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Health and Safety Executive

Healthy design, creative safety

Approaches to health and safety teaching and learning in undergraduate schools of architecture

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Research Report

HSE
Health and Safety Executive

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Approaches to health and safety teaching and learning in undergraduate schools of architecture

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In January 2010, the HSE and RIBA commissioned a team from the University of Sheffield to undertake a research project into the teaching of health and safety in undergraduate schools of Architecture in the UK. The need for the research was recognized by previous studies into 'identification and management of risk in undergraduate construction courses' [2001 and 2004] which highlighted the need for schools of architecture to have a more consistent and integrated approach to the teaching of health and safety. More recently in 2009, a project looking at 'Integrating risk concepts into undergraduate engineering courses' provided a precedent for individual higher education courses to embed health and safety into their core activities in innovative ways. In 'One Death is too Many' [2009] one of the key recommendations is a review of health and safety teaching in construction industry courses at Higher Education, suggesting that graduates do not have the knowledge of health and safety issues to play their role in reducing construction deaths. It is on this foundation that the Healthy Design, Creative Safety work is built.

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Main Messages

Findings

1. This research has found evidence of innovative and creative ways of teaching health and safety. It has also revealed that such good practice often addresses health and safety in indirect ways and knowledge is rarely shared between institutions, resulting in variability of approach and delivery of the subject.

2. Health and safety is an appropriate subject to cover in undergraduate schools of architecture. There is an academic imperative to the subject and it is not just something that should be dealt with in practice. Many interviewees recognised the need for the subject to be creatively addressed.

3. 'Health and safety' is sometimes perceived negatively by students and staff. This is largely due to a misconception that the subject is purely concerned with applying a set of rules in practice.

4. Live Projects offer an effective context to learn about risk management and issues of health and safety. Students benefit from working with real clients and scenarios, and from an active engagement with the process of making.

Recommendations

1. At undergraduate level students need to understand the principles of health and safety thinking, rather than the details of legislation. Students need to understand that as designers they are responsible for the safety of others, both during construction and in use.

2. A consideration of 'buildability, maintainability and usability' at all stages of the design process is likely to be more engaging and better understood than using the term 'health and safety'.

3. Visits to construction sites play an important role in contextualising the students' understanding of health and safety issues. The potential exists for architecture schools to form partnerships with major contractors in order to make site visits more viable. University Estates Departments can also potentially help with this.

4. Health and safety should be integrated into design projects where possible, rather than being an abstracted subject.

5. University schools of architecture should review the teaching that is given across the undergraduate years to ensure that there is a coherent strategy for teaching health and safety concepts across the degree programme and beyond.

Executive Summary

Background

In January 2010, the HSE and RIBA commissioned a team from the University of Sheffield to undertake a research project into the teaching of health and safety in undergraduate schools of Architecture in the UK. The need for the research was recognized by previous studies into 'identification and management of risk in undergraduate construction courses'[i] [2001 and 2004] which highlighted the need for schools of architecture to have a more consistent and integrated approach to the teaching of health and safety. More recently in 2009, a project looking at 'Integrating risk concepts into undergraduate engineering courses'[ii] provided a precedent for individual higher education courses to embed health and safety into their core activities in innovative ways. In 'One Death is too Many' [2009] one of the key recommendations is a review of health and safety teaching in construction industry courses at Higher Education, suggesting that graduates do not have the knowledge of health and safety issues to play their role in reducing construction deaths. It is on this foundation that the Healthy Design, Creative Safety work is built. The teaching of health and safety within undergraduate schools of architecture is centred on the Royal Institute of British Architects [RIBA] and Architects Registration Board [ARB] criteria, which states that,

'*At Part 1, students will demonstrate coherent designs that integrate a knowledge of: The regulatory frameworks, and Health and Safety considerations that guide design and building construction… The impact of design on legislation, codes of practice and Health and Safety both during the construction and operation of a project…*'[iii]

Far from being prescriptive, this guidance is interpreted by individual schools of architecture and forms part of a wider architecture degree curriculum delivery. This has led to a number of different approaches to dealing with the subject and variable levels of integration of health and safety with other aspects of the architecture curriculum.

The primary part of an undergraduate architecture education is a series of design projects undertaken by students in the design studio. The complexity and extent of these projects increases progressively as students advance through the degree programme. Design projects are the main opportunity for architecture students to incorporate learning material from lectures and seminars, and test out new-found knowledge in different design scenarios. The design projects, to a greater or lesser extent, mimic the process of design in architectural practice. They provide a learning vehicle which offers great flexibility and opportunities to focus on particular issues or subjects within a wider project brief.

Despite being part of the core curriculum, health and safety is perceived as a challenging subject to embed within design projects for students. Like other regulations and statutory requirements, introducing such a complex set of requirements can be debilitating to students' productivity and overwhelming even for the most able. Therefore, choosing how to gradually introduce such issues and selecting the essential elements to include is fundamental to successful learning.

This study investigates barriers to the teaching and learning of health and safety as well as highlighting and explaining different approaches and how these integrate imparted knowledge with design expression. This report aims to create a picture of health and safety teaching across UK schools of architecture, highlighting innovative and high quality approaches as well as signposting useful resources and opportunities to enrich established teaching approaches.

The research was undertaken in 3 phases, and focused on collecting qualitative data from schools of architecture and architecture/construction industry specialists. Phase 1 involved a review of teaching of health and safety in the School of Architecture at The University of Sheffield involving 5 members of staff across the undergraduate and post-graduate schools. Phase 2 focused on a series of interviews with 9 key personnel from 8 schools of Architecture in the UK, incorporating a Scottish and Northern Irish institution. This sample represents approximately 20% of RIBA and ARB validated schools of architecture in the UK. Phase 3 incorporated a symposium, to further explore the key themes from the earlier phases of the project. 20

delegates took part in the event, including representatives from architectural practices, academics and a range of health and safety professionals.

Objectives

This report aims to reflect the health and safety teaching zeitgeist, exploring issues and barriers to the delivery of the subject as well as opportunities and good practice approaches. Whilst it is aimed at a large and varied readership, its primary target audience is teachers and academics in schools of architecture. This project has not sought to advocate additional teaching of health and safety and it does not aim to make a case for health and safety to be elevated in the hierarchy of learning at undergraduate schools of architecture. The qualitative nature of the research material offers a frank and honest assessment of how the subject is approached. Because of this, quotations by interview respondents are not attributed. The following objectives were established at the outset of the project:

To investigate how health & safety is currently being taught in Schools of Architecture in the United Kingdom

To develop a better understanding of the quality and variability of undergraduate training in relation to the designer's role in eliminating health and safety risks and point at improvements

To determine the extent to which health and safety is integrated within the design elements or otherwise of undergraduate architect training across Higher Education institutions in the UK

To establish the reasons why areas are included or omitted within the training along with a qualitative assessment of the value of the material used

To explore how the teaching and learning of health and safety in undergraduate schools of architecture can be developed in innovative ways to enable students to effectively apply this knowledge in practice

To suggest approaches through which the universities and architect accreditation bodies are able to improve and positively influence the teaching of hazard elimination and control within undergraduate training, building on evidence of good practice identified.

Findings

1] This research has found that direct forms of teaching health and safety are still principally addressed through lectures at undergraduate architecture schools. Health and safety teaching in this way is usually delivered as part of ‘construction and materials’ or ‘technology’ subjects at degree level. Direct forms of teaching are rarer in the design studio, where few examples exist of health and safety being integrated into traditional theoretical student design projects. The most common approach to integrate health and safety into design projects was to ask students to reflect on their designs from a health and safety perspective, in report or drawn formats.

2] It became apparent to the research team through the interviews with academics that indirect and implicit teaching of health and safety was being delivered more often than interviewees realised. Examples included personal health and safety in the design studio and making large scale models [sometimes at 1:1] which involved appraisal of health and safety for buildability and use.

3] Live Projects are offered by all but one of the schools of architecture involved in this research, providing an educational vehicle that helps to explore and introduce architectural designs in a context of real life, encompassing health and safety. Research symposium delegates were in agreement that the Live Project was an important educational initiative in which to explore health and safety issues.

4] Interviews highlighted that health and safety is an important constituent of the undergraduate curriculum but that if the profile of the subject was increased, or if criteria were expanded, then the subject could constrain students in their creative thinking. In addition, the already packed architecture curriculum would not necessarily be able to sustain additional health and safety elements.

5] Interviews revealed that schools of architecture do not have the volume of personal protection equipment that can help with more applied learning for large student groups.

6] All interviewees recognised that construction site visits are an important part of a degree course, but they are becoming more and more difficult to organise and facilitate. Visits are disappearing from curriculums and only being offered to students as an added extra.

7] Through the process of interviewing teachers and academics in schools of architecture it became apparent to the research team that there was sometimes a lack of a coherent or linked strategy for implementing health and safety between years across the degree programme and beyond. Interviewees were sometimes unaware of the health and safety teaching throughout the degree and how one approach is integrated with another.

8] Through discussion at the research symposium it was recognised that the subject of health and safety [whether in academia or practice] turns people off and is not seen as being a particularly engaging subject.

Recommendations

1] Creative approaches are needed to instigate new ways to teach health and safety in a stimulating way. Including health and safety into design and experimental construction projects is an important aspect of this.

2] Using the term 'health and safety' may need to be re-considered and packaged in a different way to avoid the prejudices attached to it.

3] There is a need to re-introduce an element of experience of construction at undergraduate level. Such work should not just be about practical skills, but linked back to design considerations and health and safety thinking in a rigorous and analytical way.

4] Universities need to work closely with the wider construction industry to overcome barriers to student construction site visits, which include larger group numbers, to enable construction site visits to form an integral part of an architect's education.

5] Schools of architecture need support to help acquire and maintain appropriate personal protection equipment to enable students to experience hands-on learning.

6] Making connections and forming partnerships with construction industry members is important to support the application of learning and to provide experience-based learning materials.

7] Universities could work more closely with architectural practices, who deal with health and safety in a group design context, through creative problem solving exercises. This helps to reinforce health and safety as principally a design exercise rather than a tick-box regulatory one.

8] There is a need for a national central resource base for health and safety learning materials. Such a resource would benefit from being hosted and promoted by the RIBA and may be appropriately incorporated as part of the 'Knowledge Communities' section of the RIBA's website. As well as providing a home for this research to be easily accessed, it is hoped that schools of architecture would then provide case studies of their activities to the website, in order to create a resource that can be used around the UK.

Fig. 1 - 1st year architecture students evaluate their timber structure in Sheffield City Centre [Photo: Leo Care]

Fig 2 - Architecture students on a construction site visit at a university building refurbishment project [Photo: John-Paul Walker]

Contents

Context

Research Question

The primary research question addressed during this project is: How can the teaching and learning of health and safety in undergraduate schools of architecture be developed in innovative ways to enable students to effectively apply this knowledge in practice?

In order to fully answer this, a number of secondary questions were formed:

What are the direct and indirect ways of teaching health and safety?
What different forms of Learning and teaching approaches exist?
How does the teaching meet and possibly surpass the RIBA criteria?
What is the context and nature of the learning?
What qualitative and quantitative data exists to evaluate the effectiveness of the teaching and learning?
What are the aims and objectives of the teaching in terms of practical and theoretical application?
What areas of health and safety teaching are included or omitted?

Implicit within these questions is a need to understand how the teaching of health and safety is integrated within the design elements of undergraduate architect education and any benefits that this created. A key part of the research hypothesis is that whilst it is essential that health and safety issues are introduced in the lecture theatre, it is only in the design studio that these lessons can be fully explored and understood by undergraduate students, learning through hands-on experience.

It is also important to evaluate the quality and variability of undergraduate education in relation to the designer's role in addressing health and safety, to understand what skills they may be taking into their work-based aspects of their training.

An associated research question focused on how schools of architecture could work with architecture bodies and the wider construction industry to positively influence health and safety teaching. It was hoped that this question could lead directly to recommendations for future collaboration.

Research Context

The existing research base for this study is predominantly work commissioned by the HSE in association with other construction industry bodies.

'Identification and management of risk in undergraduate construction courses' [2001 and 2004] highlighted the sporadic nature of teaching health and safety generally. The first report in 2001 stated that,

"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".[iv]

In the subsequent report in 2004, the situation had changed little.

"The authors believe that this largely remains the case and would reiterate the need for Centres to consider the desirability of having a 'champion' in each department, supported by senior management, to co-ordinate the implementation of this subject area across the curriculum."[v]

The idea of introducing a health and safety Champion in Schools of Architecture has not been taken up by the departments whose representatives this project engaged. Perhaps in an effort to avoid the 'isolated actions' mentioned above, health and safety teaching needs to become a thread, woven into the fabric of teaching. Whereas introducing a 'health and safety champion' could conjure-up images of one person fighting a lone battle to ensure health and safety issues are addressed. This is the kind of scenario that perpetuates the idea that health and safety is the preserve of the specialist rather than commonplace in everyday thinking.

Whether as a direct result of the 2001 report or not, the RIBA amended its guidelines for Schools of Architecture to include health and safety in a more integrated manner.

"The RIBA has comprehensively revised its course requirements since the Previous Report and these are contained in a document entitled 'Tomorrow's Architect' (RIBA2003). This document gives an outline syllabus, and details of programmes and examinations. The requirements apply to courses from September 2003. The text recognises the issues associated with overcrowding of the syllabus whilst 'responding positively to the inclusion of health and safety'. It also states that 'There is a danger that, without explicit and assessed application in the work of the design studio, the themes of the syllabus will not be fully incorporated into the student's design thinking. These are considered by the Research Team to be very positive statements."[vi]

Published by the RIBA, 'Tomorrow's Architect' stresses the importance of the application of health and safety curriculum into the design studio. Investigating how this can be achieved has been one of the main goals for this research.

Rita Donaghy's Report to the Secretary of State for Work and Pensions in 2009 entitled 'One Death is too Many', is also an important reference for this project. One of the key recommendations it makes is for a review of the teaching of health and safety in construction courses.

"There should be a review by Higher Education Funding Council for England (and the equivalent bodies in Scotland and Wales), the industry and professional bodies on the adequacy and relevance of university or college curricula on undergraduate and postgraduate construction related courses. The review should look at whether health and safety is appropriately covered in the curriculum, including design and maintenance implications and site awareness not just technical and legal implications. It should also look at whether the Construction (Design and Management) Regulations 2007 are appropriately covered, that assessors are aware of developments in health and safety awareness and that moderators ensure that work is carried out in practice."[vii]

The recommendation draws particular attention to the need for 'design and maintenance implications', which suggest that students should consider how buildings are used after construction is complete. The issue of 'site awareness' is also of particular importance to architecture students, who's experience of construction sites is a topic explored further within this project. The coverage of CDM regulations teaching is also questioned. This raises a number of issues regarding how best to address a subject that is inherently practical and is arguably best learnt through practical experience.

A study entitled 'Integrating risk concepts into undergraduate engineering courses' [2009] tackled issues of health and safety education in a single construction profession. It illustrates barriers to teaching and learning of health and safety and suggests that a change in mindset is needed to overcome them.

"Risk within educational institutions can all too easily become associated with overzealous health and safety officials, compliance with legislation, tedious form filling and the fear of litigation should a student or member of the public be injured. To counter this the philosophy of the risk education for engineers project, described in this final report and the numerous publications listed in section 8, was to demonstrate how risk is part of everyday life and an essential responsibility of every practicing professional engineer."[viii]

A key aim of this research is to assess the various perceptions of health and safety in schools of architecture and understand the associated prevailing trends in teaching.

Education within schools of architecture

The Architecture course structure is created to fit with academic qualifications but also to comply with RIBA and ARB strictures for accreditation that will lead architecture students to a professional qualification and right to use the restricted title of Architect. Within this context, the majority of schools of architecture in England and Wales offer a 3 year degree course which exempts students from the RIBA part 1 examinations [Scottish schools of architecture offer a 4 year degree programme]. A minimum of 1 year is then undertaken working and gaining experience in architectural practice [or related discipline]. Students then return to undertake a 2 year diploma or Masters in Architecture that then gives exemption to RIBA part 2 examinations. Students then work in practice, generating at least 1 further year of documented experience before undertaking the RIBA part 3 course in professional practice through a higher education institution. Once complete, students qualify to be a registered architect. The current process takes a minimum of 7 years to complete.

Fig. 3 - Architecture students undertaking a group project in the design studio [Photo: Peter Lathey]

How architecture students learn

Architecture courses tend to function in a different way to other construction courses. This is in part to the central position of the design studio within architectural education. As expressed in the executive summary, the design studio is the melting pot in which the learning ingredients delivered through lectures, seminars and workshops are mixed together and expressed through design outputs. The nature of learning in the studio is student-led or inquiry-based to a greater or lesser extent. This creates a dynamic learning setting which enables students to explore their own interests within a wider set of learning outcomes. The design process is explored in numerous different ways and incorporates many aspects of problem solving.

Architecture education prioritises kinaesthetic learning [learning by doing] through the design studio activities. However, as a design discipline architecture is also a highly visual subject. All aspects of the course place a strong emphasis on the importance of visual communication to explain and express ideas, through drawings and diagrams. Together with more traditional lecture-based, auditory methods, a range of blended learning techniques are used to deal with the complex curriculum that the subject presents.

Learning through the design studio and design projects, students learning is implicit and explicit. Students are encouraged to develop their own architectural agenda through projects, adding their own set of issues and influences to the project brief. This allows for specialisms and personal areas of interest to be developed.

Fig.4 Diagram of architecture education structure

Architecture: not a pure construction course

Architecture as a professional and academic subject has historically struggled to define itself. Within Higher Education Institutions, Architecture schools can exist in faculties of engineering, social sciences, humanities or the Arts. It is a multi-faceted subject that combines any number of disciplines and pursuits, encompassing philosophy, psychology, building science, technology, sociology, geography, design. Whilst this holistic education is what makes the subject so attractive to many, it offers a full curriculum, where giving appropriate time to each topic can be challenging.

An architecture education is not purely vocational: it is not just about training for a profession, but about providing a wider more holistic and inclusive education. This is perhaps different to other 'construction courses'. The RIBA have developed a new set of Validation Criteria for schools of architecture to be introduced in September 2011. The 'Graduate Attributes' evidence the duality of practice and academia in architectural education.

"...the part 1 will be awarded to students who have: ability to generate design proposals using understanding of a body of knowledge, some at the current boundaries of professional practice and the academic discipline of architecture"[ix]

Limiting the teaching of health and safety in schools of architecture to a pragmatic level, by just looking at complying with regulations and protocols, involves reducing it to a purely technical subject. However, it can be interpreted as an applied academic subject if widened to take on the creative interpretation of regulations and the psychological and sociological implications of the subject.

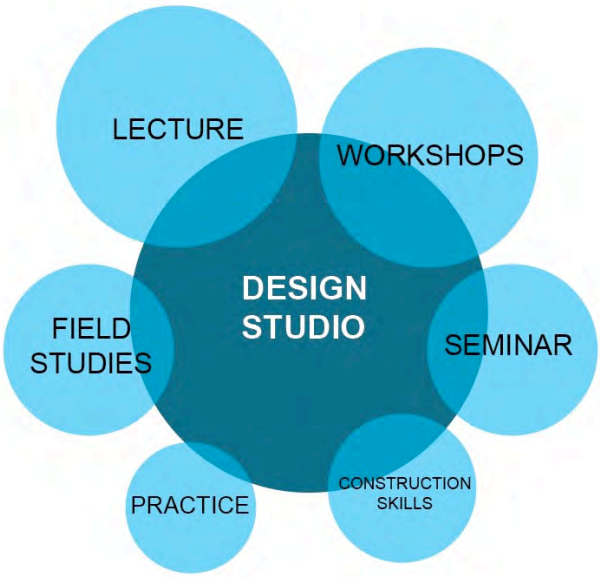

Fig.5 Diagram of design studio-focused architecture education

How health and safety is addressed in undergraduate schools of architecture

The governing bodies of vocational architecture education, RIBA and ARB, have developed joint criteria for validated schools of architecture. The criteria for each stage of the course [1,2 and 3] include health and safety as part of the core curriculum. The current guidance specifically mentions health and safety teaching in 2 out of 16 criteria for students at Part 1 and 2 level. In each statement health and safety is set within a context of regulatory frameworks and legislation.

Criteria for Validation Part 1: Design: *"At Part 1 students will demonstrate coherent architectural designs that integrate a knowledge of: The regulatory frameworks, and health & safety considerations that guide design and building construction"*[x]

Criteria for Validation Part 1: Technology & Environment: *"At Part 1 students will demonstrate, within coherent architectural designs and academic portfolio, the ability to integrate knowledge of: The impact on design of legislation, codes of practice and health and safety both during the construction and occupation of a project"*[xi]

In each of the above statements, students should be able to show evidence of 'knowledge' of health and safety within 'coherent architectural designs'. The criteria clearly state that health and safety knowledge needs to be evident within design work and not just as a related subject. Interestingly, health and safety is mentioned as part of design, technology and environment, but there is no mention of it within the 'management, practice & Law' criteria for Part 1 students. In the Part 2 criteria, health and safety does come under the 'management' section.

A new set of criteria to be introduced by the RIBA from September 2011 places a different emphasis on dealing with health and safety.

General Criteria for Parts 1 and 2, 10.3 - *"The graduate will have the skills to: Prepare designs that will meet building users' requirements and comply with UK legislation, appropriate performance standards and health and safety requirements"*

Rather than students showing 'knowledge of' the subject, the new criteria refer to students ability to 'comply with' legislation. This change in wording from the existing criteria could have an impact on the way the subject is integrated within design projects and may mean that the student design projects become more applied in their outlook.

General Criteria for Parts 1 and 2, 11.1 – *"The graduate will have knowledge of; the fundamental legal, professional and statutory responsibilities of the architect, and the organisations, regulations and procedures involved in the negotiation and approval of architectural designs, including land law, development control, building regulations and health and safety legislation"*

The criteria in the above cases do not offer additional detail as to what topics should be taught under the banner of health and safety. Therefore, it is up to universities to interpret and develop a suitable curriculum. The main subjects of health and safety currently taught include:

- Construction Design Management Regulations 2007
- Health and safety in construction
- Personal health and safety
- Risk management
- Building failure and construction accidents
- Building defects
- Construction sequences
- Risk assessments and method statements
- Building maintenance and use
- Architect's duty of care

The above topics are delivered in a range of situations, whether in the design studio or the lecture theatre and are evaluated through a range of learning outputs, including:

- Physical constructions – for practical skills development or design related
- Design proposals – drawings and diagrams
- Written reports and studies - as stand alone or accompanying designs
- Production of construction documentation – risk assessments and method statements
- Discussion and verbal analysis

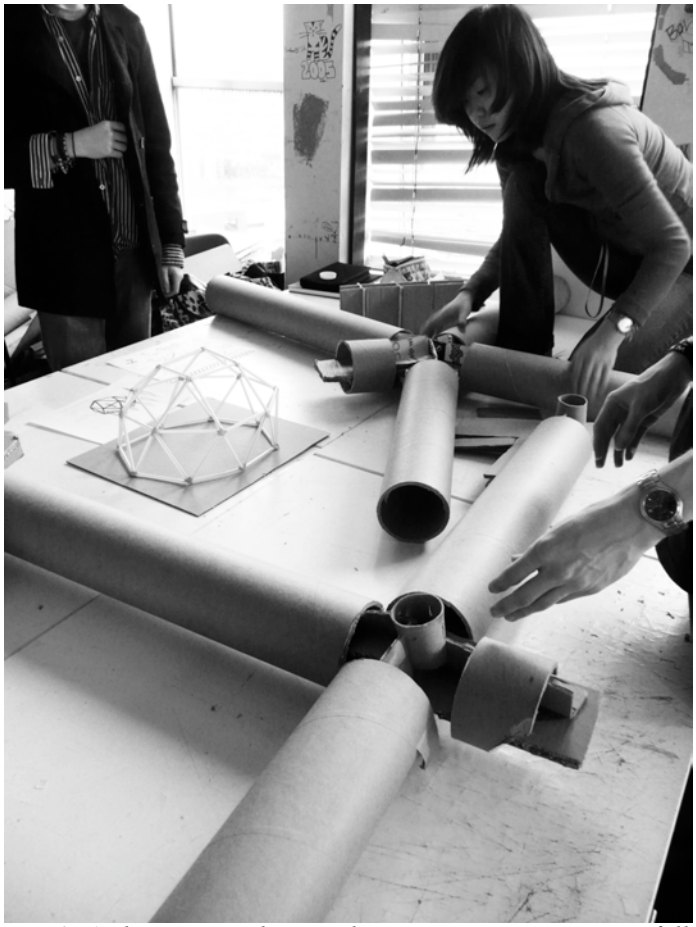

Fig. 6 - Architecture students exploring construction joints at full scale [Photo: Daniel Jary]

Research Project Approach

Building users at the centre of design

Teaching at the School of Architecture at Sheffield University has a strong social and ethical dimension. We see a careful consideration of health and safety issues as an essential part of this – the responsibility of the designer to pay due attention to the health and safety of building users and those working in the construction industry is fundamental.

The undergraduate course, and year one in particular, is focussed on developing the students' creativity in a 'real' context – working with real clients and situations, and engaging with the act of making. This is done in the belief that this will allow the students to develop design skills which can be readily applied when they enter practice. This view that creativity is best learnt working in real contexts is informed by several years of research into innovative forms of teaching and learning.

The year one design studio programme was revised in 2000/1 and specifically themed around creativity and reality. The studio aimed to support many voices in a pluralistic learning environment and sought to challenge the prevailing view that reality is a constraint on creativity:

"There was a strong feeling amongst the staff involved that the perceived oppositional relationship between creativity and reality resulted more frequently in confusion and lethargy, than innovation."[xii]

The design of the programme was driven by the goal of sustaining student motivation - as well as developing expertise - which in turn would support *sustained* creativity. Fundamental to this

argument was the idea that creative engagement with reality must start in first year, so that the expertise and motivation to sustain this creative engagement were being developed right from the start.[xiii]

Various projects were devised to help students engage with reality, in particular through the process of making. Issues of health and safety and duty of care for those realising designs came into the students' consciousness through their own direct experience and through reflection that were deliberately built into the projects. Staff noted that the grades given to students as part of the assessment for these new projects did not conform to a standard profile during the year and interpreted this to reflect the recognition that architecture can develop from a range of starting points and that 'the resultant architectures can be valued in different ways by different people at different times.'[xiv] The hope was that students 'at both ends of the creativity/realty spectrum' gained from the approach:

"the creative instinctive designers began to consider real world issues, and the students who engage readily with the real issues experienced success; an absolute pre-requisite to building the confidence needed to develop creativity."[xv]

These changes in the first year emerged during the life of the CUDE project – Clients and Users in Design Education – in which Sheffield was a key partner[xvi]. This project provided a broader context for the aspiration to engage architectural education with a wider range of voices and 'real' concerns. In particular it sought to develop architecture students' understanding of the contribution of clients, users and other members of the professional team to design. Activities were carried out across the UK, showcasing a range of ways to support students to engage constructively with clients, to work in teams, to develop communication skills, to contribute constructively to feedback and assessment processes and generally to gain more from their education.[xvii]

Pioneering Live Projects

The Live Projects are a pioneering educational initiative introduced by the Sheffield School of Architecture in 1999. Over the intervening period in excess of 100 projects have been completed working with real clients on real projects. The projects are led by architecture students [rather than architecture tutors] in the 5th and 6th [RIBA part 2] years of study, although at the end of the 6 week programme undergraduate students join in to help realise the projects. The range and scope of projects undertaken is broad. The nature of the clients is also wide-ranging.

"Architecture students work in groups on Live Projects with a range of clients including local community groups, charities, health organisations and regional authorities. In some cases the projects involve actual building, in others design of urban masterplans, in others consultation exercises. In every case, the project is real, happening in real time with real people."[xviii]

Live Projects were not conceived as a vehicle to test and develop the teaching of health and safety. However, health and safety is a fundamental part of all projects and enables students to address issues in a direct and applicable way, through the investigation of a real design. Whilst projects are mainly undertaken by post-graduate students, the Live Project ethos has permeated to the undergraduate school and related initiatives have become part of the core undergraduate programme.

Enlightened studio teaching reflection

This research project is informed by reflective practice of design studio teaching and learning over the past 4 years in the [1st year] undergraduate degree programme through the Matter-reality project. Linked to the Live Projects programme, Matter-reality was developed for 1st year degree students. It comprises a 4 week project which provides groups of students with the opportunity to design, fabricate and build a structure from a single material. The structures are designed to be installed in the public domain for a day, creating 'places for conversation'. The

installations aim to stimulate public interest and be interactive. Students are encouraged to take different roles within the design and construction team for the project.

Fig. 7 - Student installation in Sheffield City Centre as part of the Matter-reality project [Photo: Leo Care]

One of these key roles is the Health and Safety Coordinator whose remit is to work with other team members to ensure the safety of themselves as designers, fabricators and contractors; and the public as viewers and users of the installations. Students are asked to create risk assessments, one for their own working practices and another for the risks to the general public. Rather than the student health and safety coordinator working on their own to deal with risk concepts, they are tasked with engaging their group in designing-out risk and embracing this way of thinking in their design and construction processes. Results have been very encouraging with students developing clever ways of engaging their peers to embrace health and safety thinking, including making posters, using project blogs as a means of informing people of current issues and using humour to get their point across. Fabrication drawings and process diagrams have been developed by groups to help them plan ahead: assessing and managing risk together. [See appendix A & B for more information]

Research aims

Previous research has focused on approaches to teaching of health and safety at a strategic level, or looking at the teaching of construction courses generally. The exception to this is the research of health and safety teaching on higher education engineering courses. Whilst engineering and other construction industry courses have similarities to architecture and together form the construction family, Architecture as a discipline has a distinct educational heritage, distinctive teaching approach and multi-faceted curriculum, which merit further study.

This project looks at how health and safety teaching material has been developed and whether it has been successfully integrated into the degree course. One of key concerns in previous research has been the lack of connection between formal one-way teaching delivery of health and safety issues and design studio activities. Our hypothesis is that, whilst it is essential that health and safety [health and safety] issues are introduced in the lecture theatre, it is only in the design studio that these lessons can be fully explored and understood by undergraduate students, learning through hands-on experience. Traditionally architecture students have been given exposure to the realities of the design and construction process through extensive site experience, particularly during the years spent in practice. Unfortunately this has become increasingly rare, with many students' first year out being almost entirely office based, with little or no opportunities for on-site experience. Ideally further on-site experience would be offered as part of the University curriculum; however, large student numbers have been prohibitive, particularly at undergraduate level, where student numbers tend to be higher than post-graduate [Part 2]. It is therefore a key part of this study to evaluate blended learning approaches to teaching health and safety.

Implications of this research

This research is aimed at a large potential readership spanning the Higher Education sector and the wider construction industry. It is hoped that each reader will take something from this work. At a basic level it will enable a better understanding of health and safety teaching in architecture courses. On another level it is hoped that this work may help bring people together to share good practice in higher education, but also to reinforce the importance of a joined-up approach to dealing with the subject between academia and industry.

The primary audience for this report include academics, university teachers and higher education institution managers. It is hoped that this work will offer practical approaches to overcome barriers to teaching Health and safety whilst providing suggestions to embed health and safety thinking into design studio activities.

It is hoped that the HSE and those involved with implementing health and safety procedures at institutional or company level will understand the unique challenges and opportunities offered by teaching health and safety in innovative ways. It is also hoped that they will understand and support the importance of students taking controlled risks in their education process, to fully understand the implications of their professional actions.

For the RIBA and ARB this report will provide a significant level of feedback as to the approaches and initiatives that are being offered to architecture students in the UK in relation to health and safety. They may also understand the challenges that schools of architecture are attempting to overcome and how they may be able to support these actions.

It is hoped that architectural practices will understand how important their role could be in engaging with the teaching of health and safety in schools of architecture and also gain a better understanding of how students are educated in this subject.

For the wider construction Industry the research provides a window onto architectural education; how architecture students are taught and where the flaws and strengths lie in relation to health and safety. It may also offer ways that other construction-related courses could develop programmes of study or even suggest new ways of developing creative training procedures for health and safety issues for construction industry workers.

Fig. 8 - Healthy Design, Creative Safety Symposium [Photo: Leo Care]

Approach

Design of Study

The research approach undertaken within this project was organised into three phases:

Phase 1 - involved a review of teaching of health and safety in the School of Architecture at The University of Sheffield. This provided an opportunity to further understand the teaching approaches across the 3 year degree programme and link it to the postgraduate school activities. Staff also provided insight into the thinking behind the teaching approaches taken. This part of the study created an opportunity to reflect on the teaching practice evaluating its strengths and weaknesses. Lessons learnt through phase 1 helped to refine the later interviews with personnel from other schools of architecture.

Phase 2 - focused on a series of semi-structured interviews with key academics and teaching staff at schools of Architecture around the UK. The interviews were based around a prepared questionnaire, to ensure that comparable information was gathered. Key themes from the questionnaire responses could then be drawn out and collated.

Phase 3 - incorporated a symposium, to further explore the key themes developed from phases 1 and 2. The aim of the symposium was to provide an opportunity to explore these issues more thoroughly in a group context and provide an opportunity to disseminate and test some of the early findings of the research. The symposium was intended to be an open forum for all schools of architecture and construction courses as well as architectural practices and health and safety professionals.

Methods

Questionnaires

The primary method of research used as a basis for the interviews with academics and teachers was a questionnaire, which was prepared to underpin a series of semi-structured interviews, undertaken in person and by phone. The aim of the questionnaire was to gain a range of qualitative data regarding the teaching and learning activities associated [directly or indirectly] with the subject of health and safety being undertaken in undergraduate schools of architecture in the UK. Questionnaires were used for several reasons:

Flexibility – the questionnaire was used as a structure for interviews, but allowed flexibility to deviate from and expand upon areas of interest. In phone call and face-to-face meetings the script was filled in by the interviewer and then sent to the interviewee for clarification and checking to ensure that an accurate reflection of the conversation had been taken.

Parity and comparability – The same pro forma was used for internal and external interviews, offering a basis for comparing information.

Accessible – The completed questionnaire scripts are appropriate for people to read in their raw state, making data available and accessible.

The questionnaires were organised into five parts. The structure was aimed at building up a picture of activities, approaches and reflections on the teaching of health and safety.

1. Existing teaching and learning practise relating to health and safety
2. Development of teaching and learning practise relating to health and safety
3. Teaching of health and safety in the design studio
4. Barriers to dealing with health and safety in teaching
5. Initiatives and activities that deal with health and safety at other universities

The people interviewed were teachers and academics directly involved in the planning, coordination and teaching delivery at Schools of Architecture from a sample of 8 universities.

Symposium
A symposium was organised and delivered to disseminate early findings from the interviews and to encourage academics to share good practice with people from across the construction industry. The event was attended by practicing architects, building contractors, health and safety specialists and representatives from Higher and Further Education institutions.

The symposium generated a series of case studies, exploring how academics at different schools of architecture approach the subject of health and safety creatively. Presentations made at the symposium have been developed into papers, providing a more formal output from the event [please see appendix E].

Research approach selection
The research approach was driven by the call from the RIBA and HSE, which emphasised the importance of finding out about different approaches to teaching and undertaking a qualitative analysis of the findings.

In undertaking the research activities it is assumed that all Schools of Architecture that are RIBA and ARB accredited fulfil the criteria set out by the governing bodies, which specifically refer to health and safety. This assumption is based on the rigorous nature of the validation process.

RIBA and ARB validated schools of architecture in the UK are visited by a board, made up of practicing architects, academics, students and construction professionals who review the standard of education offered at each institution to ensure that validation criteria and standards are being met. The Board visit every 4 years and undertake a review over a number of days. The aim of the validation as set out by the RIBA is to identify...

"courses and examinations which achieve the standards necessary to prepare students for the professional practice of architecture."[xix]

After undertaking a thorough review of each school's activities and after evaluating a 10% sample of student work in each year of the programme, a validation report is then produced by the board, which is publicly available on the RIBA website. If satisfied that standards have been met, the board then recommend that the school is validated for 4 years. Reports carry the following statement where appropriate.

"On the basis of the sample of academic portfolios examined, the Visiting Board was satisfied that all the students graduating from the courses and examinations listed satisfied all the Criteria for Validation (which are held in common by the RIBA for validation and the ARB for prescription)".[xx]

This project is therefore concerned with understanding how teaching programmes are delivered and integrated.

Gathering information from Higher Education institutions is challenging. Whilst sharing good practice and developing teaching and learning is a fundamental part of university academic activities, universities want to preserve intellectual property and teaching capital. Institutions are therefore not necessarily willing to share the detail of their full teaching programme, down to a level of individual module descriptions and learning outputs. Requesting full syllabuses from schools of architecture was simply not appropriate and realisable for this project. Even with this information, the detail of actual teaching delivery would have been difficult to discern.

The importance of interviewing academics and identifying specific teaching activities was therefore the most appropriate and direct way of addressing the research questions. The

importance of anecdotal information is highly valued within this project as it reveals a number of issues that would otherwise have been undetected:

- Reflection on the importance and appropriateness of health and safety teaching
- Frank accounts of the successes and failures in the delivery of different teaching approaches
- Personal evaluation of the underlying issues
- Appraisal of the ability of students to engage with specific teaching programmes
- Detailed description of teaching activities

Limitations of data
Due to the personal and reflective nature of the data captured it was decided that quotations and anecdotes would be anonimised. Where possible, the role or position within the school of architecture has been labelled. The data reflects the views of the individual interviewed and does not necessarily represent the views held by the School or institution.

One of the key aims of the research was to create case studies of good practice teaching in the subject of health and safety. This has been more difficult to achieve than initially considered. This is not necessarily because there are limited examples, but reflects that teachers were not sure that their projects would stand-up to scrutiny.

- A fear that projects held up as good practice would be scrutinised and found to be wanting
- Concern that health and safety authorities may clamp down on activities
- Undertaking innovative projects that were not fully tested and were still in the early stages of development
- Reflection that many people are not sure of their ground when teaching issues of health and safety in creative ways.
- Anxiety due to the potentially litigious nature of health and safety enforcement

Analysis of data
Specific information within the interview responses has been identified that provide insight into the nature of teaching and learning of health and safety undertaken:

Learning delivery and context – as defined previously, architecture education is distinct in its delivery. It was therefore important to order and analysis questionnaire responses through modes of teaching, whether through lectures, seminars, workshops or design studio activities. The potential for cross-overs and blending of the delivery was also important to understand how approaches may be integrated. The physical context of teaching delivery is related to this and helps to understand where health and safety teaching is being delivered. In addition to projects inside the university campus, many examples also took place outside academia in the public domain.

Style of learning [auditory, visual, kinaesthetic] – Learning styles are often hybridised within schools of architecture, which is key to creating education programmes that are accessible and enjoyable to learner's needs. One of the potential issues with health and safety information and legislation is its potential for dryness and lack of visual appeal. Identifying learning materials that overcome this issue was important, to assess the likely appeal and appropriateness of teaching approaches to students.

Learning type – the type of learning [prescriptive, teacher-directed, inquiry-based, problem-based, case study-based] was often inferred within the interview responses. Inquiry-based and problem-based learning are usually associated with design studio projects and live projects, whereas prescriptive and teacher-led learning are more applicable to lectures. The aim was to understand whether there were any predominant types of learning associated with health and safety teaching.

Teaching objectives and outcomes – where possible, the reason for undertaking specific teaching and learning activities is explored. This helps to understand how teaching formed part of a wider

health and safety syllabus. In addition, outcomes were identified that express the skills and knowledge to be gained through teaching activities.

Problems and obstacles in teaching programmes – establishing any barriers to teaching and learning of health and safety was directly addressed in the interviews, to better understand areas of conflict and difficulties from a teacher, student or organisational perspective.

Project sustainability – is concerned with how difficult it is deliver a particular teaching and learning programme. This was of particular importance to new or innovative teaching approaches identified, to understand whether these initiatives could be replicated in the future or in different situations.

Results

Health and safety teaching and learning at the University of Sheffield

The research has been underpinned by an understanding of the current integration of health and safety teaching and learning at the University of Sheffield School of Architecture. Members of staff directly involved in the delivery of teaching at all levels within the school were interviewed to establish the existing course structure and content, and this knowledge was used to help formulate the questions subsequently posed to academic staff at other schools of architecture.

Whilst this report is specifically targeted at making recommendations for the teaching of health and safety within undergraduate schools of architecture, it is important to understand the degree course in the context of the overall process of becoming an architect.

The three year undergraduate BA(hons) degree course at Sheffield is accredited as giving exemption from part 1 of the RIBA examination. After gaining their degree students intending to become qualified architects are then required to seek employment in order to gain a year of practical experience. During this year the students remain registered with the University, and are required to maintain contact with the school's Practical Training Advisor.

Students wishing to continue with their architectural education at Sheffield can then return to undertake the two year MArch in architecture, which is accredited as giving exemption from part 2 of the RIBA examination. After gaining this second degree students are required to complete a second year in practice, prior to sitting the RIBA part 3 examination in Professional Practice, the successful completion of which then allows them to practice as an Architect.

Each year of the undergraduate degree course features a combination of studio project work and lecture courses. Studio teaching takes place through a combination of group and individual tutorials and workshops, with assessment carried out during project and portfolio reviews. Lecture courses give a foundation of core knowledge, and are assessed through formal examinations and written assignments. The content of both the studio and the lecture courses is designed to unfold from general ideas and concepts towards more specific detailed concerns in a manner which encourages the students to think and design in an integrated way.

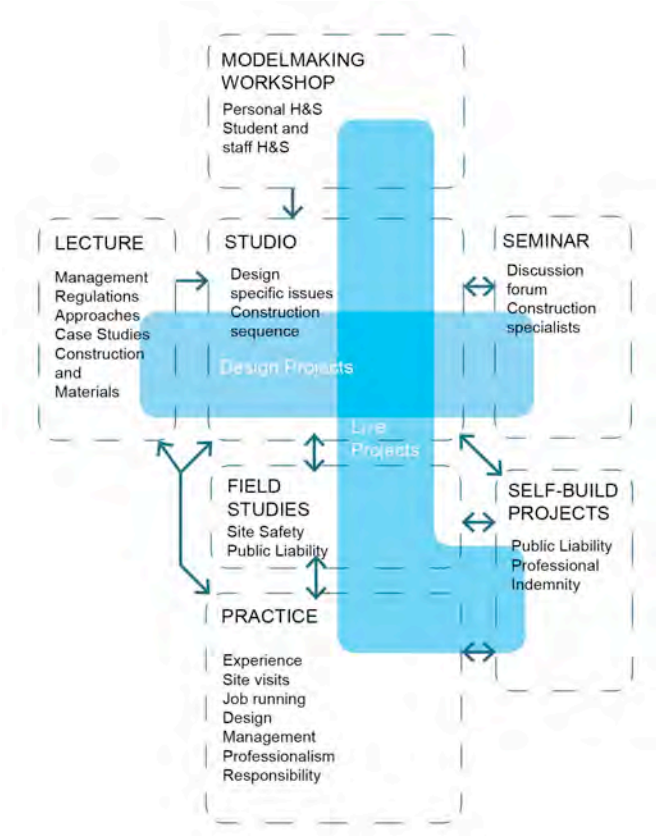

Fig. 9 – Diagram of architecture education contexts

In first year the students are introduced to the regulatory requirements that affect building construction, including health and safety legislation, as part of the 'Construction and Materials' lecture series, which forms a part of the Environment and Technology modules which run during both semesters. The issues are discussed in broad terms, giving a general awareness of principles, rather than dealing with the specifics of the legislation.

"The key to it is not teaching a lot of regulations, but teaching should give principles and understanding of major hazards, rather than issues - it needs to be an overview." [Construction and Materials Coordinator]

In the studio the 'Matter-Reality' project, which runs at the beginning of semester two, involves hands-on making using a range of construction materials. Students are encouraged to pay close attention to issues of health and safety, producing risk assessments and method statements as the project progresses. The project ends with the work being constructed in the public realm, giving the students a strong sense of their duty of care to the public.

"[We] want to make sure that we will be safe and that the things we do will not harm us or the people that come across our project. So, be sure to look through the form posted on this page and be safe." [1st year student's health and safety blog post, 2011]

In year two the 'Construction and Materials' lecture series continues, with a more detailed investigation of different forms of construction, with health and safety issues covered as part of the discussion. The lecture course includes a number of case studies of specific projects, which include an explanation of how the CDM Regulations are applied in practice. In the studio the students are expected to demonstrate an awareness of health and safety issues in their project design work. They are not, however, specifically assessed in this area.

"If students are undertaking a project that other people [lay people/general public are involved in then students need to be aware of the related H+S issues." [2nd year coordinator]

In year three building technology is taught and assessed through the studio project work and, as in second year, the students' work is expected to demonstrate an awareness of health and safety issues.

"Students often show their early designs to us [design tutors] and then say… would you be allowed to do this? – Then a conversation starts. If a student designs something that is ridiculous, then they need to understand that it is ridiculous and be aware of the issues." [3rd Year Programme Coordinator]

During semester one building construction is looked at from the point of view of design strategy and sequence of assembly, which requires the students to pay close attention to issues of buildability. Third year also includes a lecture series on 'Management, Practice and Law', which prepares students for their year in practice. This lecture series goes into more detail with regard to the regulatory framework in which architects operate, including the CDM Regulations.

In summary, the undergraduate degree course at Sheffield aims to give students an understanding of the regulatory context within which an architect operates and an appreciation of their duty of care to those constructing, maintaining and using the buildings which they design. Students at Part 1 level are not expected to have a detailed knowledge of health and safety legislation, and the assessment of studio projects does not require students to produce 'compliant' architecture.

During the year out it is expected that most students will gain some site experience, giving them a greater understanding of their responsibilities as designers. This knowledge and experience is built upon when the students return to Sheffield to continue their studies on the MArch course. Each year begins with a six week 'live' project, where groups of students are asked to work with a real client to develop a brief and explore design proposals, often resulting in the construction of a finished building. The 'live' nature of the projects requires the students to understand and engage with regulatory requirements, including health and safety issues.

During year two of the MArch course the students attend a lecture course in Management and Practice which aims to deliver an overview of the basic legal, professional and statutory requirements relating to building design and construction. The lectures are delivered both by members of the academic staff and by visiting guest lecturers with specialist expertise in the area.

"As part of final submission, students write critical essays covering management of their [design] project including health and safety. Before this, groups submit project description and discuss issues around their project... It is not until students deal with it [health and safety] in terms of their own project that they are aware what the short-comings are." [Management Course Coordinator]

This allows the students to develop a more detailed understanding of health and safety legislation, and encourages them to reflect on the experience gained during their year in practice.

"Within 6th year management we talk about accessibility and inclusivity. Not just from a statutory perspective, but from more philosophical ethical perspective." [Management Course Coordinator]

Both the Part 1 and Part 2 courses at Sheffield are accredited by both the RIBA and ARB, and the feedback from both organisations has been extremely positive in terms of the quality of teaching and learning, and compliance with the accreditation criteria.[xxi] Considering that the RIBA and ARB validation criteria include direct reference to health and safety [please see pages 4 and 10 for additional information] the courses can therefore be seen to offer a good base line from which to investigate current teaching practice, and potential opportunities to strengthen the integration of health and safety learning within schools of architecture.

Health and safety teaching in undergraduate Schools of Architecture in the UK

Review of questionnaire responses

The overall aim of this part of the research was to create a cross-section of views and approaches to the teaching of health and safety, in terms of the current state of teaching and any proposed or future directions that schools of architecture were looking into.

The following review of questionnaire responses offers an evaluation of interviews, organised in the main questionnaire subject headings. Quotations from interviewees are used to evidence the points raised. Please see Appendix C for a complete record of the anonimised questionnaire responses.

Existing teaching and learning practise relating to health and safety

The first part of the questionnaire focuses on current approaches to teaching health and safety, organised into the three main teaching contexts at undergraduate level; lectures, seminars and design studio activities.

Health and safety teaching in the lecture theatre

Traditionally the lecture theatre has been the place where students are made familiar with health and safety and other forms of regulation applicable to the construction industry. However, the delivery of lectures outlining health and safety legislation and best practice provides little opportunity for students to test and apply the knowledge imparted. At this stage in their education students have little or no practice experience with which to contextualise the content, and as a result the learning is unlikely to stick.

"It is not that we don't think that learning about health and safety is important, just that at this point in their education students are not able to contextualise and apply it." [Degree Programme Coordinator]

All schools of architecture interviewed during this study, covered aspects of health and safety legislation, practice management, the role of the architect, building regulatory structure and including CDM regulations. Subject areas were also packaged as part of a 'communication' module, understanding basics of law and professional responsibility. In most situations, the subjects were introduced and delivered in the 3rd year of the degree programme.

"Lectures on CDM, health and safety and risk assessments, avoidance of risk and common sense [are] delivered in third year lecture series on Management practice law and architectural technology." [Technology Coordinator]

Many respondents expressed that 1st and 2nd year lecture courses occurred too early in the education process to go into detail of health and safety issues, although it is important at this stage to establish principles.

"The necessity of awareness of these issues needs to come at an appropriate point in the education – students should be aware that it exists, but H+S is most usefully understood in specific terms, so yes aware that legislation exists, but responsibility exists [too]." [2nd Year Degree Coordinator]

"On a simple level – health and safety as a responsibility at a direct level of working in the studio is essential. But in terms of building design, students have too much to deal with to deal with specific issues of cleaning windows, maintaining a roof etc." [Degree Programme Coordinator]

Many universities approach health and safety teaching from a construction and materials perspective in years 1 and 2, thinking about technical considerations and how this can impact on the way the materials are used and specified in construction.

Example of 1st Year lecture series – *"Construction and material course – briefly touch upon it [health and safety]. Deliberately steer clear of legislation as do not feel it is a right time to talk about it."* [1st Year Construction and Materials Coordinator]

However, respondents were aware that unless additional practical experience of construction was delivered, some of these lessons could be lost.

"For example – if you choose pre-stressed concrete planks – you don't know implications of lifting them until you are there, using the product and working with a supplier and contractors. It is not within an undergraduate's sphere of understanding to deal with this level of detail." [2nd Year Degree Programme Coordinator]

The 2nd year of degree courses provides an opportunity to introduce the role and responsibilities of the architect. At this point in their education students appear able to take onboard the wider implications of their role as an architect, which would have been beyond them in 1st year.

Example of 2nd year lectures – *"Innovation, knowledge and communication, up-to-date ways of forward thinking, rudimentary capability for taking on responsibility, context of construction industry, Legal statutory coverage, basic regulations, but also context of industry"* [Degree Programme Coordinator]

One of the aims in 3rd year of the degree programme is to prepare students for their practical experience to follow. Teaching examples represent this imperative by focusing more on regulatory information and frameworks.

Example of 3rd year lectures – *"Lectures on CDM,* health and safety *and risk assessments, avoidance of risk and common sense, delivered in third year lecture series on management, practice, law and architectural technology. "* [3rd Year Programme Coordinator]

Teaching content and approach

Many teachers involved in health and safety delivery appreciate the potential difficulty of dealing with health and safety and overcoming the dry nature of the subject. A common approach within lectures is to discuss health and safety as one element of a construction project case study. Where this happens, students are more able to contextualise their learning and use their academic education in practical situations.

"A student sent me an email saying that she had been to site [working in their year out in practice] and discussed issues with the contractor, and that my lectures really helped to understand the terminology and finer issues with health and safety." [3rd Year Programme Coordinator]

Other programmes structure the teaching of health and safety through the framework of the RIBA stages of work. Health and safety can then be introduced as part of the wider design and construction timeline and therefore associated with other activities. This approach can help students to understand where, when and what issues they need to think about. Having said this, the stages of work do not include 'use' and 'maintenance' of the building beyond construction completion.

"A 10 credit module introduces students to RIBA plan of work, contemporary design team and management structures. Examples are provided in an easy to follow way, [exploring] the process of building in terms of legislation and liability. Health and safety is touched upon but not overt in the teaching." [Degree Programme Coordinator]

Other approaches use statistics and news reports to highlight the impact that health and safety has on people within the construction industry. This is particularly useful in the early stages of the degree programme to get across key messages.

"Introduction to the lecture series looks at the construction industry as a whole, including: building operatives, what they do and how unsafe it [the construction industry] is. A few statistics on death rates of construction industry [are included]." [Construction and Materials Lecturer]

Involving external speakers
In many schools the delivery of lectures relating to architectural practice are carried out by construction industry professionals brought in from outside universities. This ensures that the information conveyed is up-to-date, and students often respond better to learning from an external 'expert' rather than from someone they are already familiar with.

"In an education environment, it is useful to have someone to come in externally, even if they are saying the same things, students take notice of a different voice." [3rd Year Programme Coordinator]

However, it can be difficult for an external lecturer to know at what level to pitch the information, often overestimating the students' prior knowledge and experience. It could also be argued that the use of external specialists further distances the teaching of health and safety from the studio, making it less likely that the issue will be raised in tutorials and reviews. It also removes the expectation that academic staff will keep themselves up to date with changes in legislation.

An alternative approach is to bring members of the design and construction team in who have worked on a construction project together. This enables a discussion to take place and reflection from different points of view.

"We brought in a construction team to have a Q&A forum. It was a reflective process for construction team, who really enjoyed it." [Professor of Architecture]

Engaging people from outside the university help to foster new partnerships and form ongoing collaborations, leading to enriched learning experiences for students.

Assessment and outputs
Historically, lecture series are assessed through a written examination. There are still examples of health and safety being assessed in this way, but usually alongside a less constrained method.

"2nd part of the course introduces how you might address problems, contract law etc. It is assessed via group seminars. 12 groups of 7 or 8 students, each group get a stage of work and make a presentation. It is also assessed by a written exam [the only written exam in the course]. A health and safety question may crop up in exam paper." [Degree Programme Coordinator]

The idea of exploring a specific topic area in a group context and then presenting findings offers more possibilities for interaction between students and enables discussions to take place. It also offers a collaborative approach to learning, which design students tend to respond well to.

An alternative approach in terms of outputs is for students to produce reports based on a specific case studies or building.

"Each group does research on a given building following a visit from the architect and construction lectures [on types of construction including] timber, concrete, steel. Students also undertake a site visit [to the completed building]. It's not a design exercise, but a construction [project]. The subject of the study is not necessarily talking about health and safety.... [For] 2nd years, it's more important to think about how the choice of material." [Degree Course Project Coordinator]

Linkages with other teaching activities
As stated previously, the consideration of health and safety issues as part of studio project work is generally considered to be beyond what can be expected at the early stages of a student's education.

"Being a designer you have lots of different plates spinning. Health and safety is one of the spinning plates. Awareness of the subject is important, but as you become more experienced as a designer/architect there are more plates to spin." [3rd Year Coordinator]

"There are 3 kinds of students: 1 - will ignore legislation and design what they want to. 2 - want to be conscientious and will make their own designs boring because they are worried about health and safety issues and do not have the skills to resolve design and health and safety conflict. 3 – Don't really understand what we are talking about when mentioning health and safety." [Degree Programme Coordinator]

There were several examples within the questionnaire responses that linked teaching of health and safety in the lecture theatre to design studio activities. This often involved using a previous design project output as the focus of a health and safety analysis.

There is great potential for the incorporation of reflective work based on a completed project. This allows the student to take a more focussed critical perspective, removed from the pressure associated with integrating numerous, and often conflicting, design parameters.

An example of this approach was described by a member of staff at Hallam University, where students in year three are asked to complete a piece of work in semester two reflecting on a project carried out in semester one. The students carry out an assessment of the design decisions made, and their implications in terms of buildability and maintenance in the context of the CDM regulations. This is supported by a series of lectures on the subject.

"The report is a self-reflection/criticism of their own work and what might have been done differently. Sketch studies help explore the issues relating to fire issues and CDM." [Degree Programme Coordinator]

The fact that the project has already been assessed allows the students to be more open and honest about any shortcomings in their design, and means that they can identify alternative approaches without having to re-visit their proposals in detail. This creates a context where students are able to consider and demonstrate an awareness of health and safety issues related to a design they are familiar with. As a result students are more likely to gain a real understanding of how these issues affect the designer, and the lessons learnt are less likely to be forgotten.

Whilst lectures are usually associated with outputs that are written, asking students to respond to lectures by drawing out issues and thinking about health and safety issues can be productive.

"3rd year technology module – Experience of building user [and therefore safety of user]. Quite often technical submission involves creating 3D assembly drawings and cartoons. Really good for understanding technology and health & safety." [Degree Programme Coordinator]

Linking health and safety issues to the act of drawing, helps students to embed health and safety thinking into their design work, as they develop their drawn designs.

Health and safety in group seminars

Seminar activities tend to facilitate a greater level of student interaction with the subject than in the lecture theatre, but are perhaps more difficult to organise and coordinate. There were a limited number of seminar activities raised by interviewees, but where they were discussed, the level of innovation in the delivery of teaching was generally higher than in the lecture theatre. Invited guests and speakers played key roles in the seminars bringing a professional and practice-based approach.

"We've had a timber specialist, who came and spoke about building timber buildings. He talked through process of construction and brought full size elements and mock-ups that students tried. There is an inherent understanding that things are heavy and require lifting. This has obvious

and real health and safety implications that are palpable to students." [3rd Year Degree Programme Co-ordinator]

Seminar sessions were sometimes linked to a lecture series that covered health and safety. This enabled students to focus on one particular aspect of a wider subject at a greater level of detail.

Health and safety in the design studio

Interviewees often showed a reticence to integrate the teaching of health and safety issues overtly in the design studio projects, particularly in the early stages of the degree programme. People felt that health and safety could become a straight jacket for students who are busy trying to get to grips with a brand new subject.

"There is a danger that students become too limited by legislation at undergraduate level. I would rather that they thought of ideas – develop skills in designing and fluency in design skills to interpret legislation and develop innovative ways of interpreting legislation." [2nd Year Programme Coordinator]

"[undergraduate students] lack mature design skills to integrate additional [health and safety] issues – [there are] too many plates to keep spinning." [Degree Programme Coordinator]

Introducing health and safety as a mandatory subject in design projects may serve to confuse and skew the approach that students take. Therefore, it was suggested that it should be explored through a discrete project.

"Health and safety is easier to understand in the context of a specific project. It is therefore best explored within the design studio where it can be directly applied to a design." [Degree Programme Coordinator]

To overcome potential apathy or disinterest in a project that was labelled 'health and safety' it was suggested that the subject could be introduced in design projects by stealth.

"...for instance, you could set a project where students view their design in terms of how you get materials to site, accessibility, health and safety etc. It is best as an umbrella of subjects related to statutory regulations." [3rd Yr Programme Coordinator]

However, health and safety issues are more commonly addressed in associated design reports or reflections and through the construction sequence, explored through diagrams and drawings [as mentioned previously]. The following example is taken from a Part 2 course submission, which perhaps shows that this approach is more suited to more experienced students.

"As part of final submission, students write a critical essay covering management of [their design] project including health and safety." [Management Coordinator]

Health and safety in the design studio is a key part of all courses with briefings for students on their personal health and safety. Making physical architectural models and using various tools to do this means that a lot of basic health and safety issues are introduced. Whilst these are not necessarily linked directly to construction site issues, students making large scale models and using recycled or building materials/components in their work can begin to understand the associated issues.

"In 1st year, students undertake bricklaying courses. They undertake health and safety inductions and briefing as part of this. There are no formal ways to reflect on this part of the course or discuss implications in relation to their design schemes and health and safety." [Programme Director]

Health and safety can also be implicit within students design work, even when exploring an academic, abstract or polemic thesis. Building large scale models or 1:1 size explorations forces students to engage with obvious health and safety issues.

"We encourage students to build 1:1 test models. They wouldn't be structures that would be put in the public realm, but students need to be aware of the impact of their work and that the structures need to be secure." [Design Studio Leader]

Drawing at full size offers a similar experience. As part of a lecture series on construction, students are assessed by designing and drawing a window in a wall at full size.

"[During the window project] health and safety issues often crops up. Perhaps in other design projects at different scale, these issues don't often come up." [Lecture Series Coordinator]

Health and safety in design project reviews

The main way of assessing student design projects is the project review [or crit]. This has a number of different formats and varies across schools of architecture. Essentially the process involves students presenting their work verbally and visually, followed by questions and comments made by staff and students. To a great extent the reviews are driven by the presenting student. Although each project has an associated brief that students are asked to respond to, the issues explored in the project are dependent on the student's individual interests and particular approach to the project. Therefore the review process addresses issues as and when they arise. In undergraduate projects, which can last from between 1 day – 3 months, it is difficult to make certain issues mandatory without eschewing the project. It is rare that even in the longest projects [generally undertaken in 3rd year] would get to the level of detail design.

"It's difficult for students at undergraduate level – as students don't tend to get to the stage of detail design where issues of construction and health and safety crop up" [Architecture Professor]

Considering that projects range in scope dramatically throughout a degree programme, students are often exploring new issues for each project. Therefore, including health and safety as a common issue to be addressed always, would therefore diminish other issues that are equally as valid course components.

"On a simple level – health and safety as a responsibility at a direct level of working in the studio is essential. But in terms of building design, students have too much to deal with to deal with specific issues of cleaning windows, maintaining a roof etc." [2nd Year Programme Coordinator]

Health and safety in Live Projects

The interviews illustrated that many schools of architecture teach the principles of health and safety through Live Projects. Live Projects involve students working in a 'real' context rather than hypothetical one; whether this is a real client, real timeframe or built output of the project. Health and safety is an innate part of Live Projects and encourages students to engage with the subject experientially.

"Practical experience leads to a much fuller understanding of health and safety issues as they relate to them as designers – health and safety principles as a potential design generator, rather than an inhibitor" [Degree Programme Coordinator]

"Live Project outcomes are aimed at RIBA criteria; interdisciplinary, learning about materials, understanding how we communicate intent through working drawings. The projects go beyond drawings and designing buildings. Groups have to deal with budgets and monetary situations." [Teacher and Coordinator]

Each university has a different approach to creating and delivering Live Projects. Therefore the aims, objectives and outcomes vary. However there are a range of situations and scenarios that are commonly experienced throughout Live Projects, summarised in the following text, that have a particular bearing on students' understanding of health and safety issues.

Managing risk
An increased amount of intuitive learning takes place through Live Projects. In this context, the learning outcomes are not always predefined and students have to deal with real life issues as they arise. This can be particularly difficult when managing risks within the project. The ethos of Live Projects provides students with additional responsibility, with tutors taking roles more akin to mentors rather than teachers. Rather than struggling with the added pressure on them, well-supported student groups tend to rise to the challenge.

"Live Projects give students 'belief' in their abilities – believability and accountability comes naturally" [Degree Programme Coordinator]

In addition to this, when projects have a real element to them, health and safety issues cease to be just another 'plate to spin', or an abstracted notion; instead, they are about keeping safe, making sure no one is harmed, and about real constraints such as how big something is, can it be moved and can we make it safely.

"When students take responsibility, health and safety thinking follows… In Live Projects, students naturally address buildability and usability" [Degree Programme Coordinator]

Planning these types of projects does place a greater pressure on teachers and schools of architecture in terms of administration and their own health and safety systems. However, the roles within projects shift and discussing health and safety is a more tangible thing. Students are not just the receivers of information, but are implementers of that knowledge. Mistakes do and will happen, but this is an important learning mechanism, as long as the risk impact is low.

"Tutors need to allow students to manage their own risks" [Architecture Professor]

Live Projects benefit from institutional support, and it is often the case that Live Projects provide recognition for universities in directly helping communities. However, institutions can see live projects as being risky ventures.

"[When] going outside the university and beyond normal teaching areas, institutions get interested". [Degree Programme Coordinator]

Working with real clients
"We established live projects in 1st and 2nd year degree level for a number of reasons: Help students to become better citizens, doing things for people that are less privileged than themselves. Live Projects allow students to get value out of their skills in other ways." [Teacher and Coordinator]

Working with real clients gives architecture students a sense of purpose and professionalism. Knowing that a client is reliant on students showing them the way through an architecture project helps to assess and possibly address their design priorities. The feedback that clients often provide when asked to comment on designs often relates to practical considerations.

"Engaging residents creates a lot of input and feedback, which often relates to usability and health and safety" [Degree Programme Coordinator]

Again, students feel the responsibility of this keenly and sensitively consider individual as well as communal client needs.

Fig. 10 - Student Live Project constructing an outdoor classroom from locally sourced timber [Photo: Prue Chiles]

Engaging the wider community

Live Projects often involve students helping to build the skills of community groups so that they can engage with architectural projects. Students often rise to the challenge and relish the responsibility of teaching community groups about applied issues like health and safety. Actively involving members of the public in architecture projects reinforces the responsibility that architects have to inform people about design and construction issues. This issue is one that is at the heart of Construction Design Management [CDM] regulations. Talking about CDM in a lecture theatre does not have the same impact on student's learning experience compared to explaining how a structure might be created [and the associated considerations for health and safety] to people on a real [or live] project.

When making or putting installations in the public domain, close attention needs to be paid to issues of public safety. Particularly where installations can be inhabited or explored by members of the public, health and safety issues need to be addressed. Feedback received from the public can form an essential part of many projects and this can often include practical considerations as well as aesthetic and experiential comments.

Working in the public realm brings students into contact with a range of people who play important roles within everyday life that are not necessarily exclusively involved in the construction industry. Land owners, shopkeepers, council workers, service providers and cleaners, to name but a few, have a vested interest in projects that appear in the public domain and are often keen to know what is going on! Understanding how different people and groups interact with space and the built environment is an important lesson and raises wider issues of health and safety.

Complying with regulations

"A prototype was built at university and transported to site. For the 2008 project London Architecture Festival we had to get a temporary structures license. We received a veto [rejection] from the health and safety officer at South Bank. It needed quite a bit of help to negotiate hurdles, but we got there in the end." [Degree Programme Coordinator]

Live Projects, particularly where building is involved bring architecture students into contact with building regulations and health and safety on a practical level. Where this happens, it provides a great opportunity to develop strategies for dealing with such frameworks; Do you comply and adapt a design to meet requirements categorically or do you try to work creatively around the regulations? Dealing with these considerations brings new and often previously unexplored skills.

Students also respond to regulatory systems in innovative ways and see them not as a hoop to jump through but a minimum standard to be surpassed.

"In the public realm, students naturally exceed statutory minimums in making a design" [Degree Programme Coordinator]

Live Projects also offer opportunities for engaging with professionals and specialists through the design process, in an academic rather than practice-based system. In this context, relations with building control and health and safety officers can be nurtured.

"Engaging health and safety professionals may help increase potential of what can be achieved [rather than constraining]" [Architecture Professor]

Making and building

"The process of making using construction materials, giving consideration to their sourcing and transportation was invaluable" [Studio teacher]

Construction can often play a part in Live Projects and students are attracted to this opportunity to get their hands dirty. The act of making brings out different skill sets and students come to the fore, who may not have done so in a traditional theoretical design project.

"The best learning is through direct experience rather than theoretical" [Reader]

The act of designing and constructing something takes time as well as a range of skills and at undergraduate level, setting out roles and responsibilities within a group helps to create a productive and effective team. Students take on different roles within groups, project managers, builders and health and safety coordinators. Once again the act of making focuses the creative process and students deal with health and safety considerations as an integral part of their design and realisation process. When undertaking construction and building projects, groups can benefit from producing risk assessments, method statements and construction sequence drawings, both for their own working practices and for any interaction with the public.

Due to budgetary constraints of most Live Projects, buying materials is difficult. In many cases, recycled or waste objects are used in place of virgin products. This can bring its own set of health and safety issues to bear, but provided that the students are led through the process of understanding and managing the risks, unconventional structures and construction techniques can be developed, bringing another level of innovation to projects.

Live Projects abroad

"The reason that some university live projects are often undertaken in different countries is because there are needy, but also because statutory regulations and health and safety are not as rigorous. Building a similar building in the UK would be a different undertaking. This is not necessarily being critical of the practice and the amazing student learning experience. But it does raise questions relating to health and safety." [Teacher and Coordinator]

Many Live Projects occur in foreign countries for a variety reason; whether altruistic or as part of an equal partnership. Many projects also take place in developed as well as developing countries, where health and safety legislation is not necessarily less structured than the UK. The difference is often that in appraising the legislation in a different country the issues become more real.

"We have a problem with health and safety in this country, because we talk about it in an abstract way." [Architecture Professor]

Even in European countries, a different emphasis in health and safety can be found, and therefore raises the importance and applied nature of health and safety. Working in a different country means that students have to learn from scratch and remove preconceptions. Health and safety is one issue that is also seen with fresh eyes, making it a more pertinent issue to address.

"There is no legislation in some countries; therefore if you are practicing there, judgement is crucial" [Senior Academic]

Live Projects provide incredibly rich and rewarding learning experiences for students and other stakeholders, but they are resource intensive, requiring a lot of organisation and high-contact teaching. Additional limitations can include;

- time – projects are short, the level of detail is limited, and there are a broad range of issues to deal with
- cost – live projects, and working at full scale with building materials is expensive
- numbers – undergraduate year groups are prohibitively large for many activities
- facilities – learning through making is demanding in terms of space and equipment
- risk – duty of care to students and the wider community
- support – not always forthcoming from institution

Health and safety for trips and visits

This subject was a recurring theme throughout the research project and many schools of architecture expressed regret at moving away from delivering construction site visits at undergraduate level due to difficulties in coordination and arrangement, as well as delivery.

"Getting hold of the appropriate equipment makes it increasingly difficult, even for small groups. It is particularly difficult to for large groups to go on a site visit, often because of health and safety reasons… I have given up trying to organise construction site visits as it is becoming more and more difficult." [2nd Year Coordinator]

Many schools of architecture use completed buildings and analysing the construction process from this perspective. Whilst this is still a very useful pursuit, there is a feeling that a valuable learning experience is being lost.

"Less trips than we would like. Tried to organise in the past, but not succeeded yet. Access for case studies to newly occupied buildings is hard enough. Still try, but not often successful." [Senior Academic]

When trips had been arranged successfully, the sheer number of students in an undergraduate year group made ensuring safety on site challenging.

"This year we did a project with an existing building, on the edge of a large housing site. Redrow were on site at the time and kindly offered students to visit. Site agent said 'how many students?' We said 120. 'I can give them all hard hats, if you can provide jackets and boots'. An inspector from the local authority happened to come on site whilst we were there. 3 students thought it would be unfashionable to wear PPE and walked on site without knowledge of situation. Now, we can't go back to site. I made them write an apologetic letter to Redrow. I gave them a strong briefing before hand and talked about dangers of active sites, but still there was a lack of

understanding... It is so difficult with the numbers. It is better to hand-pick students." [Degree Programme Coordinator]

As described in the scenario above, reducing numbers of students per visit aids delivery and helps to ensure that the experience runs smoothly. However, undertaking a series of visits for smaller groups may prove challenging for organisers and contractors. To overcome this, trips could be offered as an additional experience rather than a core curriculum element. But then, the construction site visit is reduced to an added bonus rather than a fundamental activity.

Although site visits are more likely to occur when students are working in practice, the current construction industry situation does not necessarily support this. The type of experience that the university offers students therefore needs to include site experience where possible. A site visit through a university offers a different perspective to that of a visit when working in practice. The emphasis is on reviewing and analysing what was visible, rather than having specific issues/problems to address.

"Going on site visit could be a useful vehicle for investigating health and safety, instead of reading a list of issues, get students to think about it. It's more valuable than including a design report on how the windows are going to be cleaned in a student design, as it is so abstract." [3rd Year Coordinator]

There was a concern raised that health and safety itself was restricting site visits for students and that this needed to be addressed.

"[Health and safety considerations along with] CDM is stopping people going on site, but students are not getting the experience." [Degree Programme Coordinator]

Several approaches to overcoming this issue were highlighted in interviews. One university was looking at the feasibility of all students entering the CITB Construction Skills Certificate Scheme [CSCS] and gaining certification for site visits through this. Another group used their regional architecture institute to help facilitate a visit by organising site and personal protection equipment.

Interviewees also highlighted problems with construction site visits in terms of insuring students for visits. Some reported that this was covered by their institution whilst others believed that they did not have such backing.

"Barriers to do physical activities are to do with numbers, finance and insurance. You can't expect one contractor to do all trips [for a year group]." [Studio Teacher]

Field trips for students to visit places and spaces are also becoming important vehicles for health and safety. Standard sign off is usually required for such activities, covering general issues of personal health and safety including trips, slips and falls whilst walking around. Rather than asking students to read a completed risk assessment, it was suggested that making students engage with the subject and be proactive helps to get the message across.

"Putting basic headings in a risk assessment and then asking students to write them, or making a discussion on them." [2nd Year Degree Programme Coordinator]

Development of teaching and learning practise relating to health and safety

Is undergraduate degree the right place to introduce issues of health and safety?
All interviewees recognised the need and importance of introducing issues of health and safety in undergraduate schools of architecture. It was widely recognised that instilling basic principles of health and safety early in architectural education was vital but that it was important not to overload students.

"You can kill people with buildings and our selves. It is important that students go into practice with that knowledge... understanding that as a practicing architect you could be responsible for someone else's death! Everyone should have that awareness before going into practice." [Reader]

It was also noted that legislatory issues were best introduced in year 3, as students were most able to deal with the subject matter and that this knowledge had a better chance of being retained and used in their following practice experience [in year 4].

"Yes its [health and safety] relevant and it's about right in quantity, but is it the right quality? Y3 seems to be the most appropriate place to introduce the topic." [3rd Year Programme Coordinator]

The overriding view of those interviewed was that the amount of health and safety teaching currently going on in undergraduate schools was appropriate. Interviewees also understood the importance of the subject and felt that it was necessary to introduce it as an architectural core discipline.

"Current level [of health and safety teaching is] O.K. We have to remember that students have another 4 years of training and skills. They are going to be exposed to practice and health and safety issues in Y4 and 7 and professional practice modules in MArch." [Degree Programme Coordinator]

University teachers were also agreed that health and safety is an appropriate subject to cover in the undergraduate school, that there is an academic imperative to the subject, and that it was not just something that should be dealt with in practice. Many interviewees recognised the need for the subject to be creatively addressed,

"I wouldn't like studying to become too practical, it still needs to be academic, using rules creatively rather than following rules." [Studio Teacher]

"We have got to resolve these things and do it in a creative manner. Health and safety can overload you with documentation, which may kill it as a discipline. These often unthinking and bureaucratic processes mask the really important issues that health and safety tries to address." [Architecture Professor]

Interviewees highlighted that the link between health and safety learning in academia is not particularly well matched with the experience gained in practice after degree level and that there is scope for developing this.

"[There is a] possibility of learning more about students experience of working in practice over holidays etc. and using this to compare with academic education and issues learnt in practice." [3rd Year Programme Coordinator]

Perhaps linking academia to practice-based architecture experience is a good way to integrate health and safety education. In Scottish universities, which operate 4 year degree programmes, work experience is carried out as part of the academic course.

"The 4 year degree course includes one year of placement in a related design practice [not necessarily architects] although this is still part of the academic course. Students are given related tasks by teachers to explore in a practice context." [Degree Programme Coordinator]

Possible new initiatives at universities

Respondents were asked to state any new teaching programmes that are planned that engage with the subject of health and safety. The majority of responses suggested that schools of architecture

are looking at developing Live Projects which are concerned with designing and building structures.

"[We are] planning a whole school event next year – Live Project to construct an actual building" [Degree Programme Coordinator]

Health and safety would be a central issue in this type of project, with potential for students at different levels sharing knowledge. Building structures in an academic context requires a large amount of planning and organisation, not to mention time and human resources to sustain over a long time period.

"Proposing a Live Project for a large design and build project that may take several years to come to fruition. The management and development of this project is currently under development." [Lecturer]

Initiatives and activities that deal with health and safety at other universities

There were few initiatives in schools of architecture that interviewees had come across. Where there were projects of interest they often related to live project initiatives that addressed the issue of health and safety in an applied way.

Examples of initiatives being undertaking along live project principles were also mentioned in several different countries; these included activities undertaken by 'The Rural Studio' in the USA and 'Die Baupiloten' in Germany. One example in Sweden, explored how government, industry and academia can work together to develop possibilities for innovative ways to use materials, with an implied health and safety agenda.

"LIND University in Sweden undertake 1:1 concrete structures [project]. The project is supported by the government and private companies. The exploration of the concrete material is then developed into a design for a space for children. Where children are involved, health and safety is of particular interest." [Degree Programme Coordinator]

Additional activities mentioned included an architectural practice who offered a summer school type activity for architecture students. This paid service offers students the chance to develop parallel projects to those being undertaken within the practice, which enables students to understand how regulations and legislation impact on the design and construction process, and developing their own responses to building codes.

Perceived barriers to dealing with health and safety in teaching

Through the series of interviews a number of perceived barriers to the successful delivery of health and safety teaching have been identified.

"How do you cover something like this [health and safety], when there is pressure from university to reduce contact time with students and when RIBA/ARB increasingly demand more stringent and in-depth criteria for validation. ...How do we balance these demands and try and include health and safety teaching in a more detailed way, without sacrificing other areas." [Degree Programme Coordinator]

The perception of the subject by students and staff was raised as one of the barriers. Health and safety does have a particular way of turning people off as soon as it is mentioned.

"...Definitely perceived as boring. If we have to do it then it needs to be dealt with in creative ways." [Studio Teacher/Coordinator]

Perhaps colloquialisms such as 'health and safety gone mad' perpetuate this way of thinking. Indeed it was highlighted that some teaching staff also consider health and safety as boring.

"One of biggest barriers is teacher's perception of health and safety – one of things that struck me about a discussion for health and safety was that it can be boring. But we need to think about it in a creative way..." [3rd Year Coordinator]

One of the ways suggested to combat apathy towards health and safety was to be re-name or redefine it.

"[The] Subject needs to be tackled creatively and teaching style needs to reflect this – to be engaging. Health and safety is considered unsexy or uncool! It needs to be re-branded." [3rd Year Coordinator]

Other barriers to the teaching of health and safety have been raised in previous sections, but can be summarised as:

- Student numbers – undergraduate year groups are prohibitively large for many activities, such as Live Projects and site visits.
- Staff time – there is so much to cover in tutorials and design reviews that there is insufficient time to pay any attention to health and safety issues.
- Cost – projects involving active making and the use of specialist tools and protective equipment are expensive to run, especially when involving the whole year group.
- Facilities – learning through making is demanding in terms of space and equipment, and does not necessarily sit well with a drawing studio environment.
- Avoidance of risk – Live Projects involve an increased level of risk, both to students and to the wider community.
- Lack of support – projects involving a higher level of risk or placing greater demands on studio space in terms of cleaning and maintenance are often not supported by the institution.

Summary

The interview responses produced a broad range of approaches to teaching health and safety, as well as representing the difficulties of delivering a burgeoning architecture curriculum. Whilst all schools of architecture interviewed deliver teaching modules that include health and safety, levels of integration between lecture-based and design studio activities varied considerably. Respondents identified the need to find ways to integrate teaching of health and safety into design studio activities without the subject becoming predominant.

There was sometimes a lack of understanding of teaching initiatives across the degree programme. This was in part because interviewees were not in a position to know about other degree year teaching approaches. However, it was recognisable that each year programme coordinator has their own approach to delivery for that particular year group and therefore address topics in their own particular way. There is a corresponding lack of strategic delivery of health and safety initiatives across the degree programme, or a sense that previous learning was being reinforced and built on in later years of the degree.

Whilst Live Projects are not the only answer to the problem of integrating health and safety programmes, they offer a rich learning opportunity that enables students to test theoretical design in the real world, in a controlled and supportive academic structure. Where Live Projects engage with construction, students also gain valuable practical experience that is becoming increasingly difficult to deliver on construction sites.

Some academics were considering imminent changes to the RIBA criteria for undergraduate courses and assessing whether this required a change of emphasis or approach to health and safety teaching. It was also recognised that early lessons for students should be centred around understanding a duty of care that architects have to construction workers and the general public. Learning about legislation and applying this to designs should come at the end of the degree education to maximise knowledge retention for students going into practice.

Health and safety teaching in undergraduate Schools of Architecture in the UK: Review of symposium

Introduction

A 'Healthy Design, Creative Safety' symposium was organised and delivered in January 2011 to disseminate early findings from the interviews and to encourage academics to share good practice with people from across the construction industry. The event was attended by practicing architects, building contractors, health and safety specialists and representatives from Higher and Further Education institutions.

The symposium comprised a series of presentations from academics, architects and health and safety specialists, exploring different approaches to teaching health and safety. A lively discussion followed, which addressed people's interest in Live Projects, facilitating construction site visits and ways of creating connections between schools of architecture and construction industry organisations. [Please see Appendix D for list of attendees and symposium programme].

Symposium Presentations

Five invited academics and specialists provided stimulating presentations addressing different approaches to teaching health and safety. The following represents a summary of each, highlighting key points raised. Speakers have been invited to turn their presentations into written papers, which can be accessed in Appendix E. It is envisaged that the papers could be uploaded onto an RIBA website for wider dissemination at a future date.

OB1 Live Projects

Jane Anderson, Oxford Brookes University

OB1 Live Projects are undertaken by 1st year undergraduate students. The learning outcomes are aimed at addressing issues of social responsibility and engaging local communities in the architectural design process. Each year, OB1 has a different theme and project brief for students to work to.

In 2009, OB1 focused on developing creative interventions in a park in Oxford. Students undertook studies of the public space, including surveys of the space and nuisance studies, looking at anti-social behaviour that goes on within the park. The year group of students developed proposals for the park, which were then presented to the community in an engagement event in situ. The success of the project led to the local authority commissioning the design of a bench for the park. This design for the bench was then undertaken as an additional project over the summer holidays.

It was proposed that going outside the university and beyond normal teaching areas means thinking and working in a different way for staff and students. The Institution also gets interested when alternative teaching activities take place. In Live Projects tutors take different roles from normal teaching situations. They act as a support network for students, who lead the project and take responsibility for their design actions. When students take responsibility, health and safety thinking follows.

The project is inherently health and safety oriented as it is concerned with managing all sorts of risks including media coverage, expectations [of community and students] as well as personal risk and public liability.

Fig. 11 - Installation for OB1 Live Project [Photo: Jane Anderson]

Live Projects give students 'belief' in their abilities and accountability comes naturally with this. In public realm students naturally exceed statutory minimums in making a design. Producing a tangible result means that students rise to the challenge to make it happen, make it real. In Live Projects, students naturally address buildability and usability, because both issues are tangible.

Uncertainty is an important part of being a designer. When students engaged residents in reviewing their designs, they received a lot of input and feedback. This led to uncertainty in not knowing how to interpret and integrate this feedback into their design development. Feedback from residents often relates to usability and health and safety issues: are there sharp corners? Is it safe to sit on? Is it vandal-proof? In answering these questions, students engage with the practicalities of health and safety on a day-to-day basis.

Fig. 12 - Community engagement event for OB1 Live Project [Photo: Jane Anderson]

Live Projects don't need to be construction focused to be a strong learning experience. The opportunity to work with real clients and stakeholder groups grappling with real issues that affect their lives creates a situation where students test their knowledge. Tutors need to allow students to manage their own risks in such projects, with the knowledge that they are doing so within a supportive context.

Fig. 13 - Testing structures for installation prototype [Photo: Jane Anderson]

Embedding Health and Safety into Undergraduate Design Projects
Sandra Denicke-Polcher and Anne Markey, ASD Studio Projects, London Metropolitan University

Undergraduate studio 3 at London Metropolitan University is led by Sandra Denicke-Polcher and Torange Khonsari. Within the studio, design projects have an inherent social imperative and ideas are tested through building at 1:1 [full-size], using found and recycled objects and materials. Designs are developed and tested through making small models to start with, allowing for refinements to be undertaken and issues to be resolved. Students then engage with real health and safety issues on a day-to-day basis whilst making their installations at full size. Students are trained and supported in the use of power tools, as well as on-going discussions about construction approaches. Models made at full size are usually installed within the architecture design studio space, therefore they need to be structurally sound so not to cause a danger to other students.

Three projects were represented that take the idea of making full size models and installations into the public domain. Each had its own challenges, but together they highlight the challenges and learning opportunities for students working with the wider community.

Fig. 14 - Testing ideas through 1:1 modelling [Photo: Sandra Denicke Polcher]

Fig. 15 - Student project, temporary installation [Photo: Sandra Denicke Polcher]

Mobile Home – was a one week making workshop in Oxfordshire, which used reclaimed domestic timber doors as the building blocks to create a caravan of sorts. The mobile home was designed and constructed by students, then transported to several locations, including a local primary school, where it was used as the basis for undertaking workshops with children based around the idea of home. The structure needed to be road-worthy as well as structurally sound, which presented a number of challenges. Public interaction with the structure also meant students needed to create a high quality finish. This project enabled students to fully understand the implications of their design, through build, use and how it could be transported and maintained.

Communal Garden, Liverpool – A three day making workshop was based in Liverpool, working with a community group who wanted to create a garden for themselves. Studio 3 developed designs with the group based around the use of reclaimed timber pallets. The students proposed creating a strategy for the whole garden that the community group could realise over a period of time, with the addition of creating some prototype elements for the garden during the workshop. Again, health and safety issues had to be addressed in how people could use and construct the basic pallets, as well as how the constructions would then be used by the community.

Fig. 16 - Students and community group in Liverpool [Photo: Sandra Denicke Polcher]

Outdoor Stage, Germany – Working with a community group and local school children in Germany, Studio 3 students developed proposals for an outdoor performance space. The majority of the project was designing collaboratively with children and grown-ups to create a consensual proposal. A prototype stage platform was created to test ideas and to capture people's interest in the project. This project reflected the different issues of health and safety as well as building regulations that are apparent in different countries.

Anne Markey is the Director of ASD Projects, a chartered RIBA practice in architecture department at London Metropolitan University. ASD projects was established to support students in Live Projects and undertaking real architecture projects in a professional context. Over the last five years, ASD projects have undertaken a range of projects that have been realised in the UK and abroad. Health and safety issues are embraced in all projects. The reason for teaching health and safety at LMU is not through obligation or for validation but in order for young architects to understand their duty of care. With knowledge of health and safety and particularly CDM, students understand their responsibility. Several examples of this approach were presented. In both projects, legislation/limitations were used as drivers for creativity.

Boomerang Project – Sponsored by the London Corporation, the project aimed to create a modular unit that could be installed in a range of locations round the city and used in different ways. The 'boomerang' solution, made from laminated sheets of plywood formed seating and enclosures in a range of settings. Students worked with ASD Projects to develop the design and an innovative, safe and robust element fit for the public domain.

Installation at the British Library – Designed for the London Architecture Festival, an installation was created for the courtyard garden at the British Library. The high-profile location required a structure that was innovative, but easily erected and disassembled by architecture students. Thinking about construction sequences and health and safety issues from a builder's perspective was a particularly valuable experience. Usability of the structure was a key issue to address in the design. Providing a shelter and seating area meant that structural consultants were required and the design needed to be agreed with the local authority. Students gained real insight into dealing with legislation and statutory bodies during the project and in particular how health and safety is a key concern whilst working in public places.

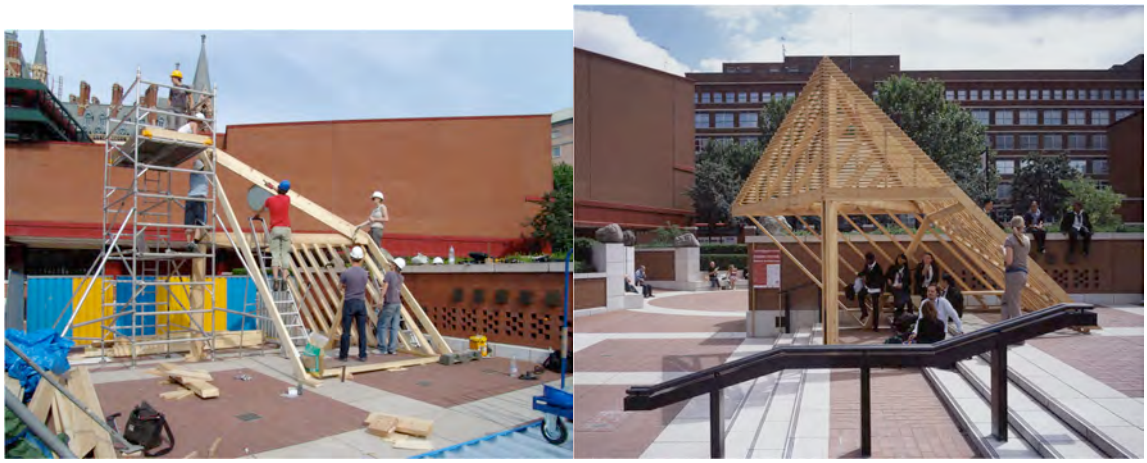

Fig. 17 - Construction of a timber structure by students fat the British Library [Photo: Anne Markey]

Compliant Architecture: Using building regulations and health and safety legislation as a starting point for creative design responses
Liam Ross, The University of Edinburgh

Compliant Architecture is the term given to projects whereby students take one piece of building regulation legislation and use it as a starting point for a creative response to a design proposal. This proposition offers students the opportunity to respond creatively to what would normally be seen as inhibitive legislation: rather than a problem, legislation becomes a design generator.

Although not always concerned with health and safety legislation, this approach stops regulations being abstracted and instead means that students explore the basic premise of the legislation and why it came into existence. With this knowledge base, students then apply the legislation in a rigorous way to create their design proposals.

Compliant Architecture offers a solution to dealing with legislation that satisfies those who think that students should have knowledge of legislation and be aware of how to respond to it, yet it also provides an academically rigorous design exercise, that offers students an opportunity to creatively respond to a design brief.

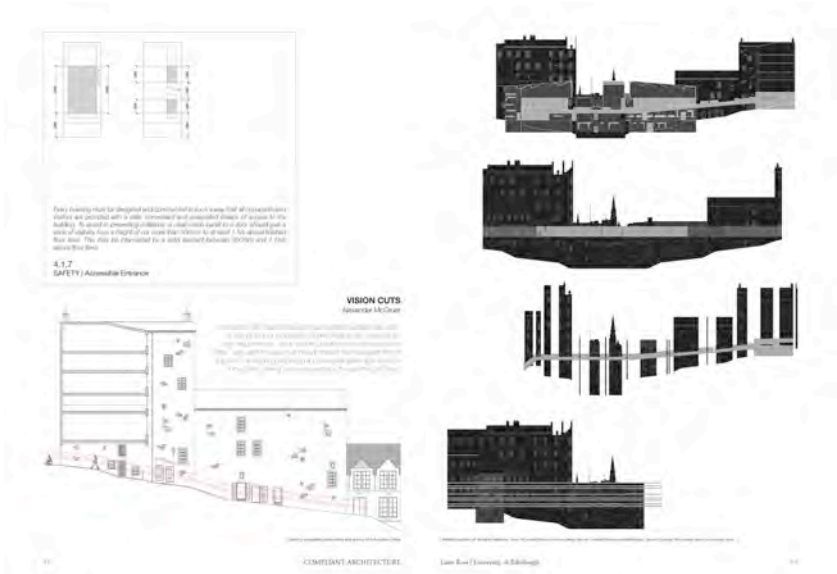

Fig. 18 - Example of student project for 'Compliant Architecture' [Image: Alexander McGruer]

It was postulated that the project revealed the 'poetry and localism' in building regulations, as building code is often developed through specific events and tragedies that occur in certain

building types and in specific localities. In addition, the project created inherently dealt with social thinking as well as health and safety thinking. By using regulations playfully, a different type of understanding of health and safety was developed amongst students.

Compliant Architecture addresses an issue of tension between regulatory bodies and regulations offered. The resolution of such conflicts is a practical concern, but one that can be creatively dealt with. Exploring and resolving such conflicts in regulations is a valued skill in practice.

Integrating health and safety thinking into student design projects - buildability, maintainability and usability
James Ritchie, Head of Corporate Affairs at The Association for Project safety and part time teacher at Newcastle University

A wealth of knowledge in the teaching and application of health and safety knowledge in practice was crystallised into a mantra for students to use when designing architectural projects: buildability, maintainability and usability. The three words emphasise that in order for students to understand issues pertaining to health and safety, they need to focus on how their building could be built, maintained and used and how the design affects people that undertake the related tasks. "A good design considers how it will be built, maintained and used". It was also proposed that part 1 students don't need to know regulations, but they do need to consider BMU. An emphasis was placed on keeping teaching simple for part 1 students to incorporate the subject into their designs. A balance of creativity and buildability is required to make a successful design and that both need to go hand in hand. This approach was considered integral for Schools of Architecture to produce people who become 'competent' architects. Critical reflection of designs and buildings in terms of buildability, maintainability and usability through student project reviews was suggested as the best way to evaluate student's learning progress.

The balance of practical and theoretical elements of an architectural education was considered, with an emphasis placed on the value of practical experience and the importance of student's 'getting their hands' on materials. It was suggested that there was no substitute for working on a construction site, in terms of gaining experience about health and safety in action. However, it was recognised that opportunities to gain this type of training were not usually possible.

The interface between universities and architectural practice was highlighted, and questioned whether practices were offering appropriate experience, to support and work in partnership with universities. It was posited that some universities thought that health and safety was dealt with in practice/year out, which was not necessarily true.

A site analysis exercise was introduced as a case study for students to understand health and safety issues in practical terms. The task involves students being given a proposal for a building to be constructed on a given site and for it to be analysed in health and safety terms.

Review of Symposium Discussion

Ensuring the future of construction site visits for students

Delegates discussed the issues associated with site visits for students, reflecting on how to improve opportunities and access. It was agreed that numbers of students was a potential barrier. 3-5 students is easy to manage, but 100+ is very difficult on any construction site. Contractors are well organised to take smaller groups on site, so reducing numbers would be the best way to achieve site visits. It was suggested that involving contractors in a real partnership could have a number of benefits, one of which would be a greater likelihood of accommodating a year group of students. Historically, there was an exchange between architecture practices and universities, with students gaining site experience in turn for work time in an architecture office.

It was posited that large numbers of students on site could limit the amount that they could see and that students may not be given experience of the range of activities on site. Large numbers also provided challenges in terms of providing PPE for all students. Site boots were particularly difficult to access.

It was questioned whether construction site inductions would need to take place for student visitors. This issue may depend on whether students are classed as visitors of workers. Even for 'experienced' visitors it is a big ask for contractors to support a number of visits.

It was suggested that university estates departments could play a part in supporting their schools of architecture by arranging site visits to building projects on campus. An additional proposal was made that a specific clause could be included into universities building contracts to benefit architecture students, by agreeing site visits or providing experience.

The value of construction site visits in large groups was raised, suggesting that activities on site could be limited due to size of group. However, it was recommended that very little activity needed to be seen on site to contextualise student work. It was however agreed that construction site visits, where possible, should be a core part of architectural education for all students? It was mentioned that in Germany you have to undertake 2 months working on a site. It is not necessary for all architecture students, but fundamental if they want to become an architect.

Fig. 19 - Healthy Design Creative Safety Symposium [Photo: Leo Care]

University links with practice and industry

The relationship between schools of architecture and architecture practices was debated. It was questioned whether architecture practices understood their responsibility in the education of architecture students. This stemmed from a view that practices see students as providing a service to them rather than appreciating the quality of experience that they provide to students. This perhaps comes from a commonly held perception in the construction industry that architecture education is training for practice; whereas universities see it is a holistic educational experience. It was remarked that there is significant variation in 'technical' education provided by universities. At the University of Edinburgh there is a more integrated practice experience which is integrated into academic work undertaken concurrently. This is in contrast to English Schools of Architecture, where practice experience is undertaken away from the university. It was questioned whether the profession could look to be more inclusive, in design and construction processes, enabling universities and students to be more involved.

Reflection on ways of learning about health and safety in architectural education

It was widely agreed that there is room for different ways of learning and working with health and safety issues. In early projects in an architecture degree, project parameters are kept very simple, to avoid overcomplicating the subject. Over the degree course, bit by bit, experience of health and safety should be built up, but it shouldn't be expected that all the information sinks in. It was stated that becoming an architect is a slow process. Overburdening students too early can be counter-productive. Perhaps post-graduate [diploma] level is the best place to introduce more specific issues of health and safety.

The perception of health and safety was considered a problem and it was recognised that the use of the term 'health and safety' turns people off [whether in academia or practice]. It was mentioned that people lose confidence and overreact when the term is used, but that health and safety should really be about common sense. One reason for having a problem with health and safety in this country is that it is talked about it in an abstract way. Health and safety is taken seriously because the last thing we want to do is harm somebody. It is one of the balancing factors, one of the essential ingredients in any [architecture] project.

It was broadly recognised by the delegation that the projects presented at the symposium offered a range of different creative ways to integrating the subject within education. It was suggested that 'the act of making' is a more effective way of learning than theory. The act of making brings out different skill sets and other students come to the fore.

There was consensus at the symposium that Live Projects are a good mechanism for learning about health and safety. Live Projects offer incremental learning that is often intuitive rather than overt: This is appealing to students. It was also recognised that there are there other ways of equipping students with knowledge of health and safety issues, including: drawing out construction sequences and disassembly of buildings as part of design projects and addressing health and safety in a life and death way through anecdotes and case studies.

Addressing health and safety legislation creatively

In the 1990's, representatives from the HSE visited designers regarding health and safety, expecting to see creative responses to legislation. However, it was clear that architects did not see health and safety as an area for innovation. It was stated that 'regulation tells us about issues but those issues can be dealt with in creative ways'. However, people rarely take this approach. It was suggested that this may reflect peoples' view of health and safety and seeing it as a barrier to creativity. It was noted that in actual fact engaging health and safety professionals may help increase potential of what can be achieved, rather than constraining it.

When working in developing countries, health and safety legislation is often non-existent; therefore if you are practicing there, judgement is important. Working in developing countries forces you as an architect to think for yourself about health and safety without having to conform to regulations. This situation brings home the importance of health and safety as a fundamental subject.

Fig. 20 - Presentation and discussion at the Healthy Design, Creative Safety Symposium [Photo: Leo Care]

Feedback
Delegates were invited to provide feedback on the symposium; giving an insight into what they had learnt and to what extent they valued the event. The following quotes represent the views of delegates.

What is one important thing you feel you've learnt from the symposium?

"That health and safety education of architecture students is alive and well in many institutions"

"The importance of live projects and being able to look at regulations as inspirational pedagogical tools."

"B.U.M. [buildability, usability and maintainability] could be used as a substitute for CDM"

"That health and safety is being address by some schools of architecture"

"The importance of site/live activity"

"That some schools of architecture at least are trying to get to grips with health and safety."

"The need for the architectural profession to improve its knowledge and understanding of safe design for its current students"

"Health and safety is an integral part of teaching live projects and it is rather common sense than regulations"

"The fact that others encounter similar problems of exposing students to health and safety issues"

"That the HSE have not imposed too much legislation – just enough – rather it is society's risk averse approach that is more of an issue"

"That health and safety education of architecture students is alive and well in many institutions"

"That there is a lot of good work going on. It needs to be shared and disseminated"

"The different approaches to Live Projects and how health and safety is perceived"

What action do you think should be taken to improve the learning of health and safety in schools of Architecture?

"Creative, empirical, practical activities: more Live Projects, site visits, student competitions"

"Make it more fun"

"Lay down the process needed to make Live Projects happen. health and safety aspects"

"I think the deliberate avoidance of seeing health and safety as a regulated imposition until later stage training is a very valuable concept – concentrate instead on buildability, maintainability and usability."

"Improve knowledge and understanding of maintainability and usability of buildings in the design process"

"Offer site visits, voluntary basis or elective to specialise a skill and a way of practicing architecture"

"Perhaps more specific guidance from the RIBA"

"As a principal contractor, the aspects of maintainability and usability are becoming increasing concerns to the designs received in reality... An understanding of integrating this into the teaching and learning is key."

"Include reflective pieces of study on design projects. Embed health and safety within social and political context where Live Projects are not possible"

"Better links with practice and industry"

"Encourage explicit use of the BMU concepts during Live Projects. Reflective Reports on previous projects"

"Allow a degree of risk control by undergraduates"

"Active discussion and sharing between schools and building stronger relationships with the construction industry to mutual benefit"

Health and safety good practice teaching case studies

One of the initial aims of this research was to gather case studies of contemporary good practice teaching and learning of health and safety. This has proved challenging to achieve. Many of the projects discussed at the symposium [page 29] and presented in the associated papers [Appendix E] are worthy of being formulated into case studies, but academics involved were not confident that their projects should be held up as health and safety exemplars without further development.

The Matter-reality project developed in the 1st year undergraduate school at the University of Sheffield has been written-up as a case study to show the potential for such a format to form part of an educational resource. Sample risk assessments, method statements and construction sequence drawings have been added to the case study to give a sample of the work that students have prepared in relation to the project in addressing health and safety, practically and creatively. The documents associated with the case study are prepared by students to evaluate live risks for themselves and the public that they and their designs come into contact with. Far from being a tick box exercise, students use the documents to guide their actions and shape their design.

It is hoped that this case study will form a prototype for a proposed online resource hosted by the RIBA. Please see Appendix B for the full case study.

Views of students

It has been an aim of this project to capture, where possible, the views of students in relation to health and safety teaching. Whilst this has been possible at the University of Sheffield, it has proved an elusive goal gaining thoughts of students from other institutions. This has been in part because teaching staff have not sought to capture such information during the delivery of their projects, but also that students are not often overtly dealing with the subject, so their awareness of it as a specific topic is limited. This is indicative of the status of the subject within schools of

architecture. The following quotes highlight how students value the opportunity to apply their theoretical knowledge in practice and how health and safety can be embraced when part of a real design and build project.

"Understanding the qualities and potential flaws in materials [is important]. When you handle a material, you get closer to thinking how to build with it." [1st Year student at University of Sheffield]

"I feel that the projects have really helped me to not only understand the properties of the material but also the different forms possible and different ways to create them, high budget or low. P5 [Matter-Reality] especially was helpful as we could interact with the material personally." [1st Year student at University of Sheffield]

"It was a busy day for a Health and Safety... there were so many hazards that I had to combat. As we know, a casual attitude towards safety = CASUALTY.... Here's a list of issues that I cracked down on:

1. *Keeping the street tidy to prevent public and workers tripping because as we know, safety stalls when you slip and fall.*
2. *Promoting good form whilst lifting*
3. *Having regular breaks from lifting*
4. *We glued the top course of bricks onto the second (held by the steel rods) to stop accidental falling, potentially extremely dangerous for young children.*
5. *Maintained a 2 person vigil at all times*
6. *All walls were secured by steel rods*
7. *Making sure all involved were concentrating and wearing gloves*
8. *Allowing enough space between sections to allow public to easily navigate through*

[1st Year student at University of Sheffield]

"I really liked that even with a 'final design', the ticket booth was constantly morphing and we were constantly questioning it; the construction was definitely a learning curve! The team was great- we all pulled together really successfully, and I enjoyed being involved throughout the whole process." [1st Year Student from Oxford Brookes, University]

Review of resources to support teaching

Throughout the course of this research a number of resources/initiatives and educational materials have been reviewed to establish the benefits they may offer to schools of architecture. The following represent a sample of resources and do not represent the extent of information available. Some examples are not necessarily aimed at architecture students but offer potential for conversion or adaptation for schools of architecture.

Safeguarding People Achieving Design Excellence Videos

The videos are a useful teaching tool for undergraduate students. They are an appropriate length, well edited and direct with easy to understand messages. The programmes convey an important message that health and safety is central to an innovative design solution, rather than hampering it.

Case studies and examples often focused on large-scale buildings or those with repeatable structures. This type of building may only be developed in 3rd year of a degree programme and therefore students will not have the experience and understanding of the importance of the specific issues dealt with in the films. CDM and health and safety issues are often developed at the detail design stage of a real construction project. However, this level of detail is not usually reached by undergraduate students until their final degree project. It is difficult to give precedence

or integrate health and safety when the design decisions made regarding health and safety are not made at the simple conceptual stages that student projects often involve.

There is a focus on the safety of construction and maintenance workers and users of the space, which is fundamental for students to understand. However, dealing with on-site issues is perhaps more useful for students who have worked in practice or who are currently working in practice.

Phasing and coordination of work [in relation to refurbishment work particularly] is very useful. However, this is difficult to simulate in studio design project without undertaking a build project as well, to understand how design intent is converted to construction activity.

Constructionarium [www.constructionarium.co.uk]
Designed for engineering students, the Constructionarium was developed in direct response to a lack of practical application of learning.

"Astonishingly, at the end of the second year over half of the undergraduates who can invert matrices, analyse beam stresses and even plot Mohr's circle cannot draw the basic components of a suspension bridge or a water supply system or a building or the different types of foundations and where they might be used." [www.constructionarium.co.uk]

The course is aimed not just at degree level, but at FE and other vocational qualifications. The Constructionarium is based around a week long workshop involving students and construction specialists. Students work on the design of 'scaled-down' structures including bridges, buildings and other large construction projects. Students are assessed at the end of the project,

"Students are assessed on the final day in terms of budgetary control, methodology and timely completion." [www.constructionarium.co.uk]

Constructionarium takes place at the National Construction College, a six hectare site where there are a number of works zones incorporating a river, flatland, mountainous area etc. The projects undertaken by students allow them to develop site skills and practically apply their knowledge. The Constructionarium offers as close as possible to real design and construction situation, using real construction materials.

The opportunity of taking a project from design to construction and realisation, working with industrial partners offers a rich learning experience for all. In a way this project is the engineering alternative to architecture Live Projects, but on an engineering scale. Locating the workshop in a controlled zone is obviously necessary for projects of this scope, however they are very much concerned with the practical application of designs to reality, but do not engage with the social aspects or dealing with real clients that architecture live projects offer. Issues of health and safety are explored through the process, but undertaking projects in a living-lab environment does not have the level of interaction that working in the public domain would.

Where Constructionarium clearly excels is in establishing collaborations with institutions and companies. In addition the feedback from students and teachers clearly shows how the experience is valued.

"It was a great exercise in people skills, as well as seeing the theory put into practice. Every student left happy more confident and friend for life." Mark Lomas [www.constructionarium.co.uk]

"We have found that the Constructionarium positively influences students towards careers in engineering and is seen as an exemplar of best practice for other departments in the Engineering Faculty." Professor David Nethercot, Imperial College [www.constructionarium.co.uk]

Summary of Findings

The following represents a summary of findings in response to the issues set out in the initial research questions [page 1]

Direct and indirect ways of teaching health and safety

Direct forms of teaching health and safety are still principally addressed through lectures. Health and safety teaching in this way is usually delivered as part of construction and materials or technology subjects at degree level, addressing the following:

- The concept of health and safety
- The need for the legislation
- Construction industry deaths and construction site safety
- CDM regulations
- Building failures and implications

Direct forms of teaching are rarer in the design studio, where there were few examples of health and safety being integrated into traditional theoretical student design projects. However there was a willingness from teachers to address health and safety issues on an individual basis with students where issues arose. Talking about health and safety in the review of design projects was not seen as an appropriate thing to do, unless there was a glaring design floor to be pursued, but it was felt that students would be unable to deal with such a strong framework of legislation at undergraduate level. The most commonly employed tactic was to ask students to reflect on their designs from a health and safety perspective, outputs from this could take the form of a written report or exploration of the construction sequence, maintenance and use of the building through drawings and diagrams. This was seen as an effective way to instil health and safety thinking.

It was apparent throughout the interviews with academics that indirect and implicit teaching of health and safety was being delivered more often than first thought. Personal health and safety was implicit within design studio and model making workshop inductions. Making large scale and 1:1 models is a relatively common activity in schools of architecture, and within the process of tutoring these activities issues of health and safety were constantly being addressed. It is therefore only a small step forward to add a reflective piece of work at the end of such an activity and/or undertake more overt planning of health and safety with students before such activities takes place.

Different forms of learning and teaching approaches

Whilst existing forms of learning and teaching approaches are delivered in the lecture theatre, seminar room and design studio, as mentioned previously, one emerging new approach to teaching health and safety is through Live Project programmes. Some schools of architecture undertake established Live Project programmes that have been in operation for a number of years, whereas other institutions are just beginning to develop programmes.

Meeting and surpassing RIBA criteria

Through the interviews with academics it became clear that Live Projects were seen as a way of surpassing RIBA criteria in terms of health and safety along with other subject areas. Live Projects at their best distil the whole architectural process into a format that students can engage with through a supportive academic framework. Because the scope and parameters vary, Live Projects can be defined to suit students at every level of architectural education. Health and safety is a fundamental part of Live Projects, whether the end result is a construction or design proposals. What makes health and safety accessible in such projects is that it can be immediately contextualised and applied. Students quickly learn that their actions affect others.

Context and nature of the learning

Effective learning approaches discussed through this research project have sought to link learning inside the university to activities that take place in the wider world. Getting this balance right is crucial in order that students understand health and safety as a subject that has academic and practical elements, but that it is also a discipline that can be questioned and creatively interpreted.

The nature of contemporary learning opportunities tend to focus on blended learning approaches and exploring subjects through a range of teaching techniques. Traditionally health and safety teaching has been limited to one-way teaching in the lecture theatre, however this is beginning to change. It is perhaps fair to say that no school of architecture has managed to integrate health and safety strands across lecture courses, seminars studio and live project learning, but linking together different approaches from a range of institutions, this begins to be a possibility. However, this may just become too complex an approach to realise and for students to fully understand.

Evaluating the effectiveness of the teaching and learning
Evaluating the effectiveness of health and safety teaching has proved to be challenging, particularly with the qualitative nature of the data collected within this project. Feedback from students received at the end of each year of study does not tend to provide this level of detail with regard to specific topics within courses of study.

In the limited number of cases that specific feedback has been garnered from students on specific teaching programmes, the indications are that Live Projects offer the most diverse and rich learning opportunities. Academics interviewed are also aware of the importance that Live Projects play in creating a varied and stimulating learning experience. At the University of Sheffield many part 2 students come to the university to study to be part of the Live Projects programme. From the Sheffield experience, external examiners and RIBA/ARB visiting boards tend to offer a good indication of the effectiveness of learning approaches. Comments for the Matter-reality project in 1st year have been well-received.

Fig. 21 - Students getting across health and safety messages and communicating them with their peers [Photos courtesy of 1st year architecture students at the University of Sheffield]

Aims and objectives of the teaching in terms of practical and theoretical application
Aims and objectives from interviewees and symposium delegates can be summarised as the following.

Architecture students should:

- gain an understanding and awareness of their duty of care to others
- have an awareness that as an architect you actions affect people involved in the design, construction and use of buildings
- have knowledge of the framework of legislation that surrounds issues of health and safety
- understand that the construction industry is one of the most dangerous industries in the UK and abroad
- comprehend that health and safety legislation is not designed as a restrictive framework, but one that allows for creative responses to achieving its recommendations
- understand how health and safety thinking should underpin their work

- recognise the health and safety implications of their designs
- experience live construction sites and be able to understand the broad health and safety issues that are apparent there
- gain first-hand experience of basic construction techniques to enable an understanding of how materials and construction are integrated with health and safety

Areas of health and safety teaching that are included or omitted
There were no significant omissions identified from the list of key topics presented earlier in this report [page 5]. However, it was more difficult to understand to what level of detail each area was addressed. **Personal health and safety** for students in their own studio environments was well documented. **Risk assessments** were widely used and students were asked to contribute or prepare these in a number of situations. **CDM** regulations were generally covered in 3rd year for students preparing for their forthcoming work in practice [4th year]. **Health and safety in construction** was widely introduced in 1st year lecture courses, usually based around types of construction and materials. **Building defects, failures and construction accidents** was addressed more sporadically through lecture/seminar case studies. **Construction sequences and building maintenance** were sometimes addressed as part of design projects, but only in a handful of cases. **Risk management** is perhaps a more difficult topic to deal with as it relies more on judgement and experience. This was one area where Live Projects were particularly effective, students being given the opportunity to manage risk in practical design and construction terms.

How are schools of architecture working with architecture bodies and the wider construction industry to positively influence health and safety teaching?
Whilst there are examples of collaboration and partnerships between schools of architecture, architectural practices and construction industry members, this is still sporadic in nature. This is reflected in the problems that schools of architecture have when trying to work outside the academy, in terms of arranging and delivering site visits. It is also representative of the fact that schools of architecture and architectural practice although engaged on the same course of education have minimal contact, which results in lessons that students learn being lost and continuity of education being broken.

Fig. 22 - Student construction project for a mobile home, Studio 3 ASD [Photo: Sandra Denicke Polcher]

Summary

The research undertaken throughout this project has indicated that there are a range of innovative approaches to teaching health and safety at schools of architecture around the country. What has also become evident is that these initiatives are not part of a degree-wide strategic approach to the subject. Inconsistency in teaching approach and lack of continuity between years was often mentioned. There also exists a potential to link undergraduate and postgraduate programmes, helping to ensure that there is a holistic approach to delivering the subject of health and safety.

Proposals and recommendations

Recommendations for teachers to integrate health and safety thinking into teaching

The first series of recommendations have been formulated for teachers and academics, in the hope that they can be used as food for thought or introduced to teaching practice. The proposals have been formulated from examples of good practice through interviews and the symposium. Some proposals are being employed at schools of architecture around the UK, whilst others are suggestions for new initiatives.

The following proposals are organised into the different learning contexts that form key parts of an architectural education.

Design Studio Projects

Student design reflection
Rather than asking students to design with health and safety issues in mind, particularly in the early stages of undergraduate education, consider asking students to reflect on a previously assessed/completed design project within an health and safety and CDM context. This approach enables students to look dispassionately and analytically at their approach to health and safety and look to improve a design from a health and safety perspective. Students can then be asked to re-design or consider how the project could be altered with health and safety in mind.

Wider design considerations
Students should place their design projects in a framework of Buildability, Maintainability and Usability, to understand the impact of their work on others and over the building's lifetime. This approach is best undertaken in 3rd year of a degree programme, as less experienced students may find dealing with this level of integrated design difficult.

Design project brief
If introducing specific legislation such as health and safety, encourage regulations to be used as a starting point for creative design responses. This may take the form of choosing one specific regulation and exploring its history, development and implications. Once a base of knowledge has been developed, explore creative interpretations and responses to the regulation and how this can provide a design generating device. The benefit of such an approach is that students begin to perceive legislation as a creative rather than a restrictive framework to work in. This is most appropriate for 3rd year degree students, as it is a potentially complex design methodology.

Construction sequence
Encourage students to draw a construction sequence for their building design. This can actively engage students in issues of CDM and health and safety, requiring an integrated design response/ solution. For 1st and 2nd year students, this exercise may be more focused on material and construction technique selection, whereas more experienced students could explore construction sequences from a management perspective.

Design project reviews
Enable a construction or health and safety specialist to engage with the design process at the interim review stage of a project. This approach would enable students to gain an understanding of how their hypothetical design would be viewed from a health and safety perspective if delivered in reality. It may be that the specialist does not refer to health and safety directly, which would show students that health and safety as a practical discipline was not concerned with restricting creativity. Such an approach may overload students in early stages of their education or simply put them off if not managed well.

Group analysis
In architectural practice, design teams are collectively engaged in designing out health and safety issues through a creative design review process. Applying this approach to longer student projects would enable a collective responsibility and encourage students to develop their critical skills of their peer's work. The aim of this exercise is to teach students that dealing with legislation can be a collective responsibility and a creative process in its own right.

Lectures

Architectural practice modules
For early year degree students, highlight the responsibility of architects, rather than focus on legislation. The aim at this stage of architecture students' education is to engender a sense of professional responsibility, without burdening students with information that they cannot contextualise or apply.

Provide an overview of health and safety principles rather than specific pieces of legislation for degree students in years 1 and 2. This approach enables students to understand the reasons for having legislation in place and how it influences architectural design, without them needing to be concerned about how to address specific legislation. It may be appropriate to go into more detail at 3rd year level.

Contextualise health and safety examples by relating to on-going and completed studio projects. Whilst this may take a substantial amount of preparation and coordination of teaching activities, it enables case studies or legislation to be contextualised by students who may have no experience of architectural practice.

Guest speaker involvement
Organise a panel of speakers from related construction disciplines to discuss their experience of health and safety issues in practice. It has proven successful in showing the roles and responsibilities in regard to health and safety in construction projects. It is particularly useful for students to understand how health and safety and CDM regulations meet design and construction reality. It is useful to record or video such a session, as it can be used at a later date if organisation becomes difficult in the future.

Guest speaker briefing
Clearly brief speakers in advance of giving their presentations, so that they understand the level that students are working at and where possible link examples back to the students' on-going design projects. This approach offers a more joined-up delivery of subject and greater clarity of learning outcomes.

Seminars

Bringing the construction team together
Where possible, gathering a team who are currently working together or who have recently worked on a successful project would be beneficial to discuss the project in terms of regulations. Although this could be difficult to organise, it enables students to gain an understanding of the teamwork required in dealing with construction and related CDM/health and safety issues.

Construction role play
Setting up a role play exercise where students play the parts of different members of the design/construction team in reviewing an architectural design is another way of encouraging students to consider how their design actions impact on others. Students would need to research their role in advance, understanding their character's responsibilities with regard to health and safety issues. This proposal enables students to understand different viewpoints and approaches to health and safety thinking.

Disasters analysis and accident causation
A commonly used but effective way of addressing health and safety is through analysing the impact of building failure and disasters on architectural design and construction. Rather than offering such case studies, students could be given an example to research and to try and represent the issues through drawn analysis rather than written analysis. The aim of this exercise is to understand causes of building failure and their social, political and architectural implications.

Health and safety abroad
Investigate how different countries approach health and safety in design and construction. For example, students could research and analyse UK, Australian, Chinese and Greek approaches to recent Olympic construction programmes. Understanding different countries' approaches health and safety could reveal differences and commonalities, along with statistical data of fatalities, and any impact on design development.

Site visits

Organisation of active construction site visits
Reduce group sizes to around 10 students where possible, as they can be easily accommodated by most building contractors. Enabling students to experience site conditions in smaller groups allows them to see more than in a larger group. This is difficult to organise for large volume of trips and organisation for a whole year group.

Use connections with university/institution estates department to access construction sites and make connections with contractors. Estates departments could help facilitate site visits, bringing together academic and professional aspects of architectural education. A collaboration with another university department may not always be possible, but it is worth finding out what projects are being undertaken by your institution and what the possibilities are for further involvement.

Ask students to prepare a risk assessment in advance of their visit to site. This can be checked before the visit to ensure a range of issues are understood. Site agents may also be interested in comparing student assessments to those undertaken by the contractors. Such assessments can also be reviewed and amended after the visit, to see if there were any additional or unforeseen issues. This process enables students to understand the risks that are associated with construction sites.

Alternative to construction site visits
Consider visits to construction material processing/fabrication businesses as a more easily accessible alternative to construction sites. Where possible this can be developed in combination with a visit to the completed building that integrates the same materials/building elements. Through this process students can understand how construction materials and elements are created and the implications of these processes. Organisation for such visits is extensive, but manufacturers are often keen to give tours of works and premises for potential future specifiers.

Construction workshops
Create opportunities for students to undertake construction at first hand. Understand the nature of construction work and the integral nature of associated health and safety. Where possible, construction experience should be related to other learning opportunities or have a design element to it. This exercise may need to be undertaken externally or with a partner organisation such as a further education college. In this case, consider students from both institutions working together to share design and construction skills in a joint project.

Live Projects

Working with real clients
Facilitate students engaging with real clients on design projects, within a supportive learning context. This simple approach supports students in understanding the duty of care that architects

have to clients and helps to ensure that clients are informed about the design process. This type of activity may require additional institutional and departmental support and may require higher levels of tutoring/mentoring as well as additional organisation.

Working with the public/community
Facilitate students engaging with the public on design projects, within a supportive learning context. Dealing with communities or client groups with multiple stakeholders can be an incredibly rewarding experience for students. It also engenders a sense of responsibility among students.

Working with professionals
Facilitate real design projects that can be constructed, within a supportive learning context and engaging other construction professionals. Working in a real context and dealing with fundamental issues of design responsibility with other construction professionals helps to empower and build capacity of students.

Recommendations to help support the integration of health and safety in education

Health and Safety Executive [HSE]
Support schools of architecture in their desire to undertake Live Projects. This should include providing information for students on understanding risks to themselves and those around them when designing and building small structures, as well as support at a departmental level for staff that are organising and delivering such projects.

Support construction site experience for architecture students in partnership with construction industry members. The HSE could support an initiative to encourage contractors to support visits for architecture students.

Royal Institute of British Architects [RIBA]
Fostering a more interconnected and symbiotic link between practice and academia, to understand how specific learning issues such as health and safety are dealt with bilaterally.

Consider a mentoring scheme to be arranged for undergraduate students by architecture practices. This need not be onerous, but should instead enable students to take their ongoing design work to practitioners during their degree course, to receive guidance on how their designs may be realised in practice and the associated issues with regulatory frameworks.

Architecture practices
Be open to collaborating with schools of architecture. There are often many opportunities to support students in their learning in addition to the traditional channels of work placement opportunities after degree level. Where possible, practices should liaise with schools of architecture to develop stronger links with students during their degree programmes. This may take the form of mentoring, master classes and practice-based project reviews.

Construction companies
This research has highlighted the reduction in site visits and construction site experience for architecture students. Whilst construction companies are supportive of site visits where possible, it would be beneficial to extend this to a more formal partnership for students accessing construction sites and where possible mentoring schemes to be developed.

University authorities
Being based in a humanities research university can mean that there is a lack of understanding of design studio practices and the more applied side of an architectural education. Universities need to be aware of benefits of Live Projects and support schools of architecture in delivering them.

Support offered should include, clear guidance for students working in the public domain and undertaking construction projects.

University Safety Services
University safety teams can be risk averse and may find it easier to refuse permission for Live Projects than to support them. It is important to overcome this and work closely with schools of architecture to establish protocols and guidelines for safe project delivery.

University Estates Departments
Whilst University Estates Departments are professional wings of the university, they nevertheless are a key part of a learning and research institution. Greater links between schools of architecture and estates departments could be a rich vein of experience for students. Estates departments could help facilitate architecture student training by establishing clauses in building contracts and framework agreements to include site visits for students on university building projects. This would set the agenda on all projects and provide a steady stream of potential experience opportunities for students.

Schools of Architecture
Be aware of the recommendations for integrating the teaching of health and safety raised earlier in this report and develop teaching where necessary or appropriate.

There is a need to understand student's experience in practice in more detail and develop ways of using this experience to enhance learning of health and safety. When students return to university to study their Diploma/Masters [RIBA part 2] lessons learnt from practice and experience are often fed-back into the course at part 2 level. There is an opportunity to bring this experience to bear on students at degree level in an organised way.

Create a linked teaching strategy for health and safety teaching across the degree programme and beyond.

Recommendations for future initiatives

Creation of a video as an extension of the 'Safeguarding people achieving excellence' addressing the health and safety considerations involved with architecture Live Projects for students. This video would focus on small-scale projects in particular and how students undertaking building work should be organised and managed.

Produce a web-based openly accessible resource that schools of architecture can access for information on health and safety, including:

- Case studies for innovative and effective teaching initiatives that address health and safety
- Samples of risk assessments and guides for students to prepare such documentation
- Learning resources that can support the teaching of health and safety including links to other websites and information sources
- Links to useful organisations and initiatives

Top tips

The term 'health and safety' has been stigmatised and can often put people off from the beginning. Perhaps refer to the subject in alternative ways, including simply referring to the subject in terms of how a building is built, maintained and used.

Learning by doing - Knowledge of health and safety issues improves with an understanding of construction and materials and in particular students making, fabricating and building things

themselves. It is easier to understand the risks associated with laying bricks once you have tried to do it yourself.

Architecture practices are often keen to help and support student architects development. Take the opportunity to make connections and use their working knowledge of health and safety and CDM regulations to help approach the subject creatively. Many practices have innovative systems in place to handle health and safety issues.

The teaching of health and safety is often delivered as an integral component rather than a stand-alone subject. On reflection of their teaching approaches many academics realised that they did in fact teach and cover a range of health and safety issues but they were so well embedded in the wider teaching objectives, they were not overt.

Appendices

Appendix A - Sample risk assessments and construction sequence investigations
Appendix B - Case Study Example
Appendix C - Collated Questionnaire Responses
Appendix D - Symposium Programme and Attendees
Appendix E - Symposium Papers

References and bibliography

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[xvi] a teaching and learning project based at the Schools of Architecture at the Universities of Sheffield and De Montfort from 1996-2000 and supported by HEFCE through their Fund for the Development of Teaching and Learning (FDTL).
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Appendices

Appendix A - Sample risk assessments and construction sequence investigations
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Appendix A

Sample Risk Assessments

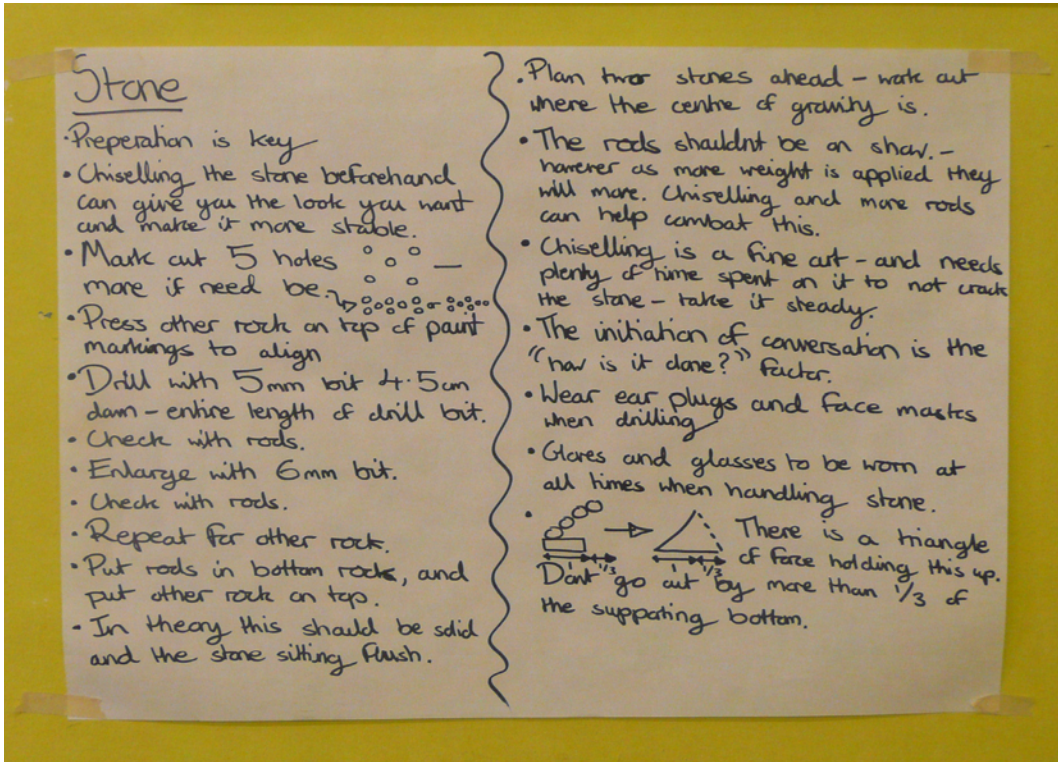
Risk Assessment Form

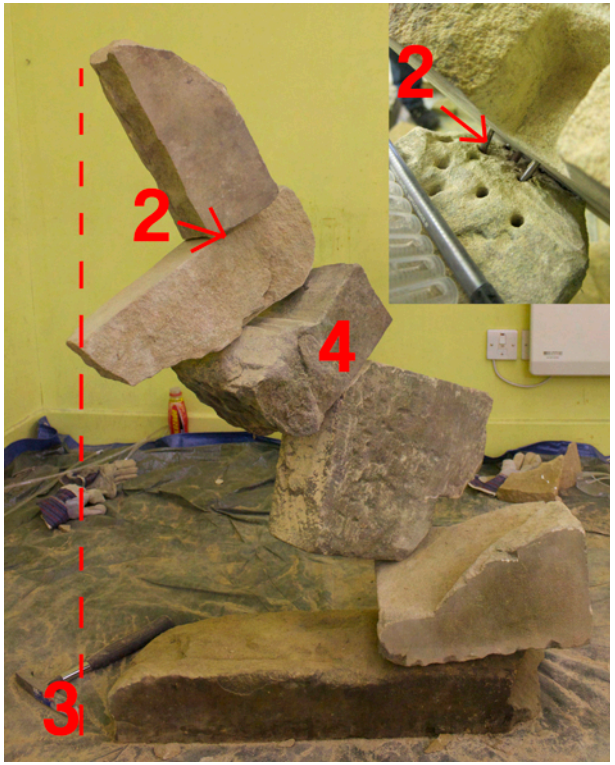
PERSONS AT RISK : (✓) Employees (✓) Contractors (✓) Public (✓) Visitors (✓) Others		Reference No: R2 2010	
Risk: (H) High (M) Medium (L) Low (O) No Risk.		Environment: Student study visits	
TASK or ACTIVITY: Visit to Fibreglass factory Stuart Pearse Ltd.	INITIAL RISK RATING		FINAL RISK RATING
SIGNIFICANT HAZARD	POTENTIAL C ONSEQUENCES OF HAZARD	EXISTING CONTROL/PROPOSED CONTROL MEASURES	
fumes emitted	suffocation	L	facials masks to be worn if necessary	L
flammability of material	burning accidents	M	fire exstinguishers, water tanks	M
dust particles in air	health problems	L	people must not eat and drink in workshop. Masks should be worn	L
dangerous machinery	injuries	M	they should be cleaned and maintained	M
loud noises	hearing problems	L	earplugs to be worn	L
tripping hazard	injuries	M	clean workshop should be mantained, railings	M
Comments:		Overall Risk:	M

Risk Assessment Form

PERSONS AT RISK : ( ) Employees ( ) Contractors ( ) Public ( ) Visitors ( ) Others			**Reference No:** P6 2012	
Risk: (H) High (M) Medium (L) Low (O) No Risk.			**Environment:** Student Exhibition	
TASK or ACTIVITY: Transportation & Display of P6: Metal structure on The Moor		**INITIAL RISK**		**FINAL RISK**
SIGNIFICANT HAZARD	**POTENTIAL CONSEQUENCES OF HAZARD**	**RATING**	**EXISTING CONTROL/PROPOSED CONTROL MEASURES**	**RATING**
Person to person collision during transporting	Injury to member of the team or member of the public	L	All members should be equipped with High Visibility jackets throughout the transportation of the structure, with a spotter heading the group	O
Sharp edges resulting from cutting with a hacksaw	Slicing or cuting of teams' hands, resulting in such complications as tetanus	H	All components of the structure will be filed down to minimise sharpness at edges. Members will be equipped with safety gloves	L
Significantly heavy load of the structure	If an insufficient number of the team attempt to lift the structure, back and shoulder injury may occur	M	The structure will be transported by no less than four members of the team as a minimum, plus the spotter	O
Prolonged exposion to varying weather conditions	May result in illness or fatigue in members of the team	L	Team members will be advised to dress appropiately for the day, however, common sense should be utilised	O
Tripping or stumbling in the shop unit	Injury to one's self or others close by	M	Shop unit should be thoroughly removed of objects which could cause potential hazards or become obstructive	L
Comments: Transporting of the structure will be best achieved if taken at a slow and steady pace so that every member can keep up with the movement of the structure			**Overall Risk:**	<L
Additional References, Tasks etc All members will have to rotate through out the date of 25th February 20011 between 1200 hours and 1500 hours				
Undertaken By: P6 2011 Metal Team: D4, E4 and 3 Architeers				

Construction Sequence Investigations





1. Transporting all our materials over to the Moor before construction and working in the shop unit, meaning we would be closer to our site and have less distance to carry the piece (hence reducing risk of back strain).

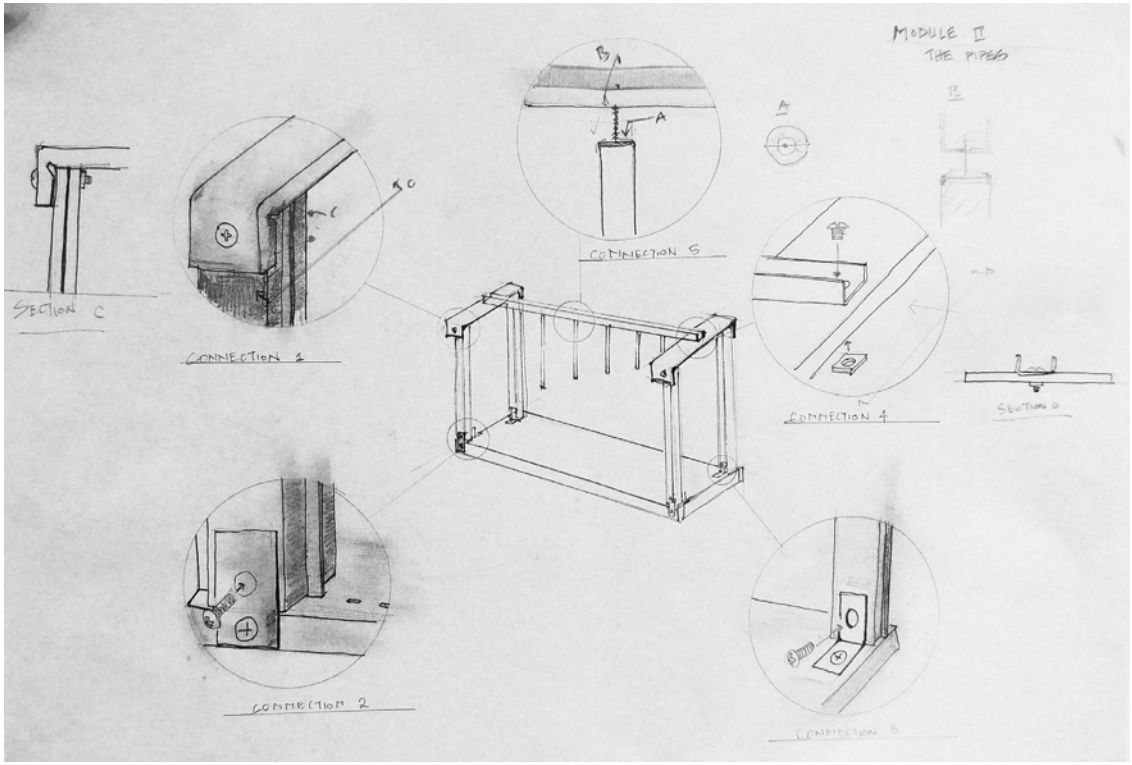
2.Ensuring the connections are strong between stone elements, by using metal rods instead of the original plan (stone connecting blocks… We tried this out and it failed- the stone was not strong enough and broke).

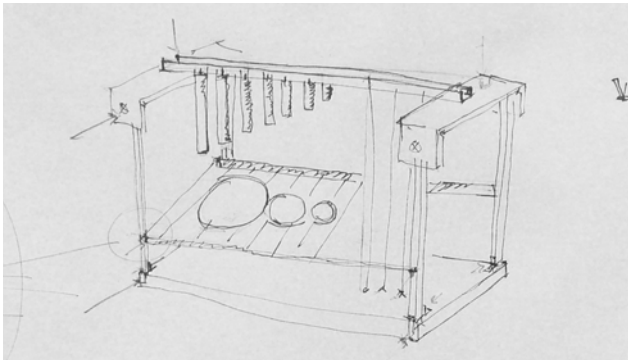
3. Using large stone slabs to form a strong base and create a triangle shape to balance the weight.

4. Arranging the rocks so that the larger, sturdier ones were at the base, and smaller ones on top, so it is less likely topple over.

5. Dropping our idea of having people write on stone slabs placed under the overhanging rock (which was meant to prove how daring our design is) for fear they may bang their heads or the structure may collapse!

Construction Sequence Investigations





Appendix B

Case Study Example

Matter-reality
University of Sheffield
1st Year Degree

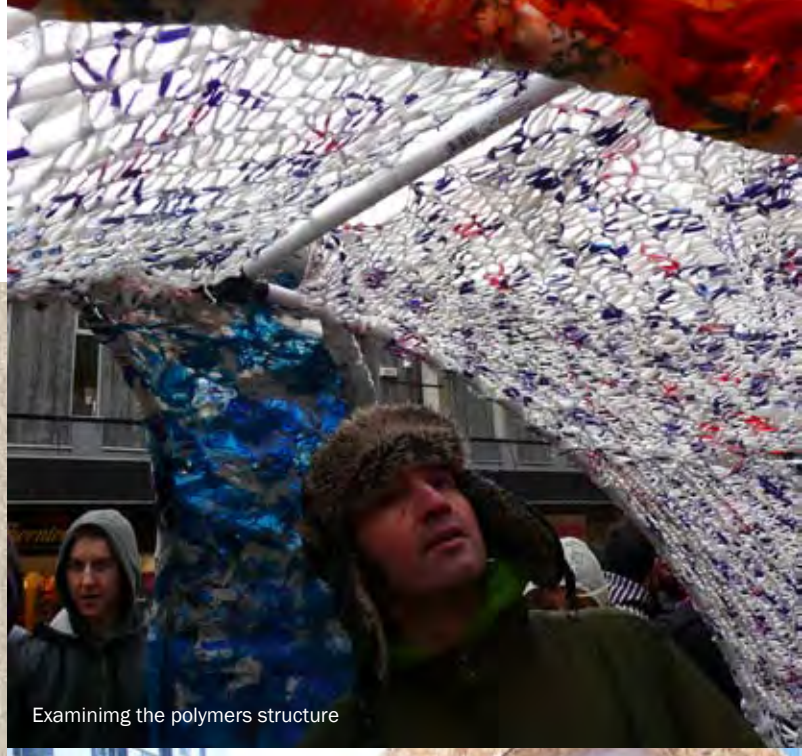
Description: Matter-reality is a 4 week project which provides groups of students with the opportunity to design, fabricate and build a structure from a single material. The structures are designed to be installed in the public domain for a day, creating 'places for conversation'. The installations aim to stimulate public interest and be interactive. Students are encouraged to take different roles within the design and construction team for the project. One of these key roles is the Health and Safety coordinator whose remit is to work with other team members to ensure the safety of themselves as designers, fabricators and contractors; and the public as viewers and users of the installations. Students are asked to create a several risk assessments, one for their own working practices and another for the risks to the general public.

Objectives: The aims of the project in terms of Health and Safety is for students to understand their obligation as designers in understanding the implications of their designs on other people within the construction industry, but also the reciprocal obligations of fabricators and contractors in safeguarding themselves. In addition, developing an understanding of how the use and habitation of buildings by the general public needs to be central to good design and designing safe environments.

Challenges: There are a range of challenges within the project;

- Organisation and co-ordination of 100 students in a project of this nature presents a series of challenges;
- Providing appropriate levels of Personal protection equipment and ensuring that students have appropriate tools and training to use the tools effectively and safely.
- Providing Public Liability Insurance and ensuring that institutional support is in place
- Organising partnerships with the local authority or land owners to arrange and agree the nature of the project and offer support.
- Ensuring that the student work is of an appropriate quality for public consumption

Educational benefits: The hands-on nature of the project is a fantastic opportunity for students to use inquiry-based learning or student-led learning. Whilst the project is set as a design challenge it embeds the learning of Health and safety at the centre of the design process without the students realising it.



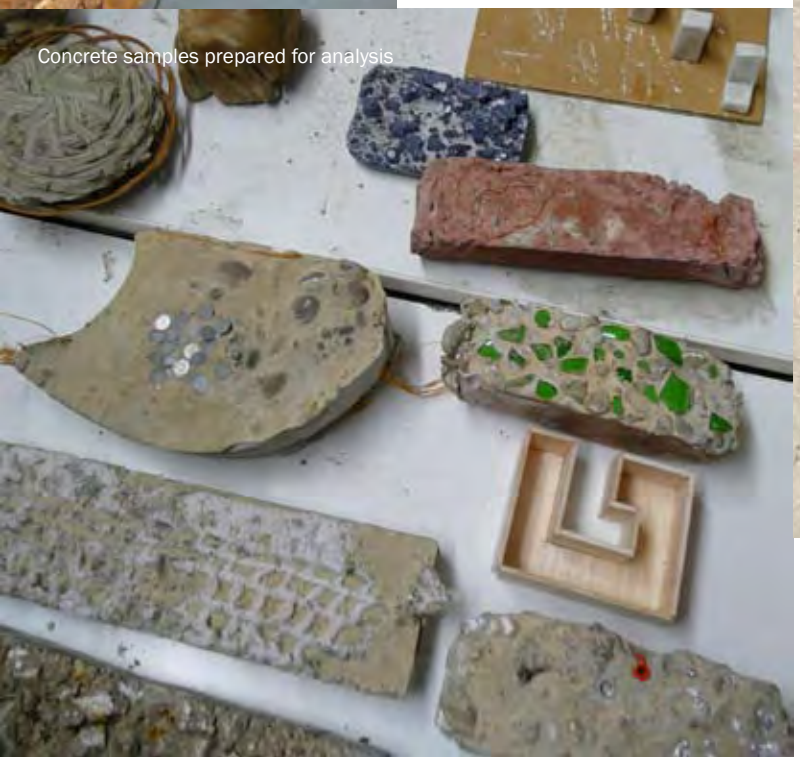
Examinimg the polymers structure

A timber structure made from rotated sqaure sections

Risk Asses

PERSONS AT RISK : ( ) Employees ( ) Contractors ( ) Public ( ) Visitors (x) Others	
Risk: (H) High (M) Medium (L) Low (O) No Risk.	
TASK or ACTIVITY: Working in the shop unit stacking bricks	
SIGNIFICANT HAZARD	POTENTIAL CONSEQUENCES OF HAZARD
Objects on the ground that may form a tripping hazard	Wounds, sprains and possible broken limbs
Lifting Heavy objects	Back injuries
Dropping Bricks	Crushed feet or possible broken bones
Chips/dust getting into eyes	Infections and eye trauma
Handling Brick	Lacerations/ scratching to hands and limbs
Constant washing of hands	Dry skin/dermatitis
Falling Stacks	Crushing/ possible broken bones
Comments:	
Care should be taken when working with other groups in the shop unit, keeping areas clear	

Intitial sketch model proposals



Concrete samples prepared for analysis

Coordinator reflection: The really great thing about the project is the way the students engaged with the implicit subject of Health and Safety in a really creative and fun way. One student blog, dedicated to health and safety, provided a range of puns and jokes interwoven with some practical analysis of health and safety issues. Posing as an HSE officer the student delivered such gems as '[preventable] hazard of the day' and attention grabbing slogans like 'casual attitude towards safety = CASUALTY'. This light hearted approach was balanced with a series of checkpoints and top tips, and not only provided good advice, but crucially engaged other students in the subject, keeping it fresh in their minds.
"The process of making materials, but also having to consider their sourcing and transportation to site was, I think, invaluable to the students. When they realised that they would never be able to
lift a solid block of concrete... they developed... an elegant solution, and one that would have been unlikely had they simply been asked to design a concrete bench." [First Year Design Tutor]

Student reflection: *"Understanding the qualities and potential flaws in materials [is important]. When you handle a material, you get closer to thinking how to build with it."*

"I feel that the projects have really helped me to not only understand the properties of the material but also the different forms possible and different ways to create them, high budget or low. P5 [Matter-Reality] especially was helpful as we could interact with the material personally."

"It was a busy day for a Health and Safety... there were so many hazards that I had to combat. As we know, a casual attitude towards safety = CASUALTY.... Here's a list of issues that I cracked down on:

1. *Keeping the street tidy to prevent public and workers tripping because as we know, safety stalls when you slip and fall.*
2. *Promoting good form whilst lifting*
3. *Having regular breaks from lifting*
5. *Maintained a 2 person vigil at all times*
6. *All walls were secured by steel rods*
7. *Making sure all involved were concentrating and wearing gloves*
8. *Allowing enough space between sections to allow public to easily navigate through"*

Appendix C

Collated Questionnaire Responses

Collated Questionnaire / Interview Responses

Details of sample
The sample was generated to represent a cross-section of higher-education institutions. Universities were selected for a wide geographical spread, a range of Russell-group and new university institutions and a diverse student intake, on sociological and academic attainment levels. The sample group constituted 8 universities:

Leeds Metropolitan University
Sheffield Hallam University
University of Edinburgh
Oxford Brookes University
London Metropolitan University
University of Portsmouth
Queens University Belfast
University of Newcastle

Limitations of sample
The schools of architecture in the sample represent regional variation, universities from Scotland and Northern Ireland included. It would have been beneficial to include a welsh School of Architecture, but a response was not offered.

Collated Questionnaire / Interview Responses

1 EXISTING TEACHING AND LEARNING PRACTISE RELATING TO HEALTH AND SAFETY

1a STUDIO-BASED ACTIVITIES

Off the cuff, I don't think we teach [H+S] at all and if so it comes up as an accident... in a tutorial or a review.

How do you cover something like this, when there is pressure from university to reduce contact time with students and when RIBA/ARB increasingly demand more stringent and in-depth criteria for validation. There are also the 'euro points'?, how do we balance these demands and try and include H+S teaching in a more detailed way, without sacrificing other areas.

From a pedagogic point of view... 3 kinds of students: 1-will ignore legislation and design what they want to. 2 – wants to be conscientious and will make their own designs boring because they are worried by H+S issues and do not have the skills to resolve design and H+S conflict. 3 – Don't really understand what we are talking about when mentioning H+S.

With 2.2 degree level students – we are just trying to encourage them to design things that are a bit more interesting and have a higher aspiration. Introducing H+S in a more in-depth manner may stop this. How do we strike a balance?

Cultural difference – architects engage, differently to architecture technologists. See architectural design as solving a set of technical issues by following rules and regulations.

Integrated into Y3 sem. 1 – Final project
4 credit H+S report creating during sem. 2 based on a sem. 1 design project. There is no teaching input on health and safety during the 1st sem. The report is a self-reflection/criticism of their own work and what might have been done different. Sketch studies help explore the issues relating to fire issues and CDM.

Mixture of studio and lecture based. Until new RIBA criteria come in, not officially assessed in design [although obviously integrated into design]
'ability to integrate knowledge of H&S' in 3rd year. Formal lecture module for this and expected to feed in to studio work

Also same for 2nd year – lecture-based module. In first year expectation that knowledge would feed into 1st year design work.

H&S – on case by case basis in design studio – know it or find out, according to their design approach. Find out as they need to with lectures running alongside.

There is specific member of staff addressing Professional studies – across the school. H&S is dealt with through this module largely at Post-graduate level

2 instances of H&S being dealt with at undergraduate level:
2nd year – Street Society [live project] 1st year degree and 1st year post grad – 1 week project. Communities send in proposals for a week. 12 groups running, a lot of projects come from Council.

Students mixed into pgt and ug groups. Handbook given to groups covering H&S and liabilities. PGT

students act as project leaders. Risk assessment and project management undertaken by them. 1st year students do not have specific training in this as they are led by pgt students. Pgt have choices of which projects to choose. Pgt told on day 1 about risk assessment – 1st years have to be cognisant. Risk assessment document submitted by day two. Projects vary from surveys - to sketch design - to building stuff in space. They complete form and address risks.
Building project in 3rd year. First real one in long time. Very short project, with engagement of students. Students undertake construction drawings and build things. Module leader uses this project as a vehicle to understand CDM and H&S.
Not certain what 2nd year do to address H&S at the moment.
[Happy to send risk assessment created by students in projects.]
Other ways students pick up on H&S... Students have to get pin numbers to access the building, sign off on h&S – in studio and agree their responsibility. Have to sign-off and agree H&S on study and field trips as well.
It is really about students being made aware of Health and safety issues. Inducted to workshops. How to behave responsibly with regard to health and safety of themselves and their fellow students is the beginning of a growing professional understanding.

Built a trailer/house/mobile home from recycled and found materials. The structure was built in the school workshop, where there is cover for health and safety. problem of using materials recycled in the school workshop – technicians suggested it was not appropriate to use on machines in workshop due to danger of hidden nails etc., so build using hand tools.
Studio took the trailer out and about. HoD asked about Health and Safety for a construction, but also in terms of road safety. We learnt that it is always best to ask and check about regulations and health and safety, but that things wouldn't necessarily be possible if you do.
Health and safety is often about using common sense, but the problem is that if you ask, then you won't get it done. So H&S is difficult and trailer project was a bit risky.
As a research project it was about home/domesticity [although no one actually lived in it].
Took the trailer to primary school and undertook a workshop with primary school children, including planting workshops.
No one had a problem with the construction or the structural integrity of the construction.
We had to have a CRB check for working with school. But no schools asked about the safety of the construction of the trailer house.
Students learnt about construction and being inventive, thinking about recycling.
As a tutor we have a certain responsibility, but the project would not have worked in the same way and the creativity and learning opportunities would have been different.
This year, the studio is undertaking a live project in Germany, commissioned to build an outdoor space with a temporary structure. The Idea of project was initiated by us. In terms of health and safety, we thought about the students constructing the structure, but in the end, there was a budget available, so a construction company were employed to do it. The council in Germany decided it need planning permission as neighbours suggested their could be problems with noise from the events that may take place there.
My studio encourages students to test their ideas with 1-1 models. A student last year created a structure made from sinks and scaffold tubes. Students often do work at home and then bring in to university. Another student created a structure with timber pallets. We encourage students to build 1-1 as test – as models. They wouldn't be Wouldn't structures that would be put in the public realm, but students need to be aware of the impact of their work and that the structures need to be secure. Health and safety issues are so difficult. We don't want to risk. Live projects – are now about client relations, but not that much buildings, in terms of providing service.

As a recently formed department there are students undertaking architecture degree programmes from both individual institutions and new students undertake a New joint course. The course is so

new that only years 1 and 2 are currently ongoing. The full course has therefore not been fully tested yet. The course does have ARB accreditation. Actual content has all been development, but modules are developed by year coordinators.
Third and fourth years structures are currently being developed. Started last year with first year of new course.
The new course is based on the other two courses as we never wanted to dismiss what we had before. Most important to establish research excellence. Also, developing research skills of staff. We hope in higher levels [Masters programme]
Skills and what students learn: the course has an abstract beginning – and then more of a deep knowledge of place is developed in second and third year.
The course also allows different paths. Students can do MA programme – 4 years [embedded 2 semester placement] still supported during course. Other option is BA degree – 3 years less credits – faster route. Both can apply for masters. Both routes give part 1. Third option – at end of 2nd year – 'Arch within creative and cultural environments'. Related to other sets of skills. Digital media. Etc. Part of ethos was to provide wider options.

H&S is addressed within the modules. 3rd year – bit more specific description.
1 and 2 years embedded within studio. – lectures feed into studio based modules which introduce specific tasks. Reflective learning – every Friday – studio crit/review. Staff present and reflect upon student work in following lecture.
Studio is very much about model-making. Students don't build anything at 1:1. A large number of models area made. Students have fieldtrip in 2nd year. 2 options – a European city and UK city. Focused activities.
Reflect on how architecture is built all the time – all architectural elements. Design proposals have to be realistic. 2nd semester – based on specific materials and students respond to materials.
3rd technology explores CDM, which is embedded in the design process. However, this is still undertaken informally.

For undergrad. I would point out issues and specific examples. If they haven't been exposed to practice. There again, perhaps not many of students in practice have had experience.

We have to see H&S as an integral part of the design process. It is important to encourage students to think about the implications of their design proposals on people and health and safety. Raising this and pointint out the issues would be – as a reality check. 'what would happen if someone walked on this roof…'

More positive side – using good examples – of projects and good practice architectural projects.. not just a drab well-functioning box.

Looking at live projects… in terms of what has been done. Student projects – films.
Not stifling things by over prescribing and cramping students approach.

Difficult for students at undergraduate level – as students don't tend to get to the stage of detail design – where issues of construction and H&S crop up.

One useful resource could be a series of slides – something interactive… where you present a series of scenarios for a class-base discussion. So even if you don't use building work as an example. Could be played as a game.

Construction industry card scheme… maybe speak to them about free scheme for students this year…

Thinking about basic issues – particularly with live projects. All groups should have a CDM person. Talk to live projects people about 1st projects.

No specific teaching
Sem. 2 – [not done this year due to space] joint project with structural engineers – tested to destruction – implicit H+S involved in this, but link is tenuous – not an issue that is reinforced through the project.

We are re-designing the construction and technology course at undergraduate – wouldn't spend time talking about H+S work specifically – because there is a danger that students become too limited by legislation at undergraduate level. I would rather that they thought of ideas – develop skills in designing and fluency in design skills to interpret legislation and develop innovative ways of interpreting legislation.

The necessity of awareness of these issues needs to come at an appropriate point in the education – students should be aware that it exists, but H+S is most usefully understood in specific terms, so yes aware that legislation exists, but responsibility exists.

If students are undertaking a project that other people [lay people/general public]are involved in then students need to be aware of the related H+S issues.

On a simple level – H + S as a responsibility at a direct level of working in the studio is essential. But in terms of building design, students have too much to deal with to deal with specific issues of cleaning windows, maintaining a roof etc.

It is not that we don't think that learning about H+S is important, it's just that at this point in their education students are not able to contextualise it and apply it. Best learning is direct experience rather than theoretical.

Design projects have briefs with real sites that exist. At an appropriate stage in the project we introduce ideas of accessibility and social cohesion. If a design project is something that no one will ever build H+S is not an imperative.

2 strands/approaches to teaching H&S. 1st strand -delivering knowledge base/skill base to do with subject. Can be delivered through lecture /seminar. 2nd strand – how can we engender a way of students thinking about H&S.

Used to have a bit of strand 1 – that we don't have now. In terms of strand 2 – we may cover it in studio, but informally. It may be brought up in a tutorial if someone is doing something stupid. As soon as you put a badge on it, then it becomes a validatable exercise.

The Idea of stealth project about H&S within a design project is best – for instance, you could set a project where students view their design in terms of how you get materials to site, accessibility, h&S etc. It is best as an umbrella of subjects related to statutory regs.

Being a designer – lots of different plates spinning – H&S is one of the spinning plates. Awareness of the subject is important, but as you become more experienced as a designer/architect there are more plates to spin.

There may be a way of developing a project that is about health and safety but making it interesting and designerly. You can set a project that reveals the subject but never uses the two words, and then have a discussion at the end.

Students often show their early designs to us [design tutors] and then say… would you be allowed to do this? – then a conversation starts. If a student designs something that is ridiculous, then they need to understand that is ridiculous and be aware of the issues.

1b LECTURE-BASED ACTIVITIES

H+S occurs possibly in module description for Y3 'communication' – 'introduction to professional practice'. A 10 credit module – introduces students to RIBA plan of work – contemporary design team and management structures. Examples are provided in an easy to follow way, the process of building in terms of legislation and liability. H+S is touched upon but not overt in the teaching. The teaching is Lecture-based. Academic year runs in terms. Taught in term 1 10 credits [120 credits per year] 2 hour per week lecture course. Module leader is a practicing architect. 1st part of course is divided up into the RIBA plan of work, 2nd part – how you might address problems, contract law etc assessed via group seminars. 12 groups, 7 or 8 students – each get stage of work and make presentation. Also assessed by a written exam. [only written exam in course] A H+S question may crop up in exam paper.

Sem 2. Fire and safety lectures are introduced to inform the report.

Y1 and 2 no overt input, but reference made to CDM issues arise.

+Y3 Q and A seminars and assessment guidance.

No other activities.

Lectures – Innovation, knowledge and communication, up-to-date ways of forward thinking, rudimentary capability for taking on responsibility. Context of construction industry. Legal statutory coverage. Basic regs. But also context of industry. This is prep. For 3rd year module. Also, technology module – experience of building user and therefore safety of user. Quite often technical submission involves creating assembly drawings. – Really good at understanding technology and health and safety. 3D assembly drawings + cartoons.

Self-build project in 3rd year teaching last year. Student called Carlos. Submission is written and drawn technology report, but mid-way through there is a review of work – part of 3rd year tech. Module.

2nd year – tech. module – case study of a building – visit users, ask what works and doesn't work. H&S not always comes up, but can focus on comfort. Reveals less about health and safety.

H&S covered in lectures as part of Professional Skills teaching in Stage 03 Sem 2 integrated module

Building studies – not always sure where risk is –

Lecture series – followed by seminars. Total of 80 students. Each group does research on a given building with visit from architect and construction lectures. Timber, concrete, steel. Also site visit. Not a design exercise, but a construction. Subject study – not necessarily talking about health and safety. – Maybe issues of fire escapes. 2nd years, more important to think about how the choice of material.

MPL – management practice and law. IDA – integrated design audit – planning, issues. Design tutors involved in with that. Design statement from construction and management side.

Trips – a risk assessment for visits – losing visits.

Technology and environment – 20 credit module. Principles of material are explored, with construction and materials systems.
Professional studies module in 3rd year.

Thinking of introducing specific issues of building regulations – Conforming to protection from falling. [check section of building regs.]

Also we are going to talk about means of escape – from fire. This begins to contextualise H+S for students.

Are you thinking about introducing CDM ? We will introduce it, but not going into detail as it will not register with students as it is not needed at that point in time for their work – in the same way that we may say that BS's exist, but won't go into individual cases.

The timescale of real projects versus timescale of student projects is huge. A 3-10 year real projects V. 6 week design project in undergraduate.

You can only write a risk assessment for something that might be built in detail and to ask others about it in collaborative way.

For example – if you choose pre-stressed concrete planks – you don't know implications of lifting it until you are there using the product and working with a supplier and contractors. It is not within an undergraduates sphere of understanding to deal with this level of detail.

Construction and material course – briefly touch upon it. Deliberately steer clear of legislation as do not feel it is a right time to talk about it.

Intro. To lecture series – introd to construction industry as a whole. Building operatives… what they do... how unsafe it is. Few stats on death rates of construction industry.

Setting up notion of responsibility – for others.

Also mention manufacturing

Also mention site safety.

Lectures on CDM, H&S and risk assessments, avoidance of risk and common sense. Delivered in third year lecture series on Management practice law and architectural technology.

Invited someone from HSE, but did not manage to arranged dates.

If I was to do a talk on HSE etc. I would talk about themes and appropriateness. In several years time, CDM and H&S regulations will change, and it is difficult to keep up-to-date, [budget does not allow for visiting people now] therefore talking through principles is important. Rather than going into specific issues within regulatory documents.

At part 3 level getting in professionals in – CDM on MARch on management course

Case studies – and specific stories stay in the mind. Thinking about risk assessment – thinking about other people in the construction process
1c SEMINAR-BASED ACTIVITIES
We've had a timber specialist, came and spoke about building timber buildings. Talked through process of construction. He brought full size elements and mock-ups, that students tried. There is an inherent understanding that things are heavy and require lifting. This has obvious and real health and safety implications that are palpable to students.
1d OTHER ACTIVITIES
Window project – 2 years ago – still doing with dual engineering students. health and safety issues often crop up. Perhaps in other design projects at different scale, these issues don't often come up. When you are designing at 1:1 these issues often come up.
Fieldtrips - students receive information about how to behave responsibly. A risk assessment form is created as part of course management. Talk to students about how to look after themselves. Basic stuff, not stepping into road while taking pics. Etc.
For undergraduates: a] building as a process [not just a complex project] process of building and how pieces go together B] workers rights – peoples rights to work in a safe environment – history, context Internationalising context of safe working. Architect of Ely cathedral in tomb in cathedral – fell off scaffold.

2 DEVELOPMENT OF TEACHING AND LEARNING PRACTISE RELATING TO H&S
2a Do you think it is necessary, appropriate and/or relevant to integrate the teaching of H&S into the undergraduate curriculum?
Current level o.k. We have to remember that students have another 4 years of training and skills. They are going to be exposed to practice and H+S issues in Y4 and 7 and professional practice modules in MArch.
Yes it's relevant and its about right in quantity, but is it the right quality? Y3 seems to be the most appropriate place to introduce the topic.
We have got to resolve these things and do it in a creative manner. H&S can overload you with documentation, which may kill it as a discipline. These often unthinking and bureaucratic processes

mask the really important issues that H&S tries to address. If students are brought into an environment where H&S is made explicit to them, that it is important. It is important that we all engage with it as a subject.
Don't think so. There are lots of other things missing, and there is not enough time. It would restrict them in terms of creativity.
H&S is easier to understand in the context of a specific project. It is therefore best explored within the design studio where it can be directly applied to a design.
Construction and technology lecture course – being developed [see above] Element of H+S of construction, in sem. 2 whether optional or mandatory – analysis and model of large span of existing building. – Fosters monograph – talks about bamboo scaffolding – important in construction – but would not have been allowed in UK [HK and S Bank]. Not sure how many construction workers died during the project! One of meetings coming up – internationalisation. Identifying an acknowledge differences between cultures – deaths or attitudes to construction sites could be a way of exploring this. How cheap is life! Contextualising H+S. Olympics and H+S records are an interesting starting point. For information on international statistics – HSE may know.
Not that involved in studio teaching can't say for sure. My guess is that we could teach more, but legislation is difficult to cover all. Fire regulation was cut from original module. Undergraduate technology – legislation is important, but how much we cover these issues is open to question. – You can kill people with buildings and our self. It is important that students go into practice with that knowledge. Need to have that porofound understanding. Fire is most dangerous of course. Having that responsible attitude and understanding that as a practicing architect you could be responsible for someone else's death! Everyone should have that awareness before going into practice.
Yes, it should be there. It doesn't necessarily have to be obvious, but strands and themes are very important.
How it should be covered: Series of different media: Historic context – visit to culture museum Lecture/workshop – pictures of sites and Sheffield and commenting/reviewing Tutorials on design work by specific people – Building as a process – so it doesn't just exist at a 1:5 detail. Someone has to actually walk across something and their life is at risk in doing so. Looking at student projects from a different angle could be really useful. Risk assessments for field trips –

Talking about generally issues –putting basic headings in a risk assessment and then asking students to write them – or making a discussion on. Live Projects – ideas of risk assessment - if it involves construction. Competitions and feasibility studies should have risk assessments if there is an intention to build! Manchester council pays out 1.8 million in compensation claims a year. Lots of people suing. You do have a responsibility to keep things in good order. Issues with construction card system – for students and professionals. H+S courses and accidents – problems with the system.
2b Should this be dealt with solely in practice? Do you have any plans to introduce H&S into teaching and learning? If so what are they?
Of course not only practice
Yes. I wouldn't like studying to become too practical, still needs to be academic. Using rules creatively rather than following rules.
The 4 year degree course includes one year of placement in a related design practice [not necessarily architects] although this is still part of the academic course. Students are given related tasks by teachers to explore in a practice context.
possibility of learning more about students experience of working in practice over holidays etc. and using this to compare with academic education and issues learnt in practice.
Guess that we probably don't deal with this fully. Key to it is not teaching alot of regulations, but teaching fshould give principles of issues and understanding and major hazards, rather than issues, needs to be an overview. Develop an responsible attitude towards it
We can get students to understand terminology and pointers. A student sent me an email saying that she had been to site [working in their year out in practice] and discussed issues with contractor, and that my lectures really helped to understand the terminology and finer issues with H&S.
2c Are you still able to offer construction site visits to students?
Very hard with undergraduate numbers to go on site visits. This year we did a project with an existing building, on edge of a large housing site. Redrow were on site at the time and kindly offered students to visit. Site agent said how many students, we said 120. 'I can give them all hard hats, if you can provide jackets and boots'. 120 students on active building site. Someone from local authority happen to come on site whilst we were there. 3 students thought it would be unfashionable to wear PPP and walked on site without knowledge of situation. Now, can't go back to site. Made them write apologetic letter to Redrow. Gave them a strong briefing before hand and talked about dangers of active sites, but still there was a lack of understanding.

It is so difficult with the numbers. Better to hand pick students. This year – first 6 weeks of 1st year programme – deal with existing building [historic].
Site visits in both Y2 and Y3 Technology course – plan to give certificate/training in house to by-pass induction on site [hasn't happened yet]
On a project by project basis. Getting hold of the appropriate equipment makes it increasingly difficult, even for small groups. It is particularly difficult to for large groups to go on a site visit, often because of H&S reasons. I have given up trying to organise construction site visits as it is becoming more and more difficult.
Less trips than we would like. Tried to organise in the past, but not succeeded yet. Access for case studies to newly occupied buildings is hard enough. Still try, but not often successful.
Undertook a visit to a building as part of professional skills. We no longer go to live building sites through university. We brought in a construction team to have a Q&A forum. Reflective process, for construction team, who really enjoyed the process. Student body did organise their own site visit. With appropriate PPE. Helped by Architects institute of Ireland. Organised from student point of view. Large building site. Easy access.
If it makes sense. Really way we are teaching is less construction orientated. Looking at we really build things.
3rd and 4th year offer more independent design modules. Some units are connected to construction and can involve live site visits. Other modules are more theoretical.
Site visits – Hepworth gallery – wasn't live site. It was a finished building. Issues for visits are student numbers and construction H+S on site. Issues are organisation and amount of time that it takes up. But still happens. A couple of trips – Small project on university campus. – Took small groups of students. Not actually going on site. But looking in... Construction works on campus – are accessible and easier to arrange visits with. In terms of site visits – do go through H+S plan – kind of introduction to site work. Shouldn't present many issues but... taking photos – don't walk at same time etc. Not entering private grounds etc. Where ever students are to listen and adhere to requests. So, it is down to what we classify as H+S teaching and how we classify it as to whether we teach it indirectly.

In terms of impact of practical things... even going on site visit, it could be a useful vehicle for investigating H+S. Instead of reading a list of issues, get students to think about it. – Thats more valuable than including a design report on how the windows are going to be cleaned in a student design as it is so abstract. It is about introducing them to the responsibility that they have in undertaking their activities.
Site visits through studio work. Numbers made it impossible, there is nothing quite like the site experience. Could be good to develop a reflective piece on experience in practice and appraise it in terms of these issues. Students could be quite vulnerable on building sites. People that often get injured are those who are new or uninitiated. At the moment it is incidental teaching – subject is dry often by dry teaching of regulations, but there are other ways. Regulations have a huge impact on building design – are our students away of this. Skill in legislation watering down a good design – and how you work with that. How do you think that through in a creative way! – Dealing with regulations- do our students engage with those issues? – Documentation easy to engage with – all accessible on line. Interesting issues behind the dryness.
C0ntradictory – CDM stopping people going on site but students then not getting experience? Large groups become unmanageable. Possibility of contacting big contractor – series of group visits
2d Do you undertake any live projects or building projects where students use construction materials and building at full size? If so how do you handle aspects of H&S. Risk Assessment?
No. This year done a schools project in 3rd year – worked with a local school. – engaged with public in non-building level. Consulting public quite a lot, paperwork with risk assessment and child protection issues have to be covered, but not too onerous. R.A. is not that onerous. Simple things. Education at Plymouth is sort of becoming more about urban design – particularly at MArch level, rather than smaller scale building. One student taped off area, etc. put posters up and intervened in city – but not building projects.
No live projects programme, but aspiration to do them. Do full size making – linked to technology – lab experiments rather than playful exploration. H+S led support.
Live projects are undertaken at undergraduate and post graduate levels. There are two ways that live projects are undertaken; one through individual academics or through PROJECT OFFICE, who put a call out to students to be involved.

Projects are often coming through tutors, who organise and set up the projects. H&S is addressed through field trips and site visits at appropriate stages in the projects. This is often student-led. Technical issues relating to H&S etc. start almost immediately and naturally get considered as a key part of the design process. At detail design stage and prior to construction students often come to PROJECT OFFICE for advice. As a functioning practice, we can offer them the appropriate support.

Assessment and marking of projects and particular aspects like H&S varies according to studios and tutors.

Projects developed through PROJECT OFFICE are more conventionally managed – someone in PROJECT OFFICE goes through the normal risk assessment and CDM. This is often done collaboratively with one of the units or studios. A group of students will develop design and one student will often take it into the PROJECT OFFICE to realise it. PROJECT OFFICE staff manage the students through the process.

We have no particular resources to facilitate the running of live projects. In relation to H&S and other issues, something would be very useful.

The challenge of actually building and making things with students is becoming more difficult. Having a teaching pack could be useful.

Sometimes students go too far down the road with their own initiated live projects before we realise, and we have to say hang on. Undergraduate students can often be a bit naive with regard to their responsibilities to Health and Safety and liability.

We often go down the route of using a craftsperson and or contractor to build things now. It has become increasingly difficult for students to actually build things, particularly with Health and Safety in mind.

Do you think about projects abroad in a different light with regard to H&S? We don't want students doing things abroad that we wouldn't want them doing here. We encourage working with NGO's and creating opportunities to develop best practice. Many of the projects abroad are on a small scale. We wouldn't allow large projects abroad, but smaller projects are ok in terms of risk but do have to work with an organisation on the ground to facilitate this.

We are having to be more open minded about what a live project is. Moving to useful projects that are more socially engaged rather than the end result necessarily being a building. A lot of technical information can be generated in a simulated environment [in the design studio] rather than having to be done through a live project.

The difference between undergraduate and post-grad students is sometimes evident. Undergrad students are perhaps a bit more gun-ho. They are less aware of role of architects, accept through live projects, usually because of their lack of practical experience.

Have you had any accidents through your Live Projects programme? No problems with build projects. As many issues in studio as on site. 8-10 build projects over a 5 year period. Some with more student involvement than others.

Do you have any formal written feedback from students undertaking live projects? On occasions where there is funding, client often needs feedback as a requirement of funding. This is not

something that we currently undertake for every project, although individual tutors and students will undertake this.

Time pressures are particularly difficult barrier for delivering projects. Summer holidays are good, but other commitments make it difficult for students to fully engage. We are trying to employ a student to undertake the project coordination role to help tie up project loose ends.

Project Office carries PII for projects – they have a good support from university – for live projects. Legal infrastructure was already in place at the university when they were first established. No resistance to projects from outside the department. Now having a tried and tested method helps.

In year 1 – we do live projects.

This year - Increase accessibility of filmmaking club in Oxford. Write brief. This year need to know about ramps to tackle project. Information provided as lightly as possible, on a need to know level. Understanding principles of ramps is crucial. Hope that a series of creative responses are developed by students. Teaching staff will filter information for students, so that that they do not get hung up on detail, but are creative.

One client for whole year group. Group work with whole group taking part. Client has a project. Keep it at level of ideas generation. As many ideas as possible from students. Fact that it is real makes students react in different ways. Issues may otherwise be ignored by students at this level.

Voluntary project for summer vacation, following on from work in 1st semester, often get commissioned to build something by client. Students understand that it may fail if they do not deal with real issues. The outcome is usually a prototype made out of light-weight materials. – made by students. Sometimes need to have engineering input. Students begin to deal with their safety in the construction process. Only ¼ of students are involved and it is voluntary. Try not to be normal tutors. Students have to realise we are not going to design it for them. Say, if it is going against what the client wants. Staff act as go-between - H&S people and building regs. Very much student project and students being in charge. Built work – prototype is built at university and transported to site. For 2008 project – had to get a temporary structures license. Received vito by health and safety at south bank, London [for the Architecture Festival]. Needed quite a bit of help to negotiate hurdles, but got there in the end.

student society organise projects including sustainable building workshops – Worskhops are voluntary/unofficial.

Often get feedback from public regarding 1st year live project which is great for students! – 'Too pointy'.

No formal teaching of H&S in year 1 – roles and responsibilities and duties of the architect. – Humanitarian, art, business. Students write statements about how design will be improved.

Established live projects in 1st and 2nd year degree level for a number of reasons:
Helping students to become better citizens – doing things for people that are less privileged than themselves – altruism. Live Projects allow students to get value out of their skills in other ways.
Live Projects offer ways of showing students how to get other things out of the degree course.
In Year 1 of the degree programme the year group of students undertake a live project, for a real client with a real need of architectural input. The whole year makes design proposals as part of their curriculum, then over the summer holidays, students are invited to take part in developing the

project, which can involve constructing things themselves as an extra-curricular activity.
Currently have 1 built project now, through this process. Another 2 commissions have been developed to RIBA stage D and another project to stage C – managed to deliver 3 projects. The projects are not fully documented.
Coordinate 2 postgrad units – 1 undergrad and 1 post grad unit, working with other tutors.
Bringing live projects into studio fits ARB criteria.
Saltaire – first postgraduate project to re-design the Hockney gallery at Saltaire. Embedding Live Projects in studio courses.
In year 2 – units deliver something in built form or design that somebody else has built. This may develop in to something more serious.
Live project outcomes are aimed at ARB criteria; interdisciplinary, learning about materials, understanding how we communicate intent through working drawings. The projects go beyond drawings and designing buildings. Groups have to deal with budgets and monetary situations.
If it is on your CV that you have built something – it provides better skills for employment.
several live projects to date. Projects to date have been supplementary and not part of core curriculum. Taken place over the summer break.
Examples: Food Share – network of food distribution. 1/3 of food produced in UK is thrown away at various stages of production and consumer cycle. Design and build project undertaken over the summer 2010, just completed. Office and meeting room for staff within food warehouse. Group of students voluntarily working on project. Small budget from client. Materials bought on Ebay – for very low budget, and designed for disassembly.
Orwin house – refuge/home for long-term alcoholics. 10 students, working over summer. Currently up to RIBA stage c – produced designs for client and hoping funding will be secured for it be built/realised.

3rd and 4th year module units on concrete; Students have access to a fantastic workshop, where they can investigate fabric formwork for concrete. One of the units connected to this linked to an architectural practice that used the design research to develop a patterned column.
The students work is hands on and they are involved in the different stages of preparing and creating the concrete.
There are two architectural workshops where students can explore 1:1 scale pieces.
In 1st year, students undertake bricklaying courses. They undertake H&S inductions and briefing as part of this. There are no formal ways to reflect on this part of the course or discuss implications in relation to their design schemes and H&S.
There is a strong culture of model making.
There is also a new system to teach technology. Information about materials is collated into a web-based resources that has an enormous number of detail drawings about materials. This enables students to easily relate their technology back to their design projects, in the studio.
This is not focusing on H&S or reflecting on it specifically.

Used to do workshops with building things – covering space – project for covering 5m space – then making full size.

3	**TEACHING OF H&S IN THE DESIGN STUDIO**

3a Where and how should H&S be integrated into the design process for students?
Tech/arch modules are shared – CDM and H+S is one. Inter-disciplinary knowledge/experience
In 2nd year, there is a lot of emphasis on fire and access. Students are drilled with those issues. A new integrated module in 3rd year is aiming to introduce professional practice into design studio. (it will run this coming semester) Integrated modules, move from lecture to studio/lecture/seminar formats. Otherwise H&S dealt with on a case by case basis.
In the studio design and making projects, integrated into this central design process.
3b Who should teach H&S? Internally or externally? Visiting speakers/specialists
Much of teaching is brought in/ specialists – CDM/fire, local authority etc. All staff are practice-based and experienced. Expertise exists in house to inform reviews. But students value the 'expert' input more.
involves external speakers. In tech. module tutors are practitioners – each give a lecture.
We can teach principles, but people that are practicing it every day are best to talk about details and practice. Also RIBA criteria does not ask for detailed teaching of it at UG level Because we have two Masters courses; construction management and sustainable practice, H&S features highly in post-graduate courses. Regulations are changing all the time and it is difficult to keep up unless you are working with them on a day-to—day basis. Triad of knowledge, skills and value, - if you can balance those and bring that out into design it is very effective. Putting a framework in place to work with based around H&S is best approach. With all specialist interest architecture and construction groups, if you bring everything into the course it would be too much to cram in and would all become too much.
Tutor team – we should be giving brief awareness of H+S subject and not going further – basic issues but not much more. Then more practical relationship with field trips – more tangible ways of thinking about their and others safety
Probably agree with idea that as practicing architects, and teachers, we should be able to cover the issues that are present in practice through our teaching at undergraduate level. In education environment, it is useful to have someone to come in externally, even if they are saying the same things, students take notice of a different voice.
3c Bringing H&S into technical requirements for students?

Sem. 1 Y3 – assessment in practice/ law, not technology Review – disregard would be highlighted/criticised Practice based creativity/ not intellectual creativity
Part of year 3 project, Looking at construction sequence. New, and therefore no outputs yet.
Accessibility – universal access issues. Stairs and ramps Obvious issues are brought up about edge restraint – protecting edges. – Handrails – raised as design considerations not just legislative issues. Not something that we raise unless glaringly obvious. Would not necessarily raise issues of cleaning windows or maintaining roofs. – Time allocated in reviews and tutorials are very tight and there simply isn't the time to go into these issues.
Students submit 1:20 detail sections along with acoustics lighting and services study as part of final degree design submission. Students used to undertake a sustainability report. Possibly bring back sustainability report and include H&S. It could be a light touch –to take a part of their building design and discuss how it would be built.
3d H&S through the design review process? For project based work?
Way that it is integrated into design is reliant on tutor and their interest. Dependent on outlook of tutor. Gives it a sporadic edge.
Not really covered. Issues of accessibility is something that comes up regularly – accessibility.

4	**BARRIERS TO DEALING WITH H&S IN TEACHING**
4a	**What are the barriers to dealing with H&S in teaching and learning? Subject perceived as boring? Lack of specific knowledge in-house? Insurance or indemnity Issues?**
Any student, as long as part of their education programme is covered under university insurance policy for site visits.	
Occasionally, barrier is H+S training/induction. Y3 group of 40 students [induction 15 students/group] Lack of mature design skills to integrate additional issues – too many plates to keep spinning. Definitely perceived as boring [fire ok, but not CDM] No lack of knowledge, but not an in-house specialist – can't be justified. Making falls under normal workshop induction, everything well supervised.	

Big one is the concern that if you overload students with information and specific details, then they will mistake that as design. Tutors may say, 'don't worry about that you are only in 2nd year' and therefore it totally depends on the tutor.
Main thing is we can't teach the subject in great detail. Teaching is always led by motivation of staff. Kind of depends on individuals and their interests. If I was trying to introduce H&S as a core topic I would first raise awareness and then get it delivered in a creative way.
Definitely perceived as boring. If we have to do it then it needs to be dealt with in creative ways. You have to learn other things first to use it in the right way.
H&S should be embedded into design work and not explicit. Issues of health and safety are there all the time in the way the students work and their designs, but not in an overt way. There are tool boxes in the studio that have tools in them. [Hammers, saws etc.] They are still potentially dangerous. There are also specific making zones. H&S is so practical and experiential. A lecture is ok, but by making it part of the design process it becomes self-explanatory.
One of biggest barriers is teachers perception of health and safety – one of things that struck me about discussion for H&S was that it can be boring. But we need to think about it in a creative way. Subject needs to be tackled creatively and teching style needs to reflect this – to be engaging. Helath and safety is considered unsexy or uncool! Needs to be re-branded.
Barriers to do physical activities are to do with numbers, finance and insurance. You can't expect 1 contractor to do all trips.

5	**INITIATIVES AND ACTIVITIES THAT DEAL WITH H&S AT OTHER UNIVERSITIES**
5a	**Are there initiatives or activities that you have seen in other parts of the school or in other universities?**
LMU vertical units – rather than whole year 120 students, different undertaking. Unit systems – one of tutors would be practicing architect- easier to engage students on work on projects that they are undertaking. London practice offer a kind of summer school, working on theoretical projects in the office, based on same brief. Making their own interventions in parallel to practice, in response to uni projects	

being so restrictive.
Nottingham do live projects in Y2 – which looks interesting
Portsmouth and Nottingham are trying to establish similar initiatives. Design-build programme in American schools. Very clear remit. In the UK it is simply not available to us at this time. It would be good to know how they actually facilitate the projects.
Looked at Rural studio work – Kept an eye on various places that are undertaking live projects.
No really Baupiloten – offering a service to clients – not sure how they are in terms of management. Guarantee health and safety. How much does one lose creativity.
Interested in Rural studio model and their inspirational work. Interested in work in Nottingham, building a nursery in Africa. Reason other university live projects are often undertaken in different countries is because there are needy, but also because statutory regulations and health and safety are not as rigorous. Building a similar building in the UK would be a different undertaking. This is not necessarily being critical of the practice and the amazing student learning experience. But… it does raise questions relating to H&S.
5b Are there any activities that you would be interested in employing or experimenting with?
Planning a whole school event next year – live project to construct actual building
This idea of giving students info. on the design of ramps is a new approach, without this info, they would be flailing around. 'If you give minimum dimensions then they won't be creative'... may be this is true! We will have to find out this semester!
Proposing a live project for a large design and build project that may take several years to come to fruition. The management and development of this project is currently under development.
Some schools are more mainly making-focused whilst others are more hypothetically orientated. LIND university in Sweden undertake 1:1 concrete structures. The project is supported by the government and private companies. The exploration of the concrete material is then developed into a design for a space for children. Where children are involved, H&S is of particular interest. At Edinburgh there is a gallery space that anyone can occupy for a 2 day slot. 1st year students were challenged with the idea of filling the space and used digital media to project images and films through a series of glass screens within the space. It was very effective, particularly from outside. It is another way of making architecture at 1:1.
Ideal – would be series of site visits – but these are very limited at moment for series of reasons.
Need people with a lot of building experience to teach it – the terrible stories are the ones that stick with you.
5c Are you aware of any achievements or goals achieved by such projects?

5d Are you aware of any barriers to delivering these activities?
Money is largest barrier – Getting the funding to projects properly is a real challenge. We won't let projects go ahead unless the appropriate funding is there. Because the project office supports live projects, we do not necessarily prescribe benefits of them in terms of skills and learning outcomes for students.

Appendix D

Symposium Programme and Attendees

Healthy Design, Creative Safety

A one day symposium exploring creative and effective approaches to integrating health and safety thinking into the undergraduate architecture curriculum.

Thursday 27th January 2011

ICOSS Building, University of Sheffield, 219 Portobello, Sheffield. S1 4DP

Hosted by the University of Sheffield and funded by The Health and Safety Executive and Royal Institute of British Architects Research Fund. This event is supported by the Association for Project Safety.

The symposium aims to:

- Look at approaches to delivering student Live Projects safely and effectively
- Explore ways of putting H&S at the heart of the design studio whilst enhancing design creativity
- Review different attitudes and approaches to the teaching of health and safety
- Discuss strategies to overcome obstacles for field trips and particularly live construction sites

The symposium will comprise a range of talks and workshop activities, with the aim of bringing together ideas to form a strategy for dealing with the teaching of H&S in the future.

Healthy Design, Creative Safety

Who should attend?

The symposium is primarily aimed at architecture schools and specifically members of staff who coordinate / deliver teaching at undergraduate level. The symposium is also open to those who deal with issues of health and safety in architecture projects in practice or academia.

Speakers

Giles Meredith – HSE
Daniel Jary – University of Sheffield
James Ritchie - Association for Project Safety
Jane Anderson - Oxford Brookes University [TBC]

Costs

The event is free to delegates, with a supplementary cost for catering of £15.

Requirements

Delegates are asked to bring good practice teaching case studies that involve health and safety, to be used in workshop discussions.

In addition, we would appreciate academic delegates filling in a short online survey at www.surveymonkey.com/s/WGKT9L6 prior to attending the symposium.

Registering and information

For more information and to register please contact Leo Care.

l.care@shef.ac.uk
+44 [0]114 2220304

Healthy Design, Creative Safety

Programme

10.00	Arrivals
10.30	Introductions and welcome
10.45	Introduction to the context of health and safety
11.05	Incorporating H&S into student design projects without compromising on creativity
11.25	Barriers to the teaching and learning of H&S at undergraduate level
11.45	Break
12.00	Critical reflection on the design and construction process for students
12.20	Undergraduate Live Projects and integrating health and safety
12.40	Tackling student construction site visits
1.00	Q & A session
1.15	Lunch
2.00	Workshop 1 – exploring challenges to the creative teaching and learning of H&S
2.40	Workshop 2 – recommendations for change and support mechanisms
4.00	Summary and closing comments
4.30	Close

Healthy Design, Creative Safety

Contributing to ongoing research

The symposium will contribute to ongoing research that aims to investigate how the teaching and learning of health and safety in undergraduate schools of architecture can be developed in innovative ways to enable students to effectively apply this knowledge in practice.

Our hypothesis is that, whilst it is essential that health and safety issues are introduced in the lecture theatre, it is only in the design studio that these lessons can be fully explored and understood by undergraduate students, learning through hands-on experience.

Outcomes

The findings from the symposium will lead to the production of a series of case studies, including recommendations and guidance for studio teachers and students. The case studies will try to address common problems with achieving high-quality mixed-mode and inquiry-based learning approaches.

HSE RIBA The University Of Sheffield. Association for Project Safety

Healthy Design, Creative Safety Symposium

Programme

Time	Activity	Leader
10.00	**Arrivals**	
10.30	Introductions and welcome	Leo Care/Dan Jary
10.35	Introduction to context of Health and Safety in Schools of architecture [10 mins]	Giles Meredith, Health and Safety Executive
10.45	Ongoing research and our approach to health and safety [20 mins]	Daniel Jary, University of Sheffield
11.05	Critical reflection on design and construction process for students [20 mins]	James Ritchie, Association of Project Safety
11.25	Undergraduate Live Projects and Integrating Health and Safety [20 mins]	Jane Anderson, Oxford Brookes University
11.45	**Break**	
12.00	Barriers to teaching and learning of H&S at undergraduate level [20 mins]	Sandra Denicke-Polcher and Anne Markey. London Met. University
12.20	Tackling student construction site visits [20 mins]	Leo Care, University of Sheffield
12.40	Incorporating H&S into student design projects without compromising on creativity [20 mins]	Liam Ross, University of Edinburgh
1.00	Q and A session	Daniel Jary, University of Sheffield
1.15	**Lunch**	
2.00	Workshop – exploring challenges to the creative teaching and learning of H&S	Led by Leo Care
2.40	workshop review	
3.00	workshop 2 – recommendations for change and support from HSE and universities	Led by Dan Jary
3.40	Workshop 2 review	
4.00	Summary and closing comments	Dan Jary and Giles Meredith
4.30	Close	

Healthy Design, Creative Safety

Symposium Attendees

Thursday 27th January 2011

External people	Organisation
Giles Meredith	HSE
Stephanie Rafferty	HSE
John-Paul Nunes	RIBA
James Ritchie	APS
Jane Anderson	Oxford Brookes University
Sandra Denicke	London Met University
Anne Markey	London Met University
Liam Ross	University of Edinburgh
Cath Basillio	Shef Hallam University
John Tinner	BDP
Lucinda Lister	Temple Safety Ltd
John Patterson	Bond Bryan
Lee Parlett	Network Rail
Roy Meakin	Kirklees College
Tony Walsh	Kier Build
Leon Jennings	Atkins
Ian Hicklin	University of Sheffield
Steve Leighton	University of Sheffield
Dan Jary	University of Sheffield
Leo Care	University of Sheffield

Appendix E

Symposium Papers

OB1 LIVE Mount Place live project construction, 2010.

This paper was originally presented at the “Healthy Design, Creative Safety” Symposium organised by Sheffield University, HSE and RIBA at Sheffield University on 27 January 2011.

Title: **“Undergraduate live projects and integrating health and safety”**
Author: Jane Anderson

Introduction
This paper discusses ways that health and safety issues can be considered creatively at both project planning and also project design and construction phases of a live project by use of a case study: a year one live project at Mount Place, Oxford. The nature of the involvement of tutors, students and clients with health and safety matters and in different phases of the project is explained and the paper describes ways that were established by the authors for each party to engage with them and increase their understanding of them.

OB1 LIVE runs a programme of live projects undertaken by year one architecture and interior architecture students at the School of Architecture, Oxford Brookes University. The projects are commissioned by local community clients and the programme is run by Senior Lecturers Colin Priest and Jane Anderson. To date OB1 LIVE has completed eight projects ranging from a ticket booth for Creation Theatre Company to environmental play devices for Donnington Doorstep Family Centre.

The authors have developed a particular approach to Live Projects that has been shaped in part by issues of health and safety. This is because the context that OB1 LIVE operates within contains potential for vulnerability on several fronts. Year one students are predominantly recent school-leavers with lots still to learn about life. The community-based clients are often charitable organisations run for the benefit of vulnerable members of society. Many of OB1 LIVE’s projects are located in the public realm and must consider the needs of all members of society, benign or otherwise and the pressures that this may put on the built project, its users and its designers / builders.

Typically OB1 LIVE’s projects do not have any financial resources attached to them. Projects must operate on a “make do and mend” basis. Normally two projects run each year with one at the start of the academic year involving the whole year group as part of the curriculum and a second voluntary vacation project at the end of the year. As a result of all of the factors described above, OB1 LIVE differs from many other live projects in that it is not primarily used as a tool to teach construction.

Mount Place: an underused public space before the project began.

Project planning and brief development: health and safety thinking
The project planning phase of a live project is critical because this gives teaching staff the opportunity to agree with the client the scope of the project and the form that the product will take. It is important to manage the expectations, needs and abilities of all parties. Live projects give a degree of flexibility because the scope and form cannot be dictated by a client to the degree that it can in a professional context. This means that project planning gives a vital opportunity to manage risk.

An observation from OB1 LIVE's experience of running live projects within a university is that institutional systems for compiling risk assessments tend to focus more on "events" such as going outside the University or the "activity" of building something. This is likely to stem from the perceived increase in risk related to different levels of supervision off campus and outside "normal" teaching areas. As discussed above, a large amount of important decision making related to risk management is needed to ensure the success of a project at the planning stage before any "activities" or "events" are defined. We would propose that the institutional Health and Safety expertise available within Universities could be better exploited at project planning stage.

The Construction (Design and Management) Regulations 2007 state that:

> Part 3.18 Additional duties of designers
> (1) Where a project is notifiable, no designer shall commence work (other than initial design work) in relation to the project unless a CDM co-ordinator has been appointed for the project.

OB1 LIVE exists and thrives within the area of "initial design work" and acts as a vehicle to expand this area of architecture by providing a more developed exploration of alternatives and by use of "speculative prototypes" to test early design possibilities. However we would argue that despite the indication of the CDM regulations that it is not necessary, the input of a creatively-minded Health and Safety professional during the project planning stage and prior to "initial design work" could help manage risk creatively, ideally enabling an increase in the ambition of each project.

Collage proposal presented to local residents and councillors.

The Mount Place project: management of health and safety issues
The following account of OB1 LIVE's Mount Place project describes how health and safety issues were managed in both the project planning stage and the design / construction stage of the project in a way that aimed to expand the ambition of the project as much as possible within the "make do and mend" conditions that surrounded it.

In September 2009 in week one of year one, architecture and interior architecture students began a project in partnership with Oxford City Council to propose improvements to a much loved public space that was in need of renovation and had become under-used. Students undertook research and analysis of the area before generating multiple ideas for presentation and discussion at a Planning Committee meeting. Eighteen collage proposals and 1:1 prototypes were made and this sparked a willingness to make changes that had been delayed by a previous lack of agreement among residents and councillors. The prototypes gave the students experience of lightweight construction and an understanding of the need to test the reality of their proposals. In February 2010 the City Council began work on landscaping and infrastructure improvements, several of which stemmed from student proposals.

In planning the first phase of a live project, tutors must adopt the role of practice principles and employ a typical designer's "CDM" approach by thinking through risks, benefits, available resources, skills, cost, time, even weather to help plan the project. At Mount Place a site was chosen in a public square that was in the public realm adjacent to the street. Students began by undertaking nuisance studies that related to health and safety issues: noise, smell, safety, ownership, atmosphere and wear / tear.

During a live project, we have observed that there is always a very important moment when students realise that this is their project and they are responsible for it. This ownership brings a level of responsibility and initiative that is difficult to match in traditional design studio projects and as a result, students are particularly responsive to taking on the responsibility of considering issues of health and safety. Risk to students in their first three weeks of architectural education was controlled by making the generation of ideas the focus of this phase of the project. Nevertheless, students needed some guidance to equip them to deal with the public, manage the public's perception of their abilities, role and responsibilities, and even deal with press publicity.

The three prototypes in the regenerated Mount Place

A very satisfying outcome of this project was that the energy and creativity of the students overcame a previous resistance to change in Mount Place. In terms of health and safety, the most radical example of this was that the students and residents agreed that the wall blocking views of the canal from Mount Place could and should be removed, showing that local people were far less conservative than anticipated when an idea was proposed that they were in sympathy with. This proposal was developed and implemented as part of the works carried out by Oxford City Council.

The next phase was a voluntary summer vacation project following a commission by the Council to design and build prototype designs for an “Infobench” to be tested on site in a public consultation exercise. The design was developed through design workshops, 1:1 ergonomic studies and a first mock up test in the studio. Three prototypes were then constructed for testing on site in conjunction with information material designed for the consultation event. Rather than present a “finished” and static design, the prototypes were designed, and the event was structured in a way that would involve the public in testing it on site. The three lightweight prototypes volumes represented the functions “bench”, “sign” and “information” and could be rotated into different configurations and locations by the public and the designers.

Risks associated with this phase of the project included dealing with members of the public, traffic and construction itself. The event required careful design and management to maintain the safety of all participants. The student designers were clearly identified with the project by their green vests and the information material supporting the event such as the “Have your say” leaflets helped to support the carefully planned activity of the event itself.

This project exploited the available skill, time and financial resources and prevented the common experience of self-build live projects where the construction period is disproportionately long in comparison to the design time. OB1 LIVE’s strategy means that although the scale, permanence and materials of the projects differ from traditional architectural projects it still gives students the opportunity to understand the relationship between the design and construction processes, particularly the importance of managing change and the continuing need for design activity during construction.

Testing ergonomic proposals for the Infobench.

The design of the project: health and safety thinking

By introducing live projects in year one, health and safety thinking is not distanced and divided from design thinking. The tangible nature of the project encourages less experienced designers to engage with it. Students unfamiliar with legislation will nonetheless naturally design with issues of lifecycle, the safety of users and builders, maintenance, and quality of user experience to a greater extent than they will in the design studio. The live project provides students with challenge, accountability, believability and responsibility.

The emphasis that a live project puts on the production of a physical object or tangible result creates an imperative to act. This in turn stimulates a willingness to make mistakes and therefore learn from them. Although health and safety culture is often associated with risk aversion, mistakes are important in this context and if well managed, to be welcomed. In a live project, the consequences of a mistake are real and students respond to this by an increased willingness to experiment and not settle for the first answer: especially if the first answer has just collapsed in front of you! OB1 LIVE promotes the use of prototypes to be tested both within the studio and on site. This enables students to consider construction, occupation and maintenance naturally from the beginning of their design process. In a purely studio based project, it is very easy to shy away from barriers to progress raised by such issues.

When faced with the reality of designing in the public realm, students do not discriminate between safety and well-being. There is no tension between a statutory minimum and an aspiration to provide healthy, comfortable designs for all members of society. This could be seen in the emphasis on ergonomic studies that students chose to pursue in the Mount Place project. The experience of building gives students insight into the importance of considering the safety and buildability of their designs. The uncertainty that live projects bring is also to be embraced because it enables students to learn to manage risk and understand the effect of change on the project. Anna Beer, a participant in the 2009 OB1 LIVE project for Creation Theatre Company, told us:

> “I really liked that even with a 'final design', the ticket booth was constantly morphing and we were constantly questioning it; the construction was definitely a learning curve! The team was great- we all pulled together really successfully, and I enjoyed being involved throughout the whole process.”

Public consultation and testing of prototypes on site.

The Mount Place project: findings in relation to health and safety

The prototype Infobench was clearly signalled as a prototype by the use of materiality, colour and the design of information material to support the consultation event. This enabled all members of the public to distinguish the prototype from a finished object and treat it appropriately, including a small number of riskier and probably inebriated characters! There was a great willingness to try out the Infobench and this revealed some interesting findings for the students. Their ergonomic studies had led them to concentrate their efforts on providing a configuration of different bench seats to suit all shapes and sizes. This was countered by a public expectation that a bench should be designed as a one size fits all object. This led to some interesting reflections on generic versus bespoke design and the potential flattening-out of difference in design that a generalised approach to risk can create.

Feedback was gathered from the public at the event and in many ways, its uncontroversial nature is a testament to the careful project planning and design that contributed to the success of the project. Comments included the pointed edges of the prototype form if it was translated into a harder, more permanent material when realised. There were also concerns about spiders, dog fouling and young people gathering at any structure that may provide a focal point.

Reflecting after the consultation event.

Conclusions

The experience of running several OB1 LIVE projects has shown that year one students can complete ambitious live projects with great success and that careful risk management at an early project planning stage is an important factor in ensuring success. While it is important to recognise that live projects are not the only means to teach health and safety, it makes these issues impossible to ignore and a shared experience of them can be very helpful for students and tutors and inform their design studio work. OB1 LIVE has tested various different models of live projects ranging from ideas generation for clients; prototype development and testing; temporary installation and intervention design; lightweight or small scale design. This makes OB1 Live a particularly good example to demonstrate that live projects do not need to be construction-based or weighted to enable students to gain an understanding of health and safety issues and their relationship to the design process.

We would propose that institutional health and safety professionals within the university could become involved at project planning stage to advise on managing risk, provide institutional support and enable an increase in the ambition of live projects. However it is important to stress that that we must not design out all risk in the planning of a project. It is essential to trust students to manage - and learn how to manage - some risk in the project design and construction. The project must be allowed to challenge students and respond to change as it runs its course in order to give students the vital opportunity to understand the nature and responsibilities of project work and the importance of retaining a high ambition for every project that they undertake.

As the Mount Place project demonstrates with its unexpected outcome of the safe removal of the wall between a public space and a canal, consideration of health and safety issues does not have to dull ambition or creativity for designers and their clients.

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H. M. Government. 2007. *The Construction (Design and Management) Regulations 2007*. [online] Available at: http://www.legislation.gov.uk/uksi/2007/320/regulation/18/made [Accessed 12 April 2011]

School of Architecture, Oxford Brookes University. 2011. *OB1 LIVE.* [online] Available at: http://www.brookes.ac.uk/schools/be/about/architecture/ob1/index.html [Accessed 12 April 2011]

Liam Ross

10 Projects for a

Compliant Architecture

10 projects for a Compliant Architecture

Liam Ross

Selected Projects, MArdes Seniour Honours Option 2008/2009

University of Edinburgh, College of Humanities and Social Science
School of Arts, Culture and Environment, Department of Architecture

10 projects for a Compliant Architecture

COMPLIANT ARCHITECTURE Liam Ross | University of Edinburgh

Compliant. *adj*.

1. Complying, disposed to comply; ‘civil, complaisant’; ready to yield to the wishes or desires of others.

2. Yielding to physical pressure, pliant.

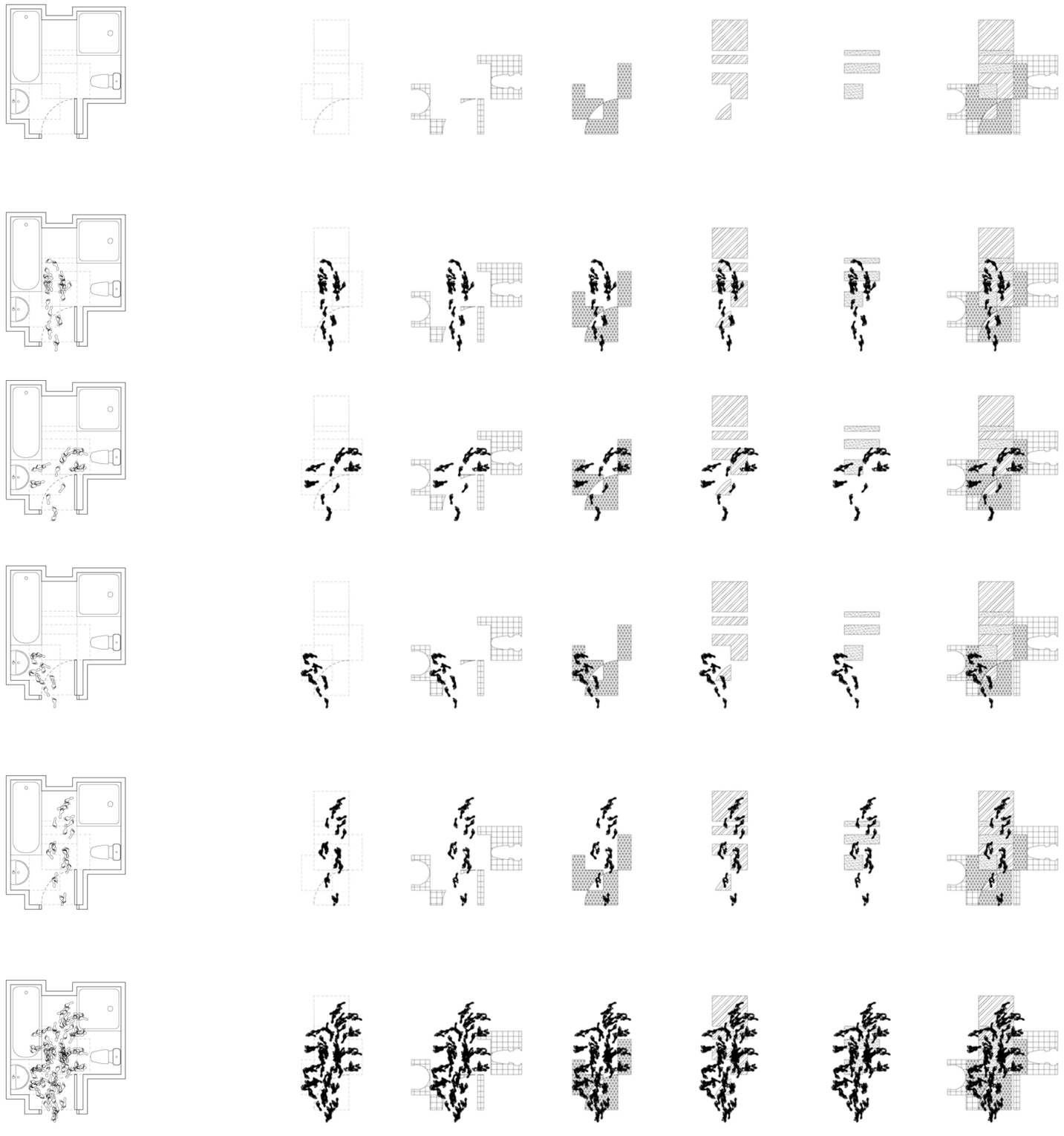
B. One who complies; a complier.

3. Yielding and adaptative to conditions.[a]

Compliant Architecture is a design, research and teaching project based at the University of Edinburgh. It conducts text-based research into the emergence of building regulations, design-research that illustrates the limits they impose, and taught design modules that explore the architectural potential of those limits.

This document presents selected projects from a 10 week architectural design studio completed as part of the MA Architectural Design programme at the University of Edinburgh, 2008-09. Each projects begins with an analysis of a single clause of the Scottish Building Standards. Students provide a brief verbal and diagrammatic description of the regulation, coming to understand the hazard it represents, and seeks to limit; trips and slips on stairs and ramps, falls from height while cleaning windows, lack of access to daylight. The projects continue by identifying an architectural potential in the limitation of these risks; that a regulated stair acts as an index of the familiarity of its users, that a window choreographs and represents the everyday act of its cleaning, that a window negotiates and represents a relation between programme and context. Each project concludes through the design of a mixed-use building in the centre of Edinburgh, playing-out the implications of the limit in a range of circumstances.

a OED, second edition, 1989



Sophie George
Regulation 3.12.13: *Activity Space in Sanitary Accommodation* | Overlapping activities / overlapping activity spaces

Regulating Education

ARB General Criteria 10 stipulates that Part 1 & 2 architecture students should be taught the necessary skills to meet buildings users' requirements within the constraints imposed by regulation. Graduating students should be able to prepare designs that comply with UK legislation, including those requirements imposed by the Health and Safety Executive[a]. However, despite this ARB's requirement, most practicing architects suggest they receive inadequate training in legislative requirements while at University[b]. The reasons for this are perhaps easy to understand; legislative requirements tend be satisfied through the demonstration of compliance, and so appear opposed to creativity, their end being necessarily pre-determined. Teaching design on the basis of regulatory compliance, then, is perhaps likely to lead to standardized and formulaic design. As such the satisfaction of both the ARB and regulatory requirements are often annexed from the design studio, to be demonstrated through separate 'compliance projects'.

Regulating Design

This attitude to the ARB requirements parallels (perhaps establishing, re-enforcing, or simply reflecting) professional attitudes to regulation generally. Building practice is subject to a widespread and sophisticated regulatory framework - from professional codes of conduct, building standards and technical guidelines, to contractual protocols, planning permissions, and consultation procedures – and qualified architects, like their educators, consider the burden of demonstrating compliance with extensive, expanding and constantly changing requirements a hindrance to the creative process, leading to standardised and formulistic buildings[c]. That is, professional practice is characterised by the same polarisation between the creativity and subjective freedom associated with design, and the apparently objective requirements of regulation, tending to think of the requirements and rationale of planners and regulators as 'external' to architecture.

Re-distributing Risk and Responsibility

This is not simply a question of 'attitudes'. The purpose of governmental regulation is precisely to define certain aspect of the design of the built environment as outwith the responsibility of architects. New regulatory requirements generate new disciplines, expertise and professions to take responsibility for them, and architects and educators are correct to recognise regulation as a disciplinary threat; that decisions about the design of the built environment are increasingly determined by agencies outside the profession necessarily limits the architects' own agency. This is not necessarily a bad thing, however, the fragmentation within the design professions - between the subjective and objective potential of building - can lead to a reduction in the potential of architecture. On the one hand, regulations define an increasing proportion of the design of the built environment – from the detailed design of a specific project, to whole sectors of the industry – as non-architectural. These aspect of design are taken out of the hands of clients and their agents, and pre-determined by apparently objective standards. On the other hand, with the architect's control of building often reduced to that of an interface manager satisfying the needs of others, they often seek to defend their subjective agency as designers. Indeed, the 'design intent' of much contemporary architecture appears reduced to that of a signature gesture that representing nothing but the symbolic authorial control of the architect.

a Architects Registration Board, 2010, 'Prescription of Qualifications: ARB Criteria at Parts 1, 2, & 3', ARB: London, p.6.

b R. and Street, E. 2006, 'The attitudes of architects towards planning regulation and con trol', Project Paper 3: 'Papers in the codification and regulation of architects' practices', October 2006, Department of Geography, King's College London, London, p. 6

c Ibid, pp. 9-12

Problematising Creative Freedom

What attitude should architects, and architectural educators, take to the regulation of building, then? This pamphlet forms part of a teaching and research project – Compliant Architecture - reflecting on this question. It documents 10 undergraduate student projects that - while demonstrating compliance with UK legislative requirements and ARB criteria – develop a specific attitude to regulation, which could be summarised as follows: The first premise of these projects is to invert the ubiquitous critique that regulations frustrate architects' creative freedom. If freedom is that "area in which the subject… should be left to do or be what he is able to do or be, without interference by other persons"[a] regulations are in fact a means to establish and safeguard freedom; regulations define an area in which architects, clients, and building users are freed to practice, without posing a risk to each-other. However, this project suggests that the disciplinary challenge posed by regulation is, perversely, the freedom that regulation offers. By taking responsibility for the risk that building poses to ourselves and others, regulations free architects from that opportunity, and it is only through our exposure to risk that we – whether we are architects or building users - develop and communicate subjectivity.

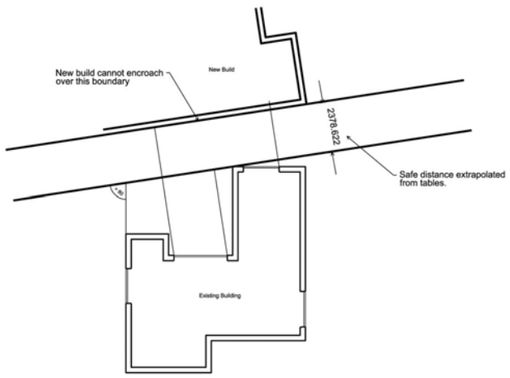
The Materiality of Risk

The second premise of the project, then, is that the risk of building is not a purely negative phenomena; the excitement of a tall space is commensurate with the possibility of a fall; a sense of enclosure is commensurate to a risk of entrapment; the opportunity provided by an opening is commensurate to the possibility that something, or someone, will pass through it. Risk is simply an aspect of the materiality of building, and not something it could ever be freed from. This project approaches regulation, then, not as a means of negating risk, but rather as a means of coming to know it. The student projects presented here employ regulatory limits as means of naming, drawings out, indexing and exposing the risks that buildings inherently pose.

Dramatising and Exposing Risk

Finally, this project contends that the limitation and exposure of risk is not a purely objective concern, but is rather part of architecture's subjective project; it suggests that architecture communicates through the attitude it takes to risk. The 10 projects represented here turn their attention to aspects of building that are risky, and that are closely regulated: spread of flame, surface water drainage, day-lighting and ventilation, corridor widths and visibility, stair and ramp geometries, and the sizes and configurations of openings. They do not seek to negate these risk, but rather appropriate regulatory limits as a means to finely calibrating our exposure to them; carefully considering – for instance - our familiarity with the geometry of a staircase, the chance of bumping into someone in the corridor, the distance water is allowed to ingress into building, which parts of a plan are naturally lit, or the distance we have to stretch in cleaning our windows. That is, while the projects comply with specific clauses of UK legislation, they do not consider this to be an end in itself. Rather, they enjoy regulatory limits as a means of designing with and dramatizing the inherent risk of building.

a Berlin, Isaiah. 1958. Two Concepts of Liberty. Oxford: Clarendon Press, p. 10



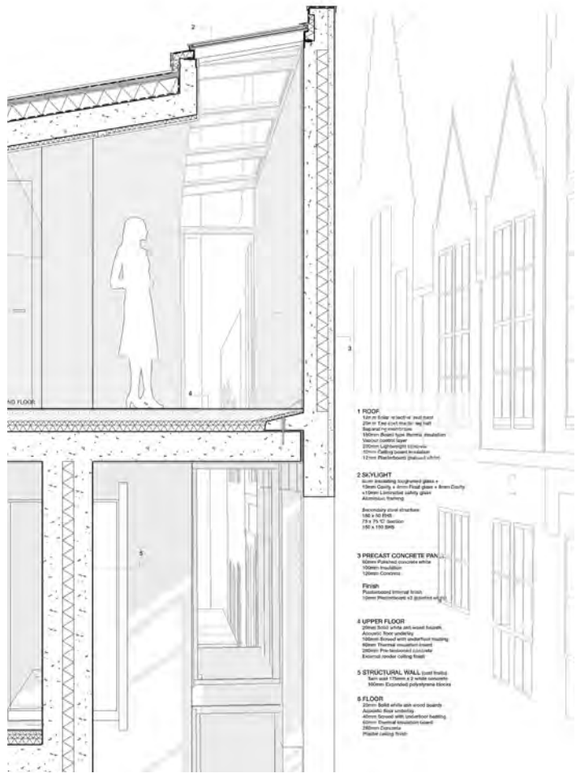
Every building must be designed and constructed in such a way that in the event of an outbreak of fire within the building, the spread of fire to neighbouring buildings is inhibited. Where the external wall of a buildings is more than 1m from the boundary the amount of glazing (m2) may be equivalent to six times the distances (m) to the boundary.

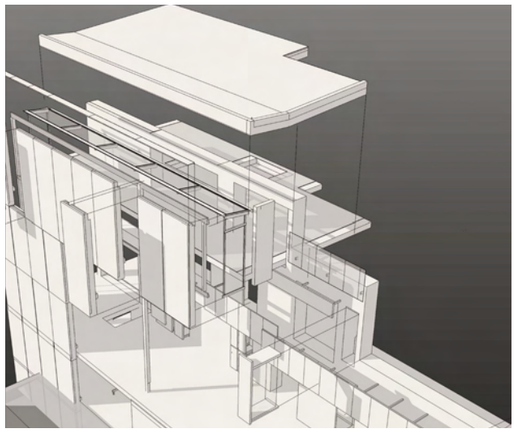
2.6.3
FIRE | Spread to Neighbouring Buildings

FRONTING THE CLOSENESS

Sara Oxley

Regulation 2.6.3 imposes the requirement to step back from the boundary when opening up. This requirement offers a language of publicity and privacy suitable to the extraordinary closeness of Edinburgh's medieval Close's. A gallery steps back to form a forecourt and open façade. Private apartments step forward to maximise footprint. The emphatically layered construction provides long oblique views and avoids overlooking, while enjoying a frontality implicit to the regulation.

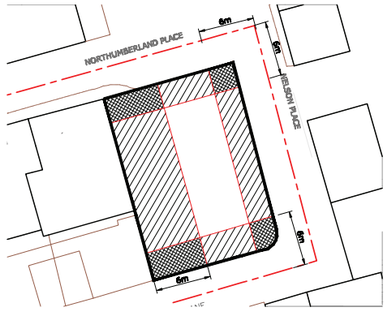


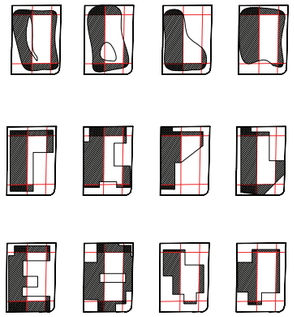


Facade section, exploded axonometric and elevation of proposed gallery and apartment development

Double elevation of Advocates Close identifying extent of overlooking; compliant and non-compliant glazing highlighted

Elevation of proposed gallery and apartment development, superimposed on opposing elevation





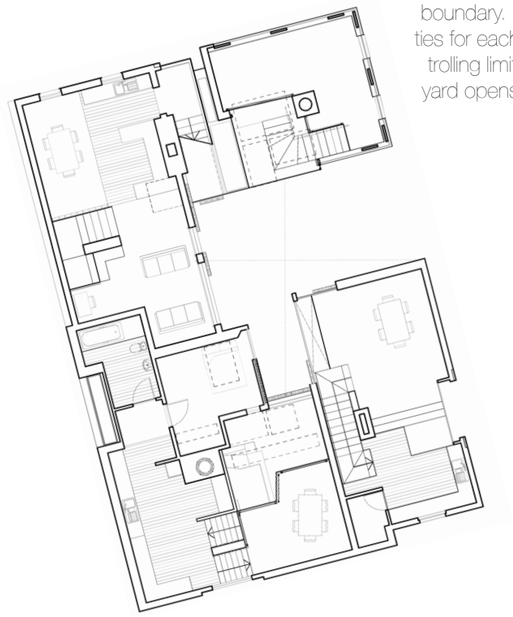
Every building must be designed and constructed in such a way that in the event of an outbreak of fire in a neighbouring building, the spread of fire to the building is inhibited. The roof of a building, including any roof lights, should have a low vulnerability if not more than 6m from the boundary.

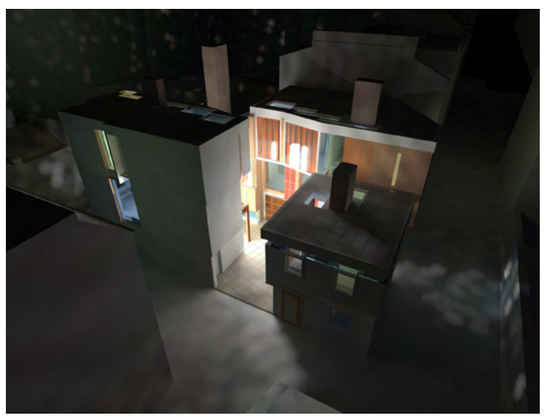
2.8.1
FIRE | Spread From Neighbouring Buildings

FIRESIDE MANNERS

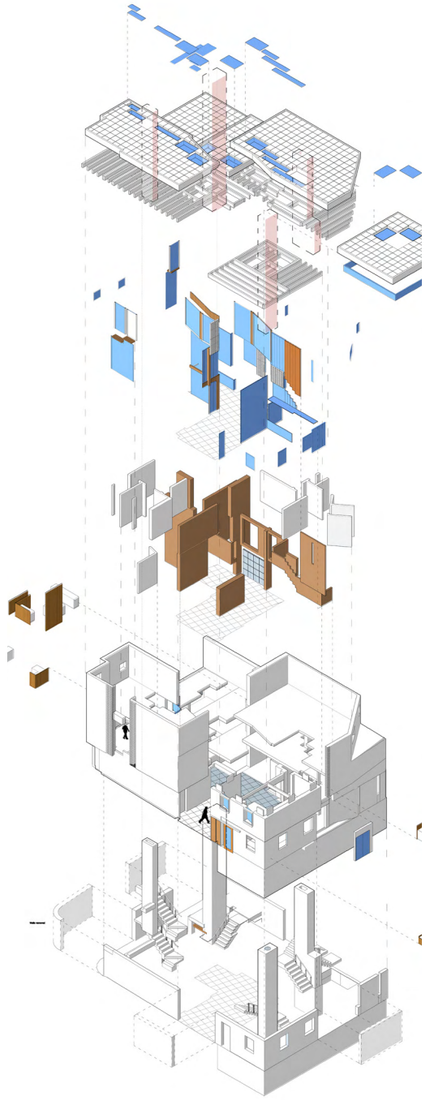
Staszek Stuart-Thompson

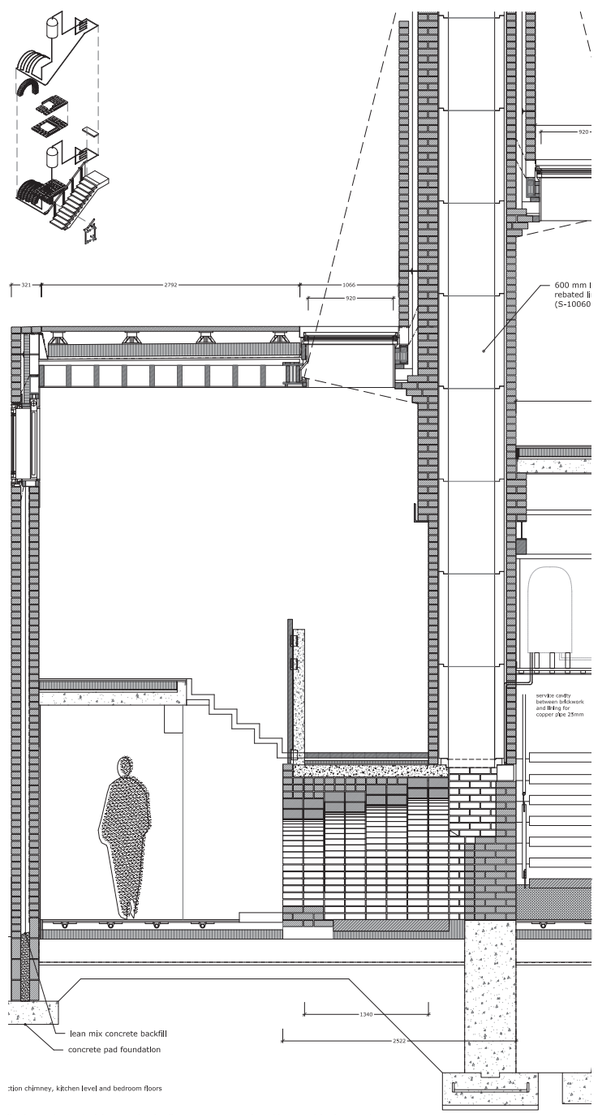
3 dwellings and a bakery are organised around four chimneys, set 6m from the boundary. The chimneys locate the vertical circulation, heating and cooking facilities for each building. The perimeter of the site is formed by a protective wall, controlling limited glimpses between inside and out. To the interior an intimate courtyard opens up, framed by lightweight and vulnerable walls. At night, the flickering of domestic lights in the courtyard forms a campfire for the street.



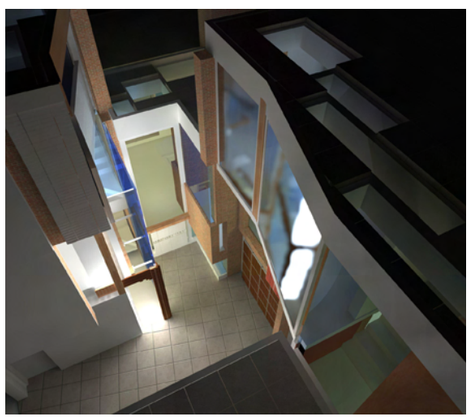


Ground floor plan of proposed courtyard development, showing relation of chimney and stair; render showing night-time view of courtyard

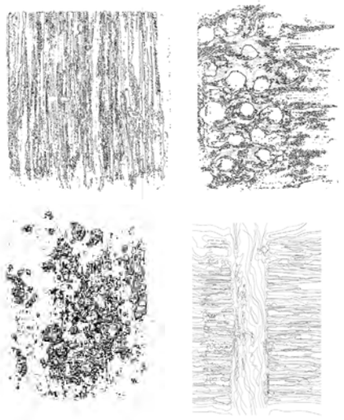




Exploded axonometric showing chimneys, carpark, courtyard linings, roof and rooflights; detailed section of chimney including axonometric of heated balustrade



Renders showing night-time view of courtyard and arrangement of fireplace, stair and kitchen



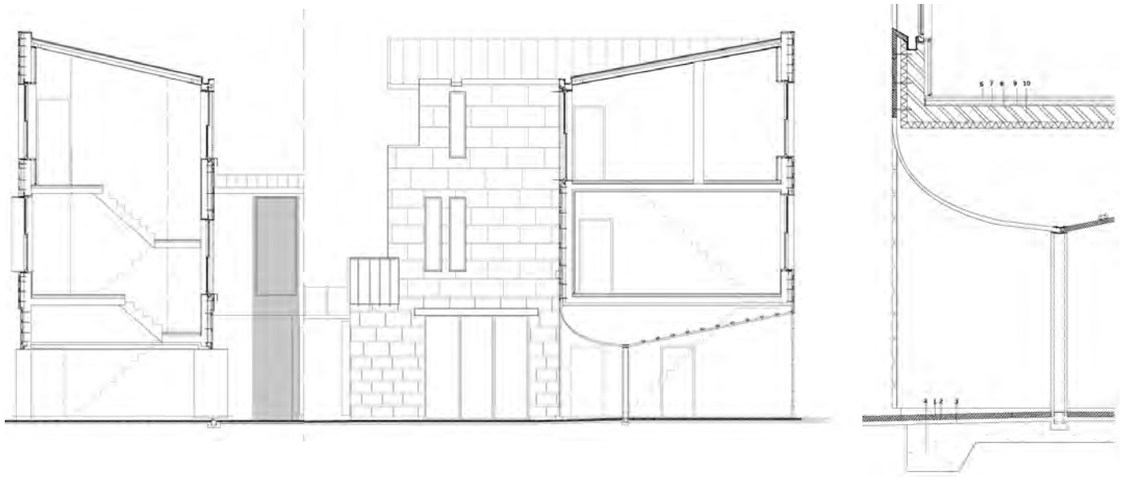
Every building and hard surface within the cartilage of a building must be designed and constructed with a surface drainage system that will ensure the disposal of surface water without threatening the building and the health and safety of the people in and around the building. Buildings should be designed to prevent water from entering doors and windows, to protect persons from falling water when around the dwelling, and to protect people from rainwater splashing on the ground. Paved surfaces should be laid so as to ensure rainwater runoff is not close to the building.

3.6
ENVIRONMENT | Surface Water Drainage

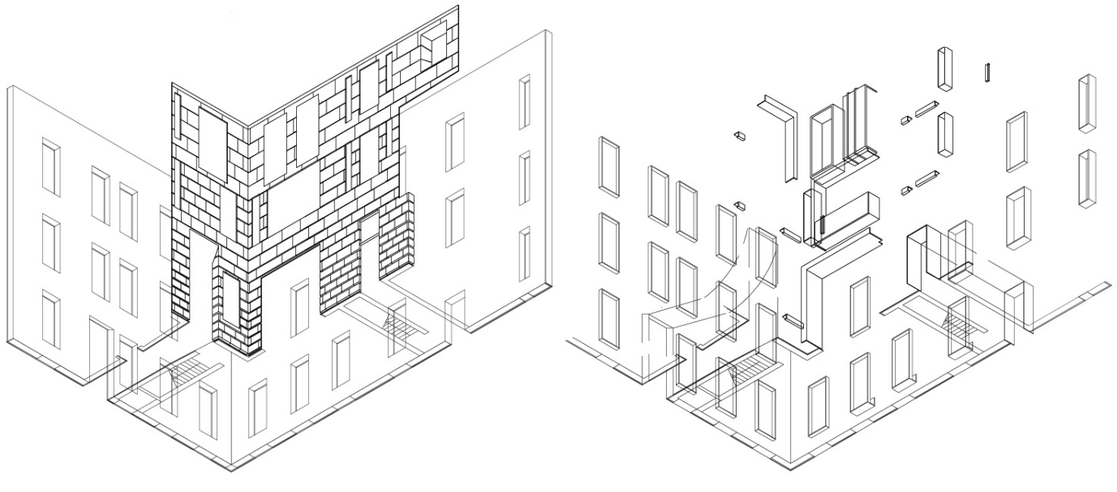
ATMOSPHERIC MECHANISMS
Gillian Storrar

The mute façade of a New Town apartment building is carefully detailed to invite falling water into window boxes, loggia and a courtyard florist. The complex mechanism of a rain shower - its fine curtains, individual droplets, convex lozenges, thin sheets, and plaited cords – animates the tight vertical space, which supplies the appropriate calibrations, foils and sensitive surfaces.

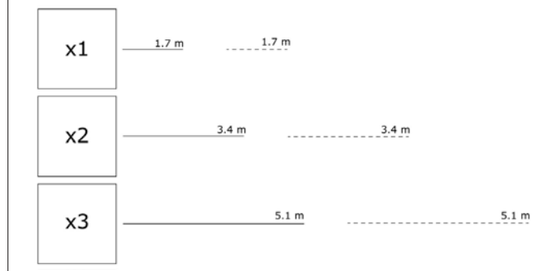
Facade net of courtyard showing anticipated water-marks



Section through close and courtyard; soffit detail inviting water into close



Axonometric of stone cladding and zinc water threshold details



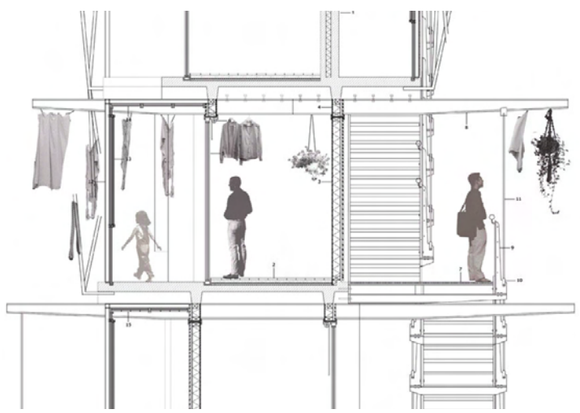
Every building must be designed and constructed in such a way that an accessible space is provided to allow for the safe, convenient and sustainable drying of washing. Since weather is unreliable in Scotland, a designated space for the drying of washing should be provided in every dwelling, and on ground immediately adjacent to the house. The area should allow for at least 1.7m of clothesline per apartment.

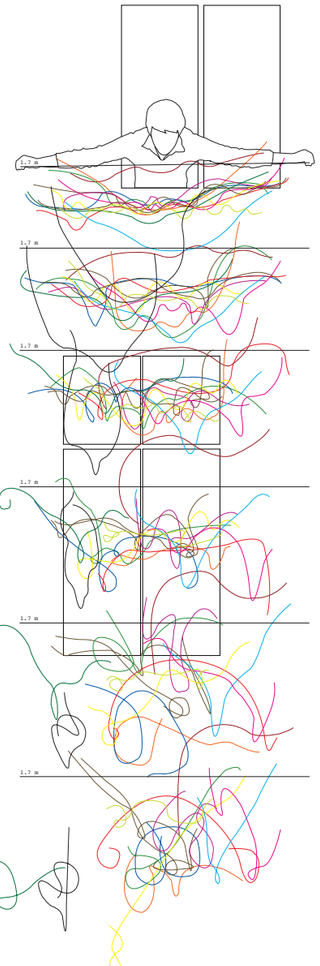
3.11.6
ENVIRONMENT | Drying of Washing

AERATING THE REGULAR

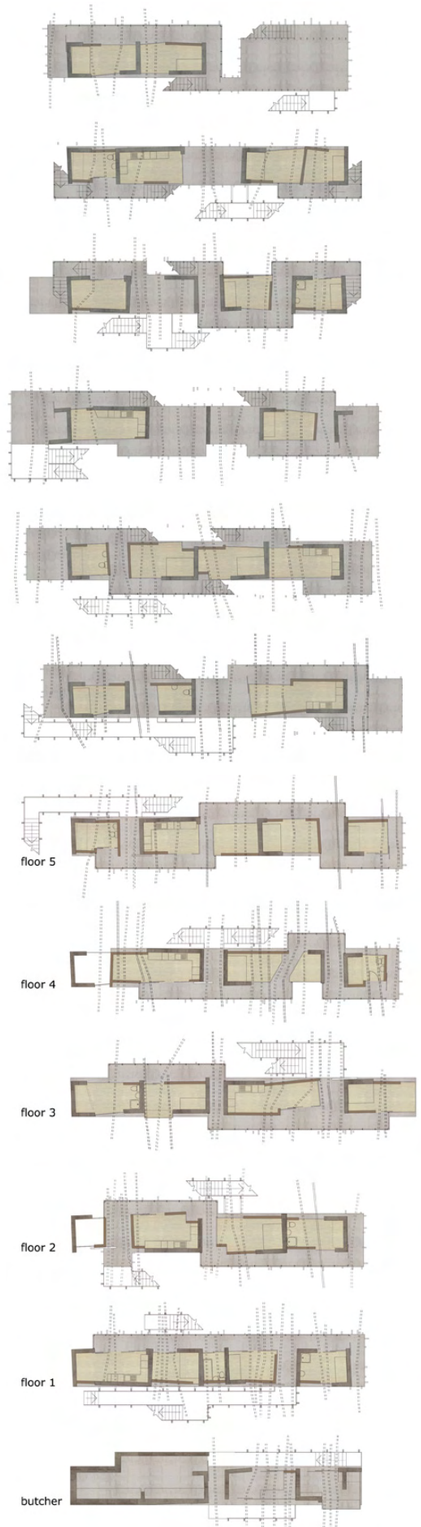
Daniel Goodacre

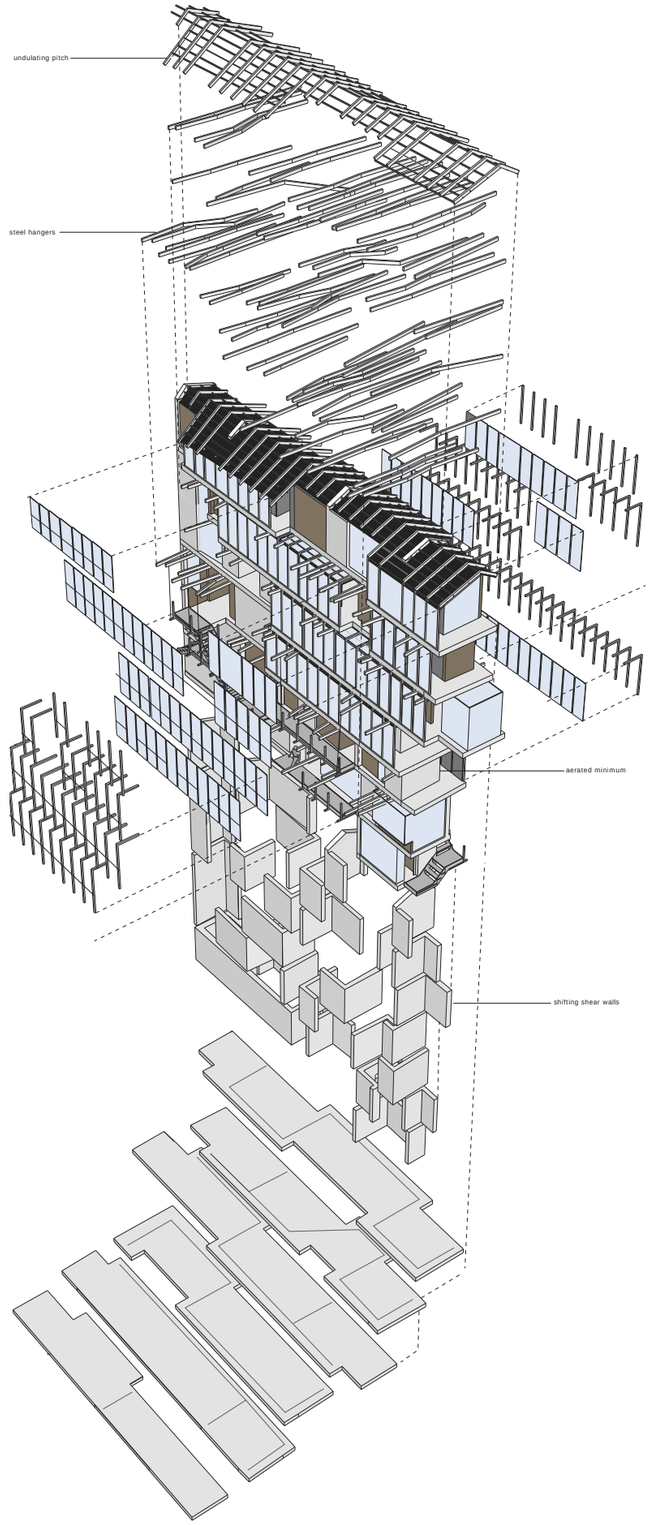
It is beautiful to watch the precision of regulation 3.11.6 (Why 1.7m? A full suit of clothes, a double bed spread?) come into contact with the chanciness of wind. This proposal for 11 apartments in an Edinburgh Close uses 84 instances of fluttering string as a guide to set several regular construction lines a-flutter; space standards, corridor routes, load paths, structural lines, panel centres, stair goings, roof pitches and drying lines.



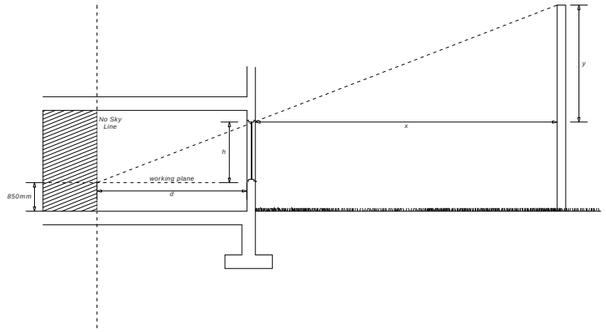


Detailed section of apartments and common stairs showing internal and external drying space; survey of regulation 3.11.6 thrown out of window





Floor plans; exploded axonometric showing corridor routes, sheer walls, cladding, common stairs, drying lines and roof construction



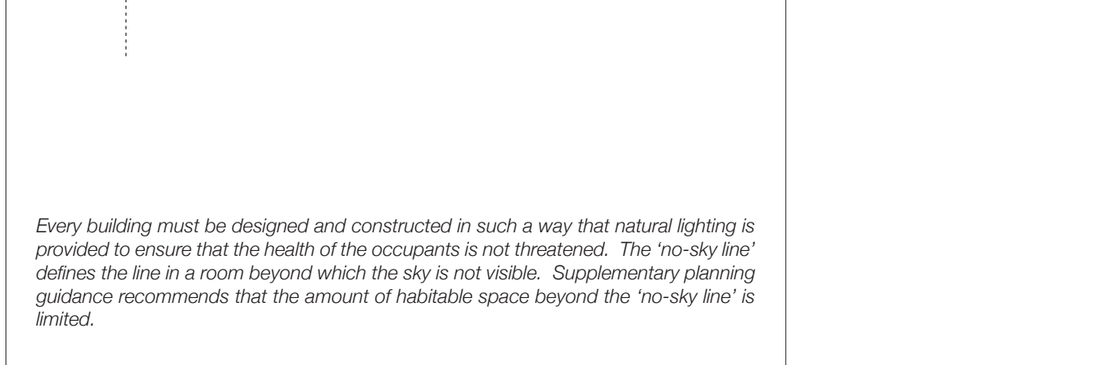
Every building must be designed and constructed in such a way that natural lighting is provided to ensure that the health of the occupants is not threatened. The 'no-sky line' defines the line in a room beyond which the sky is not visible. Supplementary planning guidance recommends that the amount of habitable space beyond the 'no-sky line' is limited.

3.16
ENVIRONMENT | Natural Lighting

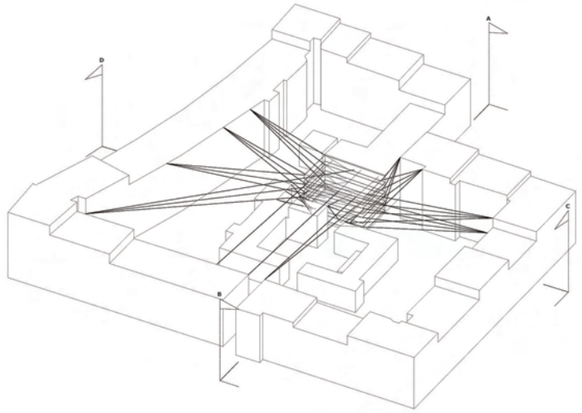
EYELINES AND SKYLINES

Alistair Blake

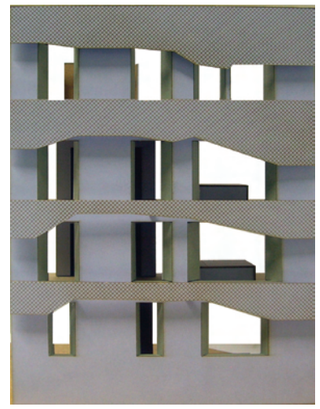
Recording the no-sky line on plan – projected through the aperture of a window - inscribes the surrounding context into building. In this proposal for artists' studios and apartments the arrangement of programme across floor slabs is inflected by the relation between an existing context and the shifting eyeline of the inhabitant. A layered façade modulates this relation, while plan and section subtly shift as they rise to the horizon.



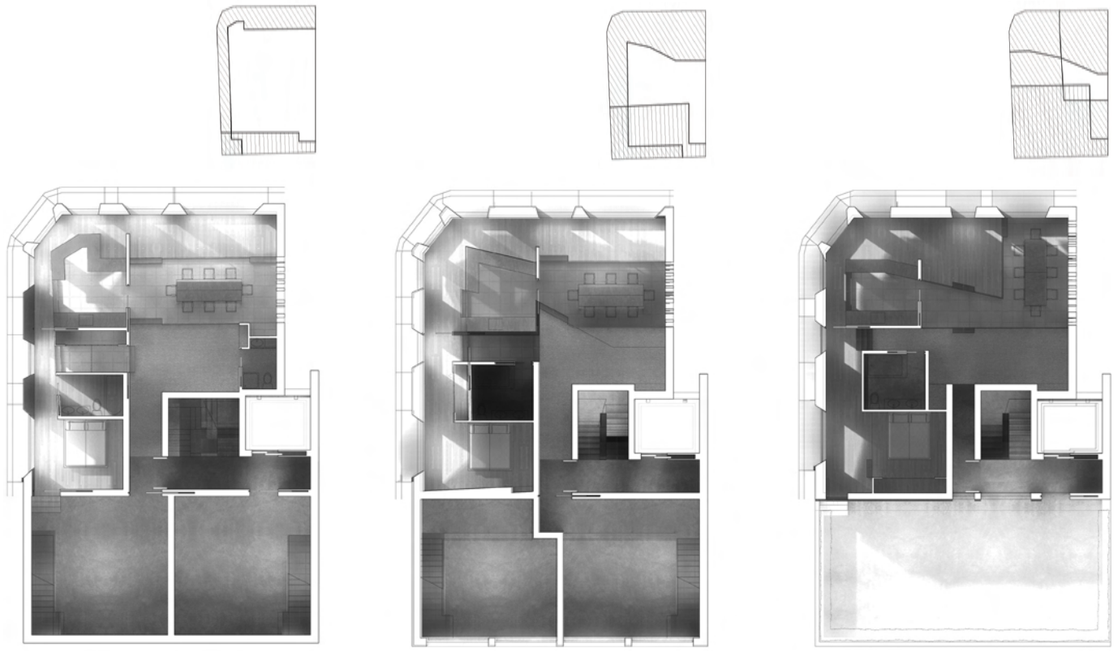
East-West section showing surrounding context, projected skyline and bed location



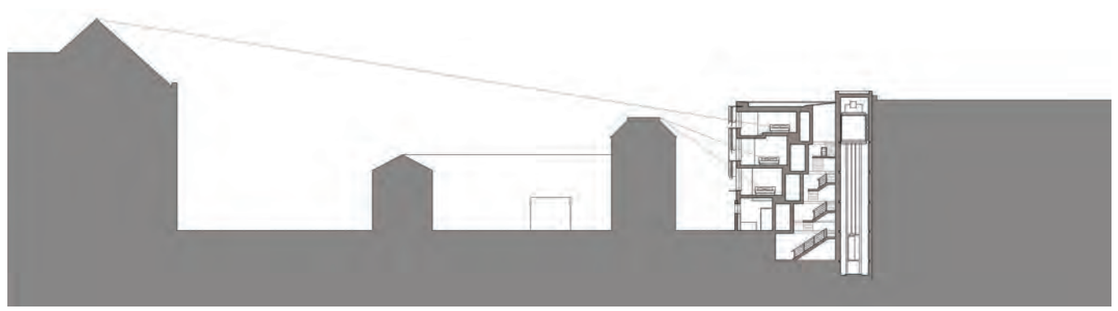
Axonometric showing no-sky line inscribed by context onto site at floor datums



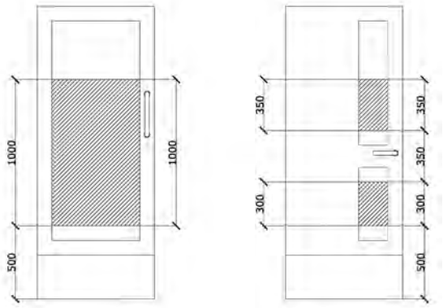
Facade model showing blinds, cills, windows, reveals and beds



Skyline diagrams and first, second and third floor plans



North-south section showing surrounding context, projected skyline and bed location



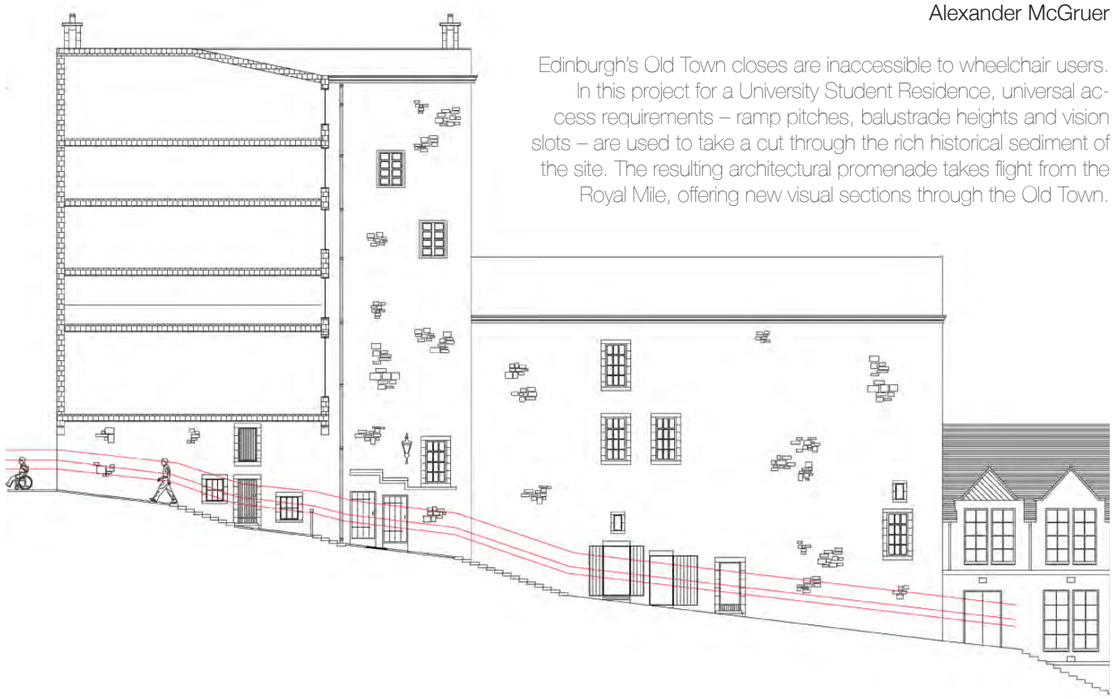
Every building must be designed and constructed in such a way that all occupants and visitors are provided with a safe, convenient and unassisted means of access to the building. To assist in preventing collisions, a clear vision panel to a door should give a zone of visibility from a height of not more than 500mm to at least 1.5m above finished floor level. This may be interrupted by a solid element between 800mm and 1.15m above floor level.

4.1.7
SAFETY | Accessible Entrance

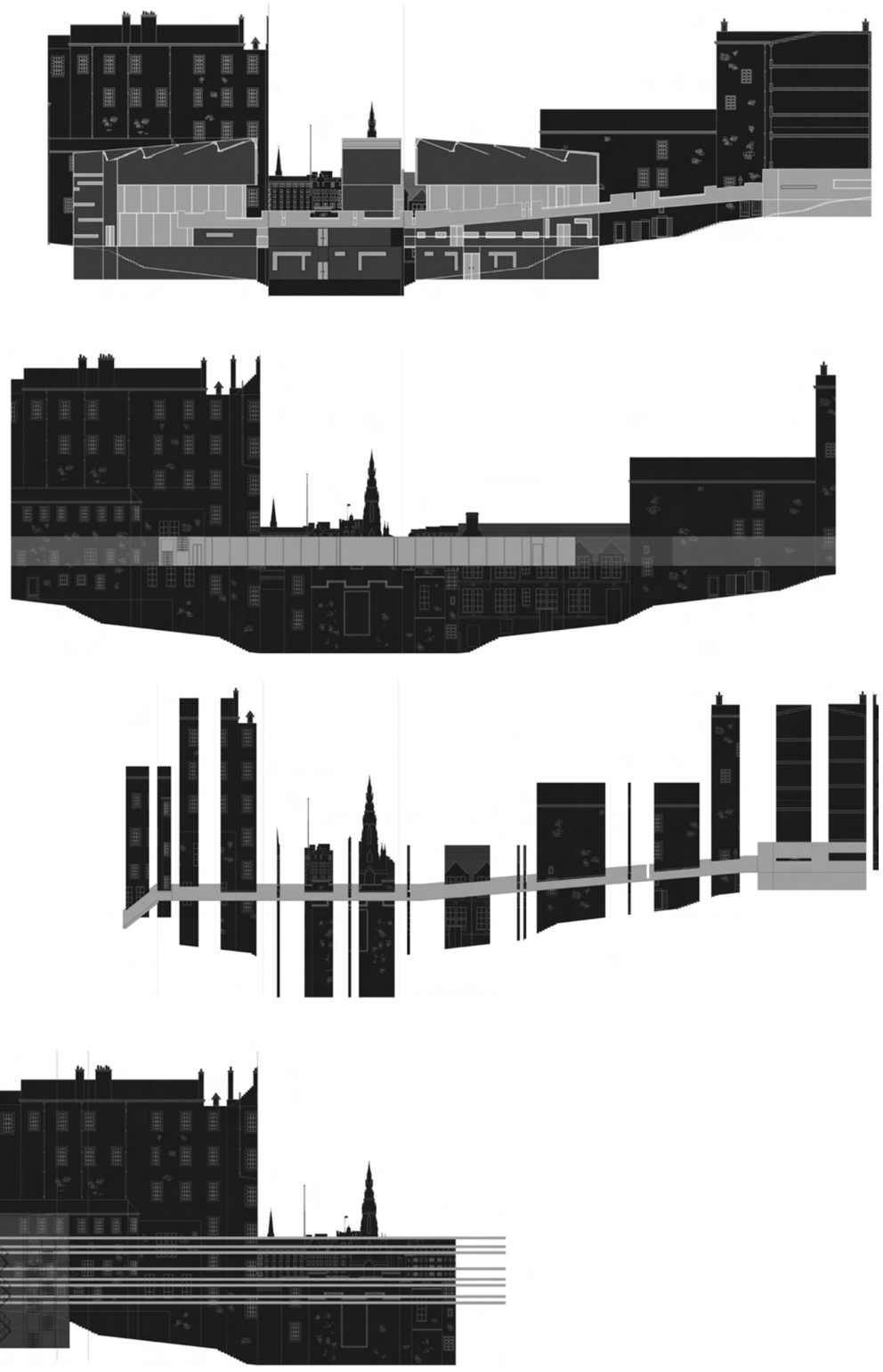
VISION CUTS

Alexander McGruer

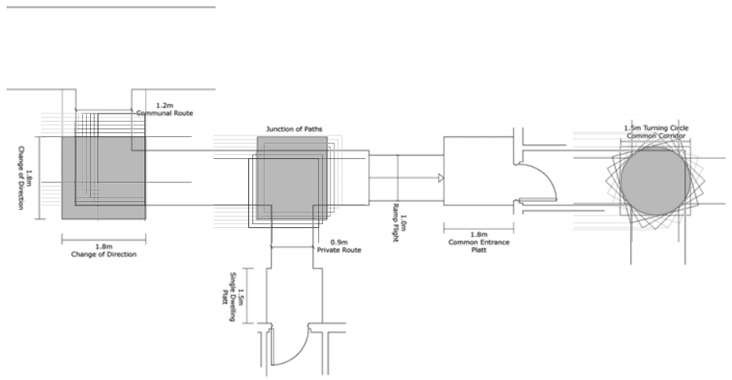
Edinburgh's Old Town closes are inaccessible to wheelchair users. In this project for a University Student Residence, universal access requirements – ramp pitches, balustrade heights and vision slots – are used to take a cut through the rich historical sediment of the site. The resulting architectural promenade takes flight from the Royal Mile, offering new visual sections through the Old Town.



Guide to accessible vision slots and survey of Advocates Close



Unfolded section of student residence; view of context from common area; view of context from accessible ramp; view of context from vision slots to common stair



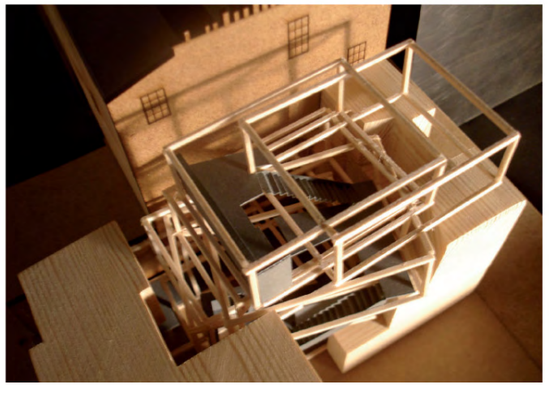
Every building must be designed and constructed in such a way that safe and convenient means of access is provided within the common areas and to each dwelling. The common areas of a domestic building remain in effect a public or shared area. Corridors should be wide enough to allow two-way traffic and manoeuvring at junctions or when passing through doorways. Where corridors are less than 1.8m in width, manoeuvring or passing places of not less than 1.8m in length and width and free of obstructions should be provided.

4.2.2
SAFETY | Access within Buildings

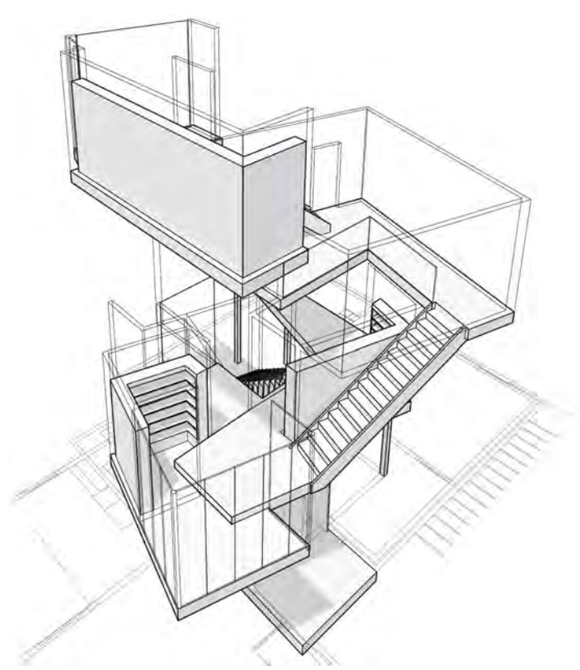
A SHIFTY CHARACTER

Joel Woodier

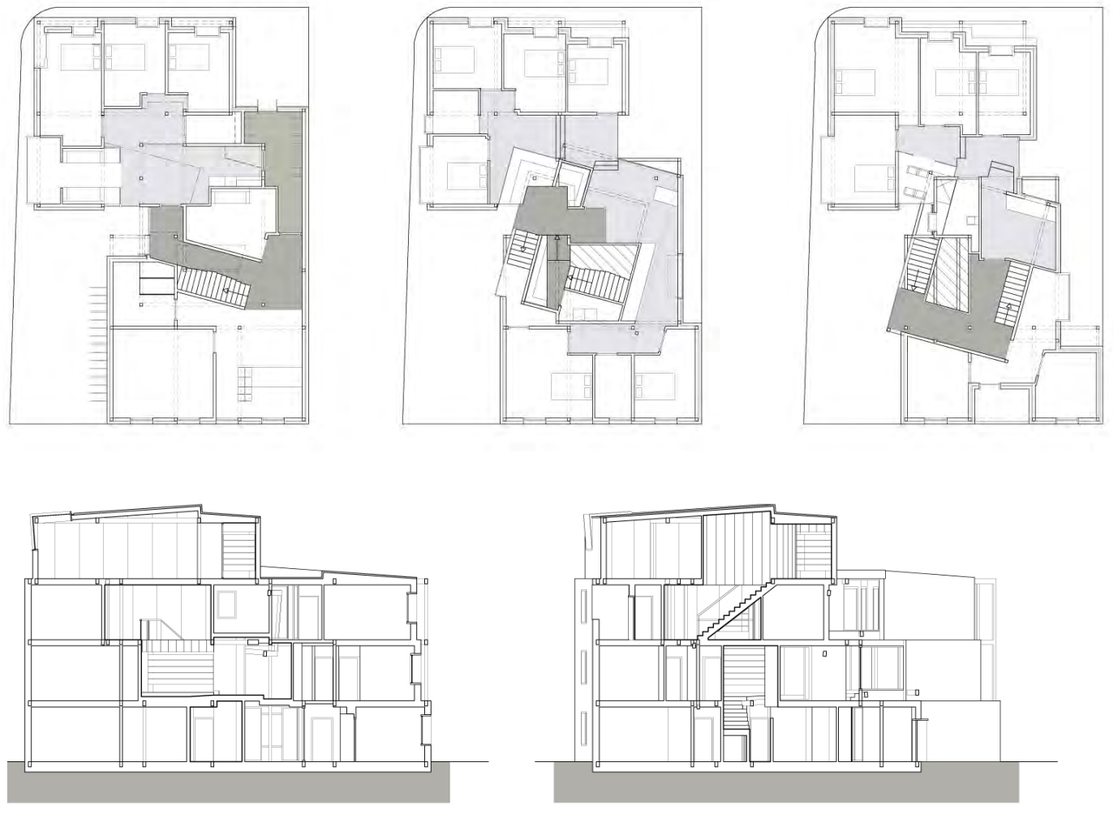
Regulation 4.2.2 opens the design of corridors to a degree of chance; the required increase in width can be acheived in a number of ways, responding to circumstantial factors. The shared common spaces of a Student Residence open the inhabitant's life to a degree of chance; whose glance will be caught when leaving the bathroom in a towel? A common stair is here animated by a series of small shared programmes that inscribe this social tension by enjoying and occupying the shifty limits of prescription.



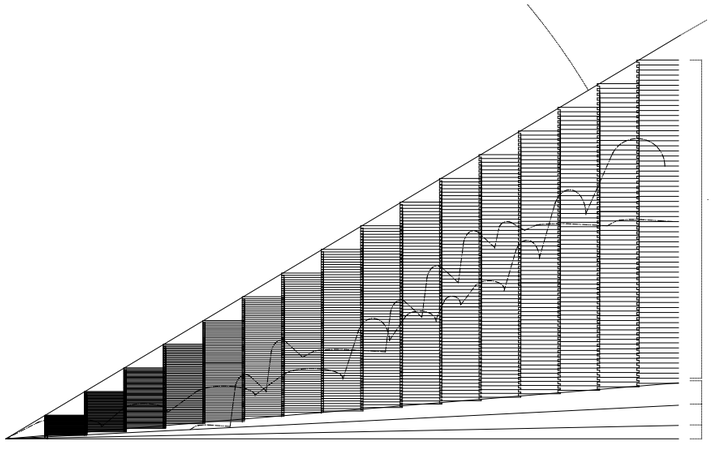
Model showing accommodation massing and stair structure.



Perspective of shared spaces in common stair; programmatic axo showing relation of private, semi-private and public spaces.



Plans and sections of Student Residence - private, semi private and public areas higlighted on plans.

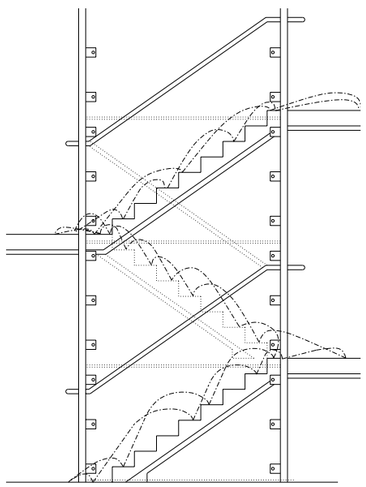


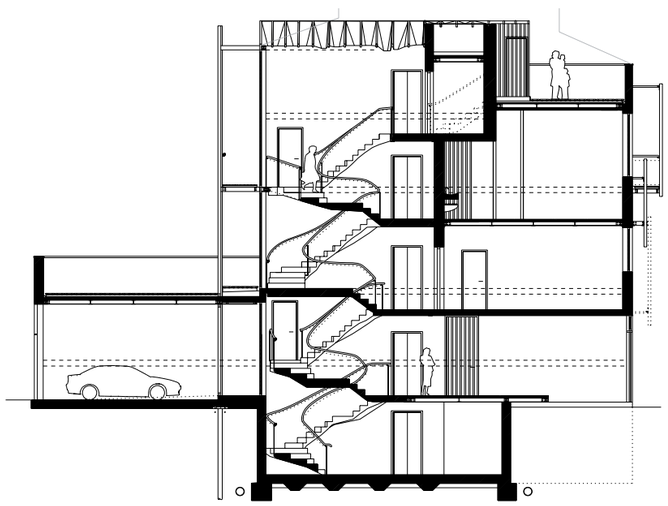
Every building must be designed and constructed in such a way that every level can be reached safely by stairs or ramps. The geometry of a stair can have a significant effect on the ability of people to use a stair safely and conveniently. The pitch of a private stair may be steeper than that of a public stair in recognition that users, as occupants, will be more familiar with the stair through frequent use. The maximum rise for a public stair is 170mm. The maximum rise for a private stair is 220mm.

4.3.2
SAFETY | Going, Rise and Pitch of Stairs

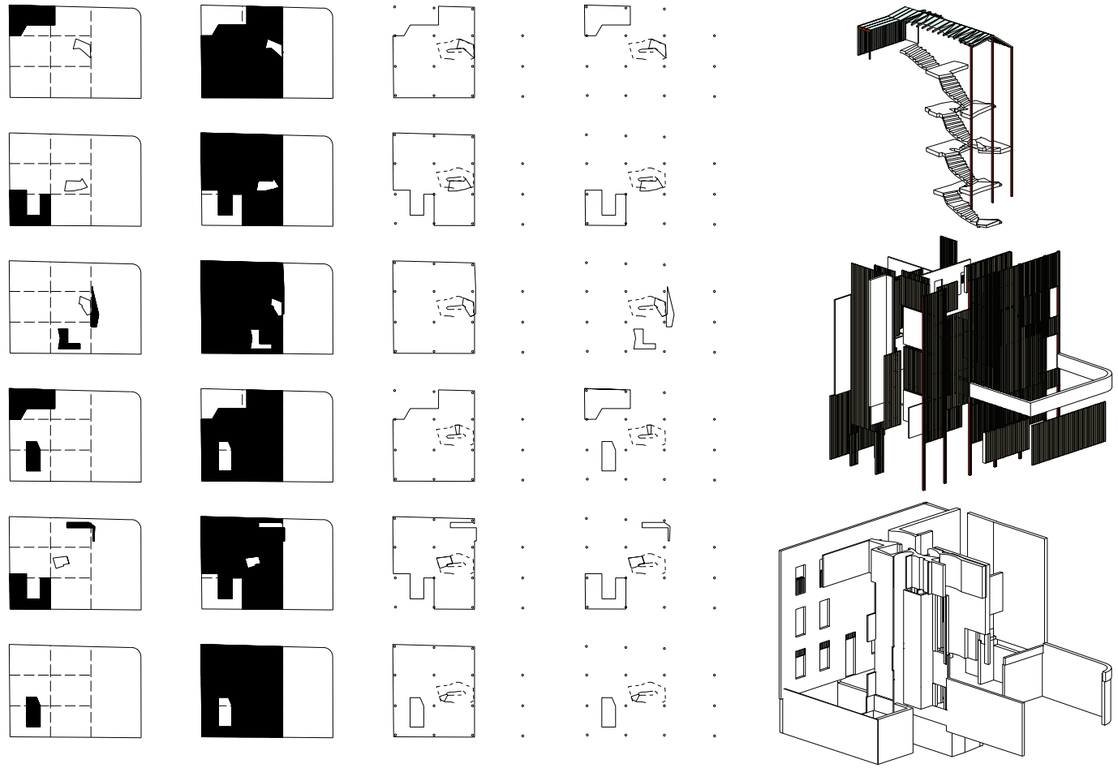
LUNGE-PLAN
Steven Bauman

Building occupants will trip-up and skip-down their stairs with a confidence born of familiarity. In this proposal for three psychiatrist's offices and residences, the regulating device of the stairs is inflected through a survey of jovial leaps; the resulting short flights set up a language of Work and Live. While the reception and office facilities occupy the principal levels - and are accessible by lift - the domestic programme occupies a Raum-Plan established by a series of half landings.



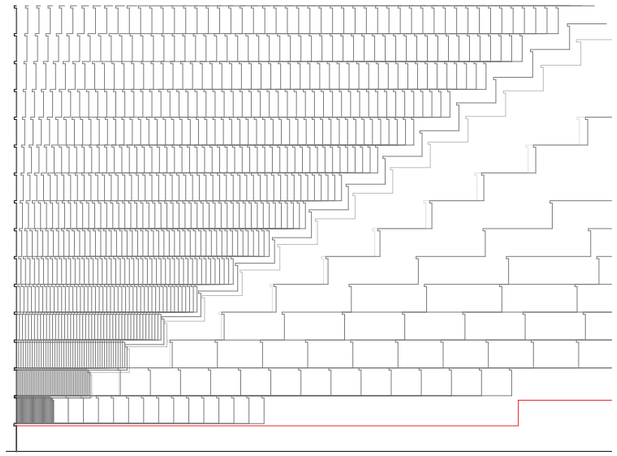


Survey of inhabitant lunging up compliant stair; section of stair showing half-landing generated.



Plan diagram showing stair landing and half-levels; exploded axonometric showing roof and stair structure, screened elevation, and core (incorportaing lift and all wet facilities)

Plans showing stair rising (left-right, bottom-top) through series of half levels seperating work and live programmes.



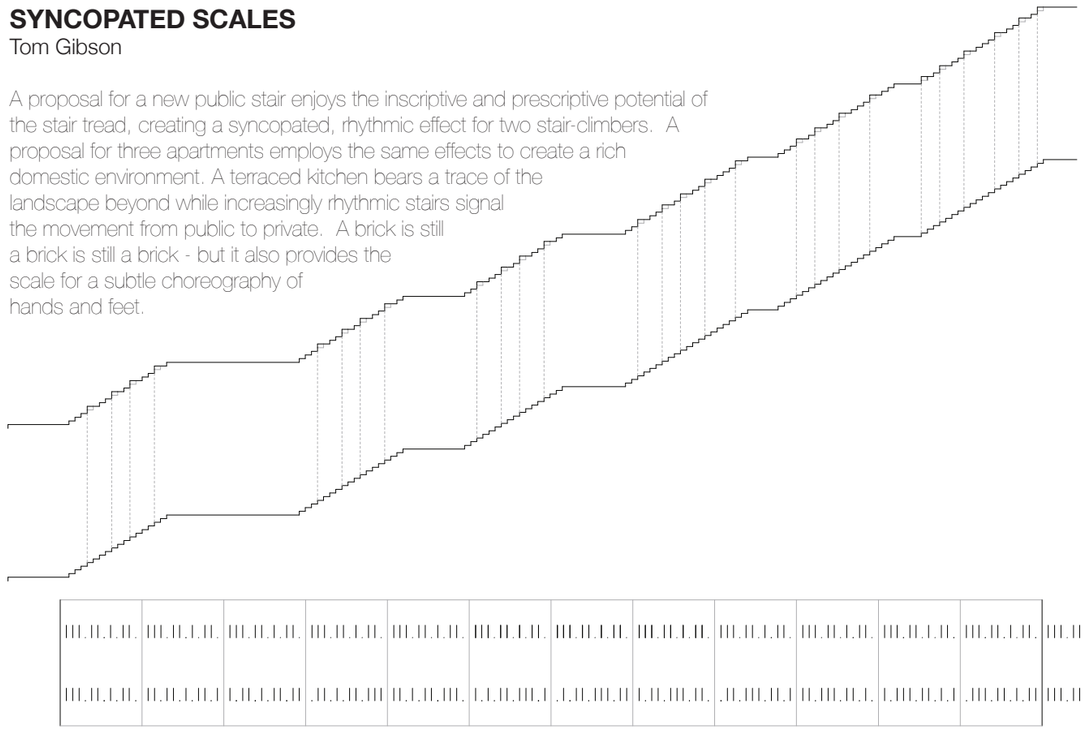
Every building must be designed and constructed in such a way that every level can be reached safely by stairs or ramps. The geometry of a stair can have a significant effect on the ability of people to use a stair safely and conveniently. The minimum going for a private stair is 225mm. The most comfortable combination of rise and going varies between individuals but in general, a going in excess of a minimum value will increase both safety and amenity.

4.3.2
SAFETY | Going, Rise and Pitch of Stairs

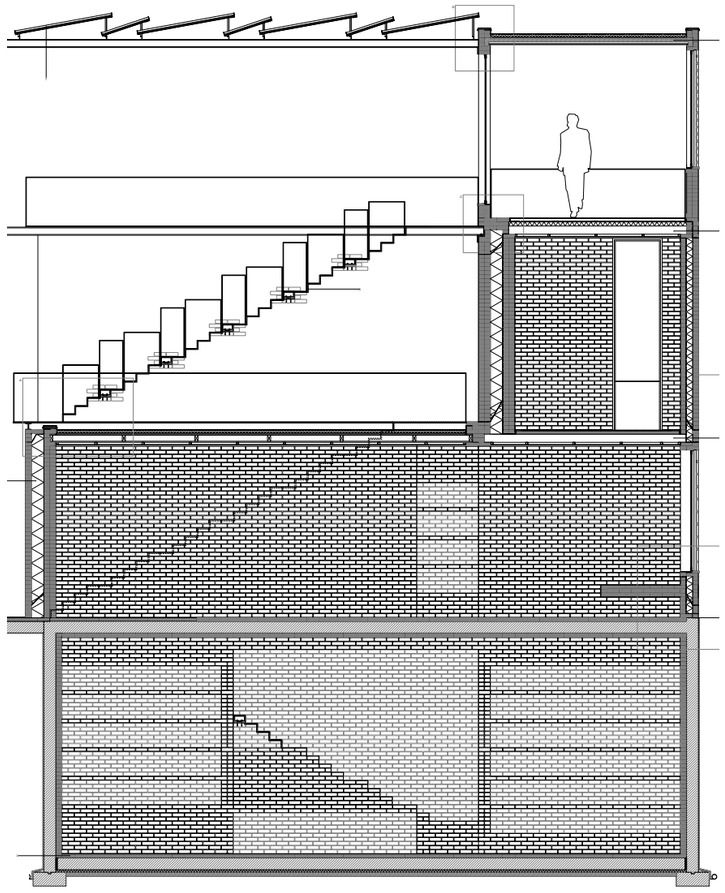
SYNCOPATED SCALES

Tom Gibson

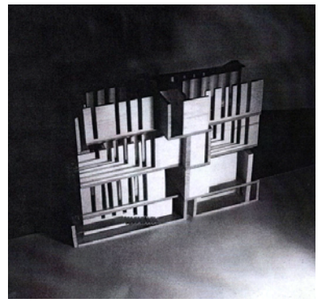
A proposal for a new public stair enjoys the inscriptive and prescriptive potential of the stair tread, creating a syncopated, rhythmic effect for two stair-climbers. A proposal for three apartments employs the same effects to create a rich domestic environment. A terraced kitchen bears a trace of the landscape beyond while increasingly rhythmic stairs signal the movement from public to private. A brick is still a brick is still a brick - but it also provides the scale for a subtle choreography of hands and feet.

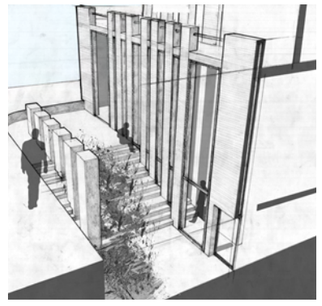


New News Steps: phase effects generated by scripting stairs to syncopated steps

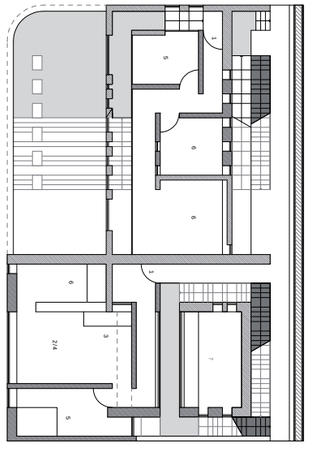


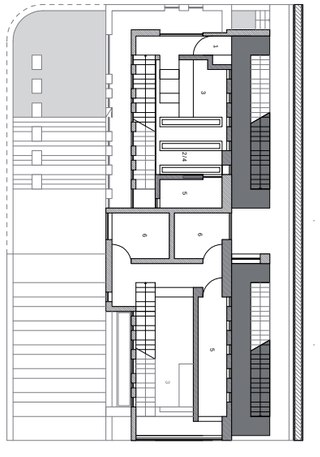
Section showing folded steel stair set-out to brick party wall.

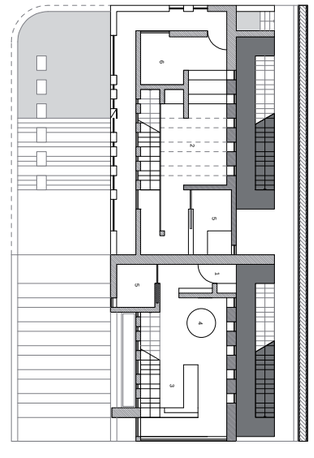




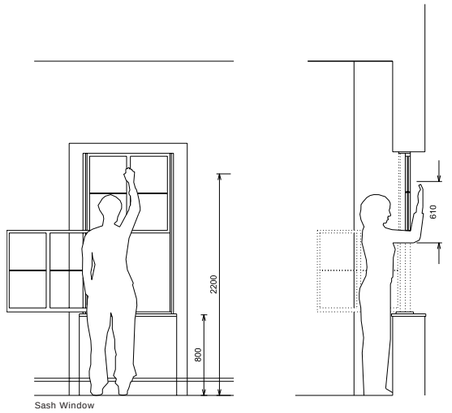
Model and sketch showing brick piers







Plans of ground, first and second floors, showing public and private stairs, and terraced kitchen.



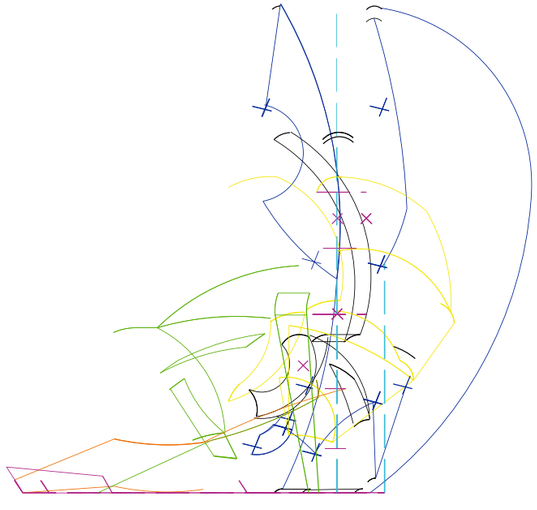
Every building must be designed and constructed in such a way that both faces of a windows are capable of being cleaned such that there will not be a threat to the cleaner from a fall resulting in severe injury. Any window of roof light more than 4m above adjacent ground should be designed so that any external and internal surfaces can be cleaned from within the building or from a load-bearing surface, such as a balcony or catwalk.

4.8.3
SAFETY | Cleaning of Windows

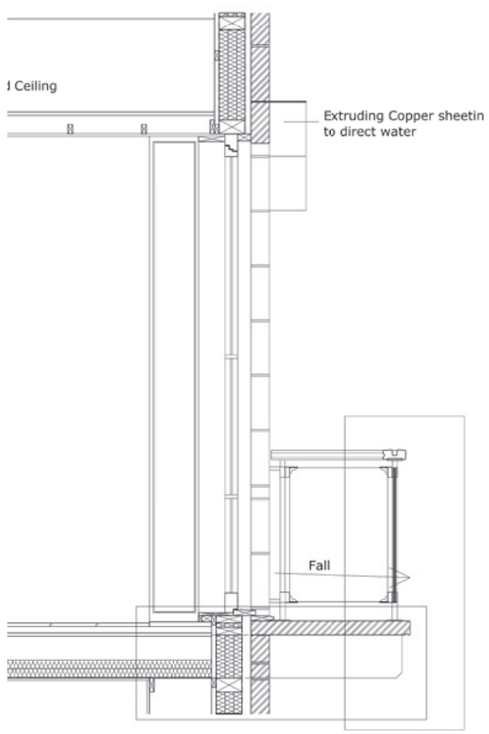
STAGED SALUTATIONS

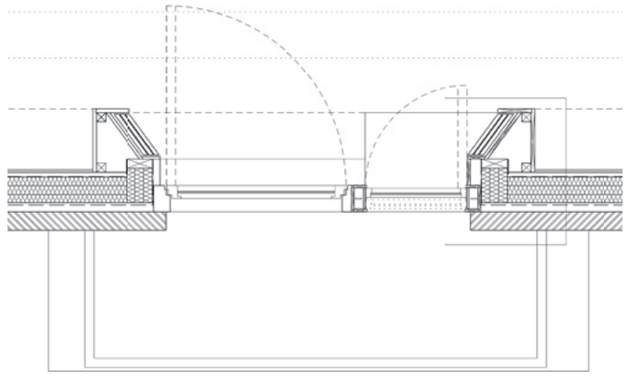
Lucy Brooke

The British Standards limit the size of windows in buildings to limit the repeated risk of injury should an occupant overbalance while stretching. The Sun Salutation in Yoga promotes repeated gradual stretching which limits the risk of exercise and improves balance. Through small and carefully designed domestic fragments, this design promotes a subtle stretching of the regulations to create more celebratory, salutatory windows, while enjoying the fetishistic and therapeutic aspects of cleaning house.



12 Stages of the Sun Salutation: photgraphic and drawn survey





Plan, section and elevation of balcony window. The balcony is designed to allow the user to practice sun salutations on the building line; the window requires subtle stretching during cleaning.

North elevation showing subtle stretches inscribed on regimented New Town facade.

The selected projects were produced during an 11 week design unit for 4th year undergraduate students as part of the MArdes Honours programme, Department of Architecture, University of Edinburgh. Students were asked to study a single clause of regulation, identify the architectural issues raised by that regulation, produce drawings that explore the abstract potential of regulation, and to use these drawing to regulate the design of building. The course was offered in 2008 and 2009, making proposals for a mixed use development on a site in Edinburgh's Old-Town and New Town respectively.

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2008

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Ingveld Hanevold
Aaron Jones
Alex Joseph
Kristinna Mair
Mike Mullins
Alex MacGruer
Katrina McSween
Sara Oxley
Chris Raeburn
Sarah Warnock

2009

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Steven Bauman
Alistair Blake
Lucy Brooke
Harry Frederick
Sophie George
Thomas Gibson
Shanaver Hamid
Vicky Harrison
Tom Hayes
Kousik Kar
Catriona MacDonald
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Health and Safety Executive

Healthy design, creative safety

Approaches to health and safety teaching and learning in undergraduate schools of architecture

In January 2010, the HSE and RIBA commissioned a team from the University of Sheffield to undertake a research project into the teaching of health and safety in undergraduate schools of Architecture in the UK. The need for the research was recognized by previous studies into 'identification and management of risk in undergraduate construction courses' [2001 and 2004] which highlighted the need for schools of architecture to have a more consistent and integrated approach to the teaching of health and safety. More recently in 2009, a project looking at 'Integrating risk concepts into undergraduate engineering courses' provided a precedent for individual higher education courses to embed health and safety into their core activities in innovative ways. In 'One Death is too Many' [2009] one of the key recommendations is a review of health and safety teaching in construction industry courses at Higher Education, suggesting that graduates do not have the knowledge of health and safety issues to play their role in reducing construction deaths. It is on this foundation that the Healthy Design, Creative Safety work is built.

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