



Programme Area: Buildings

Project: Building Supply Chain for Mass Refurbishment of Houses

Title: Summary and planning report

Abstract:

Please note this report was produced in 2011/2012 and its contents may be out of date. This deliverable defines (within the context of the Optimising Thermal Efficiency of Existing Housing project) what an acceptable level of intervention will be for the 5 main housing types selected for scenario testing. The deliverable will undertake a Technology development review activity to identify technical opportunities that are capable of reducing identified risks of refurbishment to acceptable levels.

Context:

This project looked at designing a supply chain solution to improve the energy efficiency of the vast majority of the 26 million UK homes which will still be in use by 2050. It looked to identify ways in which the refurbishment and retrofitting of existing residential properties can be accelerated by industrialising the processes of design, supply and implementation, while stimulating demand from householders by exploiting additional opportunities that come with extensive building refurbishment. The project developed a top-to-bottom process, using a method of analysing the most cost-effective package of measures suitable for a particular property, through to how these will be installed with the minimum disruption to the householder. This includes identifying the skills required of the people on the ground as well as the optimum material distribution networks to supply them with exactly what is required and when.

Disclaimer:

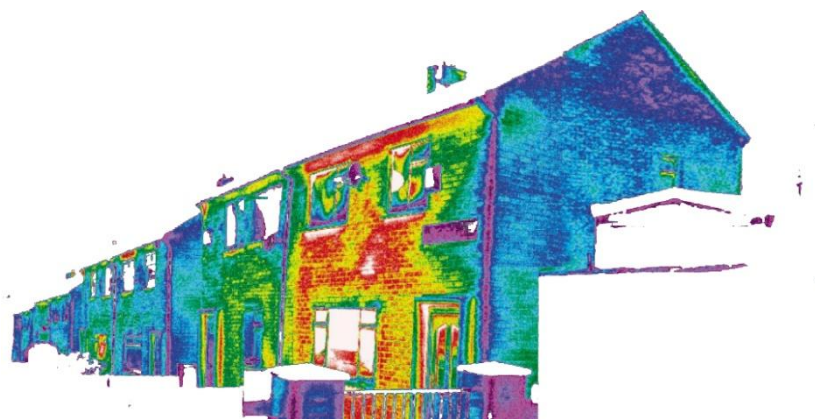
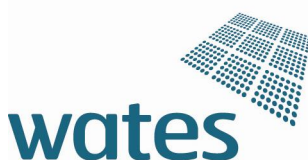
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The **ENERGY ZONE**
CONSORTIUM:



PEABODY



Optimising Thermal Efficiency of Existing Housing

BU1001_PM08_7.4_Summary and Planning
Report

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1. Executive Summary

The key findings for Workpackage 7 were:

- The number of fatalities in construction has declined over the last 20 years.
- Manufacturing is still safer and it therefore makes sense to use offsite technologies to transfer work (and risk) from construction to manufacturing.
- The performance of UK construction is amongst the best the western economies
- Accidents are much more likely to happen to less experienced people.
- The poly-competent teams need to be trained to help avoid these accidents in:
 - how to carry out the tasks
 - the correct behavioural attitudes to safety
 - best practice methods of working (including obtaining the appropriate Construction Skills Certification Scheme card
 - identifying risks
- Training in these areas would make the poly-competent team competent as defined in the Construction and Design Regulations.
- Existing culture has been identified by the Health and Safety Executive as the greatest barrier to health and safety improvements. The poly-competent teams need to take on board the recommendations of “HSE Human Factors Briefing Note No. 7 Safety Culture”
- The designer of the RetroFix and RetroPlus pallet of solutions is a designer as defined in the Construction and Design Regulations, as is the leader of the poly-competent team. However, CDM does not require a formal risk assessment unless the work is unusual or significant.
- The key technology concepts discussed include:
 - Laser scanning and CNC machining
 - The use of drones to take photos and video of inaccessible places as part of a survey
 - Offsite production of roof panels and units
 - Improved access systems

- Assistance for manual handling
- All of these would improve safety in the example house-types identified although some are of more relevance to multi-storey dwellings, whilst others are more relevant to low rise dwellings

2. Introduction

This paper is designed to summarize the Health and Safety papers and in particular, to highlight how the new ideas and concepts developed in Workpackage 7.3 could be applied to the Peabody house-types identified in Workpackage 7.2.

The consortium were also asked to also look at a plan for developing any intellectual property arising from Workpackage 7, but none has arisen, so this will not be taken forward.

This paper will highlight the leading trends and key issues around health and safety and these will be illustrated from the insights from the workshops and include the appropriate recommendations for action. The application of Construction Design and Management (CDM) Regulations to RetroFix and RetroPlus will be considered before looking at the new ideas and concepts and their application to the Peabody house-types.

Wherever text is in bold, it indicates that the words used have a legal sense that is defined in the CDM Regulations. These definitions are in Appendix A.

3. Trends and Key Issues

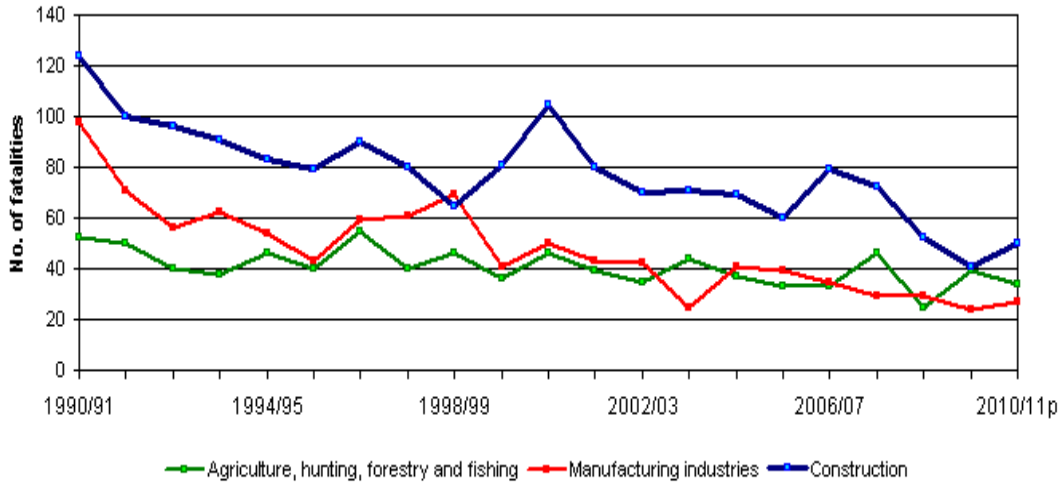


Figure 1 Twenty year trend in worker fatalities in three different sectors of work

Source: www.hse.gov.uk/statistics/

The general trend in the number and rate of fatal injury from 2004/05 to 2010/11 is downwards, but it has been fairly static over the past 3 years, but the statistics for these years are not complete.

The gap with manufacturing performance is closing, but remains a gap. It therefore makes sense to look at transferring work from the site to the factory using offsite cutting of materials or offsite prefabricated components, such as roof elements (see section 4).

Figure 2 shows that the trend in improving safety within construction has continued even when output has risen.

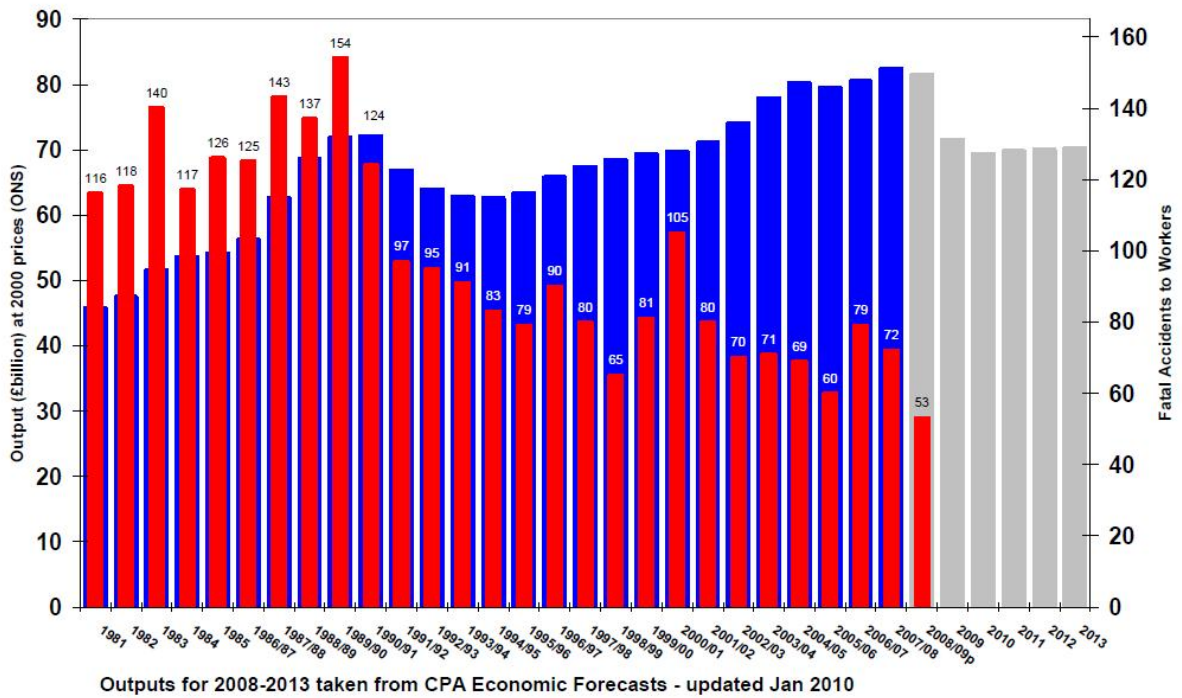


Figure 2 Fatal Accidents to workers v Industry Output

Source: www.hse.gov.uk/construction/pdf/conintreport.pdf

These trends have not impacted relative the proportion of *fatal* accidents to all accidents (see figure 3), thus implying that refurbishment is no more safe or dangerous than other construction work.

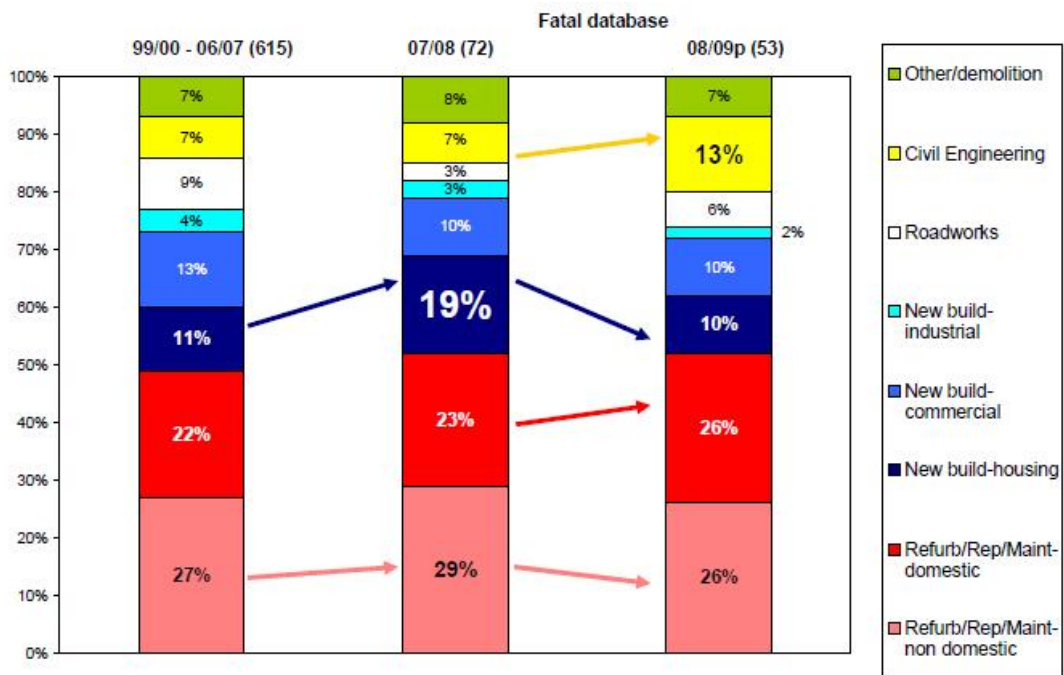


Figure 3: Where fatal accidents occurred 2008/09

Source: www.hse.gov.uk/construction/pdf/conintreport.pdf

The performance of the UK construction industry compares favourably against other major economies (see figure 4):

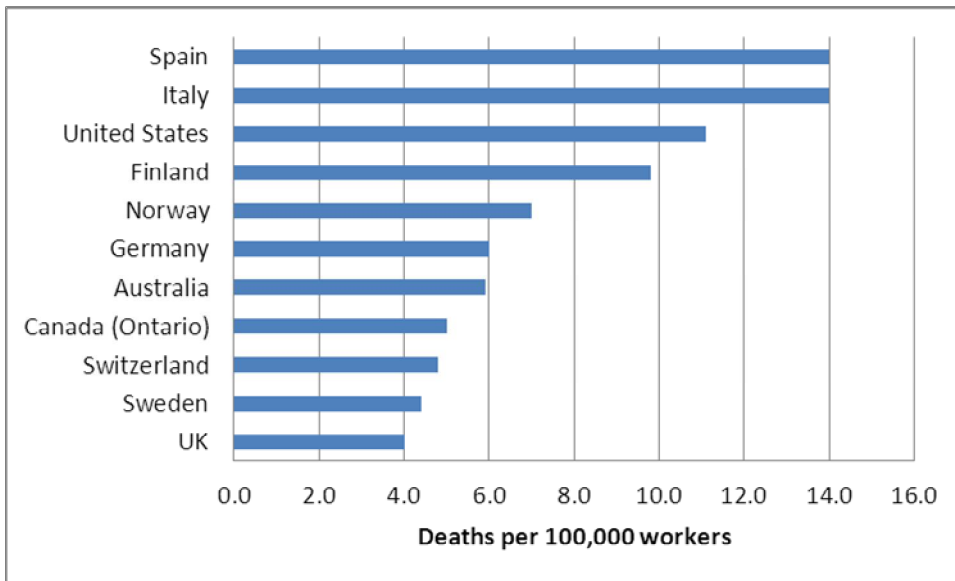


Figure 4: Rate of deaths from injuries in construction, selected countries, 2005 and UK (2005/6)

Source: (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Health_and_safety_at_work_statistics)

except for UK, which is www.hse.co.uk/statistics

Figure 5 shows who in the workforce is being injured by length of job tenure:

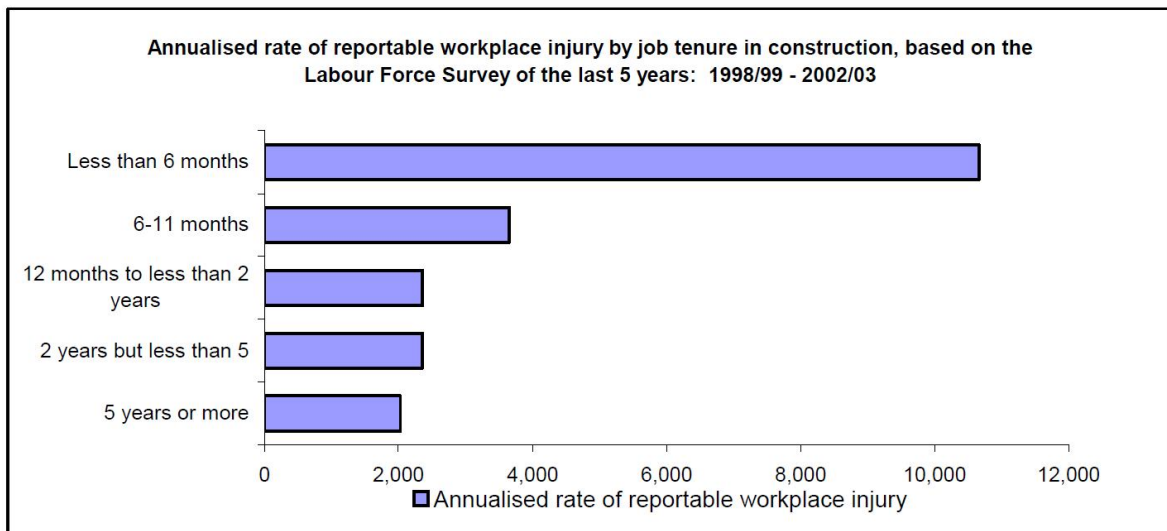


Figure 5: Reportable Injuries by job tenure

Source: www.hse.gov.uk/construction/pdf/conintreport.pdf

The chart shows that those with the least experience have the most accidents. This illustrates that safe working practice and attitudes are being learnt on the job and that much more needs to be done to educate people before they start work. This supports the recommendation that

the poly-competent teams need to be trained in health and safety, before they start work, in order to be a competent contractor. That training must include:

- how to carry out the tasks
- best practice methods of working as illustrated in “Health and safety in construction” published by the Health and Safety Executive. This should be backed up by the team members passing tests for the appropriate Construction Skills Certification Scheme card.
- the correct behavioural attitudes to safety which needs to be part of safety culture as outlined in “HSE Human Factors Briefing Note No. 7 Safety Culture”
- identifying risks using the Health and Safety Executives “Stop, Look, Assess, Manage” procedure, with the knowledge of where/how accident occur (see figure 6)

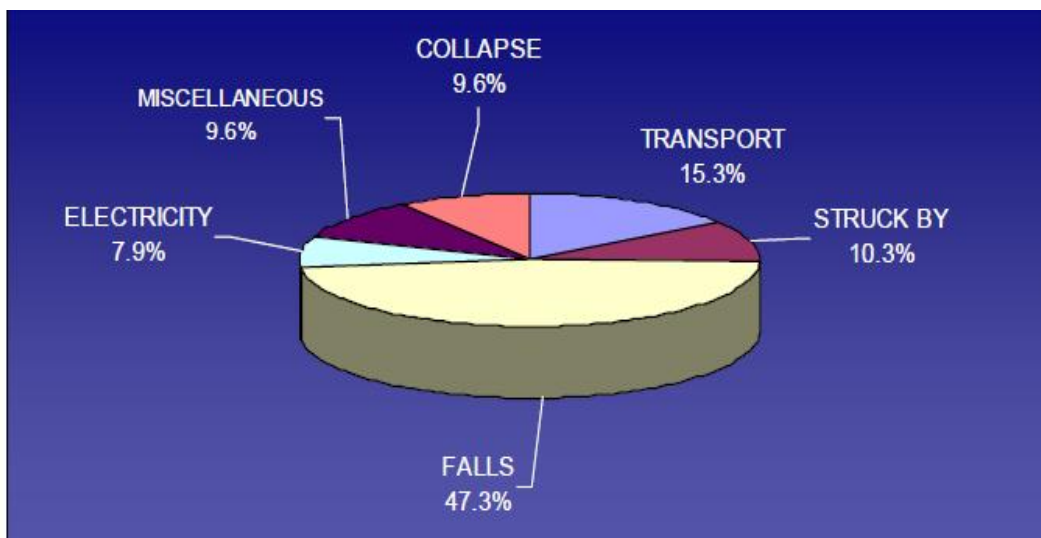


Figure 6: Fatal accidents by Kind of Accident

Source: www.hse.gov.uk/construction/pdf/conintreport.pdf

Figure 7 shows what people were doing when accidents occur:

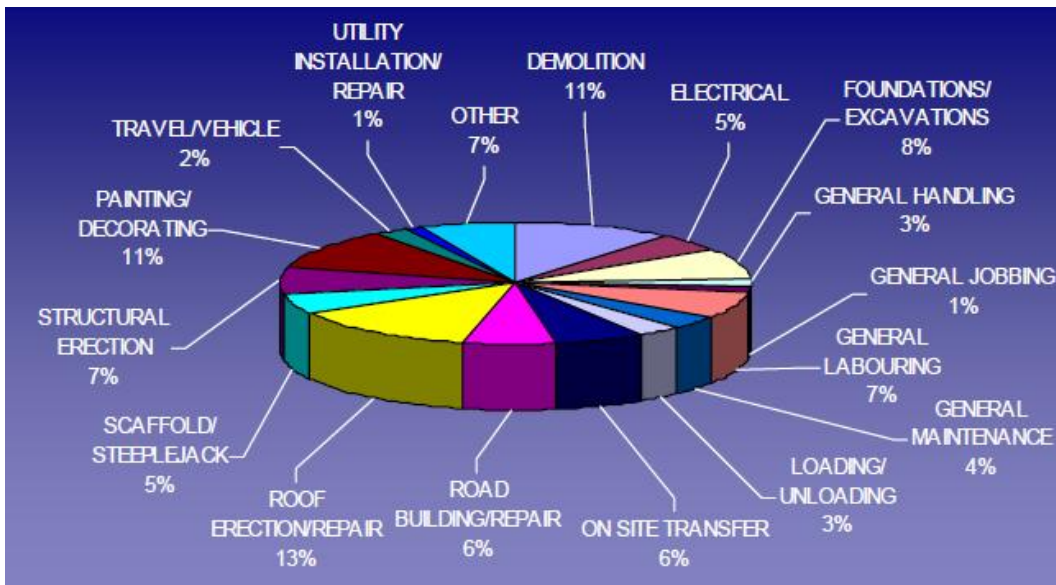


Figure 7: Fatal accidents by Work Activity:

Source: www.hse.gov.uk/construction/pdf/conintreport.pdf

One of the most dangerous areas is painting and decorating. At the workshop Worksafe Innovation, provided some photographs to illustrate why this is happening and this highlights the need to identify and recognise risks as recommended in the training for the poly-competent teams.



The construction industry's views of the greatest barriers to health and safety improvement are shown in figure 8:

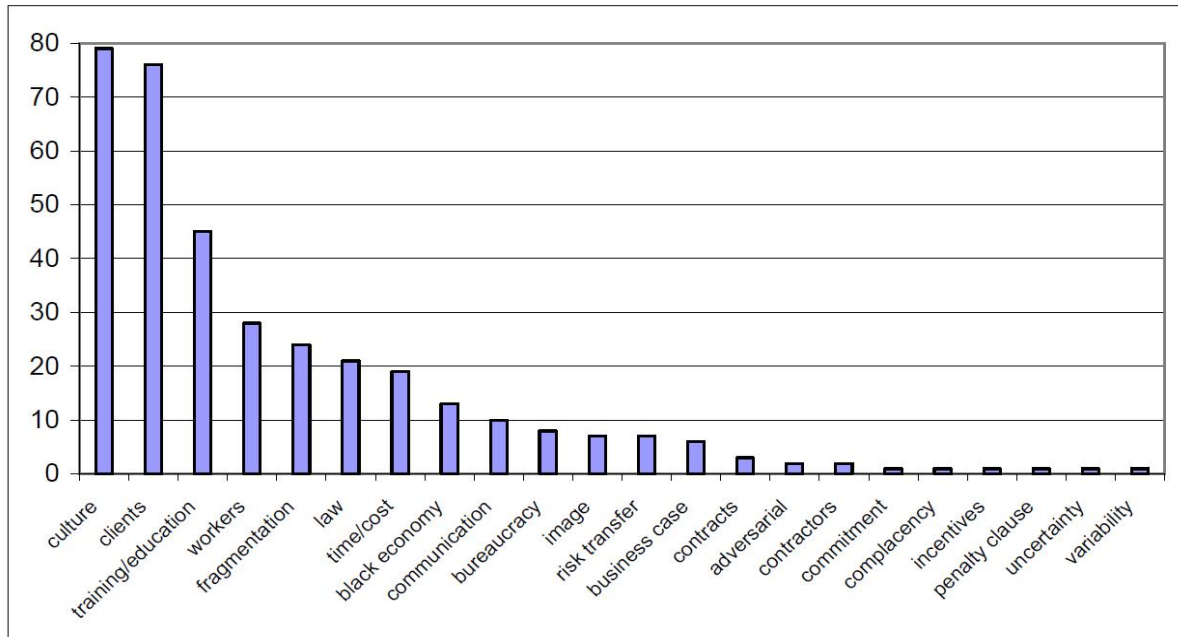


Figure 8: Answer to Question: "What were the greatest barriers to change within the industry?"

Source: <http://www.hse.gov.uk/consult/2002.html>

This shows that the leading issue is culture. The Health Safety workshop provided qualitative evidence to support this when a supplier of safety equipment commented on the problem of what one supplier described as the "macho" approach, with employers purchasing cheaper equipment, which was not as easy to use or more uncomfortable than more expensive alternatives. This results in the tendency to remove the item, which then might lead to an avoidable injury and underlines the recommendation that the poly-competent teams have an appropriate culture and training in behaviour.

3. Construction Design and Management Regulations

The key aim of the Construction Design and Management Regulations 2007 is to integrate health and safety into the management of a project and to encourage everyone involved to work together towards:

- Improving the planning and management of projects from the very start
- Identifying hazards early on, so they can be eliminated or reduced at the design or planning stage and the remaining risks can be properly managed
- Targeting effort where it can do the most good in terms of health and safety and
- Discouraging unnecessary bureaucracy

To discourage bureaucracy the Regulations are designed to apply to longer projects with an emphasis on the “unusual” or “significant”. It is planned that the poly-competent team should be able to complete their work in 5 days. This means that unless 25 or more houses are in the contract the work will never be Notifiable under CDM Regulations in addition the scope of risk assessment is very limited when it comes to Retrofix or RetroPlus works, as the works are normally not “unusual” or “significant”.

Having said that; anyone who specifies work is defined as a designer under CDM Regulations and designers have responsibility for risk assessments. Those who design the menu of refurbishment options for Retrofix or RetroPlus are a designer. Anyone choosing from such a menu (ie the leader of the poly-competent team is also a designer.

This simply means that they need to mitigate the risk of the work they are proposing. Specifically under CDM this applies to work that is “unusual” or “significant”. In all cases considering where accidents tend to occur (see figure 6, page 8).

The primary method of managing work under CDM that is not “unusual” or “significant” is through the appointment of competent contractors. The poly-competent team would have to be competent contractor. The implications of this for training were outlined in the previous section.

4. The Application of New Concepts to the sample House-types

In Workpackage 7.2, six house types were identified as showing the key features/issues that would need to be addressed as part of RetroFix or RetroPlus. These six properties were chosen to match the four prototypes that PRP had chosen in their Whole House Solutions Report. The six chosen cover all aspects of the four property types that PRP had identified from a review of typical UK stock.

The house types were as follows:

- A. Blackfriars Estate, Peabody Square – This was chosen to match the mid-rise block of flats, albeit an older version of the one selected by PRP.
- B. Faraday House, Charing Cross Road – This was the hard to treat property, although not matching the particular property that PRP created. The property was however, a hard to treat property in its own unique way because it is a multi-storey building in the middle of London.
- C. Roscoe Street Estate, Roscoe Street – This matched the high-rise tower block.
- D. Muriel House, Muriel Estate – This matched the mid-rise tower block selected by PRP more accurately, but had more floors
- E. Shaftsbury Park, Eversleigh Road – This was a mid-Victorian terrace property. This was not selected by PRP probably because much of the issues are the same as for the three bed semi-detached property, but this is a common property throughout the UK.
- F. Ashford Avenue, Hillingdon – This was chosen to match the three bedroom semi-detached house

The main risks that had been identified were:

- 1. Access around the site to carry out the works. The main issue for this is the placing of scaffolding, whether there is room and whether the surface is flat
- 2. Properties are likely to remain in occupation throughout the duration of the works
- 3. Possible presence of asbestos
- 4. Current condition of the property

Other issues that were highlighted, but would probably be resolved as the works progress would include:

5. Pest control
6. The actual process of carrying out the works as previously discussed above
7. Condition of the property

As stated in previous reports the risks and hazards that have been listed are not necessarily that unusual or significant but are still risks nonetheless.

The concepts that have been put forward in Workpackage 7.3 should help in ensuring that on site methods of works are made safer not only for the main risks identified but also in mitigating all risks.

The concepts and their potential safety improvements are shown in the table:

Idea	Concept	Potential for implementation	Potential Safety Improvement	Tech Feasibility
Laser Scanning & offsite CNC cutting	To provide a more efficient, reduced disruption method for IWI (Internal Wall Insulation) preparation.	<i>Medium</i> – available almost immediately	<i>Medium</i> – removes work from site and reduces the risks of accidents through cutting insulation This will mitigate main risks 1, 2 and 6 This would apply to all the house types.	Existing Product, some development may be required.
Video and photography drone with laser Scanning	Remote control drone (Similar to Parrot Control adult toy), linked to ground based scanning device, ground laser unit acts as datum while the drone can adapt to 3D imaging while traversing the building.	<i>High</i> – allows surveying without having to erect scaffolding	<i>High</i> – reduced risk of falls from height This will mitigate main risks 1, 2, 4 and 6 This would apply particularly to multi-storey properties such as A, B, C and D	Proven prototype, several developments completed successfully.

Offsite production of roofing systems	To use pre refurbishment survey information (from Laser Scanning as detailed above) to fabricate modular roofing solutions, to include; SIPS Panel Roof or Stress Skinned panel roof (eg Smartroof) Roof with combined HVAC system Room extension	<i>High</i> – offsite capability easily transferable from new build	<i>High</i> – removes risk from working at height This will mitigate issue 1 This would apply to all the house types, especially multi-storey properties such as A, B, C and D	Proven prototype, several developments completed successfully in Austria and Switzerland.
Cherry Pickers, Mini Cranes and Lift Attachments	Reduction of working at height with difficult and heavy loads, greater opportunity	<i>Medium</i> – viable now, but space constraints in housing	<i>Medium</i> This will mitigate issues 1, 2, and 6 This would apply particularly to multi-storey properties such as A, B, C and D, but also to a limited extent to houses such as E and F	Existing Product, Proven Technology some development required to suit textured EWI.
Exoskeleton & Manual Handling	A mechanical device to allow an individual to lift and move substantial loads without the need for a forklift truck or pallet trucks.	<i>Low</i> - Prototype developed for military, excellent potential for civilian use. Maybe cost prohibitive	<i>Medium</i> This will mitigate issues 1, 2, 4, 6 and 7 This would apply to all the house types	Proven prototype working, however a lot of development is still required
Scaffold & Towers, Ladder safety	Better and more efficient set up and take down of scaffold and ladders. The adaption of ladders to become safe working platforms for certain tasks.	<i>High</i> – easy to take up solutions	<i>High</i> – sensible proven adaptations to prevent falls This will mitigate issues 1, 2, 4, 6 and 7 This would apply to houses such as E and F.	Existing Product, Proven Technology

<p>RFID Tagging to control access</p>	<p>Control of access to equipment, theft reduction, staff management.</p>	<p><i>Medium</i> – difficult to apply on smaller sites</p>	<p><i>Medium</i> – the same end could be gained through appropriate training and enforcement</p> <p>This will mitigate issues 1 and 2</p> <p>This would apply to all the house types</p>	<p>Existing Product, Proven Technology</p>
<p>Competency Software & CCTV</p>	<p>Modification of compliance software from the chemical and refinery industry for use on site to provide a competency based system, and combine with HSE and/or CDM review requirements.</p>	<p><i>Medium</i> – works with existing software, but more difficult on smaller sites</p>	<p><i>Low to Medium</i></p> <p>This is more to improve the overall performance of the poly-competent team.</p> <p>This would apply to all the house types</p>	<p>Full feasible, needs development time</p>

4. Conclusions

The quantitative studies in Workpackage 7 have shown that although there is much room for improvement that construction in the UK it is getting safer and that the UK is one of the safest counties in the western world in which to work in construction.

Further progress is needed and workplace culture remains the biggest challenge that needs to be overcome. This message was reinforced from the qualitative feedback received.

One of the most significant graphs from this study is figure 5 on page 7 which shows the vastly increased likelihood of fatalities for those new to their jobs. This reinforces the need for the poly-competent team members to be thoroughly trained before they start work so that they understand best practice ways of working, how to identify risks, but most importantly on the behaviours needed as part of a safety aware culture.

With regard to the specific requirements of the CDM Regulations the specifier of any solutions and any person who chooses from a pallet of solutions, such as the leader of the polycompetent team, is defined as designer. Designers need to show that they have mitigated the risks on all works that are unusual or significant. Most of the work proposed for the Retrofit and Retroplus refurbishments is not unusual or significant. This work can therefore be completed by a competent contractor. The polycompetent team would be regarded as competent if they had received the training recommended in this report.

New ideas and concepts can work to improve things and the ones identified in Workpackage 7.3 have been identified as mitigating risk for the sorts of house types that it has been envisaged that the poly-competent teams will work on.

Appendix A: Glossary of terms for the Construction Design and Management Regulations 2007

“CDM or CDM2007” means the Construction Design and Management Regulations 2007

“client” means a person who in the course or furtherance of a business—

(a) seeks or accepts the services of another which may be used in the carrying out of a project for him; or

(b) carries out a project himself;

“competent” To be competent, an organisation or individual must have:

(a) sufficient knowledge of the specific tasks to be undertaken and the risks which the work will entail;

(b) sufficient experience and ability to carry out their duties in relation to the project; to recognise their limitations and take appropriate action in order to prevent harm to those carrying out construction work, or those affected by the work

“contractor” means any person (including a client, principal contractor or other person referred to in these Regulations) who, in the course or furtherance of a business, carries out or manages construction work;

“construction site” includes any place where construction work is being carried out or to which the workers have access, but does not include a workplace within it which is set aside for purposes other than construction work;

“construction work” means the carrying out of any building, civil engineering or engineering construction work and includes—

(a) the construction, alteration, conversion, fitting out, commissioning, renovation, repair, upkeep, redecoration or other maintenance (including cleaning which involves the use of water or an abrasive at high pressure or the use of corrosive or toxic substances), de-commissioning, demolition or dismantling of a structure;

(b) the preparation for an intended structure, including site clearance, exploration, investigation (but not site survey) and excavation, and the clearance or preparation of the site or structure for use or occupation at its conclusion;

(c) the assembly on site of prefabricated elements to form a structure or the disassembly on site of prefabricated elements that, immediately before such disassembly, formed a structure;

(d) the removal of a structure or of any product or waste resulting from demolition or dismantling of a structure or from disassembly of prefabricated elements which immediately before such disassembly formed such a structure; and

(e) the installation, commissioning, maintenance, repair or removal of mechanical, electrical, gas, compressed air, hydraulic, telecommunications, computer or similar services which are normally fixed within or to a structure,

but does not include the exploration for or extraction of mineral resources or activities preparatory thereto carried out at a place where such exploration or extraction is carried out;

“design” includes drawings, design details, specification and bill of quantities (including specification of articles or substances) relating to a structure, and calculations prepared for the purpose of a design;

“designer” means any person (including a client, contractor or other person referred to in these Regulations) who in the course or furtherance of a business—

(a) prepares or modifies a design; or

(b) arranges for or instructs any person under his control to do so,

relating to a structure or to a product or mechanical or electrical system intended for a particular structure, and a person is deemed to prepare a design where a design is prepared by a person under his control;

“domestic client” Domestic clients are people who have work done on their own home or the home of a family member, that does not relate to a trade or business, whether for profit or not. It is the type of client that matters, not the type of property. Domestic clients have no client duties under CDM2007, which means that there is no legal requirement for appointment of a

CDM co-ordinator or principal contractor when such projects reach the notification threshold. Similarly, there is no need to notify HSE where projects for domestic clients reach the notification threshold. However, designers and contractors still have their normal duties as set out in Parts 2 and 4 of the Regulations and domestic clients will have duties under Part 4 of the Regulations if they control the way in which construction work is carried out. Designers and contractors working for domestic clients have to manage their own work and co-operate with and co-ordinate their work with others involved with the project to safeguard the health and safety of all involved in the project

“principal contractor” means the person appointed as the principal contractor under regulation 14(2);

“unusual and significant” refers to risks that are not necessarily those that involve the greatest risks, but those, including health risks that are:

- (a) not likely to be obvious to a competent contractor or other designers;
- (b) unusual; or
- (c) likely to be difficult to manage effectively.