants in the construction process have emphasised the necessity for this change and, after all, “Many of the features of effective health and safety management are indistinguishable from the sound management practices advocated by proponents of quality and business excellence” (HSE2000d).

Even after six years of CDM, however, the culture change is not widespread, and this concurs with the responses to a survey in 1995 carried out by New Civil Engineer/New Builder in which over 40% of respondents thought that this would not happen for 5 years or more.

Indeed, it may be several more years before health and safety management becomes second nature to the whole of the construction industry. This may only happen when current construction students, inculcated into the correct culture, reach positions of authority and influence in the industry.
Nevertheless, it can only be by influencing the culture of the industry that change can be effective and improved health and safety can become sustained and widespread. **This is where training ends and education takes over.**

Academia therefore has a key role to play in commencing the process of cultural change. It is Academia that has the opportunity, and the obligation in relation to any Accreditation Body requirements, to create the intellectual mindset appropriate to a 21st century construction industry.

For many years there was no requirement for degree courses to contain a health and safety element and this was a bone of contention amongst many practitioners. The picture is now changing but this report will show that there is significant variation across the disciplines as to the extent, emphasis and detail of this change and that the concept of integrating health and safety risk management into construction courses has not yet been fully embraced by Academia.

Unfortunately, the term ‘health and safety’ is frequently misunderstood and consequently the topic of health and safety risk management is often not accorded equivalent status to other academic subjects. Furthermore, health and safety is often perceived as an uninspiring, even boring, subject whilst it is in fact a large, complex and stimulating area of study.

Health and safety issues pervade all aspects of construction projects and they require the consideration and involvement of all members of the design and construction team, including the client. For instance, the development of effective project strategies, the planning, organisation and control of projects, and an understanding of the behavioural and psychological factors which govern people’s contributions to project outcomes, are all fundamental aspects of health and safety risk management.

The subject also contains complex and interesting facets relating to science, human biology, technology and design, and it is not concerned with low-level bureaucracy or rule-based technology as is often thought to be the case.

The reasons for these misapprehensions are outside the scope of this report but, insofar as they are relevant to the Educational Base we believe we should in fact be making a step change by considering health and safety as an integral part of construction risk management. This is in line with the philosophy outlined in the opening paragraphs to this Introduction and as such enables health and safety to be presented as an intellectual challenge illustrated by practical example.

Hence reference to ‘health and safety’ throughout this report should be read in this context.

The Institution of Occupational Safety and Health (IOSH) also recognises the importance of including health and safety issues within Higher Education courses (IOSH 2000), stating that:

- **The integration of health and safety with relevant subject areas should continue into further and higher education, reflecting the fact that those progressing to these levels are more likely to be the opinion formers of the future.**

- **Health and Safety issues should clearly be integrated with the core subject matter of relevant degrees, and care should be taken that the term ‘relevant’ is not interpreted too narrowly.**
The need to enhance the level of health and safety teaching has been further emphasised by the Government in the ‘Revitalising Health and Safety’ Strategy Statement, which specifically recognises the importance of the subject and that ‘we must take forward the new strategic direction through concrete action in the shorter term’; viz:

**Action Point 34:** The Government and Health and Safety Commission will act to ensure that safety-critical professionals such as architects and engineers receive adequate education in risk management. This will be delivered through a programme of direct approaches to relevant higher and further education institutions and professional institutions.

It is felt that one of the difficulties associated with the construction industry generally, and the issue of health and safety is no exception, is the sheer number of industry groups, institutions, organisations and the like with a vested interest in construction.

These interests are often narrowly construed and are frequently pursued along an independent and unco-ordinated path which takes little or no account of the wider picture. To those unfamiliar or not intimately involved with these organisations, the unravelling of the connection between the various groups and their affiliations is a major exercise, and it is almost impossible for even construction-related individuals on the periphery to comprehend what they are doing and why.

Efforts have been made to contact and liaise with as many of these organisations as possible as part of this study, but it is by no means certain that all have been picked up as the boundaries to this subject area are somewhat ill defined and extensive. Those bodies which have been approached or which have a known interest in the study, are either scheduled in Appendix 1 or mentioned in the body of the report. It is hoped that this information will be of use to others and perhaps to the groups themselves, in enhancing co-operation and co-ordination in the future.

Most recently, the need for this study has been given additional impetus, if any was required, by the accident statistics published in December 2000 (HSE 2000c) and the Health and Safety Summit called by the Deputy Prime Minister in February 2001. As a consequence of the Summit there are a number of initiatives currently in hand via the Construction Industry Council and others, which may impact upon the subject matter of this report and some of the recommendations that we have made may already have been put in hand. Whatever the case, the subject needs to be openly debated, and a great deal more transparency is needed for those concerned to be able to understand what is very much a fluid and rapidly changing subject.

### 1.2 THE STUDY

This study was conceived against the backdrop outlined above. In this regard, the Research Team believes that there is a clear gap between where we are now and where we need to be, and that everyone’s thoughts, aspirations and efforts ought to be brought to a focus in order to initiate and implement a unified and coherent approach. It is hoped that this research report will act as a catalyst for this overdue and necessary change.

The Research Team, comprising:

Symonds Group; Health and Safety Department, together with Liverpool John Moores University, School of the Built Environment and Charlton-Smith Partnership
was appointed in April 2000 to undertake a three-stage research study. The professional experience of the Research Team members includes architecture, engineering, health and safety and surveying, and their current work encompasses both academia and industry.

The brief for the research project was:

**Part A:** to determine the current situation as regards the delivery of health and safety teaching within accredited undergraduate construction courses, and to ascertain how Universities/Schools of Architecture might be assisted through the provision of teaching aids.

**Part B:** to develop initial teaching aids based on the advice received from Part A and to investigate the use of the World Wide Web as the medium of access.

**Part C:** to audit the implementation of the teaching aids developed during Part B and the progression of health and safety teaching generally.

Part A was completed over the period June 2000 to March 2001 and Part B is due to run from November 2000 to July 2001. It is intended that the study will finish with Part C running between April 2002 and December 2002.

**This report is concerned with Part A of the study.**

This study has centred on the principal construction related disciplines covered by the following professional institutions, viz:

- Chartered Institution of Building Services Engineers (CIBSE)
- Chartered Institute of Building (CIOB)
- Institution of Civil Engineers (ICE)
- Institution of Structural Engineers (ISE)
- Royal Institute of British Architects (RIBA)
- Royal Institution of Chartered Surveyors (RICS)

RICS has been included as their members, acting primarily as Quantity Surveyors and Project Managers, often have a significant impact upon health and safety issues.

This report considers the key drivers behind the provision of health and safety within undergraduate construction courses and then goes on to describe the study and its findings. Conclusions are drawn and recommendations are made.
2. KEY DRIVERS

In this section, and as a background to the study, we have summarised the key drivers to the inclusion of health and safety within undergraduate courses. These may be broadly categorised into five main groups:

- High level Government-led bodies / funding councils
- Industry-led interest groups
- Accreditation Bodies
- Professional institutions
- Academia itself

2.1 HIGH LEVEL GOVERNMENT BODIES

Within this category there are a number of organisations that have the potential, or the duty, to ensure that curricula are appropriately formatted and provide suitable outputs. These bodies do not deal with the detail of particular course elements but may nonetheless send important messages to Higher Education (HE) Centres.

The Higher Education Funding Councils (HEFC): These act as a high level influence, and amongst other things they play a key role in ensuring good practice. Within their powers under the relevant 1992 Act they are able to:

‘attach such terms and conditions as HEFC thinks fit to any grants….’

To date there is no evidence to suggest that they have used their position to influence course content in respect of health and safety.

The Quality Assurance Agency for Higher Education (QAA): The main business of the agency is to review and report on performance of higher education institutions, on behalf of HEFC, in respect of quality and standards. Three inter-dependent areas are reviewed - programme outcome standards, subject benchmark statements, and quality of learning opportunities.

At the time of writing, Benchmark Statements have been produced for Engineering and Architecture (QAA2000) and those for Building are due to follow.

The Engineering Statements mention safety but they suffer somewhat from being generalised references intended to be applicable across all engineering disciplines. In this respect, the Architectural references to safety are more relevant. In neither case however is there any mention of health.

The Health and Safety Executive (HSE) itself, through the Construction Industry Advisory Committee (CONIAC), has a training and education working group. This is keenly aware of the need to improve the education of undergraduates in respect of health and safety but has not been able to make any significant headway. It has however had success within the Further Education sector via the Association of Colleges (AoC 1999).
The HSE does not have any authority over the Education sector and has to rely on persuasion to achieve its objectives. In this regard, the HSE sponsored a national competition for students of architecture, which was held in 1998 and which carried total prize money of £2,250. The idea was to encourage innovative design and good health and safety risk management practice. There were only five entries however, and the judging panel was unable to choose a winning submission.

2.2 INDUSTRY-LED INTEREST GROUPS


Appendix A of the CIB report gives a series of recommended learning outcomes which are intended to be adopted as a common set of objectives amongst all the institutions within its membership.

These outcomes include ‘professional awareness’ which requires candidates to have the ability to perform a task illustrating the essential components of the legislative framework, and another where health and safety are major issues in the brief and the solution.

Following withdrawal of financial support, the CIB is likely to be disbanded in June 2001.

The Construction Industry Council (CIC): In conjunction with the CIB, the CIC has published a ‘Memorandum of Understanding’ (CIC 2000) which has been adopted by fifteen of the professional bodies that accredit construction related courses in the construction and built environment fields. One notable exception to this at the time of writing is the Institution of Structural Engineers. A copy is enclosed in Appendix 3.

By signing up to this Memorandum the participating bodies agreed that the granting of accredited status would be dependent upon evidence that the learning outcomes listed within the memorandum were achieved.

The prominence given to this however, will inevitably depend upon the emphasis placed upon it by the relevant accreditation body and the nature of its review cycle. In any event, the current statement is very brief (in line with other learning outcomes included) and will lead to wide interpretation.

CIC with others is due to revise these learning outcomes shortly.

The Construction Industry Training Board (CITB) Business Plan for 2001-2005 (CITB 2001a) includes the following aims relating to the HE sector:

Address the skills needs of professionals through the Memorandum of Agreement with the Construction Industry Council/TOPIC* and by forging closer links with the higher education sector and professional institutes.

*TOPIC is the Training Organisation for Professionals in Construction.

Discuss industry’s needs with many partners. These include ..........and higher educational bodies.....

And, amongst the Key Themes for 2001:
Work with partners in the higher education sector and professional institutions to increase the health and safety content in construction related degree courses and equivalent qualifications.

On 12th February 1999 a Heads of Courses Conference was held at the Institution of Civil Engineers in London on the theme Teaming up for Education.

The conference was organised by the CIC in collaboration with the Construction Industry Advisory Committee (CONIAC) of the Health and Safety Commission (HSC), with the aim of bringing together those concerned with the integration of health and safety into the teaching of undergraduate construction professionals.

Those attending included representatives from industry and further and higher education, as well as professional institution members of CIC who were signatories to the Memorandum of Understanding (Accreditation/Validation) of 1998 mentioned above.

In order to move this initiative forward, conference participants were invited to:

- help establish learning outcomes for health and safety education;
- help form a working partnership with industry to identify suitable case studies to assist in the delivery of these outcomes;
- learn what sources of information on health and safety are available;
- establish an action plan for the future.

Some constructive ideas emerged from this.

Firstly, the concept of a ‘health and safety champion’ at each university was proposed, whose role would be to lead and co-ordinate health and safety input. Secondly, one of the breakout sessions was on the subject of ‘establishing learning outcomes for health and safety education’, and it was reported informally (McCleod 2000) that the consensus of this group was that there should be a base curriculum for all professionals, and that this should reflect fundamental objectives, ie:

- to develop a motivation and ability to carry out risk assessments wherever and whenever appropriate;
- to develop a common understanding across all disciplines of the value of health and safety in the construction process (which includes of course the maintenance phase and decommissioning).

It was suggested that the components of such a base curriculum should be:

**Attitude**  
the ethical view; health and safety integral with all we do; everyone’s responsibility

**Competence**  
be able to implement the basic risk assessment process

**Knowledge**  
of legal matters, the value of health and safety; human behaviour and learning from history
The **Engineering Council (EC)** was established by Royal Charter to enhance education in, and to promote the science and practice of engineering. Its requirements in respect of the routes to registration as a Chartered Engineer, Incorporated Engineer and Engineering Technician are set out in the publication ‘Standards and Routes Towards Registration 3rd Edition’ (SARTOR3).

Nominated bodies (such as ICE, ISE, CIBSE) may be licensed by the EC to accredit programmes of education and initial professional development providing the standards meet the requirements of SARTOR3. These requirements have been summarised for HSE (Lee 1999).

The requirements of the SARTOR3 document, although making reference to health and safety, are set out in very generalised terms however, and it is left to the licensed institutions to make their own more detailed interpretations.

The **Movement for Innovation (M4I)**: Among M4I’s aspirations is a major cultural change in the industry and it also places heavy emphasis on the improvement in both health and safety standards and attitudes through the ‘Commitment to People’ initiative (DETR 2000b).

Implicit within these aims is the necessity to ensure the new generation of construction professionals (and others) are imbued with an understanding of health and safety principles.

The **Association of Planning Supervisors (APS)** has helped drive the CIC agenda in establishing its action plan for ‘Step Change in H&S’, part of which focuses on education initiatives. APS is currently involved in, inter alia, a training module for use in the tertiary sector. The APS has stated that it is willing to allow the development of this material to form part of a teaching aid package.

The **North West Safety Initiative**, together with HSE, have sponsored two conferences (in 1996 and 1998) which included an element on education in respect of construction duty holders.

### 2.3 ACCREDITATION BODIES

All Higher Education Centres running accredited degree courses are obliged to follow the requirements of their respective accreditation bodies in respect of course aims, content and coverage. These requirements vary considerably between the four accreditation bodies reviewed for this study, but all mention health and safety as being of importance.

The chosen accreditation bodies considered to be the principal construction related authorities are:

- Chartered Institute of Building (CIOB)
- Joint Board of Moderators (JBM) Representing the Institutions of Civil, Structural, and Building Services Engineers, (ICE, ISE, CIBSE) under the auspices of the Engineering Council (EC)
- Royal Institute of British Architects (RIBA) / Architects Registration Board (ARB)
- Royal Institution of Chartered Surveyors (RICS)
The attitudes of the various accreditation bodies towards health and safety vary greatly; this is discussed in greater detail in the next Section. In essence they do not, on the whole, provide sufficient leadership in respect of health and safety issues. They also collectively represent a poor example of coherence and consistency in a common learning area. To some extent, perhaps, this may be as a consequence of the traditional independence and compartmentalisation of the industry.

It is noted that the Institution of Chemical Engineers (IChemE) has produced some useful guidelines for their accredited courses (IChemE 2000) and these include a matrix of health, safety and environment topics for inclusion, and approximate times that should be allocated.

2.4 PROFESSIONAL INSTITUTIONS

The Professional Institutions in construction set the standards for their own Accreditation Bodies and in this respect they have the opportunity to demonstrate support for and a belief in the need for health and safety within undergraduate courses via their councils, committee structure and publications.

They also set the standards for the professional conduct of their members, and members of the CIOB for instance are obliged to have ‘knowledge of the health and safety risks in the industry and the main principles and strategies for control’ (Rule 15.1). ICE members ‘shall have full regard for the public interest, particularly in relation to the environment and to matters of health and safety’ (Rule 3).

Such rules apply to all members, whether practising professionals or academics, but the level of compliance is very variable and largely unsatisfactory. It is generally felt that the Institutions are not ‘on board’ with health and safety, and although a number of them have health and safety committees or panels they appear to have little impact.

In this respect it is noted that Institution of Structural Engineers’ Study Group (on Risk & Reliability) has only just been established. The RICS and CIBSE have no health and safety panel albeit that the RICS Guidance Notes on Professional Ethics (RICS 2000) advocates that ‘members should manage health and safety matters as any other critical business activity ……’ (11.1.2).

The 1998 President of CIOB wrote to the ICE, IStructE, CIBSE, and RICS (Deas1998) asking for support in raising the profile of health and safety. There is no sign that this initiative ever moved forward.

The Inter-Institutional Group for Health and Safety (comprising members of the IChemE, ICE, IEE, IMechE, HSE, and the Hazards Forum) has also published helpful guidance (IIG 1999), largely compatible with the JBM guidelines. This is intended as a pan-engineering template but, as the guidance states, is equally applicable to architecture and surveying.

2.5 ACADEMIA

Although there are ‘umbrella’ organisations, eg the Engineering Professors’ Council, none appears to have adopted health and safety as a topic for discussion in any detail. In general, Academia will understandably follow its own path unless obliged to cover a particular topic by an external authority. This is particularly so for those with a high Research Rating, which has a significant influence on Centre funding. There is also great pressure on academia generally to include new material within curricula despite existing constraints of space and time.
The Engineering Professors Council (EPC) has published initial Engineering Graduate Output Standards (EPC 2000). These include various ‘Ability to’ benchmarks including:

_The graduate has demonstrated experience of taking account of risk assessment, and social and environmental impacts, in the setting of constraints (including legal, and health and safety issues) in the context of the design of an engineering system...._

The EPC and QAA approaches currently differ in some respects; it is recognised by them that there needs to be convergence.

Academia is represented within most professional and industry interest groups, and on accreditation body committees in particular.

There appears to be a number of committed individuals within academia who are involved in moving the health and safety agenda forward or who have developed significant health and safety elements to those courses for which they are responsible. These are few in number however, and they tend to act in isolation.

### 2.6 TURNING CONCERN INTO ACTION
_(the Conference called by the Deputy Prime Minister on 27.2.01)_

This conference was instigated by John Prescott as a result of his concern at the underlying levels of accidents and ill health in the construction industry. This concern had been heightened by the number of multiple fatalities at Hull and Canary Wharf, and the recent reversal of the long term downward trend. There were three proposals arising from this conference which relate to undergraduate learning:

(i) the CIC confirmed their intention to review and make more specific their ‘Common Learning Outcomes’; and

(ii) to work towards every undergraduate course having at least one health and safety awareness day in each year;

(iii) the **Construction Industry Training Board** (CITB) in their ‘Key Actions for 2001’ (CITB2001b) include - *Work with the HE sector and representatives from the industry to introduce a more comprehensive and relevant health and safety content in higher level courses.*
3. ACCREDITATION BODY REQUIREMENTS

There are four principal bodies which accredit construction-related courses in the UK but, despite being part of the same industry and notwithstanding statutory provisions with respect to competence, their respective requirements with regard to the coverage of health and safety matters vary considerably in both approach and detail.

The current requirements of the various accreditation bodies are set out below and these have been extracted from the relevant host documents. In summary these are:

<table>
<thead>
<tr>
<th>Accreditation Body</th>
<th>General statement</th>
<th>Explanation</th>
<th>Detailed requirements</th>
<th>Learning Outcomes detailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIOB</td>
<td>Y</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>JBM</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>RIBA/ARB</td>
<td>Y</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RICS</td>
<td>Y</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

3.1 CHARTERED INSTITUTE OF BUILDING (CIOB)

The CIOB has an Education and Professional Development Manual. This makes a number of positive statements regarding health and safety including the important commitment to ‘examination’, but overall the requirements could be clearer so as to provide greater clarity to Centres.

The introduction to the Education Framework (September 1994) emphasises that:

“A knowledge of safety, health and welfare, along with the maintenance and improvement of the environment is considered to be essential and is inherent and examinable in all subjects of the Education Framework. Similarly, information technology and quality management are considered integral to all the syllabuses.”

The CIOB degree structure includes:

- Formation Studies Level 1
- Core Studies Level 2
- Professional Studies Level 3

There are seven primary Level 1 modules, two of which refer to ‘safety’. The Design and Technology module includes “.... below ground workings and the importance of safe workings” (as an objective) and also “safety” in relation to “access mechanisms”. Structures mentions “recognise the safety requirements in the design and provision of structural components” (as an objective) and also “safety considerations” in Temporary Works.

There is scope for inclusion of health and safety in other modules, such as Business Environment for instance, which deals with the law, but no explicit reference is made.
At Level 2, the commentary states:

“Health, safety and welfare policies are covered within these syllabuses, together with procedures for identifying hazards and key risk areas. Course presenters should address the Construction, Design and Management Regulations (CDM).”

Additionally, the “Basement and Foundations” element within the Management of Building Production module includes “... safety implementation and mandatory requirements” whilst in the Building Services module there is reference to “safety precautions” in relation to electrical supply.

At Level 3, one Function Area has to be selected which for construction professionals will be either Project Management or Construction Management. The former has no explicit inclusion with regard to health and safety but the latter makes several references to it.

For instance, in Module D1 Building Management 10% of the syllabus should be devoted to ‘Health and Safety. This is of paramount importance in the building industry and should have already received extensive coverage from varying perspectives as a result of prerequisite study and industrial application. Given this foundation, study at this level should concentrate upon policy formulation and implementation. Full consideration should be given in this respect to levels of policy formulation and implementation. These levels range from international, eg European Union, national, industrial, company and site. Comparisons on an international, industrial and company basis should be illuminating. Safety records, insurance and accident cost should be discussed in relation to the productivity equation.”

The content required is “The legal framework for health and safety in the building industry; policy formulation and implementation.”

In Module D4 Site Management, 10% of the syllabus should be devoted to “health and safety policy”. The objectives of this module include the ability to “understand health and safety legislation...” and the content required is “The development and implementation of an effective Health and Safety Policy and Plan.”

### 3.2 JOINT BOARD OF MODERATORS (JBM)

The three major construction engineering institutions (ICE, ISE, CIBSE) have established the Joint Board of Moderators (JBM) and the Joint Accreditation Panel (JAP), in order to both maintain and strengthen links with UK Universities and ensure the adequacy of first degree standards for Chartered and Incorporated Engineers respectively.

The JBM has comprehensively picked up the baton and its requirements for engineering degrees are the most thorough of all the accreditation bodies, albeit that the requirements relate to learning outcomes only.

The general requirement is “A deep understanding of Health and Safety issues and the need to operate safe systems of work is mandatory for practising engineers and courses must expose Undergraduates to the issues and need to extend the analysis to the legal requirements as well as risk analysis.”
The JBM publishes an Annex to its course Guidelines specifically dedicated to health and safety, entitled ‘Annex C: Health and Safety Guidelines’ (see Appendix 4). This provides principles, a commentary and a list of learning outcomes measured against the four commonly adopted levels of achievement, ie:

- Awareness
- Knowledge
- Experience
- Ability

These terms are also used by others such as Engineering Professors Council (EPC), and the JBM guidelines closely match those published by the Inter-Institution Health and Safety Group (IIG 1999).

### 3.3 ROYAL INSTITUTE OF BRITISH ARCHITECTS (RIBA)/ARCHITECTS REGISTRATION BOARD (ARB)

The RIBA/ARB requirements are encompassed within a short and general statement, supplemented by equally generalised requirements relating to one of the five areas of study. However, there is little to assist schools in detailed implementation in either qualitative or quantitative terms.

The RIBA Outline Syllabus recognises that there is a need for an “understanding of health and safety issues” (mentioned in respect of Part 1). Of the five areas of study, Constructional and Architectural Technologies includes within its learning outcome the need for an understanding of “hazards associated with materials and building” (Part 1) and a ‘working knowledge of health and safety Regulations and the professional responsibility with regard to the Construction (Design and Management) Regulations” (Part 2).

The course content and the interpretation of the above is left to the schools.

The Research Team understands that the syllabus for both Part 1 and Part 2 is being reviewed. Part 3 is not considered as part of this study.

### 3.4 ROYAL INSTITUTION OF CHARTERED SURVEYORS (RICS)

The RICS makes what can only be described as a passing reference to health and safety in their Guidelines which is to “Understand and apply Health and Safety Regulations in the context of the organisation.”

Although health and safety is mentioned in this way it is left to Universities to decide how they include this subject and no further guidance is given.

### 3.5 REVIEW

All Accreditation Bodies have a review cycle of between 5 and 7 years. The review usually consists of a visit by a mixed team of senior academics and industrialists, but the effectiveness of the review on the specific subject of health and safety depends very much on the approach and interests of the review team. In this regard it has to be remembered that health and safety is but one small part of the curriculum to be reviewed, and that this takes place within a very tight timeframe.
3.6 SUMMARY

It can be seen from the above that there are wide ranging requirements for the ‘health and safety’ content of undergraduate professional courses as between the various institutions and also that there is much scope for differing interpretations of these requirements within any one particular set of guidelines. This perhaps goes some way to explain the variable quality of teaching in the subject of health and safety risk management, and why there is such inconsistency and fragmentation of course provision and student learning outcomes in universities.
4. STRUCTURE OF VISITS TO UNIVERSITIES AND SCHOOLS OF ARCHITECTURE

4.1 GENERAL

A number of studies on this topic have been previously undertaken (APS 1998, Fairlie & Cameron 1999, Lee 1999) using both telephone and personal interviews as a means of obtaining information. These studies, whilst relatively recent, have tended to be either limited in scale or restricted to particular disciplines and the results cannot therefore be generally extrapolated.

Consequently, it was recognised that there was a need to establish the current situation in the teaching provision of health and safety risk management in construction disciplines. Additionally, it was agreed with HSE at an early stage that in any such study it would be of benefit to:

- include all major construction related disciplines;
- visit the Centres rather than rely on postal questionnaires or structured telephone interviews.

The Research Team felt strongly that any visit should be of value to the University/School (referred to as ‘Centre’) as well as to the study. Some considerable thought was devoted, therefore, to devising an approach and structure that achieved this end as far as reasonably possible.

The first stage was to write to Centres in the UK which were running degrees accredited by the four accreditation bodies. The letter was addressed to the head of department or equivalent, determined by phoning each Centre beforehand. To assist the Centre, and encourage a response, a stamped addressed envelope was enclosed with each letter.

The purpose of the letter was to inform the Centre of the study and its remit and, importantly, to emphasise the desire to be of assistance in what was clearly recognised from anecdotal evidence as a difficult and potentially sensitive area.

The enquiry letter also enclosed a single sheet, to be returned, asking whether the Centre had a member of staff nominated to ‘lead’ on health and safety, and if so, their name and whether the Centre would be willing to receive a visit from the Research Team.

The letters were sent out over the summer of the year 2000 and the responses are scheduled in Table 2 below.

<table>
<thead>
<tr>
<th>Accreditation Body</th>
<th>Letters issued</th>
<th>Responses received</th>
<th>Willing to have a visit</th>
<th>Having a ‘leader’</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIOB</td>
<td>27</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>JBM</td>
<td>53</td>
<td>27</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>RIBA/ARB</td>
<td>35</td>
<td>15</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>RICS</td>
<td>42</td>
<td>14</td>
<td>13</td>
<td>6</td>
</tr>
</tbody>
</table>
Some responses included unsolicited comments and letters supportive of the study’s aims and some Centres were clearly anxious to inform the Research Team of what they were doing with respect to health and safety teaching.

4.2 SELECTION OF CENTRES FOR VISITS

It was recognised that there were a number of ways in which the Centres to be visited could be selected, but no attempt was made to do this statistically or by using strict sampling techniques in view of the inherent variables. However the Research Team felt that it was important that the research reflected the views of those Centres that had not responded to the initial enquiry, as they might represent those with the greatest difficulties in embracing health and safety. It was also felt that those who did not have a ‘leader’ or ‘champion’ should be included as well as those who appeared to be supportive.

This, then, was the rationale chosen for the selection of Centres to be visited. In this regard, the Research Team was particularly conscious that the study was not only aimed at determining the state of teaching of health and safety, but also sought to establish needs and assistance desired in respect of teaching aids and the like.

On this basis the visits were notionally allocated as follows:

- No response to letter 20%
- Response to letter:
  - no ‘leader’ 20
  - declared ‘leader’ 60

The distribution between accreditation bodies was made approximately in line with the number of Centres relating to each. The final selection also attempted to give a reasonable geographic spread and a balance between the ‘new’ and ‘old’ universities (see location map following this section).

A total of 31 Centres was visited which was agreed with HSE at the study negotiation stage.

4.3 FORMAT OF VISIT

In line with the stated aim of trying to bring some value to the Centre itself, rather than the visit being seen as ‘yet another survey’, the Research Team devised a programme structure that attempted to involve the whole department. It consisted of:

- an interview with the nominated ‘leader’ (details of which are described in the following section);
- a presentation on 'risk management' to the Department staff and undergraduates;
- a short meeting with final year undergraduates to ascertain their views on health and safety issues.

In the event, and for a number of practical reasons, some Centres were not able to accommodate one or both of the last two items.
4.4 INTERVIEW FORMAT

Considerable thought went into the derivation of a standard interview format in order to ensure consistency and obtain the data required. Notwithstanding this, individual comment was encouraged and welcomed and some wide-ranging discussions arose. These were considered as valuable as the formal interview itself and are therefore reflected in the ‘Findings’.

The first interview was attended by all the Research Team to ensure a common approach and act as a pilot. Thereafter all interviews were conducted by one Research Team member. The Research Team member allocated was, in most cases, from an appropriate background consistent with the Centre visited. This process was designed to maintain a reasonable level of consistency across all interviews.

In order to encourage frank and detailed answers, the Centres were assured that their responses would remain confidential to the Research Team. This was thought to be necessary as it was anticipated that a number of Centres would not be complying strictly with their accreditation body requirements. Notwithstanding this, Centres were almost invariably open and frank in discussing their approach to the teaching of health and safety on their courses and also with regard to their views on the subject generally.

4.5 VISIT SCHEDULE

The visits were made over the period November 2000 to February 2001.
5. RESULTS AND FINDINGS

5.1 INTRODUCTION

Although there is much anecdotal evidence in respect of the delivery of health and safety within the undergraduate curriculum, there is limited recent researched or documented data.

Surveys undertaken by the Association of Planning Supervisors and the North West Safety Initiative, for example, pre-dated the implementation of the JBM Guidelines arising out of SARTOR3.

A more recent paper (Fairlie, Cameron 1999) relating to CIOB courses however stated that:

“The main finding is that, in general, construction management Undergraduates receive insufficient formal health and safety education during their period of study. Indeed, few universities can even attempt to quantify the number of taught hours dedicated to the subject.”

HSE undertook a scoping study (Lee 1999) on education in risk concepts in 1999 but this, however, concentrated exclusively on engineering courses. The conclusions from this study are nonetheless compatible with and relevant to this study; they are therefore included in Appendix 5. These conclusions in summary confirm:

- variation in interpretation of guidelines, which in the main are too generic;
- the general desire for source material, probably web based;
- the need for formal assessment of Undergraduates;
- that an understanding of risk is an intellectually challenging subject and is not confined to health and safety matters.

5.2 RESPONSES TO INITIAL LETTERS

Letters were sent to all Centres accredited by the accreditation bodies applicable to this study. Of the letters issued, 39% of recipients replied. All, with the exception of two, expressed a willingness to host a visit (see Figure 1).

58% of those responding indicated that they had a ‘leader’ (or ‘champion’ as generally referred to in the report) to co-ordinate health and safety within the curriculum (ie 23% overall if it is assumed that those not responding had no leader).
5.3 INTERVIEW RESULTS

5.3.1 Accreditation Board Matters

77% of those interviewed stated that they were aware of the relevant accreditation board requirements in respect of health and safety issues. Generally speaking, however, apart from the ‘Curriculum Committee’ or similar implementation group, other staff were not aware of the detail. This point applied particularly to staff specialising in theoretical subjects and it was emphasised on a number of occasions that such staff were not interested in health and safety.

It was also acknowledged during discussion with the Centres that this lack of awareness or interest in health and safety risk issues could preclude valuable opportunities for inserting useful illustrations of health and safety principles into theory lectures. For instance, the dangers of confined space entry, as illustrated by the Carsington Dam incident, and the inadequacies in the structural design of the Port of Ramsgate Walkway, could be introduced as practical examples to illustrate theoretical principles in a number of subject areas in various construction disciplines.

60% of Centres ‘had discussed health and safety’ as a department curriculum issue, but this was often either restricted to those with responsibility for curriculum or done in what appeared to be a superficial manner. These findings were consistent with the answers given above, and reflected as noted elsewhere the lack of a co-ordinated cross curricula approach. Schools of Architecture had the lowest percentage in this respect at 15%.
On the whole respondents concluded that no further guidance on accreditation body requirements was necessary, although further assistance with delivery was keenly sought (this is discussed later).

50% of Centres that had recently been reviewed by their Accreditation Body reported an interest by the Review Team in the subject of health and safety risk management.

5.3.2 Staffing Matters

Health and Safety Champions: 65% of Centres visited had a ‘Health and Safety Champion’ as proposed at the ‘Teaming up for Education’ conference and discussed in ‘Key Drivers’. The role and knowledge of the individual varied significantly, but very few had received any formal professional development or had any qualifications in health and safety. Where an individual had a particular interest or involvement via external committees and organisations, or had previous industrial experience, they tended to be the driver and sole mover behind the inclusion of health and safety within the curriculum. This appeared to result however in:

- the topic only being introduced in those modules for which the ‘champion’ had direct involvement;
- the remainder of the department assuming that the matter was adequately dealt with.

Most Champions believed that they had a formative influence on the curriculum but, notwithstanding, there was often no overall strategy to ensure a comprehensive cross curricula approach.

There were a small number of Centres where a team fulfilled the role of ‘champion’ rather than an individual. This approach appeared to work well, both as a consequence of the combined enthusiasm of the those involved, their support for each other and their greater ability to influence the curriculum as a whole. This resulted in a coherent strategy.

Training: There was little stated support for additional qualifications or professional development for ‘champions’, and almost no training had in fact been provided. The same situation appertained to staff generally mainly due to the lack of time. A commonly expressed view was that ‘construction’-based academic staff should be knowledgeable in health and safety matters as part of their professional competence and should thus be able to discharge the curriculum satisfactorily without specific training.

Staff Support: The Research Team was advised of almost universal staff support for the inclusion of health and safety within the curriculum. This was borne out by the desire for additional teaching aids and support. In 30% of cases, however, it was reported that the inclusion of health and safety was not being driven from senior levels within the Department.

Staff Concerns: The prime concern of staff was reported to be the lack of time to consider the subject area of health and safety adequately. Concerns also related to lack of knowledge and support (either in respect of learning aids or further staff resource).
5.3.3 Curriculum – Incorporation Of Health And Safety

Those interviewed identified a number of ways in which health and safety was incorporated into the curriculum, as shown in Figure 2:

![Bar chart showing incorporation of health and safety into the curriculum](chart.png)

### Table 4
#### Examples of Health and Safety Incorporation in Curriculum

<table>
<thead>
<tr>
<th>Example</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Via Existing Modules</td>
<td>The most common method of delivery. The extent of health and safety coverage is variable and dependent upon the knowledge and enthusiasm of the individual lecturer. There is no guarantee that students will be tested on specific outcomes either in coursework or examinations.</td>
</tr>
<tr>
<td>Dedicated Module</td>
<td>19% Centres visited used this method; others provided a single lecture as a means of introduction. It was noted however that the health and safety content of ‘dedicated’ modules was often built around other subject matter as well, hence the actual health and safety emphasis did vary. The view was expressed that ‘a dedicated module (or even a lecture) on the subject of health and safety ‘would be the kiss of death….’ but other respondents were firmly of the view that a dedicated module offered distinct advantages. This included the provision of a sound foundation in health and safety risk management which could then be further extended in other modules. In some cases it was thought that course sponsorship by contractors had a positive influence on the provision of specific modules or lectures on the subject of health and safety. One Centre had a week long ‘hands on’ safety course involving scaffolding, lifting, welding etc.</td>
</tr>
<tr>
<td>Coursework</td>
<td>Very variable content; health and safety risk issues were infrequently included or tested and consequently were not covered in the answer.</td>
</tr>
</tbody>
</table>
Project Work: Very variable coverage; health and safety was often not specifically mentioned in the brief and inclusion was therefore left to the discretion of the student. Externally run competitions (by say SCI, HSE) were welcomed as a useful vehicle.

Site Visits, Residentials: Health and safety usually introduced in the form of an induction concerned mainly with personal safety and the provision of personal protective equipment. Often no attempt however to use this as an introduction to basic responsibilities.

Laboratory Work: Hazards were explained to undergraduates; a few centres took this further by getting undergraduates to undertake risk assessments. Often no attempt to use this in order to explain basic principles of health and safety law.

Some subject areas are clearly less suited to the inclusion of health and safety elements than others. Nonetheless, few Centres had made a co-ordinated effort to introduce health and safety as a cross curricula subject nor was there much evidence that opportunities had been taken to include practical examples or elements of learning across programmes.

The incorporation of health and safety into the curriculum was clearly influenced by the research rating applying to the Centre in question and this tended to influence attitudes significantly. Some of those with high ratings (4 or 5) were often open in stating their aims to be first and foremost to maintain their rating in view of the funding implications; what they taught tended to reflect particular research interests and the more specific accreditation body requirements.

5.3.4 Curriculum - Content

As was noted in earlier sections of this report, it is only the JBM that gives any real guidance as to coverage and, consequently the Research Team used the JBM guidelines as the basis for their enquiries:

<table>
<thead>
<tr>
<th>Element</th>
<th>Included</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Management Philosophy</td>
<td>77%</td>
<td>A few very well developed courses</td>
</tr>
<tr>
<td>Learning from Disasters</td>
<td>68%</td>
<td></td>
</tr>
<tr>
<td>CDM Principles</td>
<td>80%</td>
<td>Often the core of health and safety teaching</td>
</tr>
<tr>
<td>Appreciation of human influence</td>
<td>65%</td>
<td></td>
</tr>
<tr>
<td>Legislative framework</td>
<td>74%</td>
<td>Usually through existing law modules</td>
</tr>
</tbody>
</table>

In the time available the Research Team was not able to ascertain the depth or quality of the learning associated with these responses, although documentation to illustrate the course objectives and outcomes and individual module content was presented by some Centres.
### 5.3.5 Curriculum - Delivery

The delivery of health and safety material to undergraduates was found to be primarily implemented by existing staff although the lack of knowledge of the subject within many Centres clearly limited the effectiveness of this process.

In 57% of Centres, staff were supplemented by visiting industrialists who assisted in the delivery of health and safety risk management topics. The point was made that the successful use of industrialists in curriculum delivery depends not only on local industry giving their time and expertise, but that those doing so be adept at mentoring and lecturing.

A small number of Centres had made a clear success of this and the benefits of an academia/industry partnership were very evident. Those industrialists involved were clearly proud of their contribution.

A number of Centres made the point that the timing of the introduction of health and safety risk management within the curriculum is not an easy decision. Among the many considerations in this respect are the need to relate delivery to undergraduate abilities and knowledge, to use suitable co-existent material in order to integrate health and safety topics, and the knowledge-base of teaching staff. This difficulty is noted specifically by the IChemE document ‘A Guide for Assessors and University Departments’ (IChemE 2000).

The Research Team found that teaching was spread through most years although Year 1 was often excluded in order to catch the direct entrants in Year 2, or because it was deemed to be too early in the course.

### 5.3.6 Curriculum - Assessment

Centres agreed that the assessment of undergraduates is very important. A number of Centres expressed the view that ‘if something is not assessed, the undergraduates will not do it’!

Formal examination papers, coursework and projects were found to be the common assessment vehicles as shown in Figure 3 below:
Table 6
Methods of Assessment

<table>
<thead>
<tr>
<th>Method of Assessment</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papers</td>
<td>Where health and safety questions did arise in examination papers, it was often the case that they were not compulsory.</td>
</tr>
<tr>
<td>Coursework</td>
<td>In many cases health and safety was not a compulsory element, nor was it examined specifically.</td>
</tr>
<tr>
<td>Projects</td>
<td>Project work is increasing in degree courses; in architecture it has long been the traditional method of teaching and learning. As above however the health and safety element was not always compulsory.</td>
</tr>
</tbody>
</table>

Overall, 43% of centres stated that they examined undergraduates in health and safety. However as noted above, further questioning revealed that this was not in fact always a compulsory element. In particular, only one of the Architecture Schools visited made any assessment of health and safety and this was through examination papers.

A subsequent question asked whether undergraduates were tested against learning outcomes. The answer broadly matched the answers to the previous question on assessment but it was noted that:

i) apart from the JBM, none of the accreditation bodies has any developed learning outcomes;

ii) only 8% of JBM Centres appear to be using the learning outcomes to assess their undergraduates.

In this regard, the Research Team noted that a number of RICS Centres indicated that curriculum content in respect of health and safety elements was developed beyond that which might have been expected from the very limited requirements of the Accreditation Body.

5.3.7 Time in Industry

Many Centres recognised that time spent in industry during an undergraduate course is valuable experience that can greatly enrich the overall student learning experience. The point was also made that the practical experience of students not only adds to their own competence and understanding but also ‘rubs off’ on fellow undergraduates.

Unfortunately, as far as health and safety experience is concerned this was reported as something of a lottery. Discussions with both undergraduates and lecturers suggested that many of the former are not receiving the kind of knowledge expected (with respect to the CDM regulations for example), nor in most cases are they even receiving basic general health and safety inductions! It was reported that undergraduates who are mentored during their ‘time out’ are more likely to return with valuable experience.

The point was also made by Centres that mature students bring a valuable experiential quality to the course by virtue of their working knowledge and understanding.
5.3.8 Site Visits

All centres confirmed that undergraduate visits to construction sites adds value to the course and provides a valuable first insight into working practice for many of them.

Disappointingly, however, it is clear that Centres are having very variable success when it comes to organising site visits for undergraduates. Factors creating this variation appeared to include:

- staff contacts with industry
- staff interest
- concerns over ‘safety’ (either by the Centre or the contractor)
- lack of available sites
- lack of personal protective equipment (PPE)

The last point (regarding PPE) was a major issue for some Centres and yet less so for others. One particular Centre arranged for all their undergraduates to purchase hats, vests, and boots without which they were unable to take part in the very comprehensive visit schedule. Another Centre reported that it had purchased its own stock of PPE and this was provided free to students.

It was also reported that Contractors’ concern over the safety of undergraduates was leading, in some cases, to visits being so restricted or curtailed that the benefits and interest value were significantly reduced.

5.3.9 Teaching Assistance

There was universal agreement that some form of assistance would be of use to those delivering the subject of health and safety within the curriculum.

Although all of those interviewed stated that additional experienced resource (such as visiting industrial lecturers or learning materials) would be useful, all particularly sought an easy to use, adaptable information source. This was generally acknowledged as likely to be Web based.

A number of choices were put to those visited.

<table>
<thead>
<tr>
<th>Table 7 Choice of Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice</td>
</tr>
<tr>
<td>Hard Copy Material</td>
</tr>
<tr>
<td>Web based</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Availability of Experienced Persons</td>
</tr>
</tbody>
</table>
A number of different types of information were identified, viz:

<table>
<thead>
<tr>
<th>Table 8</th>
<th>Types of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Preference</td>
</tr>
<tr>
<td>Factual data</td>
<td>2=</td>
</tr>
<tr>
<td>H&amp;S Principles (eg risk assessment, gaol setting)</td>
<td>2=</td>
</tr>
<tr>
<td>Case Studies</td>
<td>1</td>
</tr>
<tr>
<td>Module Packs</td>
<td>-</td>
</tr>
<tr>
<td>CDM Documentation</td>
<td>2=</td>
</tr>
</tbody>
</table>

Respondents made it clear that whatever was presented had to be in an appropriate format for undergraduates and that, presently, good sources of quality teaching and learning material were sorely missing.

5.3.10 Good Practice and Ideas

During the course of the visits a number of examples of good practice, and some helpful ideas to assist the learning process, were mentioned or illustrated by those involved with curriculum delivery. These are worthy of dissemination to others and hence they are scheduled in Appendix 2.

5.3.11 Websites: Awareness and Use

As a point of interest for respondents, and also in order to indicate their broader knowledge and awareness of current industry initiatives, the Research Team raised two questions with respect to their familiarity and usage of two particular websites viz,

HSE | www.hse.gov.uk and
M4I (Movement for Innovation) | www.m4i.org.uk

The responses are summarised below:

![Website: Awareness and Use: Figure 5](image)

Column 1 is awareness
Column 2 indicates usage
5.3.12 Discipline Differences

The study found that there were inevitably a number of differences across the disciplines represented by the four accreditation bodies. In reporting these, however, the Research Team is conscious of the fact that no common datum exists in respect of accreditation body expectations, and of the difficulty this causes in assessing the qualitative nature of some answers.

Having regard to the stated caveats however, the study shows:

- RIBA Centres showed the lowest (weakest) responses overall with some very low results in some cases.
- JBM Centres enjoyed the highest level of support from head of department or equivalent.
- RICS and CIOB Centres were found to include the widest range of health and safety subject matter within their courses.
- Although the JBM requirements are more detailed than other accreditation bodies, few Centres tested undergraduates against these explicitly.

5.3.13 Presentation to Undergraduates

As mentioned earlier in the report, the Research Team offered to give a presentation on risk management during the visits to Centres. This was taken up by 48% of Centres and appeared to be well received. Each member of the Research Team developed their own text in this respect and delivered to their own style. Details of the presentation were often requested by the Centre. Attendance varied between 4 and 60 attendees.

The presentations made the point that businesses have to assess a wide range of risks and that this need has been given further emphasis by the Turnbull Report. The construction industry was quoted as being one of the most dangerous with a poor culture. It was noted that health and safety risks have a special impact because of the statutory nature of the associated duties, the human element with respect to accidents and ill health, and the huge cost to business as a consequence of health and safety related incidents.

Some very interesting debates arose following the presentations with some undergraduates asking pertinent questions or making telling comments on the industry. Comments and suggestions made included:

- The adoption of a compulsory health and safety ‘passport/competency’ scheme for all those involved in construction.
- That the subject of health and safety was inappropriate for a degree course.
- The benefit of ‘project packs’ with a health and safety bias, similar to those produced by some of the major water companies.
- A levy on industry to pay for increased HSE resource.
- Importance of clients in raising health and safety standards and expectations.
- Allocating a specific sum of money within the Bill of Quantities for health and safety.
- Concern at the culture within the industry.
- Fear of raising health and safety breaches during work experience.
6. CONCLUSIONS

In the main, the conclusions arising out of the Research Team’s work confirm anecdotal evidence and support previous enquiries.

The whole issue of health and safety inclusion within the curriculum suffers from a lack of coherence and drive from the wide range of organisations involved and there needs to be an immediate improvement. However, it is unreasonable to assume that Academia can achieve what is necessary on its own, nor should it be expected to do so.

The Research Team is able to conclude that there is much support and willingness within Academia for appropriate incorporation of health and safety matters into the curriculum, but that greater co-existent support and guidance is required from institutions, accreditation bodies and industry. This needs to be recognised as a ‘team issue ’ which is, perhaps, another interpretation of what Sir John Egan referred to as ‘joined up construction’ (DETR 1998).

Specific conclusions are:

1. 40% of Centres visited had not discussed health and safety as a departmental curriculum topic and, in some cases - notably those relating to Architecture - this figure was significantly higher. These results severely limit the ability of Centres to treat health and safety as a cross curricula subject.

2. Accreditation body requirements were not universally known within Centres although paradoxically a significant proportion of respondents did not feel that further guidance on these requirements was necessary. This perhaps suggests that teaching aspirations are set no higher than these requirements (which are minimum standards) or that Centres were content with the status quo. There was little evidence, in any case, that current accreditation body requirements are being met.

3. 65% of Centres visited had a ‘health and safety champion’ and these individuals were usually enthusiastic and keen to do their best. Even where such a role existed, however, there was a lack of overall strategy which reduced the role’s effectiveness and the individuals concerned rarely had any real authority over the curriculum or its development. This illustrates that the concepts developed at the ‘Teaming Up For Education’ conference have not been adopted as envisaged. It is likely that the proportion of UK Centres overall having a champion will be less than the percentage given above.

4. Many of those that the Research Team met were enthusiastic in their endeavours to incorporate health and safety risk issues into the curriculum and to emphasise its importance in built environment disciplines. Some Centres had aspects of excellence in this area of the curriculum. Enthusiasm was particularly evident in Undergraduates as evidenced from the questions arising from the presentation given at selected Centres. This provides an encouraging foundation on which to build, but the actual level of provision within the curriculum serves to emphasise that Centres require guidance and impetus in order to realise the aspirations of the few.

5. It is evident that the aims of the ‘Teaming Up for Education’ conference have not yet been integrated into the undergraduate curriculum which perhaps explains why not all centres have adopted the ‘health and safety champion’ role previously mentioned.
6. The majority of Centres have not integrated health and safety into the curriculum, nor has the cross curricula nature of the subject generally been appreciated. The health and safety implications of project risk are pervasive and far-reaching and as such provide the potential for risk management issues to be developed in most elements of construction courses.

7. Few Centres had carried out audits of their courses. Those that had done this benefited from the process by identifying inefficiencies and determining the extent of risk management content. Such audits revealed opportunities for further material to be included in the curriculum and suggested ways as to how the subject of health and safety risk management might be integrated as a whole.

8. Provision for academic staff to undertake professional development in the subject of health and safety is inadequate. In addition, for those members of staff who belong to professional institutions, the study raises a question with respect to the personal obligation of individuals to keep abreast of matters relating to their area of work through continuing professional development.

9. 30% of Centres reported that there was no real support from the Head of Department or equivalent with respect to the inclusion of health and safety within the curriculum. It is unlikely that a successful health and safety risk management policy will exist in these circumstances.

10. The Research Rating of the Centre was found to have an influence on attitudes to incorporating health and safety into the curriculum. Those Centres with high ratings were often open in stating that the retention or improvement of their rating was the most important goal and hence the teaching of specialist subjects and maintaining research time was considered more important than accommodating additional subject material such as health and safety.

11. The research revealed that there is still considerable resistance in Academia to accept ‘health and safety’ as being an appropriate area of study for undergraduate degree courses. This attitude is contrary to the general view expressed by the survey respondents which was that ‘health and safety’ is a practical subject with a strong intellectual underpinning which merits its place in the academic curriculum. This is a fundamental and important issue and is something that needs to be addressed urgently by accreditation bodies and Academia itself.

12. There was no consensus in the research findings to suggest that there is a ‘best way’ of introducing ‘health and safety’ into the curriculum, and a variety of teaching and learning methods were adopted. However, the most popular method was via existing subject modules where health and safety has been introduced as an additional item or element in the learning process. Few centres utilised dedicated modules, although those that did believed that this gave health and safety appropriate prominence in the programme and provided undergraduates with a sound understanding of the principles of risk management and law which could feed into other modules.

13. The Research Team was unconvinced as to the quality and depth of coverage of curriculum content as stated by respondents (eg those elements identified in Table 5). Whilst the responses indicated a reasonably extensive coverage of these topics, in very few Centres was evidence provided to support this and the Research Team was not able to verify what was contended. This issue will be clarified, no doubt, via the audit proposed in Part C of this Study.
Practitioners working in Industry have a vital role to play in providing Academia with practical experience of health and safety risk management and skills as mentors, assessors, advisors and lecturers. Some organisations and individuals already play a valuable and generous role, though usually unpaid. This potential, however, is under-utilised and only 50% of those Centres visited reported engaging industry in this way. In this respect, the modular/semester system is a constraining influence as there is less leeway for arranging appropriate times for involvement than is the case with the traditional term.

Concern was expressed by Academics at industry’s ability to offer sufficient people with appropriate academic skills, quality and availability to supplement the academic teaching resource.

The extent to which learning outcomes are assessed shows significant variation. Whereas some Centres did incorporate structured assessment, the majority did not have a considered policy in this respect, which is contrary to accreditation body requirements and good academic practice.

Centres confirmed that undergraduates with industrial experience, obtained either prior to entering higher education or as part of a sandwich course, brought significant benefit to the programme as a consequence of their learning experience. In many cases, however, this particular benefit had not been realised with respect to health and safety as Centres had not agreed objectives or standards of provision with employers, nor had they monitored progress during the year out placements. As a consequence the knowledge gained by the undergraduate was very variable. Useful recommendations are available in this regard (UCEA 1999).

All Centres believed site visits to be a valuable part of undergraduate health and safety education. However the Research Team found that many Centres had experienced problems in organising these visits and, in addition, the constraints placed on such visits by some contractors had significantly reduced the potential benefits and interest to undergraduates.

There was universal agreement between staff and undergraduates that some form of teaching and learning support is essential to the overall delivery of health and safety risk management within the curriculum. A number of options were supported, of which the most popular choice was web based material and case studies.

The Research Team felt that in some Centres there was a lack of appreciation of the differences between statutory health and safety requirements relating to the centre as ‘Employer’ and the course content stipulated by the accreditation bodies. Whilst the former is a useful background to health and safety in action, and serves to illustrate some important principles (eg Employer and Employee duties, risk assessment etc), it does not address the central issue of integrating health and safety risk management within the curriculum. It was generally found, however, that Centres with a positive health and safety culture were also pro active in introducing health and safety into the academic programme.

The study identified a fundamental dilemma - how to deliver a subject across the curriculum when generally only a few members of staff may have any knowledge of it. This problem is acknowledged but the Research Team concludes that those staff teaching core subject areas, such as design, management, project work and the like, should receive appropriate professional development, supplemented by input and advice from industrialists and supported by the teaching aids discussed elsewhere.
7. RECOMMENDATIONS

7.1 GENERAL

This study identifies that the quality of delivery and the support given to health and safety risk concepts within construction undergraduate courses is generally inadequate and, despite examples of good practice extant, substantial improvements need to be made on several fronts. The construction industry generally needs to recognise that all sectors have a part to play in this and that academia, government bodies, institutions, and interest groups are jointly and severally responsible for improving the current situation.

It has been established that there are individual examples of excellence and innovation in some Centres but also that a coherent and strategic approach is needed in order to universally develop and extend such initiatives to all providers of construction professional education.

Part of the strategy requires that those in positions of influence and responsibility assist Academia as it strives to satisfy the various and often competing demands placed upon it, and thereby enable the industry to respond in a unified manner to the challenges that have been set before it. We owe it to those following.

In order to avoid an uncoordinated and fragmented approach, a single body, representative of and accepted by construction as a whole, should in the first instance set out pan-industry guidelines. Furthermore, the Government, via its position as funding agent, should help to drive this through.

The suggested vehicle for this is Action Point 34 of the Revitalising Health and Safety Strategy Document.

In line with the above, health and safety should be repackaged and promoted as an element of ‘risk management’ as a means of, inter alia, presenting the subject as an intellectual challenge alongside other project risk considerations.

It is recognised, however, that any proposals to improve the current situation must:

- be pragmatic;
- recognise the real concerns and practical difficulties to be faced; and
- be owned by all participants.

In order that this investment for the future can bear fruit sooner rather than later, and in order also for it to be developed integrally with other current initiatives such as those generated by M4I, urgent attention is required by all those involved.

The following recommendations are based on the conclusions derived from the study together with the impressions gained from the visits to the centres. They have been grouped so as to assist assimilation and identify those bodies with the ability to action them.

It is hoped that the following will serve as a draft agenda for action.
7.2 GOVERNMENT

1. DETR should implement Action Point 34 of the ‘Revitalising Health and Safety Strategy Statement’ as the high level driver of improvements to health and safety teaching.

2. The funding agencies (HEFCE, SHEFC, HEFCW) and the QAA should require inclusion of requisite health and safety matters within funded courses as a condition to receipt of funding.

3. HSE should increase their profile in this area by for example:
   (a) considering an undergraduate/student page for their website;
   (b) promoting the development of teaching material for use by universities/schools (commencing via Part B of this study);
   (c) providing free literature and other information specifically geared towards the education sector.

4. HSE (with others as appropriate) should organise a conference involving all those with an interest in the Education Base, as a follow up to the 1999 ‘Teaming Up for Education’ conference. The issues from this report should be debated and action plans identified.

7.3 INDUSTRY GROUPS

1. The Construction Industry Council (CIC) should use their central representative position to lead, co-ordinate and support the recommendations stemming from this report. This could be done by using the existing CIB Memorandum of Understanding as a starting point.

   The CIC should be encouraged to include organisations beyond their immediate membership, eg Senior Safety Advisors Group and the IOSH Construction Group.

2. The proposed review of the Common Learning Outcomes, contained within the CIB Memorandum of Understanding, should be used as an opportunity to strengthen and expand the existing requirement with respect to health and safety.

3. The revised learning outcomes should be based around a pan-industry template that allows universities/schools the essential freedom to incorporate the topic into courses as they wish but which is specific as to:
   (a) syllabus coverage and attainment outcomes;
   (b) the need for examination;
   (c) the risk management context of health and safety.

4. Although the JBM and IChemE Guidelines are already well developed, other approaches that emphasise inputs as well as outcomes should also be considered. Whichever approach is taken it is important that the subject be presented in a risk management context with a suitable balance between practical application and intellectual underpinning.
5. The CITB and CIC in particular should act in tandem in order to achieve a coherent set of proposals. In this respect consideration should be given also to the concept of a ‘passport’ or ‘Design Safe Certificate’ for all those graduating - akin to the Construction Skills Certification Scheme (CSCS) - as evidence as to competence and as an entry permit to the workplace.

6. The Construction Confederation should use its position to identify contracting organisations willing in principle to afford Centres opportunities for organised site visits.

7. In order to identify and remove some of the difficulties experienced by Centres in organising site visits, consideration should be given to developing a site visit template/protocol through those involved with the M4I’s Demonstration Projects.

7.4 ACCREDITATION BODIES

In order to improve the quality of undergraduate education in health and safety risk management, and in support of government initiatives such as ‘Revitalising Health and Safety’ and the Movement for Innovation’s ‘Commitment to People’, the accreditation bodies should:

1. Work to harmonise their requirements with respect to academic coverage of risk concepts, in the form of pan-industry guidelines.

2. Recognise that, where specific risk issues are of concern to particular disciplines, these should be included in the curriculum in addition to the above guidelines.

3. Agree that learning outcomes be explicitly examined.

4. Present the discussion on health and safety in terms of ‘risk management’.

5. Encourage the above to be realised via the CIB Memorandum of Understanding.

7.5 PROFESSIONAL INSTITUTIONS/INSTITUTES

1. All professional institutions acting within the built environment should give health and safety greater prominence generally, and in the Education Base phase in particular.

2. Professional Institutions should actively strive to raise the profile of health and safety at professional level and it is specifically recommended that:

   (a) all institutions should have a health and safety board or similar as a focal point with adequate status within the committee framework so as to make a tangible impact;

   (b) such boards should have the ‘Education Base’ high on the agenda;

   (c) institutions ‘sign up’ to the concept of health and safety being of prime importance and demonstrate this in a visible way by, for example, a joint president’s letter and action plan, and active support for CIC’s common learning outcomes. [This would be in conjunction with other actions taken generally following the Health and Safety Summit (Feb 2001)];
(d) institutions actively promote the concept of health and safety being part of risk management;

(e) institutions ‘sign up’ to the concept of a health and safety ‘passport’ for graduates;

(f) institutions use their influence and membership to actively assist academia in locating suitable industrialists willing to contribute as lecturers, mentors or assessors;

(g) institutions re-emphasise the need for academic members to undertake CPD appropriate to their work;

(h) institutions add a ‘student’ web page to their respective Web Sites in order to provide a focal point for health and safety topics and for other information of relevance to undergraduates.

7.6 ACADEMIA

1. Academia should recognise that health and safety risk is part of construction risk management and an essential intellectual element of all construction related courses.

2. Academic courses/programmes of study should be thoroughly audited with a view to including health and safety risk management in all built environment programmes as an integral and cross curricula element.

3. Health and safety elements of courses should be subject to specific assessment and this should be quality assured.

4. Health and safety ‘champions’ should be appointed, with appropriate status, as a means of achieving genuine co-ordination across the curriculum.

5. The concept of ‘health and safety awareness days’ (say one per year) should be considered as a supplementary means of introducing risk management in an intellectual and stimulating way.

6. Professional development opportunities should be provided for relevant staff having particular regard to their professional institution obligations and specific funding should be sought, if necessary, to assist in this respect.

7. Appropriate learning outcomes in health and safety risk issues should be offered to vacation and year out placement students and Centres should negotiate with host companies to provide suitable training and experience to undergraduates in their care. Centres should monitor delivery and progress in order to maximise the opportunities afforded by industrial experience.

8. Academia should endeavour to utilise Industry good will to bring contemporary practical experience and exemplars of good practice to construction undergraduate courses.
ACKNOWLEDGEMENTS

The Research Team would like to express its thanks to all the Centres visited for their hospitality and courtesy. Many Centres went to considerable lengths to provide data and make time, staff, industrialists and undergraduates available.

The CIC through its Education Director (Sheila Hoile) was very supportive and helpful in providing background information.

The Research Team would also like to thank all those universities who responded but were not in the event visited.
REFERENCE LIST

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2. THE ASSOCIATION OF PLANNING SUPERVISORS (APS) 1998
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3. CARPENTER JOHN 2000
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   Letter to Presidents of Institutions
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   Educating the Professional Team
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    The adequacy of health and safety education within construction management and undergraduate programmes
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   Health and Safety Education for Undergraduates - Why, What and How 
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33. UNIVERSITIES AND COLLEGES EMPLOYERS ASSOCIATION (UCEA) 1999 
   Health and Safety Guidance for the Placement of HE Students 
   Management Guidance June 1999
APPENDICES

APPENDIX 1

<table>
<thead>
<tr>
<th>Industry groups, institutions and the like contacted as part of the study</th>
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<tbody>
<tr>
<td>Group</td>
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<tr>
<td>Accreditation Bodies</td>
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<tr>
<td>Chartered Institute of Building (CIOB)</td>
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<td>Joint Board of Moderators (JBM)</td>
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<tr>
<td>Royal Institute of British Architects/Architects Registration Board (RIBA/ARB)</td>
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<td>Royal Institution of Chartered Surveyors (RICS)</td>
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<tr>
<td>Industry Groups</td>
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<tr>
<td>Association of Planning Supervisors (APS)</td>
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<td>Construction Confederation</td>
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<td>Construction Industry Council (CIC)</td>
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<td>Engineering Council (EC)</td>
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<tr>
<td>Institution Groups</td>
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<tr>
<td>ICE Health and Safety Board</td>
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<td>Inter Institution Group for Health and Safety</td>
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### APPENDIX 2

#### Examples of good practice and general assistance noted during visits to Centres

<table>
<thead>
<tr>
<th>Item</th>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td>Laboratory Work</td>
<td>Asking Undergraduates to carry out their own risk assessments as part of their assignment.</td>
</tr>
<tr>
<td>Site Visits</td>
<td>Preparatory health and safety inductions prior to site visits (in addition to inductions on site implemented by the contractor). Undergraduates tested on these</td>
</tr>
<tr>
<td>Year Out</td>
<td>Issue of CIRIA booklet on Site Safety</td>
</tr>
<tr>
<td>Web Sites</td>
<td>Use of Movement for Innovation and HSE web sites for case study examples and information (<a href="http://www.m4i.org.uk">www.m4i.org.uk</a> and <a href="http://www.hse.gov.uk">www.hse.gov.uk</a> respectively). University Sites <a href="http://sol.brunel.ac.uk/bola/safety">http://sol.brunel.ac.uk/bola/safety</a> <a href="http://www.gre.ac.uk/directory/lcm/hsnotes.htm">http://www.gre.ac.uk/directory/lcm/hsnotes.htm</a></td>
</tr>
<tr>
<td>Slides</td>
<td>Use of slides at end of the lecture to illustrate a particular health and safety issue.</td>
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<tr>
<td>Projects</td>
<td>Integration of H&amp;S into design projects through compilation of ‘health and safety plans’.</td>
</tr>
<tr>
<td>Disasters</td>
<td>Study of disasters as a means of learning from mistakes.</td>
</tr>
<tr>
<td>Industrial Input</td>
<td>The use of industrial mentors or lecturers to provide contemporary experience and practical application.</td>
</tr>
<tr>
<td>Exam Rubric</td>
<td>Inclusion of requirement to draw out health and safety aspects in answers.</td>
</tr>
<tr>
<td>Exposure to Industry</td>
<td>It was very apparent that on those courses where Undergraduates had direct exposure to industry (eg Part Time or Sandwich courses), or where the cohort included mature Undergraduates, that their experiences were valuable and rubbed off on all Undergraduates.</td>
</tr>
<tr>
<td>Student Guides</td>
<td>Issue of a guide book covering basics of the design process, references, risk assessment, report writing</td>
</tr>
<tr>
<td>Induction Course</td>
<td>Specific awareness course on practical aspects</td>
</tr>
<tr>
<td>Course Audit</td>
<td>Audits of the existing courses to establish how and where health and safety issues might be appropriately inserted</td>
</tr>
<tr>
<td>Role Play</td>
<td>Acting out professional roles within a project scenario</td>
</tr>
<tr>
<td>Resource Room</td>
<td>Provision of an area containing health and safety learning resource, eg Videos (CIRIA, CITB), Reports, Papers</td>
</tr>
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APPENDIX 3

CONSTRUCTION INDUSTRY BOARD

MEMORANDUM OF UNDERSTANDING
(Accreditation/Validation)

BETWEEN the Construction Industry Board and Professional Bodies who are members of the Construction Industry Council and who accredit or validate degree programmes in construction and the built environment disciplines.

1. The case for multi-disciplinary education of construction professionals was rehearsed by Sir Michael Latham in his report ‘Constructing the Team’.

2. A Working Group (Working Group 9) was established by the Latham Review Implementation Forum to co-ordinate the delivery of various report recommendations on the education of construction professionals.

3. Working Group 9 (WG9) recommended a common set of learning outcomes to be achieved by all construction professionals

   (a) In programmes of study at degree and sub-degree level.
   (b) In early career.
   (c) In mid career.

4. The WG9 report has been adopted by the Construction Industry Board. The common learning outcomes specified for programmes of study at degree level are listed in the Annex attached to this Memorandum.

THE PROFESSIONAL BODIES who accredit or validate degree courses in construction and the built environment agree that the granting of accredited status (or validation) will be dependent upon evidence of the learning outcomes listed being available during the accreditation visit, on the understanding that:

1. The wording of a learning outcome may be modified to make it relevant to a particular discipline.

2. The outcomes are independent of mode or method of delivery.

3. Provider of courses will only need to provide evidence that the outcomes have been achieved at least once during the programme of study.

4. The outcomes represent a minimum menu independent of time allocation, academic importance and worth, and frequency of achievement.

5. A Professional Body may set its own standards of achievement expected for each learning outcome: for some disciplines a competency may be required: for others an awareness could suffice.
6. Courses which are accredited by Professional Bodies and which provide for these learning outcomes may be designated a ‘CIB Course’ or a ‘CIB Course in the Built Environment’ as appropriate and may use the CIB logo.

7. The obligations of an engineering institution as a Nominated and Licensed body of the Engineering Council are not affected.

THE PROFESSIONAL BODIES also agree jointly to review progress in achieving the objectives of this Memorandum and report to the Construction Industry Board by 31 December 1998.

________________________________________  ____________________________________
for the Construction Industry Board for Professional Body
Date: ___________________________ Date: ___________________________
CONSTRUCTION INDUSTRY BOARD

Degree Courses in Construction and the Built Environment

COMMON LEARNING OUTCOMES

COMMUNICATION
Candidates are required to:

* Prepare and present a written report.
* Prepare and make an oral presentation.
* Participate in a forum where their own view(s) are subjected to peer group criticism.
* Engage in an activity requiring manipulation of numbers.
* Prepare and make a presentation involving graphical description.
* Engage in an activity requiring use of information technology.

GROUP DYNAMICS
Candidates are required to:

* Obtain set goals whilst working in a group.
* Perform a set role within a group setting.
* Achieve set goals whilst chairing a group.
* Negotiate and progress the resolution of a dispute.
* Identify and codify the roles of individuals in a group at work.

PROFESSIONAL AWARENESS
Candidates are required to:

* Engage in an activity where ethical standards are central to the problem.
* Engage in an activity where issues of protection and/or care of the natural and the built environment are central to the problem.
* Engage in an activity where issues of energy management and energy conservation are central to the problem.
* Perform a task which illustrates the differences in interpretation of the idea of the quality in construction.
* Perform a task which illustrates the essential components of the legislative framework within which construction activity takes place.

* Perform a task where the concept of value for money is illustrated.

* Perform a task where design imperatives are in conflict with the cost of the solution and resolve the conflict.

* Perform a task where health and safety are major issues in the brief and the solution.

**Professional Bodies who have signed the Memorandum of Understanding**

Architects and Surveyors Institute
Association of Building Engineers
British Institute of Architectural Technologists
Chartered Institute of Building
Chartered Institution of Building Services Engineers
Chartered Society of Designers
Institute of Building Control
Institution of Civil Engineers
Institution of Civil Engineering Surveyors
Institute of Highway Incorporated Engineers
Institute of Maintenance Building Management
Landscape Institute
Royal Institute of British Architects
Royal Institution of Chartered Surveyors
Royal Town Planning Institute
APPENDIX 4

JBM GUIDELINES

EXTRACT FROM JOINT BOARD OF MODERATORS (JBM) BEng and MEng

ANNEX C

GUIDELINES FOR THE TEACHING OF SAFETY ISSUES TO UNDERGRADUATES

1. **PRINCIPLES**

1.1 That teaching on safety and risk should as far as possible be an integral part of all other teaching, with particular emphasis in design and management studies.

1.2 That design concerns the design of systems (including people and organisational issues, life-cycle management etc) and is not just about the design of artefacts (eg a bridge).

1.3 That the JBM should concern itself with the achievement of learning outcomes rather than an adherence to some standardised syllabus.

1.4 That the learning outcomes be described in terms of levels of attainment as specified in the training objectives of graduate trainees of the ICE, ie the JBM is concerned with four levels of knowing about safety and risk, ie

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Appreciation and awareness, be able to refer to something</td>
</tr>
<tr>
<td>K</td>
<td>Knowledge and understanding, be able to explain something</td>
</tr>
<tr>
<td>E</td>
<td>Experience, be able to do something with help and closely supervised</td>
</tr>
<tr>
<td>B</td>
<td>ABility - be able to do something without supervision</td>
</tr>
</tbody>
</table>

1.5 That safety and risk issues involve deep and fundamental ideas concerning what we know and how we behave and they need to be related to the student’s own experience.

2. **TEACHING AIMS AND LEARNING OUTCOMES**

Some suggested learning outcomes are set out in Section 4.

The overall aims of teaching in safety and risk should be to enable the student to understand that:

1. **RISK** - The likelihood that harm from a particular hazard will occur and the possible extent of harm, ie severity
2. **RISK SOURCE** - Something with the potential to cause harm
2.1 Risk and safety issues are all pervasive.

2.2 Safety is about safeguarding life and health.

2.3 There are safety implications of risk being inherent in all decision making.

2.4 Risk and safety are complex, i.e. that systems are not easily predictable and therefore must be monitored and managed to achieve purpose.

(Note that this is in contrast to the scientific ideal, implicit in much of our teaching, that some ‘truth’ is being predicted. This means that the approach is one of using formal techniques not only to predict but as (partial) evidence in the decision making process. Many accidents result from the unforeseen and unintended consequences of human action.)

2.5 There may be safety and environmental risks.

3. COMMENTARY

3.1 Engineering is about making systems that are fit for purpose (i.e. have quality).

3.2 A system is not fit for purpose if it is unsafe.

3.3 Safety is therefore part of quality. Management for safety is therefore part of management for quality.

3.4 The safety record of the construction industry must improve. The industry traditionally has a poor safety culture. Safety culture is ‘the way we do things around here with respect to safety’.

3.5 Safety, risk and reliability theory is in its adolescence because we are gradually coming to terms with its inherent limitation (e.g. incompleteness, human and organisational factors).

3.6 There are, in simple terms, two (complementary) approaches to safety, the technical and the human/organisational.

3.7 The technical approach starts with safety factors, permissible stresses, load factors and limit state design (in structures) and develops into risk and reliability theory, probabilistic risk assessment (PRA), failure modes and effects analysis, fault and event trees. The problem for complex systems is that there are severe simplifying (often non-conservative) assumptions about dependencies in systems. The interpretation of subjective probabilities (needed when data is sparse) as statistics can be most misleading and potentially dangerous.

3.8 Risk concerns questions at the heart of what we know. It challenges us to describe the limits of our models. We have to justify what we do.

3.9 The relationship between risk source and accident is often not clear - there may not be a causal model. These ‘soft’ risk sources must be managed just as the hard risk sources.
3.10 The human/organisational approach to safety comes from the social sciences. There are two contrasting approaches - those concerned with individuals issues (ie psychology) and those concerned with collective (social). These two are currently merging. The issues are complex. Individual perceptions of risk and human error, whether slips, lapses or mistakes, are studied. Ways to manage safety culture within quality management ideas are being developed.

3.11 It is clear that accidents and failures rarely occur ‘out of the blue’. Accidents incubate - a situation of an ‘accident waiting to happen’. There are nearly always signs of impending doom - if only someone can read them. Risk management is probably more about reading those signs than performing PRA - it is a learning process. We must not fall into teaching more techniques at the expense of helping the Undergraduates to grasp some of these ideas.

3.12 There is a distinct responsibility to teach Undergraduates about their own responsibilities for themselves and those who, in the future, may work for and with them. When they go on a site visit or work in a laboratory or just cross the road or smoke etc. They need to see risk implicit in everyday life and have confidence, with humility, in the way we cope with it. Engineers must be aware of safety legislation and appreciate that they will be judged by the repercussions of their acts and their omissions because as professional engineers they will have a higher duty of care than members of the general public. We don’t need to calculate risk to manage it - necessarily - but there are circumstances where calculations are helpful.

3.13 The civil engineering profession has lacked an emphasis on feedback and learning. It is imperative that we get our young engineers to understand the importance of learning from failure. How many people see failure as an opportunity to learn rather than an opportunity to blame?

4. **LEARNING OUTCOMES**

A graduate of an accredited course should be able to:
(with some amplification or examples in brackets)

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 design simple engineering systems for safety (eg limit state design of structures)</td>
<td>E</td>
</tr>
<tr>
<td>4.2 define and discuss critically concepts of safety, risk, risk source (know that safety is everyone’s responsibility)</td>
<td>K</td>
</tr>
<tr>
<td>4.3 describe how risk is part of every day life (eg crossing the road, smoking etc.)</td>
<td>B</td>
</tr>
<tr>
<td>4.4 define and discuss critically natural and man-made risk sources (think through the various demands on the capacity of a system)</td>
<td>E</td>
</tr>
<tr>
<td>4.5 explain the difference between ‘hard’ and ‘soft’ risk sources (eg tripping and falling off a scaffold, poor communications)</td>
<td>A</td>
</tr>
<tr>
<td>4.6 describe a systematic risk management process, including who owns a risk, as a learning process (eg as set out in HSE, CIRIA publications or similar)</td>
<td>K</td>
</tr>
</tbody>
</table>

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4.7 discuss critically the balance between risk and benefit (including financial, business, environmental and ethical issues)  

4.8 explain the interdisciplinary nature of safety (the role of other professionals, environmental issues)  

4.9 demonstrate that at least one case study has been studied in detail (eg Ronan Point)  

4.10 describe the basic issues in a number (say 5) of famous failures (recognise the importance of types of human error and that people are the most unpredictable risk source and that poor communication is the greatest risk source)  

4.11 explain the importance of learning from failure (eg, the hypothesis that all swans are white is true until you find a black one!)  

4.12 explain that there are limits to what we know and what that may imply for safety 
explain some of the complexities of individual risk perception (eg why do some people smoke when all the evidence is against?)  

4.13 explain some of the complexities of organisational issues (are Directors of companies culpable for accidents?)  

4.14 behave appropriately when on site (know about the dangers of working on site)  

4.15 describe relevant legal and professional responsibilities for safety (Health & Safety at Work, CDM)  

4.16 define safety culture and be aware of its influence on a project (‘macho’ image, the way we do things around here, the no of accidents)  

4.17 carry out a risk assessment (eg, for the University labs)  

5. SUGGESTED READING  

Executive Summary

In 1998, the Health and Safety Executive held a high level meeting with the Engineering Council to explore what should be done to equip engineers of the future to operate in harmony with the health and safety regulator. The regulatory regime for health and safety recognises that industry, as the creator of the hazards which expose people to risks, is in the best position to control those risks. The non-prescriptive, risk based approach of the regulatory regime is intended to enable industry to devise solutions appropriate to the problem at hand and to adapt these solutions as time goes on to reflect technological change. In seeking to fulfil their responsibilities, duty holders – those with duties under the law – rely heavily on the level of understanding of risk concepts and the practical application of that understanding by their engineers, both in management and in the engineering of products and processes.

The meeting with the Engineering Council considered how HSE could work together with the Council to ensure that engineers, in their education and subsequent professional development, are equipped to fulfil the requirements expected of them. This report represents the outcome of the first stage of that consideration.

The report is concerned solely with the education of engineers in the undergraduate phase of their formation. It presents the results of a study of the essential requirements of the education of engineering Undergraduates in risk assessment and risk control concepts. The study sought information and views from structured interviews with a wide selection of representatives and individuals from different parts of the engineering community. The sampled population was necessarily small in view of the need for a comprehensive interview structure. The emphasis was on the quality of the participation rather than on quality. There were no group discussions.

The study focused on the gathering and collation of views on:

- the existing situation;
- the situation as desired by the interviewees;
- the extent to which SARTOR 3 standards were felt to reflect the needs and expectations of interviewees.

The main findings were:

- the concept of hazard and risk are not well understood and differentiated by new graduates;
- each professional institution has interpreted SARTOR 3 in its own way and produced guidance to universities on course content although there are wide variations in the content of the guidance;
• the accreditation system operated by the professional institutions provides a generic assessment of compliance with SARTOR 3 requirements but is unsuited to assessment of the detailed coverage of risk concepts;

• the need to impart risk principles in the teaching of individual subjects should be proportionate to the degree to which uncertainty prevails in the practical application of the subject; a generic, modular presentation was felt to be of limited utility;

• the familiarity of teachers in universities with techniques of hazard identification and risk reduction is variable and many would welcome good source material for integration into subject presentations;

• the provision of such source material by HSE and industry is seen as essential to improvement in standards of presentation;

• the preferred medium for the source material is the Internet. A web site giving details of case studies with lessons learned found universal favour;

• although there is much written material already available it was felt that HSE should produce a simple, straightforward leaflet explaining the fundamentals of hazard, risk and risk control aimed specifically at the expected undergraduate level of understanding;

• to be successful the subject must be presented in an intellectually challenging way and this will require the development of high quality teaching material drawing on the resources of all interests;

• computer aided learning using an interactive learning package was considered ideal if used with case studies and hard copy material;

• provision of training opportunities for teaching staff should be integrated with the development of teaching material;

• the provision of the necessary development finance is seen as an attractive proposition for industry and government in view of the benefits that will ensue;

• achievement of learning outcomes should be capable of assessment both in course work and in examinations;

• the point was made repeatedly that an understanding of risk issues and the handling of uncertainty is fundamental to the development of expertise in the exercise of sound judgement. This underpins the professional life of engineers and is not confined to health and safety matters.

In summary, there was an overwhelming belief that the material provided and the method of teaching must encourage Undergraduates to think creatively from first principles and not reply on following codes, standards and rules. This is the intellectual challenge facing undergraduate engineers of the future and their teachers. Its achievement would do much to fit new graduates for the professional life that will face them in the new millennium. It will provide a sound foundation on which training in the course of Continuing Professional Development can build.