Steering Group on Competence
for Building a Safer Future

RAISING THE BAR
APPENDIX A

Improving Competence
Building a Safer Future

August 2019

RAISING THE BAR

IMPROVING COMPETENCE

BUILDING A SAFER FUTURE

APPENDIX A:
Compilation of Supporting Documents

INDUSTRY RESPONSE GROUP STEERING GROUP ON COMPETENCE FOR BUILDING A SAFER FUTURE

August 2019

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Working Group 01 - Engineers

Annex B - Barriers to Delivery

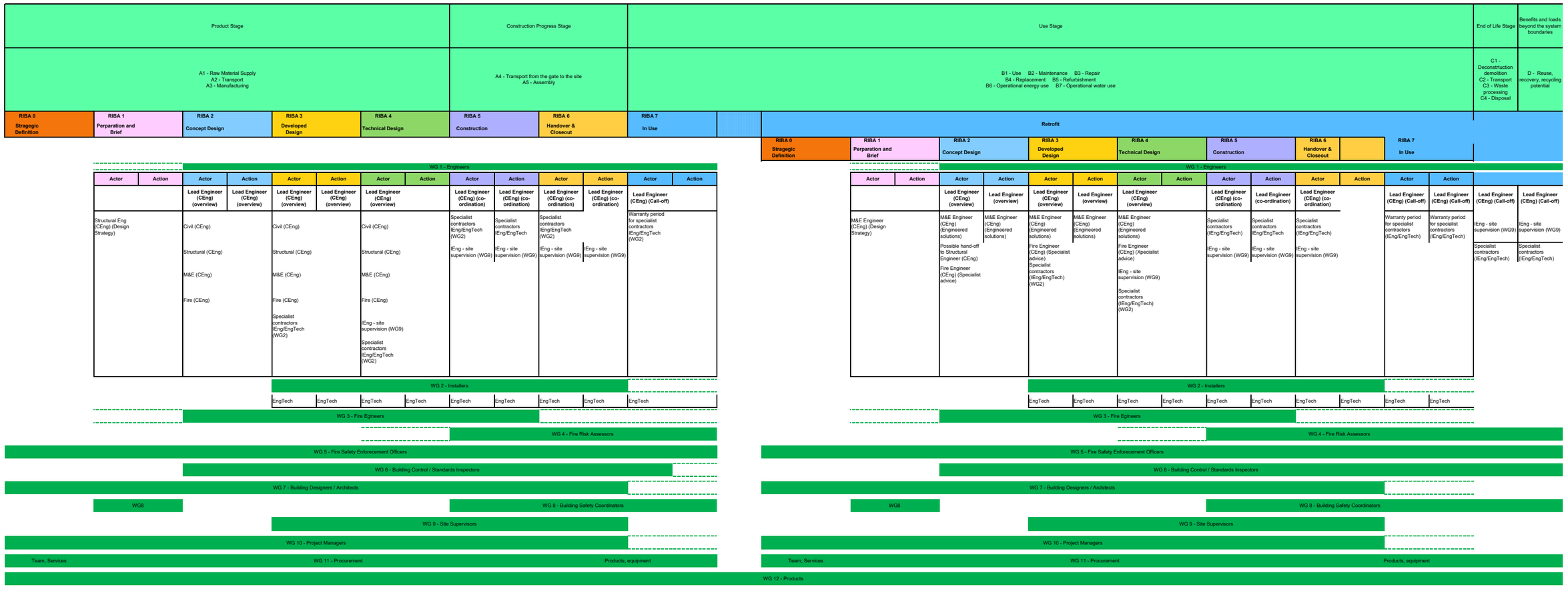
What is the barrier?	Why is it a barrier?	How might it be resolved?
Lack of Safety Management Systems	Building owners unable to maintain buildings in a known safe condition	Working with exemplar owners to develop processes
Significant resistance across our industries to recognise & adopt the benefits of Safety Case Requirements.	There will almost certainly be excuses where cost, time, additional labour resource, project delay & training requirements will appear.	Robust legislation enforcing good practice & penalties (allied to risk assessment & consequence) for non-compliance.
Failure to adopt Safety Case regime	Perception of too much bureaucracy and unnecessary cost	Ensure safety case requirements follows good practice. Ensure cost is commensurate with risk
Execution	Competence to create a Safety Case and communicate that to the building owner and its occupiers.	Training and certification provided by recognised construction professional and operative bodies.
Failure to deploy competent persons identified by the agreed process	This is a barrier as if it is not addressed there may be no change in competence or ethical practice in the industry, if no restriction is created to ensure only demonstrably competent persons are deployed the work of the groups could be ineffective.	This may be resolved by the introduction of a requirement in legislation or, potentially, by the issuing of guidance by the regulator/enforcers.
Implementation	The competence requirement will become mandatory for all those wishing to 'work in' an HRRB. This will require assessment and registration. Whilst WG1 (and WG2) have defined competence requirements and individuals can apply for registration from 'day 1'. There will not be 'anyone qualified' to assess.	PEI should identify a series of early adopters such that assessments can take place as soon as possible following 'go live'
Failure to adopt re-validation/re-certification (licence to practice)	Employers/individuals unclear of licence requirements. Clarity of appropriate CPD for re-licensing. Ability (of industry/PEIs) to assess CPD	Clear CPD pathways and opportunities, including work-based CPD. 100% CPD record submission with appropriate sampling based on risk.
Leasehold rules	Difficult to control safety in individual flats.	Legislation
Vested interests in new build	Hinders improvements in the safety of existing buildings.	Follow through on Hackitt proposals, which must be applied to existing as well as new HRRBs.
Why me/us and not them?	Our industries are notoriously adept at reapportioning blame & hence responsibility for resolution.	Procurement and contractual responsibilities unequivocally defined and mandated at all stages of all relationships.
Lethargy	A combination of short memory, 'a job for somebody else' and	A deep cultural change across the board is essential. Only

	an overbearing & unjustified focus on completion dates and minimising costs.	statutory enforcement can deliver this change.
Failure to fund professional recognition	Employer perception that professional recognition is low/poor value.	Improve communication with employers. Mandate recognition in Local Government contracts.
Liabilities	Greater legal burdens placed on building owners.	Legislation through health and safety for building use and the production of robust guidance on how building owners are able to comply with it.
Financial	Cost of creating a Safety Case and communicating it to building users/occupiers via simplification.	Legislation to ensure Safety Cases are created for HRRBs and the publication of robust guidance on how they are drafted and communicated to building occupiers/users. Long-term cost efficiency may be achieved through improved quality of delivery.

Working Group 01 - Engineers

Annex C - Engineering roles and interfaces with reference to RIBA Plan of Work

Annex C



Engineers are likely to have involvement with products, either design, manufacture or use of - how would you like to represent this.

Working Group 01 - Engineers

Annex D - Lead Engineer role description

This note is an attempt to define the role of the 'Lead Engineer' (LE). It is not a role that currently exists in so far as Working Group 1 of the Competence for Building a Safer Future programme is concerned.

While it is fundamental that any building needs to be safe, there is also a need to ensure that the kit of parts it is assembled from are compatible with one another to the point where the intent to construct a safe building is realised. This is where the LE's role is proposed to be put into place. It is a suitably competent person or organisation that is responsible for ensuring that all the components of a building are compatible with another and provide a safe and functioning building throughout its prescribed design life.

Considering the above it is proposed that the LE's role is defined as follows:

The Lead Engineer is responsible for ensuring all the components of a building project are suitably co-ordinated and compatible with one another in terms of safety, functionality, efficiency and future maintainability.

The LE is an overseeing role that provides an independent peer review of the building project with respect its functionality in terms of the health and safety of its occupants. They will have to review all design documentation produced for the building project that directly address how it is to be used and maintained. They shall confirm their acceptance that all their observations and comments have been acknowledged and addressed prior to declaring the project to be complete.

The LE is integral to creating the safety case. They must establish the static and dynamic life safety systems and their design interfaces and review the test and commissioning plan to ensure a co-ordinated solution is achieved. The LE is an enabler of the safety case and will rely on it to execute their responsibilities during the life of a HRRB.

As an adjunct to the above definition, it is also important to understand how a LE would be engaged during the life of a building. This provides substance as to how the LE would be able to fulfil their role sufficiently to meet the requirements of the role as described in the definition.

Determining the need to commission a LE is dependent upon what action is being proposed to be carried out on the building, which includes constructing it. Therefore, the engagement of a LE can best be described against the three phases of the life of a building, those being construction, maintenance and demolition.

Table 1 describes the board actions of the LE when compared against the three phases of the life of a building.

Phase	LE Actions
Construction	Establish safety critical elements of the design of the building based on its Safety Case
Maintenance	Ensure safety critical items defined in the Safety Case are reflected in the Operations and Maintenance Manual
Demolition	Review proposed demolition plans comply with guidance provided within the Operations and Maintenance Manual with respect to the structure and components of the plant for building services

Table 1 –Lead Engineer actions during the life of a building

To illustrate the role of the LE further the following fictional scenarios describe how they would provide guidance and advice to owners and occupiers of buildings.

Scenario 1 –New 15 storey residential block

A developer seeks to construct a 15-storey residential block that contains 80 units in the outskirts of a town. The LE would be engaged from RIBA Stage 3 to develop the Safety Case for the building in conjunction with the design team.

Scenario 2 –Modification to heating system to a 30-year old 12-storey residential block

The plant within an existing residential block needs to be replaced as it is beyond its life expectancy and is repeatedly breaking down. The LE would need to be consulted to determine if any proposed replacement is compatible with all the safety critical components of the building based on its Safety Case. In instances where a safety case does not exist, the LE will have to develop one based on record information and surveys of the building.

Scenario 3 –Change of use from a Commercial Property to a Residential Block

A 20-storey commercial property is to be converted into a residential block. This is a significant change of use and will require the Safety Case to be reviewed and possibly redrafted as the mitigation measures for the management of the building will be significantly different. This would need to be carried out by a LE as they would be required to not only revise the Safety Case but also assist with the development of the operation and maintenance documentation.

Scenario 4 –Planned engineering audits of a 16-storey residential building to review incremental change in use and the maintenance of life safety systems identified by the Building Safety Manager that could impact the safety critical elements of the building.

A periodic audit would form part of a licence to operate the building that would require its owner to capture any alterations to it. Such changes could instantaneously or over time impact on the safety case process analysis and require the LE determine if these changes have undermined the Safety Case as part of the audit.

These changes could include type of tenancy, such as dwellings changing to multi tenancies, or a mix in owner/private or social tenant that would impact the risk profile assumptions in the Safety Case. Other examples include but are not limited to:

- Individual works that may occur as single activity
- A newly introduced service or technology
- A revised or enhanced system
- Tenants/landlords/managing agents adopting new technologies
- Replacement of appliance/s within the dwelling or the facility
- Change to existing systems or structure/fire compartment fabrics.

Scenario 5 –Demolition of a 24-storey residential block with a transfer structure in its basement and at mid-height

Prior to the demolition the LE will need to be consulted by the specialist contractor to determine that they have taken cognisance of the unique aspects of the structure when developing the demolition plan. This is to ensure that the risk of premature collapse of the structure is avoided during the proposed demolition works.

In terms of output, the LE would need to provide evidence that they have reviewed and/or created the Safety Case for the building. They would need to provide commentary on the design documentation with respect to the Safety Case.

The above definition and description of the engagement of a LE is being presented as a point of discussion within Working Group 1 of the Competence for Building a Safer Future programme and would invite all its members to provide feedback on it.

Working Group 01 - Engineers

Annex E1 - Safety Management Process

1 Summary

The Hackitt Report, Building a Safer Future, recommends that HRRBs should be subject to a Safety Case Review process under an independent regulator to be known as the JCA, and that all those working on HRRBs in any capacity should be specifically and suitably competent.

This proposal covers the proposed Safety Case Review process as curated by Working Group 1: Engineers. Proposals for the Competence of Engineers working on HRRBs are covered by a separate report.

The intention is to propose a practical and realistic safety management process for HRRBs that can be implemented quickly from existing resources and then developed and improved on a continuous basis.

2 Background

The Steering Group on Competences for Building a Safer Future is a sub-group of the Industry Response Group (IRG) that was set up under the auspices of the Ministry of Housing, Communities & Local Government (MHCLG) in July 2017 in the wake of the Grenfell Tower fire to coordinate action and advice to building owners.

The BSF report recommends a very clear model of risk ownership, with clear responsibilities for the Client, Designer, Contractor and Owner to demonstrate the delivery and maintenance of safe buildings, overseen and held to account by a new Joint Competent Authority (JCA).

BSF Recommendation 3.1 reads:

> a. Government should specify that responsibility for the safety of all parts of a HRRB must be held by a clear, senior **Dutyholder** which should be the building owner or superior landlord.
>
> b. The JCA and residents must be kept notified of the name and UK-based contact information of the Dutyholder (whether that is an entity or a named person).
>
> c. The Dutyholder must nominate a named **'Building Safety Manager'** with relevant skills, knowledge and expertise to be responsible for the day-to-day management of the building and act as a point of contact for residents. The building safety manager's name and contact information must be notified to the JCA and to residents and should be displayed in the building.

BSF 3.31 reads:

> It is proposed that the Dutyholder presents to the **JCA - a safety case**, at regular intervals, which shows that across the whole building the risks are being managed effectively. **The safety case is an evidence-based approach in which the Dutyholder identifies the hazards and risks, describes how risks are controlled, and describes the safety management system in place, including emergency procedures in the event of an incident**. This approach is tailored to each building and is proportionate because the level of detail and amount of information required is determined by the level of risk.

WG1's understanding is that the approval of a Safety Case for an HRRB by the JCA will be effectively a "Licence to Operate". The first Operating Licence would be issued prior to occupation for a new build. For existing buildings there will need to be a start up period both for the Building Owners to be prepared and for the JCA to process the Safety Cases. An application for relicensing will be required when a significant (material) change to the building may in the view of the Dutyholder involve changes to the safety or risk assessment of the building.

2.1 Engineering competences

In total there are 12 working groups reporting to the steering group. WG1 Engineers, led by the Engineering Council, is working on a contextualised standard for engineering professionals as proposed on p.135, Building a Safer Future:

Proposal: The relevant Professional Engineering Institutions (PEIs) should work with the Engineering Council to develop a contextualised standard for chartered and incorporated engineers working on HRRBs. *(nb, WG1 has expanded the scope to include Engineering Technicians and the term 'engineering professionals' is used to refer to Chartered Engineers, Incorporated Engineers and Engineering Technicians collectively)*

As a first step in this task WG1 considered when and what type of work engineers would be undertaking in HRRBs. The RIBA Plan of Work provided a high-level overview of stages in the building lifecycle but was felt to focus primarily on construction, and possibly major refurbishment work. Consideration of the safety case process was identified as a means to better understand the engineering role in respect of HRRBs already in use. In particular, hazard identification and assessment would point to when a competent engineer would need to be involved in routine, planned and emergency [maintenance] work.

As Safety Case Reviews are new to the UK Construction Industry WG1 has taken advice from various experienced parties including IGEM, IMechE Safety Group, and risk specialists Risktec to understand how a safety case for a HRRB could be constructed. Safety cases are well established in hazardous industries such as Offshore, Nuclear, Hazardous Chemicals, Aerospace, and Railway, and WG1 also sought to learn from these.

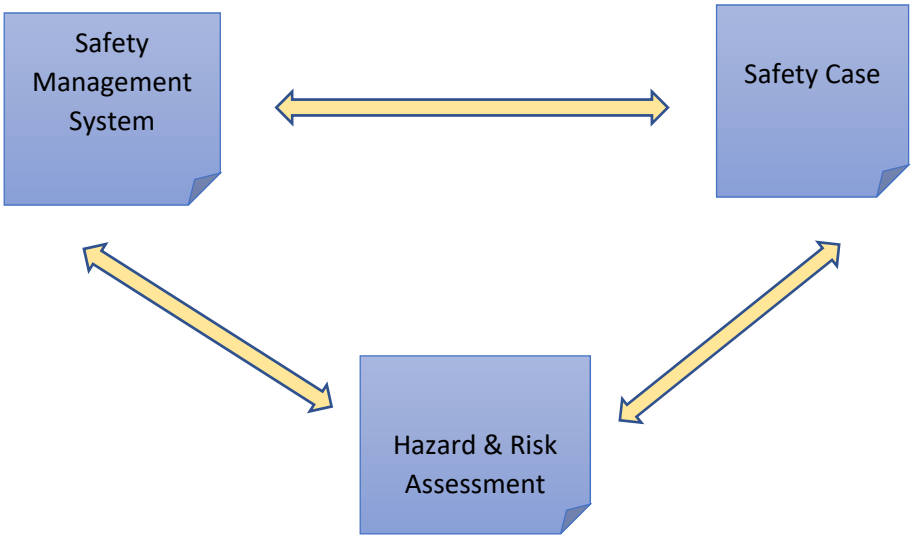
In order to develop the process in a practical way, an anonymised learning exercise is being carried out including site visits to existing high-rise buildings and workshops with a number of HRRB owners. We are very grateful for the excellent cooperation we are receiving during this exercise.

In addition to informing WG1s work to develop contextualised competences for engineering professionals, this exercise has led WG1 to make the following report and proposals for the Safety Management Process as it applies to HRRBs.

WG1 noted that following the Grenfell Disaster and the large number of Government notices to building owners covering cladding, LPS Buildings, Fire Doors, and other safety matters, the Building Managers in the London Boroughs with whom WG members had contact were very well informed about the safety situation in the buildings under their control. In the year and a half since Grenfell a lot of remedial work has been undertaken.

3 What is a Safety Management Process?

A Safety Management Process can be visualised as having three interconnecting parts which interact with each other:

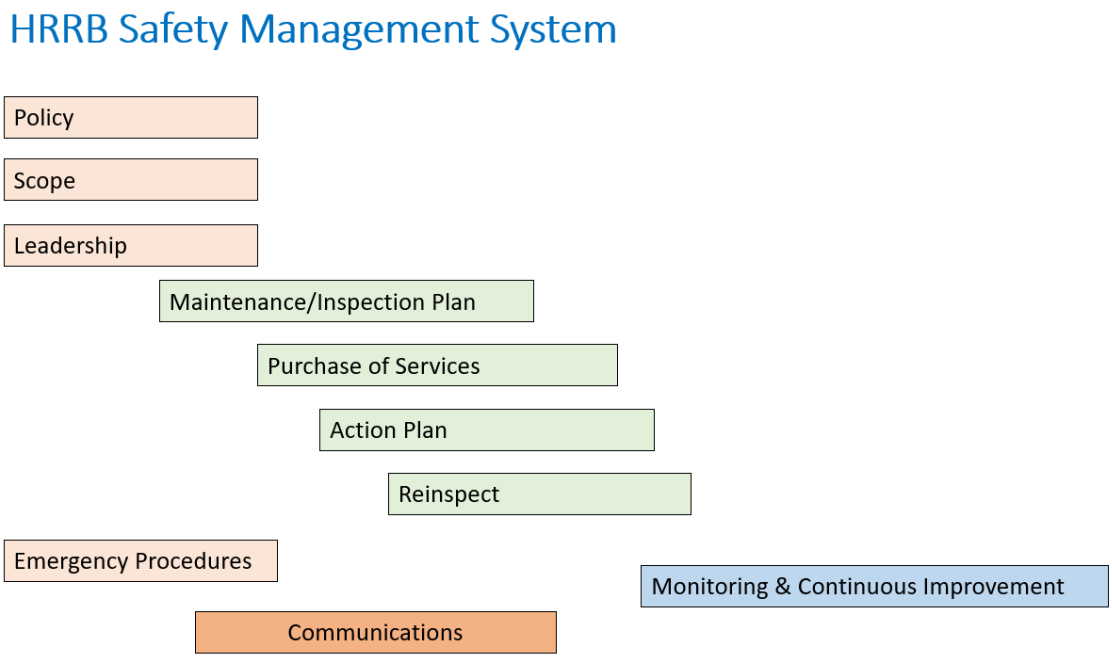


3.1 Safety Management system (SMS)

A safety management system (SMS) is a systematic approach to managing safety, including organisational structures, accountabilities, policies and procedures.

The day to day work of maintaining safety in the HRRB is carried out under the safety management system.

It is desirable that the SMS is structured according to the ISO High Level Structure. This makes it compatible with other management systems that the organisation may already have in place such as ISO 50001 Asset Management System, ISO 450001 Health and Safety System, ISO 9001 Quality system etc.



Policy: Organisation's Safety Policy

Scope: Buildings/Assets covered by this SMS

Leadership: Including identification of Dutyholder and appointment of Building Safety Manager/Coordinator.

Maintenance/Inspection Plan: Ongoing rolling programme of maintenance and inspections and tests as required to comply with applicable legislation, best practice and output of the hazard and risk analysis.

Purchase of Services: Qualification and appointment of competent suppliers to fulfil the maintenance/inspection and test programme and the ensuing action plan.

Action Plan: Planned action to correct the faults found during inspection and testing.

Reinspect: Rechecking of work carried out under the action plan.

Emergency Procedures: As required by current building status and risk assessment.

Monitoring & Continuous Improvement: Measurement of control parameters such as number and timespan of outstanding action plan items.

Communications: Includes Residents Voice, employee communications, website, newsletters, PR statements etc.

It is understood that some Building Owners carry out a large part of these functions under current Asset Management procedures. However, the emphasis under asset management is generally to preserve the value of the assets. Other Owners use Planned Preventative Maintenance (PPM) planning software. Safety may not always get the necessary priority.

3.2 Safety Case

BSF Recommendation 3.3 reads:

> "The safety case must identify the hazards and risks, describe how risks are controlled, and describe the safety management system in place"

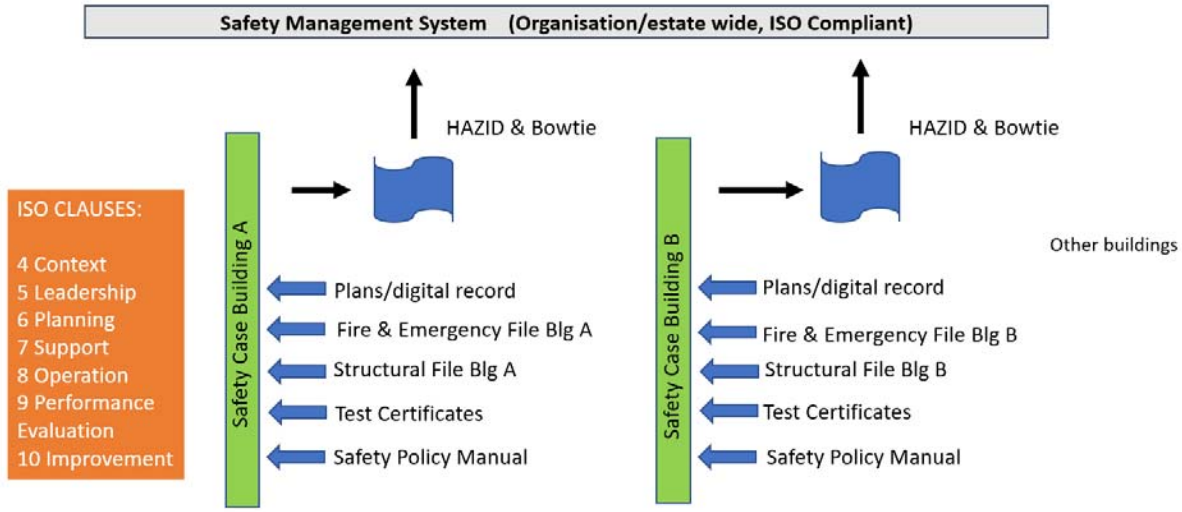
and that (BSF 3.34)

> “the safety case file should include:
>
> • information on the building management system in relation to fire and structural safety, records of maintenance, inspection and testing undertaken on the structure and services and evidence that the competence of those undertaking work on the building was sufficient;
>
> • a resident engagement strategy;
>
> • the maintained and updated Fire and Emergency File (see Appendix D) and digital record (see Chapter 8);
>
> • A copy of any fire safety inspections undertaken by the Dutyholder and/or regulator; and a copy of the latest fire risk assessment and evidence of actions taken and the appropriate competence of the person who performed it.

Based on its work to date, WG1 proposes the template at Appendix A for use by Owners of Existing/Occupied Buildings.

For a typical Building Organisation there will normally be one safety management system but safety cases for each HRRB as shown:

(There may be a case for a small number of identical buildings within an estate to be covered by a single Safety Case)



This Safety Case is supported by a Safety Policy Manual. This is a controlled document which has original signed copies of the Safety Policies underlying the SMS and the Safety Case. It should form part of the supporting documentation for the Safety Case together with other documents such as the Fire and Emergency File, Fire Risk Assessment, OH &S manual etc.

Example: Policy for the purchase of safety related goods and services.

3.3 Hazard Identification and Risk Assessment

The Safety Management System and Safety Case are informed by hazard identification and risk assessment. Hazard identification is used to identify the critical independent hazardous situations affecting the building, and ranking them in order of criticality. Risk assessment considers the probability of the hazard occurring, the consequences if it does and the effectiveness of any mitigation measures.

3.3.1 Hazard Identification

A hazard is a situation that poses a level of potential threat or risk, to life, health, property, or environment. Most hazards are dormant or potential, with only a theoretical risk of harm; however, once a hazard becomes "active," it can create an emergency situation.

Hazardous situations in buildings can be thought of as either External or Internal.

Examples of external Hazards are flooding, nearby chemical release etc. The risk from these hazards are normally assessed at the LA level but need to be considered by the building owner as part of the overall risk assessment. Internal risks are for example various kinds of fire, gas explosion, burst water pipes etc.

The CAA has identified the so called “Significant Seven” top level hazards for Airline operations. These are separate hazardous situations such as an onboard fire or an obstruction on the runway. Although the mitigation barriers may be common in some cases, looking at each hazard in turn makes the risk assessment stage more manageable.

Applying this principle to HRRBs it is suggested that the following four situations are the most critical hazards events (Significant Four):

Fire
Flooding
Gas Explosion
Vandalism or potential terrorist action

Each building management team needs to identify the most critical hazards for their building stock. This might take the form of a workshop involving representatives of all stakeholders.

3.3.2 Risk Management

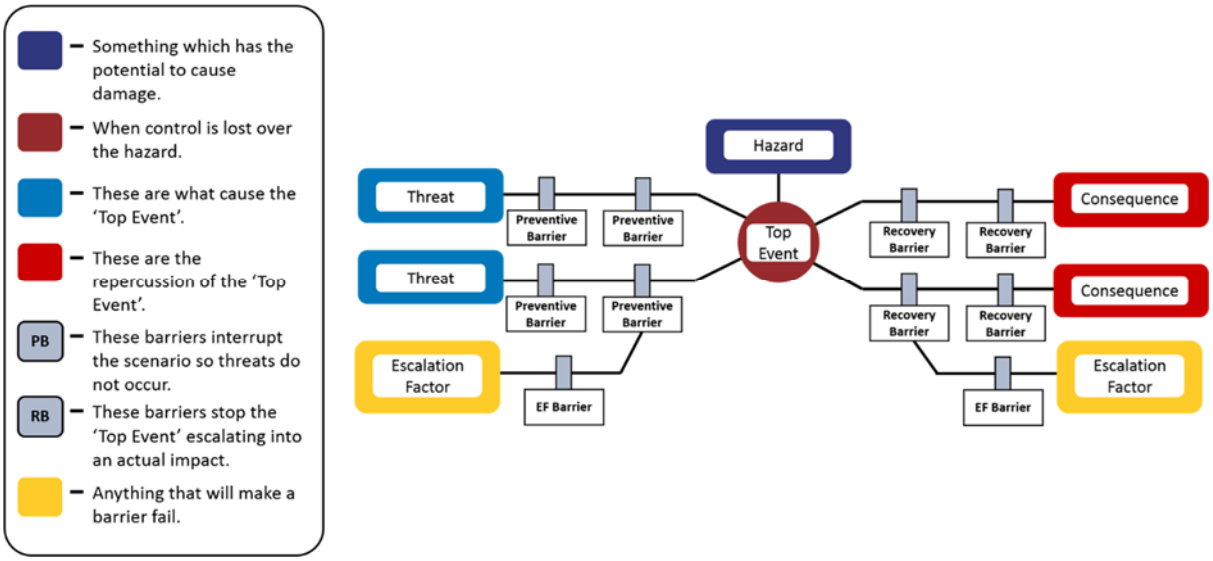
Various risk management methodologies are used by the industries mentioned above. Through discussion with representatives from other industries, WG1 identified the ‘Bowtie risk barrier model’ as the basis for furthering its understanding of how a Safety Management approach could work in HRRBs. The bowtie model is widely used in the Oil & Gas, hazardous chemical, nuclear, civil aviation and rail sectors and by some Fire & Rescue Services. A particular appeal is that, in its simplest form, it is accessible to a wide audience, and for it to be most effective all stakeholder groups must be involved in developing the model for any given situation.

The bowtie process involves the following steps:

- identify the barriers to the hazard occurring
- identify the barriers which mitigate the consequences if the hazard occurs
- analyse the barriers in terms of: critical person(s), critical equipment, critical documents, re-assess the risks in light of the barriers.
- assess the criticality of the risk using a risk matrix.

The whole is done through a team process involving (at least initially) all stakeholder groups.

WG1 worked with TüV Rheinland Risktec to develop a Bowtie model for a hypothethical HRRB. Engineering competence was found to be a critical competence in the analysis of a significant proportion of the barriers to the hazard risks and consequences. This led WG1 to conclude that the Dutyholder and Building Safety Manager would need to have or have access to engineering competence throughout the building lifecycle.



An excellent introduction to the Bowtie method is available on the CAA Bowtie site

https://www.caa.co.uk/Safety-Initiatives-and-Resources/Working-with-industry/Bowtie/

Once the Bowtie model has been created it can be used to map the impact of a change to any individual barrier or group of barriers across the whole model. This can be used to determine factors including:

- whether a change or a series of sequential changes is significant (material) and will require a change to the Safety Management System and Safety Case
- the impact of a change to one component of a building on the safe functioning of the building as a whole system;
- the competences needed to implement the change while maintaining the integrity of the building safety strategy

In the case of Rail Safety, the **Railways** and Other Guided Transport Systems (Safety) **Regulations** (**ROGS**) ref 1 Section 2 covers the issue of deciding whether a change to the operation results in a material change to the safety of the operation. Where the answer is yes, an application for licence renewal would be required.

In ROGS this decision is made by the Dutyholder. If there will be a new significant safety risk or a significant increase in risk (the 'risk test') then the Dutyholder must appoint an Independent Competent Person to do the verification assessment.

Whilst the size of HRRB estate can vary significantly, the Safety level requirement and therefore the competence of those responsible remains the same. Where used, the bowtie model described above can help to determine the competences building owners and Building Safety Managers will need to have or have access to when planning any changes to an occupied building.

(A bowtie or other risk analysis of an existing building will usually lead to the conclusion that retrofitting a sprinkler system will significantly reduce the fire risk. We have found that building managers in London and elsewhere are well aware of this and many are already starting to install sprinkler systems.)

4. Learning from other industries

The Safety Case Review process is very well developed in the Offshore, Nuclear and Chemical related industries. There is also much to be learned from the Aviation and Rail industry safety

procedures. The transport industries have similar safety problems to HRRBs in that there are large numbers of people in close proximity to any potential hazardous event.

5. Key Roles

WG1 proposes three key roles within the HRRB safety management process:

Dutyholder
Building Safety Manager
Independent Competent Person

Dutyholder

As defined in *BSF* Recommendation 3.1:

> Government should specify that responsibility for the safety of all parts of a HRRB must be held by a clear, senior Dutyholder which should be the building owner or superior landlord.

Building Safety Manager

As defined in *BSF* 3.16

> The Dutyholder must nominate a 'Building Safety Manager' with the relevant skills, knowledge and expertise to assist in discharging their duties and to be available to residents concerned about safety in their building. They will also need to bring in the right additional expertise (if they do not have it*) ie the Independent Competent Person*, to undertake work such as fire risk assessments or carry out internal safety management system audits prior with Safety Case submission.
>
> The Dutyholder must notify the JCA, residents, and occupiers of other premises in the building of the name and contact information of the Building Safety Manager, or declare that they will take that role themselves.

BSF 3.17

> Accountability must remain with the Dutyholder. They cannot pass or delegate their *accountability* to the Building Safety Manager but can delegate the *responsibility* for certain tasks to them. For many buildings the day-to-day management of safety and engagement with residents will be undertaken by, for example, a residential management agent who would most likely be nominated as the building safety manager.

Independent Competent Person

BSF does not set out a role of Independent Competent Person. However, WG1 concluded that the Dutyholder and Building Safety Manager will require engineering competence or access to engineering competence in order to assess whether proposed and completed changes result in a new significant risk, an increase to an existing risk, or another change to the risk profile. WG1 proposes that this role be identified as an Independent Competent Person, and is seen as the continuation of the Lead Engineer role appointed during the construction phase.

Clearly over the lifecycle of an HRRB this will not be a single person, and the person appointed may need to have specialist competence appropriate to the project involved such as M & E, Building Systems, Fire Safety, Structural Engineering, etc.

From the ROGS rail regulations guide:

> 2.7 There are three important things to consider when appointing an independent competent person.

(i) They must have the skills and knowledge needed to carry out the safety verification.

You should gather and keep evidence to prove this. This evidence usually includes:

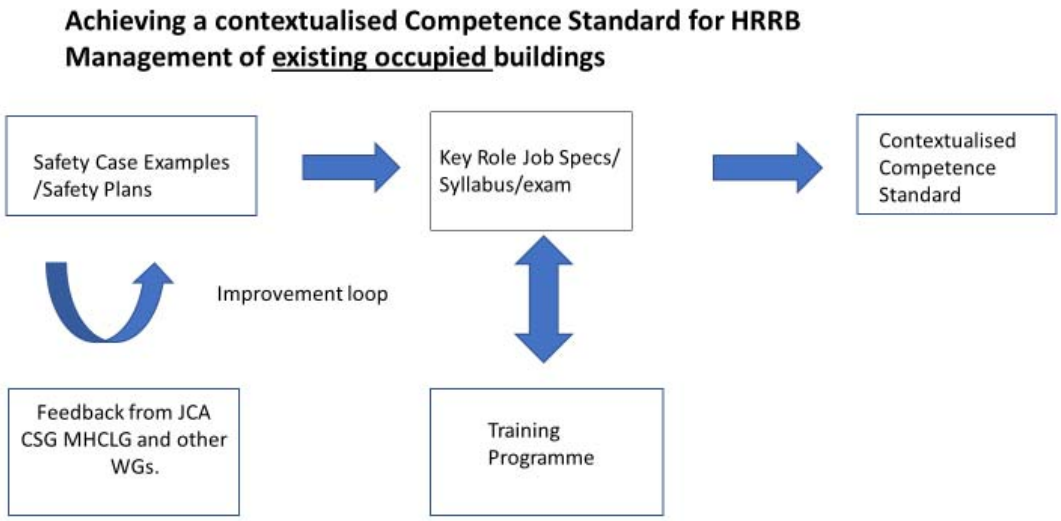
- written qualifications that can be checked;
- experience in the industry or the type of work and workplace;
- direct knowledge of the specific process they are overseeing;
- experience of the regulatory process, in terms of setting standards and gathering evidence appropriately;
- being aware of current best practice; and
- being aware of the limits of their skills and experience.

(ii) They must not have been responsible, in a way that might cause them to be biased in their assessment, for any of the things they will have to assess. For example:

- they should not benefit personally from the project being completed successfully and quickly; and
- they should not profit from the project being introduced, such as if they owned shares in a company which makes parts being used in the project.

(iii) They must not be part of the management chain that is responsible for introducing the project.

6 Achieving Competence



Both existing building owners and newly appointed Building Safety Managers will need to be trained and qualified as competent in their roles. This will include being able to recognise when and how to bring in an Independent Competent Person to review the Safety Case.

Training for these roles will need to cater for early career staff as well as experienced staff who may be new to the particular requirements for managing HRRBs.

Detailed proposals for the Competence of Engineers working on HRRBs is covered in a separate report.

7 Residents Voice

Regular opportunities should be provided for Residents to know about, discuss and contribute to the safe operation of the building. This may include regular Residents Group meetings with the building management, publication of all relevant documents in an open and transparent way on a website and in newsletters.

New residents should receive a New Residents Pack including safety information and be guided through the safety procedures in the building.

Opportunities for residents to engage in the Risk Identification and Assessment process can also be valuable. This can provide a means for residents to understand how they contribute to the management of risk barriers, and also to achieving the objective that they not only are safe but feel safe in their homes.

8. Proposed Safety Management Process for HRRBs

In summary, WG1 proposes that a practical and realistic Safety Management Process for HRRBs could include the following practice from other safety critical industries:

- Day-to-day work of maintaining safety in the HRRB should be carried out in conformance with a Safety Management System
- The Safety Management System should follow the ISO High Level Structure, and where possible and appropriate be integrated with other management systems used by the Dutyholder
- Where the same Safety Management System is used for multiple HRRBs, each HRRB (or cluster of identical HRRBs) should have its own Safety Case
- The Safety Case should follow a standard template, such as the one at Appendix A
- The Safety Management System and development and review of the Safety Case is supported by adoption of an appropriate hazard identification and risk assessment methodology, such as the Bowtie risk barrier model
- Hazard identification should be undertaken through a team process including representatives of all stakeholder groups
- Hazard identification should, as a minimum, consider the ‘Significant Four’ top level hazards of gas explosion, fire starting in a flat [or common or adjacent area] and spreading, flooding, vandalism or terrorist action in a flat, common or adjacent area
- The Dutyholder and Building Safety Manager should at all times have access to the services of a suitably qualified Independent Competent Person to assess the impact of any change on the Safety Case and provide independent safety audits.

9 References

1 https://www.caa.co.uk/Safety-Initiatives-and-Resources/Working-with-industry/Bowtie/
2 http://orr.gov.uk/__data/assets/pdf_file/0020/2567/rogs-guidance.pdf

APPENDIX A: Safety Case Template for Existing/Occupied Buildings

Draft 06/03/19 Version 2

(General: format A4 PDF aim for less than 10 pages. Supporting documents accessed via links)

A Heading: Site Name and Address Allocated Ref Number

B Document Control

1 Executive summary including clear Ownership Statement.

2 Policy

The organisation's safety policy.

3 Scope

The scope of the building(s) covered by this Safety Case.

The context of the organisation.

(ISO Clause 4)

4 Leadership

Names of the Dutyholder and Building Safety Manager. Organisation chart.

Competence processes for internal and external use.

Evaluation procedure for Independent Competent Persons/Organisations involved.

Policy on external contractors re C(DM) regulations and HRRB specific training.

(ISO Clause 5)

5 Building Details and Structural Design Statement.

Link to Digital Record, BIM files if available, and latest Structural Surveys.

Include separate Cladding, Fascia and curtain wall (ADB B4) assessments where appropriate.

Internal Structure including Compartmentation (ADB B3)

6 Fire and Emergency Statement

Link to Fire & Emergency File including Fire Strategy Report where available, latest Fire Risk Assessment, CDM H & S Files and Fire Incident log/reports.

7 Hazard Identification and Risk Assessment

Identification of most likely Hazardous Situations for the building (s). Using HAZID or other process to consider at least Gas explosion, Fire Spread, Flooding and Arson.

Use Bowtie or other process to assess the risk to People, Environment, Assets and Reputation/Trust (PEAR).

8 Safety Management System (SMS) and Safety Manual

Description of the safety management system used to create, plan, carry out, and check the actions required resulting from the Structural, Fascia and Fire reports, Hazard ID and Risk Assessment, Regulatory Inspections such as water, asbestos etc, and best practice.

The SMS Action plan should include regular discussion with residents, and other stakeholders.

The SMS should include monitoring of the effectiveness of the process leading to continuous improvement.

The SMS should include clear procedures for the procurement of outside services and products.

Training of those working on the building(s) to be planned and recorded.

It is preferred that the SMS should be integrated with other ISO management systems already in use by the organisation.

There should be a Safety Manual containing original signed copies of the safety policy and all safety procedures and processes. This should be a controlled document under the responsibility of the Building Safety Manager or other named individual.

(ISO Clauses 6,7,8)

9 Emergency Procedures and Evacuation Strategy

Incident response procedure and log

Procedures in place to deal with known risks. Evacuation strategy and evidence of training and practice of the strategy for both organisation employees and Residents. (ADB B1)

10 Residents Voice

Description of the regular opportunities provided for Residents to know about, discuss and contribute to the operation of the facility.

11 Continuous Improvement

Description of monitoring and measurement procedures, Internal audit process, and

Non-conformance reports and log.

Regular management reviews with records and timetable.

-end-

Working Group 01 - Engineers

Annex E2 - Site Visit Reports

WG1: Report on visit to the Ledbury Estate, Peckham, Southwark November 30th 2018.

The Ledbury Estate is in Peckham and includes four 14-storey Large Panel System (LPS) tower blocks. The estate belongs to Southwark Council. The buildings were built for the GLC between 1968 and 1970. The dates of construction as listed as Bromyard (1968), Sarnsfield (1969), Skenfrith (1969) and Peterchurch House (1970).

The WG1 group visited Peterchurch House on November 30th 2018.

The WG1 group was met by Tony Hunter, Head of Engineering, and, Stuart Davis, Director of Asset Management and Mike Tyrrell, Director of the Ledbury Estate.

The Ledbury website https://www.southwark.gov.uk/housing/safety-in-the-home/fire-safety-on-the-ledbury-estate?chapter=2 includes the latest Fire Risk Assessments, the Arup Structural Reports and various Residents Voice documents. This allowed us a good understanding of the site situation before the visit. In addition, Tony Hunter sent us copies of various standard regulatory reports.

Southwark use Rowanwood Apex Asset Management System to manage their regulatory and ppm work.

Following the Structural Surveys carried out by Arup in November 2017 which advised that the tower construction was not adequate to withstand a gas explosion, all piped gas was removed from the Ledbury Estate and a distributed heat system installed with Heat Interface Units (HIU) in each flat. Currently fed by an external boiler system.

A tour of Peterchurch House was made including a visit to an empty flat where the Arup investigation points could be seen. There are currently fire wardens in each block.

Subsequently to the visit a second meeting was held with the Southwark staff at their Tooley Street offices to review WG1's thinking on the use of the Bowtie hazard analysis method and the likely form of a HRRB Safety Case.

WG1: Report on visit to Chalcots Estate, Adelaide Road, Swiss Cottage February 15th 2019

The Chalcots Estate is on Adelaide Road nr Swiss Cottage.

The Estate comprises five high-rise tower blocks. Four identical 23-storey towers (Taplow, Burnham, Bray, and Dorney), and one smaller 19-storey block (Blashford). The blocks were built in two stages, with approvals being given in 1965 and 1966, and construction in 1967 and 1968. The estate belongs to Camden Council. The blocks are of rigid concrete construction.

The estate was significantly refurbished between 2006 and 2009.The refurbishment included the roofs, installation of external thermal rain screen cladding and new windows.

The WG1 team visited Bray House on the 15th February 2019. They were met by Dominic Johnson Head of Safer Homes, Camden Council, and Pat O'Neill, Head of Service delivery. A vacant flat was visited and a visit to the roof showed the passive smoke vent. There are currently fire wardens in each block.

Following the Grenfell fire, Camden Council identified the cladding as similar to that used at Grenfell. Samples were tested and found to be unsatisfactory. A decision was made to remove the cladding. Subsequently an LFB inspection showed that other remedial work was also necessary.

Chalcots tower with cladding removed showing the original concrete panel finish

A Fire Risk Assessment was carried out on August 3rd 2017. The overall risk classification of the building is **normal**. All FRAs are now publicly available.

https://opendata.camden.gov.uk/Housing/Camden-Fire-Risk-Assessments/g7pt-6m5rAugust

After a difficult period, the situation in the Chalcots towers has settled down. There are currently fire wardens in each block.

WG1: Visit to Broadwater Farm, Tottenham March 15th 2019

Broadwater Farm was completed in the early 1970s and built using the Large Panel System. It belongs to Haringey Council and is managed by Homes for Haringey which is a wholly owned subsidiary of Haringey Council.

Broadwater is an integrated mix of high rise (two 18 story tower blocks Northolt and Kenley), and ten medium high rise including the central so called Ziggurat block called Tangmere. Originally the blocks were connected by walkways but these were removed in the 1990s. All the accommodation starts on the first floor. This was designed to avoid any flooding problems from the River Moselle which runs under the estate. (Although there is no record of any flooding)

The WG1 team visited Northolt tower block.

We were met by Marek Sicak of Homes for Haringey, who arranged the visit, and David Sherrington, Director of Broadwater Farm Estate. Four MHCLG staff and a staff member from Haringey Council also attended the visit together with Dominic Johnson of Camden Council.

Homes for Haringey (HfH) manage the Broadwater site. They are an Arm's Length Management Organisation (ALMO), which was set up in April 2006 to manage London Borough of Haringey's (LBH) council housing provision. HfH currently manage around 16,000 tenanted and 4,500 leasehold properties. HfH was created as a limited liability company, whose sole shareholder is Haringey Council

Following the structural investigations at the Ledbury Estate in Southwark, all owners of high rise LPS buildings were advised by MHCLG to have their buildings examined. Haringey arranged structural surveys with Ridge & Ptnrs. Following this it was eventually decided to demolish the Northolt tower block and the Tangmere ziggurat building due to the excessive estimated cost of repair. Remedial work will be done to the other buildings. Sometimes difficult and ongoing negotiations with leaseholders have had to be managed in order to achieve vacant blocks.

As with many other older buildings, only limited original drawings are available.

The tower blocks are heated from a district heating system supplied from an energy centre near the Northolt tower, so there is no piped gas supply. However, Northolt also failed the lower pressure assessment and would need strengthening work. The other tower, Henley passed the lower pressure standard. The rest of the estate is now being connected to the district heating system (as it was originally) following the removal of piped gas.

Haringey Council have some 50 High Rise Tower Blocks (over 6 stories).

As noted in the Haringey Scrutiny Committee report July 2018 various follow up work in accordance with Government advice is also in progress:

> A full survey is underway of all properties with full height window panels to establish the construction of the window infill panels.
>
> HfH are currently reviewing all composite fire door installations to ensure manufacturers fire door certification is consistent with the doors installed. There are 7000 composite front entrance doors from a range of manufacturers.
>
> Historically landlords have only completed type 1-2 risk assessments which are non-intrusive communal area surveys. HfH is about to start type 3-4 fire risk assessments which includes intrusive surveys in communal areas and within properties. These risk assessments will help to identify breaches in compartmentation on vertical risers.

Housing Associations in Haringey have also had to remove cladding found to fail fire tests on some buildings.

The proposed Safety Case Format was discussed. Some changes in operation and organization might be needed to meet the requirements as written. A further discussion would be useful.

Haringey carry out many Risk Assessments but in the conventional RAG format so Bowtie would be a new exercise. Fire Safety is managed by a Chartered Building Engineer. It would be useful to have a discussion with the Fire Safety Manager at a future meeting.

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Competence for Building a Safer Future

Project ref:
Working Group 1 - Engineers

From:
Chris O'Regan

Date:
14 April 2019

DRAFT

Memo

Subject: Assessment of Safety Case for the *Commercial Building* Rev A

One of the tasks of IRG/CSG Working Group 1 is to carry out a review of existing buildings with a view to creating a safety case for them. Two buildings were selected, one a residential and the other a commercial. This note concerns the commercial building that was visited on Friday 23rd November 2018 by the following Competence for Building a Safer Future Working Group members:

George Adams – WG1 (Chair)

Chris O'Regan – WG1

Anthony Taylor – WG8 (Chair)

John Briggs – WG8

During this visit data was collected concerning the commercial building, which was in a city centre and was constructed in 1950's. It is currently occupied by its owner. The following text is a description of the building and how it is to be assessed in terms of a safety case. From here on in the building will be referred to as the *Commercial Building* and aspects of it will be described in abstract form.

DESCRIPTION OF BUILDING

The *Commercial Building* is a 27 storey structure with two levels of basement. There are plant rooms on 25th, 10th floors and both basement levels that provide heating, power and communication infrastructure throughout the building. It is located with a well-developed city centre adjacent to a river, water from which is used to spread cool air through the building. It was constructed between 1957 and 1962 and consists of a steel frame structure that is clad in concrete and has in-situ reinforced concrete floor slabs and a concrete shear core that acts as both fire escape and lift shaft.

OCCUPANCY AND USE

The *Commercial Building* has been in continued occupation since its construction, spanning over a period of 56 years. It has been primarily used for offices from which the owner occupier has been running its European arm of its business. There are no third party tenants within the building, thus negating the issue of landlord vs. occupier rights that are normally found in commercial properties.

Due to the nature of the type of work the occupier is involved in, the *Commercial Building* is in constant operation, 24 hours a day, 7 days a week. The only exception to this is the need to carry out maintenance works, that result in temporary closure of parts of the building.

CONDITION OF BUILDING

The *Commercial Building* is advanced in its age with it technically drawing towards the end of its design life. Nevertheless the fabric of the structure is in good condition with little signs of deterioration.

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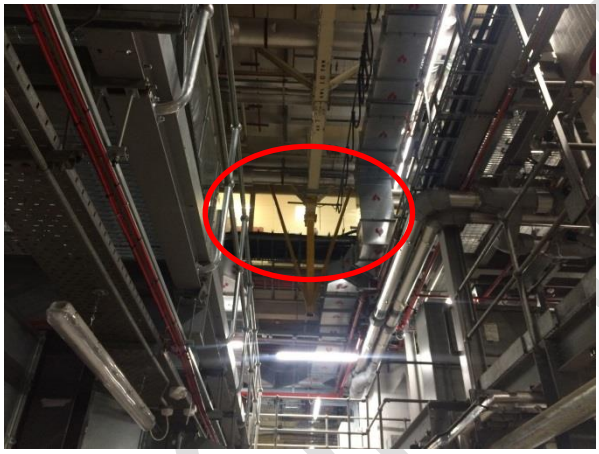
The same cannot be said of the existing mechanical and electrical plant, which is currently undergoing a significant refurbishment with most of the original installation being replaced.

Similarly the building envelope has undergone a significant amount of refurbishment as well due again to its age and the owner occupier's desire to extend the life of the building.

MAINTENANCE REGIME

The owner occupier has invested in a robust maintenance regime of the *Commercial Building* that has resulted in creating an onsite facilities management team that ensures the continued safe and efficient running of the building.

Contained within the basement of the *Commercial Building* is an extensive monitoring station that assesses the heating, ventilation and power of the building. All communication infra-structure is principally monitored from the plant room on the 25th level, but is also overseen from other smaller hubs throughout the building.



Multi-level plant room within the basement, with monitoring station circled

While the building services aspect of the *Commercial Building* are under constant scrutiny, the fabric of the structure, which includes the primary and secondary elements as well as the envelope is monitored sporadically, with comprehensive surveys commissioned only when significant modifications are proposed to be carried out.

RECENT MODIFICATION WORKS

The *Commercial Building* is currently undergoing a significant amount of refurbishment works that principally relate to the replacement of the plant that provide the building services. Currently there are large sections of now disused plant that is being broken down and carefully removed to provide increased storage space within the *Commercial Building*.

Replacement boiler plant installed in 2017

Along with the plant replacement and upgrade there is the renewal of the glazing within the building envelope. The original glazing did not meet the current requirements of acoustics and thermal transfer and needed to be replaced. This has been done while maintaining the existing masonry/stone cladding that is considered as a key visual component of the *Commercial Building*.

The roof cladding to the *Commercial Building* was stripped back and replaced in February 2018 with a contemporary lining and finish to arrest any water leakage into the plant room below on Level 25.

Finally there is the installation of a link bridge structure that spans between the *Commercial Building* and a recently constructed structure that is of similar specification only using contemporary technologies and methods of construction. This bridge is considered to be a component of the *Commercial Building* and not of the adjacent building and therefore falls within the maintenance regime of the former structure.

KNOWN MATERIAL HAZARDS

The *Commercial Building* was constructed at a time when asbestos was in common use. It therefore follows that any modifications to it have resulted in significant removal of asbestos where it was likely to be disturbed during the works.

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DRAFT

Plant rooms contain asbestos both in the containment lining and fabric of the structure

Similarly the decommissioned plant that resides within the building does contain hazardous material such as asbestos and lead, requiring close monitoring with regards to exposure of it to the *Commercial Building*'s occupants until such a time as it is eventually removed.

OPERATION OF BUILDING

With the building being occupied almost constantly its owner occupier has seen fit to establish an onsite facilities maintenance team that monitors equipment and plant that ensures that it functions as intended.

This is an important facet of the operation of the *Commercial Building* that, while it is technically high risk in its form and level of occupancy, it is afforded the luxury of having a team of engineers and technicians whose responsibility is the safe running of the building. This must be taken into consideration when developing a safety case for the *Commercial Building* as the presence of this team acts as a significant mitigation measure to most risks relating to the safe operation of the building for its occupants.

SUMMARY

While the *Commercial Building* is drawing towards the end of its design life, it is notable that the owner occupier has gone to great lengths to maintain it with the aim of significantly increasing projected lifespan. This needs to be taken into consideration when developing the safety case for it as its age will be a constant source of risks that need to be mitigated against.

This is true for all structures that are undergoing a series of refurbishments and the study of the *Commercial Building* will most likely aid the development of safety cases for other older buildings.

Regards,

Chris O'Regan BEng(Hons) CEng FIStructE FICE

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Working Group 01 - Engineers

Annex F1 - Contextualised competence guidance

Engineering Professional Competence Framework for Higher Risk Residential Buildings Version 0.4

(DRAFT)

General principles for built environment professionals and workers

This competence framework has been developed taking into account the following principles**.**

Purpose

The fundamental purpose of all built environment professionals and those working on higher risk residential buildings is to deliver better living and working lives for the public. This includes procuring, designing, creating, operating and maintaining buildings that are safe and feel safe for those who live and work in them. Everyone connected to building procurement, design, construction, operation and management has a role to play in delivering this purpose, which is why it sits at the heart of our competence framework.

Principles

We expect those involved in the built environment to do what's right by following three key principles: people matter – buildings matter – professionalism matters.

Our work should be outcomes driven. This means that we will champion better living and working lives by making a positive difference on every level – personally and professionally. This includes behaving ethically and reflecting on individual behaviors.

Our work is evidence-led. This adds weight to professional judgement by supporting building safety during construction, refurbishment and in use through diverse sources such as research, gathering data and listening to our stakeholders.

Refer to principles of competence here.

Core behaviours

These are our ways of thinking and acting which makes us effective in our work. Core behaviours must include:

- respect for life, law, the environment and public good
- honesty and integrity
- accuracy and rigour
- responsibility for direction, conduct and communication

Core knowledge

Our core behaviours are supported by core knowledge. Regardless of our role, sector or specialism, these are the things we need to know to consider ourselves suitably expert in construction and operation of buildings to be able to work in the public interest.

Specialist knowledge

The individual frameworks for specialist disciplines set out the specialist knowledge required to enable individuals to work on higher risk residential buildings.

The following sections set out the competence framework for professionals working on higher risk residential buildings. However, we believe this has general application for the built environment profession as a whole.

0.1 Introduction

This competence framework has been developed in response to recommendations set out in the Final Report of the Independent Review of Building Regulations and Fire Safety following the Grenfell Tower fire in 2017.

The report made the following recommendations:

Recommendation 5.1: The construction sector and fire safety sector should:

a. demonstrate more effective leadership in relation to developing a responsible approach to delivering building safety and integrity;

b. work with other sectors to learn and translate good practice and implement it within the sector; and c. develop continuous improvement approaches to competence levels.

Recommendation 5.2:

a. The professional and accreditation bodies working within the construction and fire safety sectors should continue the work started in response to the interim report and present a coherent proposal to government within one year. As a minimum, this proposal should cover the role and remit of an overarching body to provide oversight of competence requirements and support the delivery of competent people working on HRRBs, including:

• the professional bodies, professions and disciplines in scope;

• its membership and governance;

• its role in receiving, agreeing and monitoring the individual competence frameworks for those bodies, professions and disciplines in scope for individuals within their membership or on their register, and/or whether a single competence framework for professional bodies in scope should be established;

• its role in agreeing and monitoring accreditation and reaccreditation, and the period within which the competence of individuals should be reassessed and reaccredited;

• its role in establishing a method for demonstrating or proving competence;

• how the correct balance between construction sector skills and fire safety skills should be balanced; and

• whether the competence requirements for those working on HRRBs should also be extended to cover other multi-occupancy residential buildings and to institutional residential buildings.

b. Progress should be monitored by government, with the professional and accreditation bodies providing government with quarterly progress reports.

c. If government does not consider that the proposed approach provides the necessary assurance to the JCA, or there is evidence that the fragmented approach to the oversight of competence will continue, then government should mandate a body to establish the competence levels required and oversee its implementation.

Recommendation 5.3: Relevant parties, along with the relevant professional bodies, should:

a. Continue to work together to develop a new common approach and competence framework which meets the requirements of the new regulatory framework and the new skills required of Building Standards Inspectors when working on HRRBs, and those offering consultancy and verification services to duty-holders.

b. This framework should apply to all Building Standards Inspectors whether they are LABS Inspectors and part of the JCA or AIs offering their services to Building Standards or to duty-holders.

c. Consider whether these competence requirements for Building Standards Inspectors working on HRRBs, and AIs, should also be extended to cover those working on other multi-occupancy residential buildings and institutional residential buildings.

Recommendation 5.4: Relevant parties should work together, along with the relevant professional bodies, to develop and define a robust, comprehensive and coherent system for:

a. the competence requirements for the role of building safety manager of HRRBs; and

b. the remit of this role in introducing and overseeing the process by which residents in HRRBs would be able to access fire safety awareness training.

0.2 Objectives of the framework

We have set out a framework for the assessment of the necessary competences for engineering professionals working on higher risk residential buildings within the wider context of an overarching competence framework for all professionals working on these buildings. The purpose is to ensure that engineering professionals working on these buildings have the skills and knowledge to undertake their work in an effective way that ensures building safety and an awareness of the competences and responsibilities of other professionals working in the same environment.

The framework can also be used to:

- support the development of qualifications for engineering learning and training
- assist in assessment of candidate suitability for engineering roles [in the sector]
- support engineering professionals to develop their own career and personal development plans
- revalidate ongoing competence of engineering professionals on a periodic basis

The framework sets out the core competences required by any person undertaking work as an engineer or engineering technician and sets out the level of competence expected of these professionals. Typically, engineering professionals include the following roles:

- Principal/Lead engineer during design, construction or operation of a building
- Building Services engineer/technician
- Design engineer/technician
- Construction engineer/technician
- Façade engineer
- Heating and Ventilation Engineer
- Installation engineers and technicians where not covered by other frameworks
- Mechanical and Electrical/Building Services
- Structural engineer
- Building Engineers where not covered by other competence frameworks
- Fire Engineers where not covered by other competence frameworks
- Any other persons deemed appropriate by the Overarching Competence Body

Engineering professionals possess skillsets that are transferable to roles such as Fire Risk Assessors, Building Control, Building Designers, Building Safety Managers, Site Supervisors, Project Managers and Procurement. Engineering professionals undertaking such roles will need to meet the appropriate role-related competence framework.

Competence profiles for different roles are defined through a mapping exercise which reflects the different level of decision-making responsibility relevant to that role. Further information is provided in the following sections:

Section 1 – Using the Competence Framework sets out how to use this competence framework.

Section 2 – Engineering professional competence framework for higher risk residential building sets out the framework for assessment and validation and provides guidance on how suitable competence may be demonstrated.

Once the role of the Principal Designer in relation to HRRB is more clearly defined it will be necessary to consider how this framework may need to be amended to reflect that role, or whether a separate specific framework for lead engineers should be developed using this framework as a base.

0.3 Scope

This framework is relevant to any person undertaking engineering work in relation to the construction, alteration, extension, operation or maintenance of higher risk residential buildings. It includes Lead Engineers who are *responsible for ensuring all of the components of a building project are suitably co-ordinated and compatible with one another in terms of safety, functionality, efficiency and future maintainability.* It also includes discipline-specialists (such as façade engineers) who have responsibility for the design, construction, installation, commissioning, operation or maintenance of significant components of a building.

In this context, engineering professionals will have different roles at different stages in the lifecycle of a building. Suitably qualified engineers may undertake the role of Principal Designer or Principal Contractor as defined in the CDM Regulations during building design, construction or major refurbishment projects. Engineering professionals also undertake specialist and generalist roles during major and minor projects in buildings under construction, in use and during demolition and site restoration. They will have specific responsibilities in creating and maintaining the Safety Case for a building.

0.4 Roles and responsibilities relevant to this competence framework

In principle we believe that competence for engineering professionals should be managed at two levels: Engineering professionals leading on HRRB projects should be independently verified as competent against this framework, with all others undertaking engineering work under the supervision of an engineering professional internally assessed and audited against the same framework.

This is the practical framework against which industry can deliver effectively. MHCLG may wish to consider the extent that the assessment of competence which is not independently assessed (i.e. those working under supervision of engineering professionals) is audited or reported to the JCA for HRRB.

This could be achieved by imposing a legal duty on any business offering engineering services to ensure engineering work on an HRRB is led by a person independently validated as a competent [HRRB] engineering professional. Engineering professionals will then have a subsidiary duty to manage and take responsibility for assuring the competence of those working under their supervision on higher risk residential buildings.

In practice the responsibility and competence of those working under the engineering professional will vary depending on their role within the engineering team, experience and seniority. There should be an explicit duty on the engineering professional (both a legal entity and an independently validated person managing an HRRB project) to check and audit the competence of those working under their supervision.

The engineering professional or their employer will therefore be required to use suitable competence assessment techniques to map out specific responsibilities and skill sets and ensure people are working within the safe limits of their competence.

These assessment processes should use the different levels of competence described in section 1.3 of this document mapped against the engineering professional Competence Framework.

Engineering professionals may also undertake the Principal Designer role yet to be defined by MHCLG, as well as the Principal Designer role as defined by the CDM Regulations. These are additional competences which are not covered by this framework at this time.

0.5 Eligibility, qualifications and prior learning

Any person wishing to be independently assessed against this framework should:

- Be a current full member in good standing of a relevant engineering professional organisation
- Be required to have in place a suitable programme for continuing professional development (CPD)
- Be subject to and adhere to a Code of Conduct and disciplinary procedures
- Have suitable academic qualifications or equivalent learning in a built-environment subject
- Have the specified or relevant experience in complex building projects

The baseline minimum level of prior learning for a competent engineer to be independently validated against this framework will be at the level of a UK Bachelor degree (or equivalent) with at least 2 years post qualification experience relating to HRRB or similar more complicated buildings. The baseline level of prior learning for a competent Engineering Technician will be at level 3 in the regulated qualifications framework for England, Wales and Northern Ireland (or equivalent) with at least 2 years post qualification experience in HRRB or similar complex buildings.

0.6 Definitions

[Add once complete]

Continues on next page

SECTION 1

1.0 Using the Engineering Professional Competence Framework

1.1 What is competence?

Competence is the ability to put a combination of relevant knowledge, skills, behaviours and experience into practice in order to perform a job in an effective and efficient manner to an established standard.

Engineering professionals working on higher risk residential buildings must demonstrate that they have the competences necessary to ensure that design, construction and use of the building which they are working on, or over which they have authority protects life safety effectively throughout the building life cycle.

Engineering professionals must understand the performance of the building as a system and how the work for which they are responsible impacts on the life safety strategy of the building as a whole. They must have key competences relating to fire safety, structural safety, public health and building safety and be able to apply these principles consistently and effectively in practice. They must understand their professional obligations to only undertake work for which they are competent and their duty to warn Dutyholders and others where they see examples of practice and work which could compromise the safety of building users.

1.2 Who assesses competence?

[This should be aligned with OCB structure, process and accreditation once determined]

This framework sets out additional specific to higher risk residential buildings which are additional to the generic professional competence requirements for professional engineering registration with the Engineering Council. This framework and its associated assessment and associated validation process will be approved by the Overarching Competence Body (OCB) to ensure that it meets the required standard.

Assessment of individuals to meet the [overarching] competence framework is undertaken by independently verified professional bodies or suitably accredited certification bodies whose procedures for assessing competence have been approved by the OCB or an independent body approved by the OCB.

As set out in section 0.5 of this guide, engineering professionals must already be a member of a professional engineering institution licensed by the Engineering Council, with relevant qualifications and experience prior to seeking assessment against this framework.

1.3 Using the competence framework

[This should be aligned with OCB structure, process and accreditation once determined]

The way in which competence is assessed will be determined or approved by the OCB. The engineering professional competence framework is set out in section 3. Competences are structured under 5 key headings:

- A Technical knowledge and understanding
- B Design and development of processes, systems, services and products
- C Responsibility, management and leadership
- D Effective communication and inter-personal skills
- E Professional Commitment

Core competences for all professionals working on HRRBs are listed under each heading in column one of the Framework in Annex F2. Column two provides typical scope and knowledge relevant to

that competence that will be expected. The third column of the framework sets out the specific competences that engineering professionals should be able to demonstrate and the fourth column explains common ways that the competences could be evidenced. For engineering professionals these are tailored by the professional engineering institutions with reference to particular engineering disciplines or practice areas.

The level of knowledge, understanding and skill associated with each competence varies depending on the level of responsibility against which a candidate is being assessed and are described as follows:

Level 1 – Awareness / Foundation

Has an understanding of the competence, its relevance to own work and any key inter-relationships

Level 2 – Appreciation / Intermediate

Has sufficient knowledge and understanding to be able to apply the competence under the supervision of a more senior professional

Level 3 – Detailed knowledge / Advanced

Has all essential knowledge and understanding to be able to act with autonomy in making key decisions and delivering a broad range of outcomes relevant to the competence

Level 4 – Comprehensive Knowledge / Specialist

Has comprehensive and in-depth knowledge and the skills required to effectively make complex decisions and judgements in relation to the competence.

For the Lead Engineer on an HRRB project, competence will be expected at Level 3 across all the core competences with Level 4 in key competences relating to the building as a system, hazard identification and risk assessment, and challenging statements or policies that give them personal or professional concern. The level of knowledge required to be demonstrated by those supervising smaller projects or work packages will reflect their responsibilities and area of expertise. The competence of those working under the supervision of an engineering professional should then be mapped and audited relative to their role.

1.4 Validation and re-validation

The accreditation and reaccreditation process should comply with requirements as set out by the OCB [as yet to be determined].

Independent assessment against the engineering professional [HRRB] competence framework may be carried out by professional engineering institutions licensed by the Engineering Council for this purpose.

Discipline-specific annexes to this framework have been developed by the professional engineering institutions. The Engineering Council maintains a list of institutions licensed to undertake the assessment in each discipline.

Following successful independent assessment, engineering professionals will be entered on the [Engineering Council HRRB register/HRRB section of the Engineering Council register at the applicable level/ JCA or OCB held register…..] for a period of xx years.

Registered HRRB engineering professionals should undergo a re-registration process every five years to ensure that:

- The scope of work for which they need to be competent has not changed, and if it has to reflect this in their re-registration assessment
- They have maintained their competence in relation to the work they undertake
- They have developed or plan to maintain their competence or develop new competences where necessary.

The validation and revalidation process for engineering professionals will be overseen by an independent validation panel consisting of at least two persons at the same level or higher seniority and with relevant experience in the same sector.

Where engineering professionals are working under the supervision of an independently validated engineering professional, their competence should be assessed (either internally or by third parties) by a panel composed of suitably experienced peers. This can include line managers within the same business, or for those professionals working in smaller organisations suitably qualified peers from another organisation.

The validation and revalidation process should as a minimum consist of:

Part 1 - Submission of records

- An updated competence self-assessment;
- An accompanying report setting out relevant experience gained over the preceding two to five-year period;
- CPD records and information on any additional qualifications or career development activity in at least the previous two years;
- A summary list of the work undertaken over the preceding two years providing brief details of the scale, nature and value of projects in that timescale;
- References or testimonials from professionals or clients relating to the competences.

Part 2 - A Competence based interview

An interview should be held and should use a structured competence-based approach utilising the information submitted to test key areas of the engineering professional's competence. The interview should consist of:

- A presentation followed by Q&A based on the report as submitted with the application.
- A structured interview which confirms appropriate awareness or comprehension of all core competences and tests key competences as defined for the discipline.

The outcome of the validation or revalidation process should be:

  - A report confirming competence; or
  - A report setting out areas for improvement, (with registration subject to submission and approval of a suitable personal development plan); or
  - A report raising points of concern in terms of scope or competence.

Where the applicant succeeds in demonstrating competence the professional body will nominate them for admission to the HRRB Section of the Engineering Council Register. In the case of engineering professionals assessed as competent for the statutory roles of Principal Designer, Principal Contractor or Building Safety Manager the Engineering Council will pass their details on to the OCB for admission to the HRRB register.

1.5 Continuing Professional Development (CPD)

[Suitable requirements for undertaking and monitoring / evidencing CPD to maintain and develop competence should be introduced in line with requirements established by the OCB]

All engineering professionals working on higher risk residential buildings must comply with the continuing professional development (CPD) requirements of their relevant professional engineering body. They are responsible for demonstrating their continuing competence to work on higher risk residential buildings.

1.6 Personal Career Development

Engineering professionals at all grades should:

- Review their competence self-assessment annually
- Identify development needs; and
- Undertake relevant continuing professional development to develop or maintain existing skills.

This could be by meeting a set of prescribed objectives, or through setting a personal development plan.

1.7 Complaints, disciplinary and appeals

[A suitable mechanism to deal with complaints or concerns about the competence of engineering professionals will need to be in place in order to ensure that any person determined to be no longer competent is removed from the register].

Concerns about the competence of an engineering professional in relation to work on higher risk residential buildings may be raised with the registering professional engineering institution. The professional engineering institution should in the first instance deal with that complaint through their disciplinary procedures.

Working Group 01 - Engineers

Annex F2 - Contextualised competences

A	**Use a combination of general and specialist engineering knowledge and understanding**			
	1- Key competence	**2- HRRB scope/ knowledge (all professions/trades)**	**3- HRRB Specific competence – engineering professionals**	**4- Typical evidence to demonstrate engineering competence**
A1	The ability to understand and apply relevant fire safety principles and practices in the design, construction, operation and maintenance of HRRBs.	Fire science • Principles of Heat transfer • Properties of Materials • Principles of Fire chemistry • Principles of Fire dynamics Human behaviour and evacuation • Human behaviour and physiological response to fire • Life safety design concepts and practice • Fire protection systems • Passive fire protection systems • Active fire protection systems • Fire detection and alarm systems • Fire suppressions systems Fire safety design and specification • Access and facilities for fire and emergency services • Fire performance of materials • Compartmentation and spread of flame • Principles of structural fire protection design • Commissioning and interrogation of specialist analysis by others	This should include underpinning knowledge and understanding of: • The building as a system and how the technical interfaces contribute to the functionality and safety of the building and its occupants • The interrelationship of design and specification with fire performance • Key features and principles of passive and active fire protection (including suppression systems) This should include the ability to: • Apply relevant fire safety principles and practices in the engineering of HRRBs. • Apply fundamental knowledge of fire science, (including key aspects of fire performance of materials) in the engineering and specification of HRRBs. • Integrate key principles of human behaviour and fire escape design in the engineering and arrangement of escape provision in HRRBs. • Integrate and coordinate relevant passive and active fire protection systems into the engineering components of HRRBs • Integrate and coordinate compartmentation and structural fire protection in to the engineering of HRRBs with particular reference to measures which prevent the spread of flame and smoke. • Integrate and coordinate fire-fighting access requirements and provision of fire-fighting facilities into the engineering design and layout of HRRBs. • Integrate new engineering approaches, theories or techniques into engineering practice whilst ensuring safe outcomes.	Examples from your work where you have effectively applied principles of fire safety in the engineering of an HRRB
A2	The ability to apply knowledge and understanding of relevant principles and technical standards for building safety and co-ordinate and integrate these into the design of HRRBs.	Structural safety • Structural design /fixing of cladding / envelope at height • Secondary fixings specification and design • Disproportionate collapse Protection from falling or collision • Stair safety • Guarding / balustrades • Balconies Public Health • Air quality / ventilation • Above ground drainage	This should include underpinning knowledge and understanding of: • The process by which different aspects of building safety should be successfully integrated into the overall design of an HRRB. • The critical safety engineering principles relevant to structure, public health and building services. • Fire safety engineering principles relevant to maintaining the integrity of the building fire strategy. This should include the ability to:	Examples from your work where principles of building safety (other than fire safety) have been effectively applied in the engineering of an HRRB.

		• Water storage • Combustion appliances Building Services • Gas appliances and services • Electrical safety • Mechanical services • Fire integrities Building fabric • Interstitial condensation / corrosion • Water penetration / weather tightness • Service penetrations • Maintenance • Glazing and glazing systems	• Evaluate and integrate new technology safely into the engineering design of HRRBs taking into account:. o Building lifecycle o Buildability o Maintenance and refurbishment • Recognise when advice from others including specialist professionals is needed, obtain this and ensure it integrated effectively in to the engineering design of HRRB. • Co-ordinate the engineering, specification and assessment of building fabric including where necessary commissioning and integrating the work of other specialist building professionals to achieve safe performance throughout the building lifecycle. • Integrate new engineering approaches, theories or techniques into engineering practice whilst ensuring safe outcomes. • Ability to undertake statistically sound appraisal of data to underpin safe engineering outcomes. • Understand original design intent and principles and maintain these when making minor or major modifications to an HRRB	
A3	The ability to apply knowledge and understanding of relevant legislation, regulations, statutory guidance, standards of performance applicable to HRRBs.	Construction legislation relevant to high risk buildings including: Construction Legislation • The Building Act • The Building Regulations • Approved Documents • AD7 Materials and Workmanship • Building regulations (procedural) • Local acts / enactments • Government communications / circular letters • Sustainable and secure building act • Regulatory reform Fire Safety Order • CDM Regulations • Health and Safety at Work act • Gas safety (installation and use) Regulations 1998 Related • RIBA plan of work • BISRIA plan of work • Civil, criminal and case law • Contract Law • Law of Agency • Employment Law • The Housing Acts 1985,1988, 1996,2004 • Housing Health and Safety Rating System • Equalities act 2010 • Town and country planning Acts • Housing and Regeneration Act • Licensing legislation • Water Bylaws	This should include underpinning knowledge and understanding of: • relevant legislation, regulations, statutory guidance and standards of performance in the engineering of HRRBs • the respective responsibilities of roles specified in regulations and relationship of own role to that of the duty holder and other professions, trades or engineering disciplines. This should include the ability to: • Meet or exceed requirements set out in relevant legislation, regulations, statutory guidance and standards of performance in the engineering of HRRBs • Recognise how the statutory or legal requirements of other roles relate to the role of the engineer where these could impact on building safety. • Advise others on what needs to be done to comply with relevant statutory requirements.	Examples from your experience of engineering an HRRB in order to ensure robust compliance with statutory requirements; and evidence of understanding or awareness of relevant statutory regimes.

A4	The ability to develop, manage, distribute and maintain information which is critical to ensuring that HRRBs are safe, built to be safe, operated safely and maintained to be safe throughout the building lifecycle.	Understanding of • Golden thread of building information Safety Management Systems • Safety case • Health and safety file • Fire and Emergency File • Design /construction, as built / as maintained information • Building safety strategies • Building maintenance information and scheduling • Testing and commissioning information • Lifecycle and replacement data • Building installer / constructor / maintainer competency requirements • Regulation 38 • HRB records and certificates • As built information • BIM	This should include underpinning knowledge and understanding of: • All documents (and their content) which the engineer must create, maintain or use to ensure HRRB safety • Competence and needs of building safety managers and owners This should include the ability to: • Develop, manage, distribute and maintain information about the engineering of HRRBs which is critical to ensuring that they are engineered to be safe, built to be safe, operated safely and maintained to be safe throughout the building lifecycle. • Develop and communicate clearly expressed engineering strategies to meet building safety requirements. • Comply with requirements to prepare and submit relevant documentation as part of the Safety Management System, Safety Case, Fire and Emergency file or Health and Safety plan, • Utilise suitable information management tools to ensure accurate design and as built information are developed and issued. • Manage changes to engineering information in order to ensure an accurate set of as built information is available at key gateway stages. • Identify what information is needed from other parties and coordinate that information where relevant to the role of the engineer, including operation and management documents required to operate the building safely	Examples of good practice in developing and maintaining as built information; evidence of leading role in the development of key building safety information packages such as the safety case or fire and emergency file; effective development of information setting out key engineering safety strategies for use by building owners or emergency services; examples of effective management of information post completion.

B	Design and development of processes, systems, services and products			
	1- Key competence	**2- HRRB scope/ knowledge (all professions/trades)**	**3- HRRB Specific competence – engineering professionals**	**4- Typical evidence to demonstrate engineering competence**
B1	The ability to apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and re-cycle building engineering processes, systems, services and products.		This should include the ability to: • Identify, review and select techniques, procedures and methods to undertake engineering tasks. • Contribute to the design and development of engineering solutions within a HRRB. • Implement design solutions and contribute to their evaluation. • Establish the static and dynamic life safety systems and their design interfaces • Review the test and commissioning plan • Ensure a co-ordinated life-safety solution is achieved •	
B2	The ability to apply relevant standards, testing, assessment and maintenance procedures for building materials, products, components, assemblies and systems effectively through the life cycle of the building.	• British and international product standards • Testing standards, procedures and interpretation of results • Good practice specification • Product characteristics and performance • System / component / assembly testing and performance • Prototyping and sample panel and testing • Maintenance requirement • Maintenance testing and commissioning of building systems and services	This should include underpinning knowledge and understanding of: • Relevant standards, testing, assessment and maintenance procedures for building materials, products, components, assemblies and systems. • Methods and practice of building maintenance. This should include the ability to: • Apply these effectively as part of the engineering process to ensure safety through the life cycle of the building. • Apply these in ensuring the building performs safely as a system. • Conduct testing and verify quality and suitability of delivered/procured products and .materials	Evidence of suitable application or use of relevant standards, testing or assessment procedures in the engineering of an HRRB.
B3	The ability to work within or apply in practice statutory process and procedures applicable to HRRBs.	• Gateway process and stages for HRRB • Role of the JCA • Tenant voice and engagement.	This should include underpinning knowledge and understanding of: • Statutory processes and procedures • Tenant engagement channels This should include the ability to: • Advise clients, project team members and others on duties and procedural requirements relating to the engineering of HRRB • Comply with relevant engineering development activities in order to demonstrate compliance with building safety requirements to the JCA at differing gateway stages. • Engage positively with the JCA and its constituent bodies. • Engage and communicate with tenants and the public.	Examples of successful project delivery through statutory cycles or process; examples of specific complex interactions, discussions or process meeting requirements for HRRB.

B4	The ability to use suitable knowledge and understanding of specific risks relevant to HRRBs in the development and application of risk management frameworks and safe systems of work.	• Definition of HRRB • Critical risk factors in high risk buildings • Safety case development • Safety case review • Fire risk strategy • CDM regulations • Health and safety file • Deleterious materials • COSSH regulations • Building management and maintenance for building and occupier safety;	This should include underpinning knowledge and understanding of: • How and why HRRB are defined and relevance to engineering activities • The importance and purposes of Safety Management Systems • Hazard identification and risk assessment methodologies • The specific engineering risks relevant to each type of HRRB, including typical critical modes of failure and consideration of maintenance and replacement cycles • How these risks should be managed through the design process, including through commissioning or undertaking of work by other specialist persons. This should include the ability to: • Contribute to and work with safety management systems for HRRBs • Lead or contribute to the development, modification and management of the Safety Case • Lead, carry out or contribute to hazard identification and risk assessment • Execute their duties and responsibilities in accordance with the Safety Case	Examples from your work of the development or application of risk management process, procedures, safety case, safety information or frameworks. Examples of identifying specific risks and how these were subsequently successfully managed.

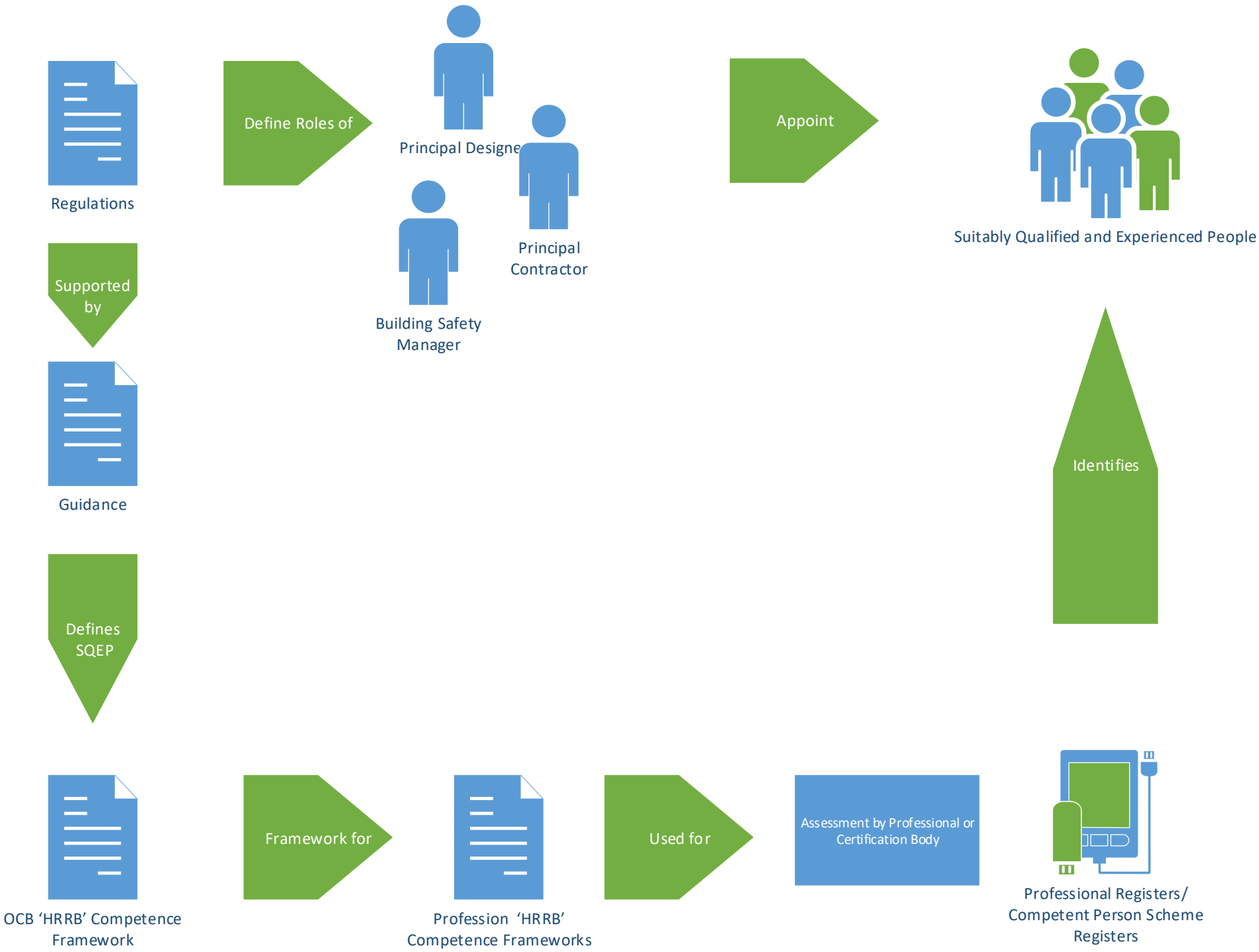
C	Responsibility, Management and Leadership			
	1- Key competence	**2- HRRB scope/ knowledge (all professions/trades)**	**3- HRRB Specific competence – engineering professionals**	**4- Typical evidence to demonstrate engineering competence**
C1	The ability to identify and where applicable fulfil roles, responsibilities and duties in relation to HRRBs.	• Duties and responsibilities of key roles/dutyholders including client, contractor, building owner / manager, building safety manager, resident • Joint Competent Authority/Regulator • Overarching Competence Body • Local Authority • Relevant statutory regulators • Profession/Trade regulators; • Fire and rescue services • Through life management and maintenance	This should include the ability to: • Explain and comply with the duties of an engineer in relation to HRRB's • Explain the roles and responsibilities of other key duty holders and their interactions with the role of an engineer on HRRBs • Work effectively with other key duty holders • Act as or engage effectively with the Principal Designer, Principal Contractor or Building Safety Manager of a HRRB. • Integrate understanding of through life management and maintenance criteria in engineering activities to ensure safe outcomes • Challenge others where duties are not being effectively met.	Evidence of specific roles and responsibilities you have held as part of your work on HRRB. Evidence of your involvement of ensuring awareness and fulfilment of specific duties relevant to HRRBs; examples or interaction with other key duty holders.
C2	The ability to challenge unacceptable behaviour or practice and to raise, escalate or flag risks to safety at any stage during the building lifecycle.	• Whistle blowing policies • Public Information Disclosure Act • Public duty to report • Liabilities • Company or organisational reporting and escalation policies and procedures.	This should include the ability to: • Explain and comply with professional and ethical duties to raise concerns relating to public safety • Effectively raise safety concerns with colleagues and where necessary escalate these concerns through management chains • Identify if and when it is necessary to utilize whistleblowing provisions under the Public Information disclosure Act and how to do so. • Explain and act on any other duties to raise concerns about life safety within a HRRB.	Examples of industry practice where you may have had concerns and acted upon them; how you have been effective in leading on building safety issues; how you integrate good building safety practice in your day to day work.
C3	The ability to effectively manage or work within complex project teams and co-ordinate technical and procedural compliance to ensure safe outcomes.	• Project management and control • Sequencing of work • Assembling and appointing teams • Effective management practice / procedures for engineering of high-risk buildings.	This should include underpinning knowledge and understanding of of • what competence frameworks and qualifications exist. • change management and change control techniques • quality management techniques This should include the ability to: • Integrate requirements for building safety into project planning and management activities • Assess competencies required within engineering or project teams and ensure suitable expertise is procured. • Apply quality management, control or audit procedures in order verify that building safety measures have been discharged • Explain and comply with relevant procedural requirements, submission and process. • Create and maintain appropriate project and control documentation. • Establish quality criteria for engineering work and objectively evaluate outcomes against those criteria.	Examples of effective team working and team management; good practice in assembling and managing project teams; examples of your role in leading on, participating in or coordinating delivery of complex integrated systems or buildings.

D	Effective Communication and inter-personal skills			
	1- Key competence	**2- HRRB scope/ knowledge (all professions/trades)**	**3- HRRB Specific competence – engineering professionals**	**4- Typical evidence to demonstrate engineering competence**
D1	The ability to communicate with residents, the public and with others clearly and effectively, verbally and in writing.	• Requirements / obligations to communicate, consult with and respond to residents or persons otherwise affected by buildings / building work; • Communication through media relevant to role (verbally, written, drawn) • Communication of technical complex information to non-technical audiences • Effective communication within project and client teams.	This should include the ability to: • Explain and comply with duties to communicate with clients, residents and other persons or organisations involved in or affected by projects on HRRBs. • Write reports, letters, e-mails or give presentations in a manner which can be clearly understood by non-technical persons. • Clearly identify and effectively communicate responsibilities and issues relating to HRRB safety within design, engineering or project teams. • Ability to explain complex technical issues to ono-technical audiences • Ability to promote and actively engage in collaborative working across disciplines. • Understand challenges and requirements of other disciplines. • Read and understand technical documents/drawings and convey details to others • Be inclusive, promote and welcome diversity of thought/ideas • Write clear guidance for end users.	Evidence or examples of effective engagement with residents, building users or those affected by building work; reports, presentations and academic submissions; examples of effective client briefing; examples of effectively explaining complex technical considerations clearly to clients or other non-professional or technical audiences.
D2	The ability to identify limits of competence of self and others involved in the design, construction, maintenance or management of HRRBs buildings and undertake mitigating actions to manage risk.	• Principles and value of competency • Competency assessment techniques • Roles and responsibilities in advising on and ensuring competency • Procurement and management of specialist competencies • Managing residual risk.	This should include the ability to: • Identify limits of competence of individuals or organisations involved in the engineering, construction or maintenance of HRRBs buildings • Identify suitable mitigating actions to manage risk. • Explain what competence is and how this relates to building safety • Identify when and how to assess or request evidence of competence from other project team members • Explain and comply with duties to ensure competence relating to the engineering of HRRBs. • Identify the need to seek advice from others with specialist competences and how to procure that advice • Effectively raise concerns about the competence of individuals or organisations if this is of concern • Mitigate any residual risk relating to competence	Competency self-assessment records and learning from that process; examples of quality assurance or management procedures to ensure competency of self / staff / specialists or other organisations; use of competency scoring or assessment techniques; involvement in competency assessment of individuals.

E	Professional Commitment			
	1- Key competence	**2- HRRB scope/ knowledge (all professions/trades)**	**3- HRRB Specific competence – engineering professionals**	**4- Typical evidence to demonstrate engineering competence**
E1	The ability to apply understand ethical considerations in the occupation of HRRBs and apply these in practice	Obligation to consult / tenants voice; Duty of care to residents Considering diversity and inclusion including differential needs e.g. emergency egress Adhering to Codes of Conduct.	This should include the ability to: • apply understanding of specific ethical principles in engineering practice • Act with honesty, accuracy, respect, integrity, responsibility, and within limits of capability in order to build trust • Respect concerns and issues raised by tenants and respond appropriately • Apply duty of care to residents and people living or working in and around buildings • Take account of differential needs of older and disabled people in accessing and ability to escape from high risk buildings • Act in accordance with professional or company Code of Conduct • Act in accordance with Code of Ethics for HRRB.	Evidence or examples of effective engagement with building residents or users; evidence of consideration of specific needs of older or disabled people in the engineering process; evidence of leading discussions on or presenting ethical arguments in practice; examples of instances where you have raised ethical concerns with clients or as part of a design or project team.
E2	Commitment to maintaining professional competence to work on HRRBs and to ensure continuing competency of others	Continuing Professional Development; Undertaking competency self-assessment; managing personal development; assessing and managing development of team members	This should include the ability to: • Assess the limits of own competence in relation to work being undertaken • Identify personal development needs and put in place a suitable personal development plan including CPD relevant to HRRB • Engage with peer review / assessment and feedback process to obtain external perspective on competency and areas for improvement • Identify the limit of competency of co-workers and take action to assess and manage development of team members to support improvement where necessary.	CPD records; self-assessment records, personal development plans; training records; obtaining of new relevant qualifications; courses attended; evidence of leadership within teams or organisations; involvement in developments of new standards or research relevant to role on HRRB; evidence of on the job learning;

Working Group 01 - Engineers

Annex F2 - Competence system diagram


Regulations
Define Roles of
Principal Designer
Principal Contractor
Building Safety Manager
Appoint
Suitably Qualified and Experienced People
Supported by
Guidance
Identifies
Defines SQEP
OCB 'HRRB' Competence Framework
Framework for
Profession 'HRRB' Competence Frameworks
Used for
Assessment by Professional or Certification Body
Professional Registers/ Competent Person Scheme Registers

Regulations

Define Roles of

Principal Designer

Principal Contractor

Building Safety Manager

Appoint

Suitably Qualified and Experienced People

Supported by

Overarching 'body'

Guidance

Identifies

Defines Suitably Qualified and Experienced Persons (SQEP)

OCB 'HRRB' Competence Framework

Framework for

Profession 'HRRB' Competence Frameworks

Used for

Revali dation

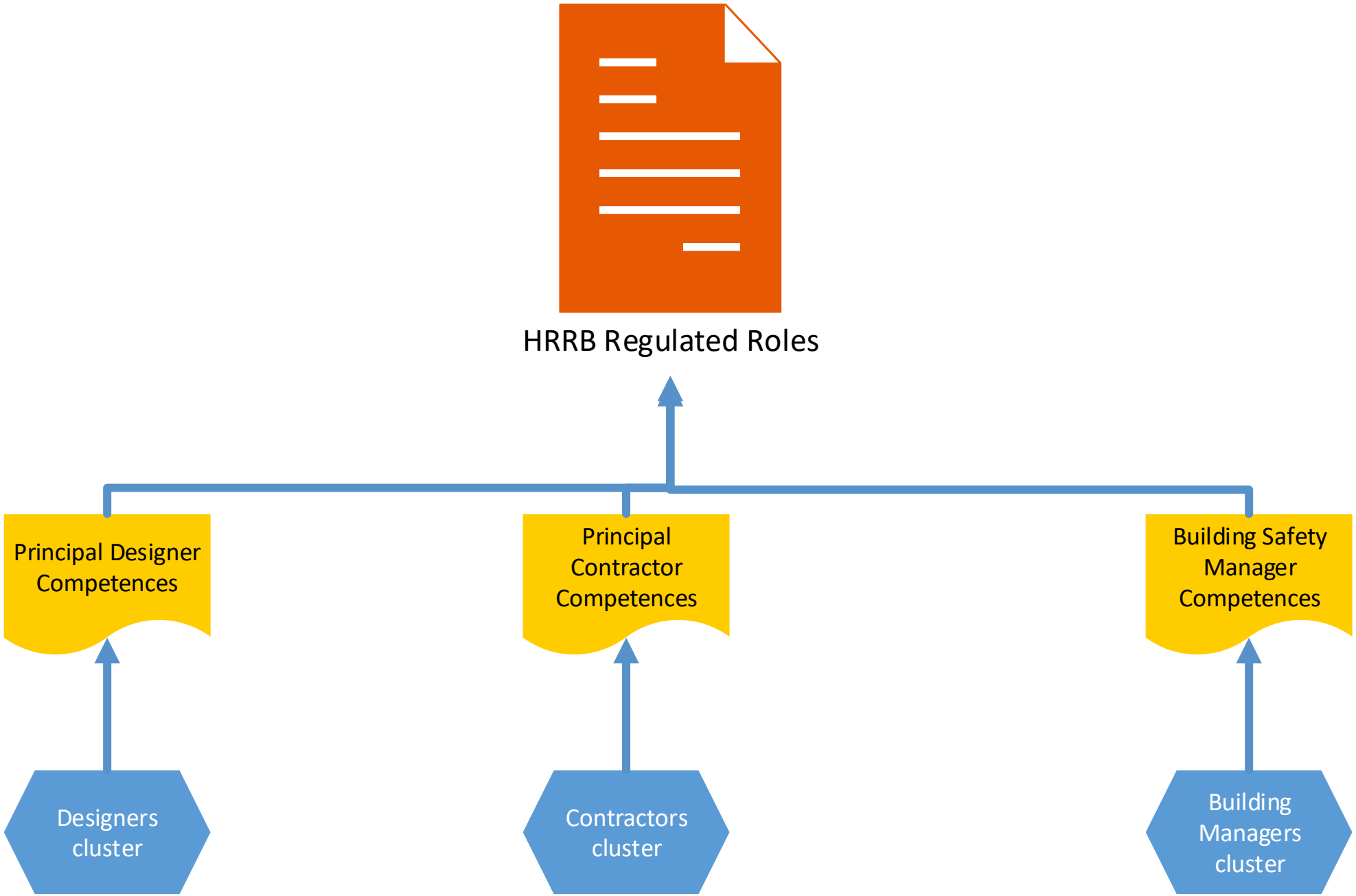
Assessment/ re-validation / investigation / discipline by Professional or Certification Body

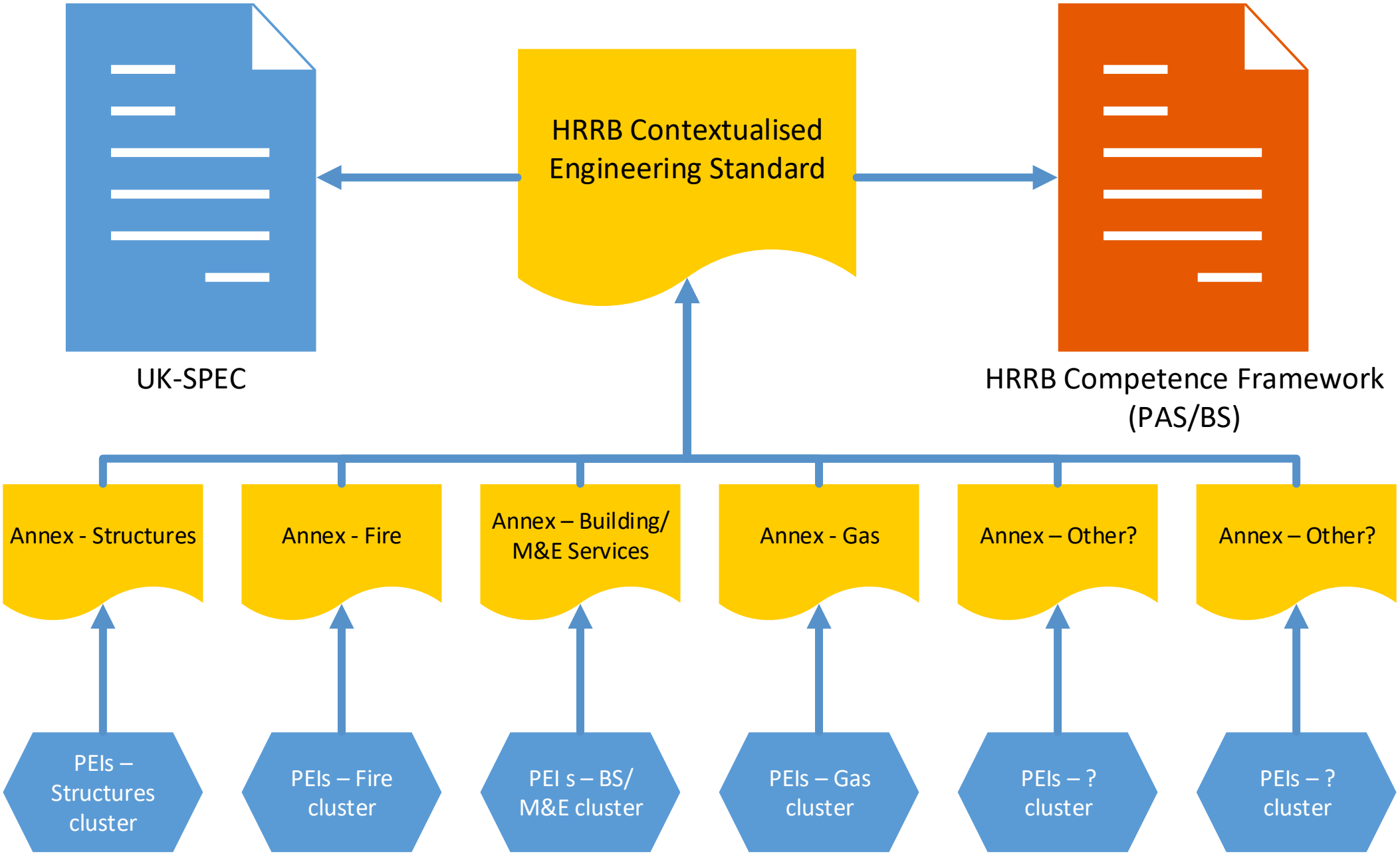
Professional Registers/ Competent Person Scheme Registers

Checks fitness for purpose

'Oversight' bodies

Assures Process


HRRB Regulated Roles
Principal Designer Competences
Principal Contractor Competences
Building Safety Manager Competences
Designers cluster
Contractors cluster
Building Managers cluster


HRRB Contextualised Engineering Standard
UK-SPEC
HRRB Competence Framework (PAS/BS)
Annex - Structures
Annex - Fire
Annex – Building/ M&E Services
Annex - Gas
Annex – Other?
Annex – Other?
PEIs – Structures cluster
PEIs – Fire cluster
PEI s – BS/ M&E cluster
PEIs – Gas cluster
PEIs – ? cluster
PEIs – ? cluster

Title

Phase

Overarching Competence Body	SQEP Standards-setting bodies	Competence Assessment Bodies	QA	Engineering Council	PEIs
HRRB Competences	Profession Competence Profile – Engineering - EngC	Evidence profile / occupational competence	Accreditation of Conformity Assessment Bodies (UKAS)	Sets Engineers HRRB Competence Standard to meet OCB framework	Develop discipline HRRB evidence profiles
Competence Assessment method	Profession Competence Profile – ARB/ RICS etc	Evidence profile / occupational competence	Licensing of Professional Engineering Bodies (EngC)	Attains OCB Approval of Engineers HRRB framework	Assess engineers for HRRB competence
PD Role Profile	Profession Competence Profile – ISO/ BS	Evidence profile / occupational competence	Licensing of Professional Bodies (?)	Extends licensing / licenses to include contextualised HRRB standard	Re-validate engineers HRRB competence
BSM Role Profile	Profession Competence Profile – Conformance Assessment Body	Evidence profile / occupational competence		Sets up HRRB Register/ Section of EngC Register	
Revalidation frequency		Evidence profile / occupational competence			
Revalidation requirements					

Working Group 01 - Engineers

Annex G - UK-SPEC

knowledge.experience.commitment

EngTech, IEng and CEng

UK-SPEC

UK STANDARD FOR PROFESSIONAL ENGINEERING COMPETENCE

Engineering Technician, Incorporated Engineer and Chartered Engineer Standard

Third edition

www.engc.org.uk

Engineering Council

CONTENTS

Operating under a Royal Charter, the Engineering Council is charged with regulating the engineering profession in the United Kingdom, setting the standard for the practice of engineering, and maintaining the registers of professional engineers and technicians. The Engineering Council is governed by a Board representing the professional engineering institutions in the UK, together with individuals drawn from industries and sectors with an interest in regulation of the engineering profession. This internationally recognised UK Standard is published by the Engineering Council on behalf of the UK engineering profession. First published in 2003, it was developed in collaboration with the profession and is kept under review. It was most recently reviewed in 2013.

FOREWORD

Engineering is all around us, satisfying everything from our basic needs to our more complex dreams and ambitions. The engineers and technicians who make this possible enjoy contributing to teams through technical endeavour to sustain and improve lives. They possess an incredible range of creative talent that is underpinned by their enquiring minds and balanced by their intellect and judgement.

Society rightly places great faith in the engineering profession, trusting engineers and technicians to regulate themselves on its behalf. This trust can only be delivered through significant individual commitment that is publicly demonstrated by the attainment of the professional competence and behaviours that are described in this Standard.

The men and women who aspire to be recognised as professional engineers and technicians require independent assessment of their competence and commitment, and the UK Standard for Professional Engineering Competence (UK-SPEC) provides the means to achieve this.

UK- SPEC has been developed collaboratively by members representing the breadth of the profession, from industry and academia, and from the many different disciplines and specialisms that make up the 'Universe of Engineering'.

THE PURPOSE OF UK-SPEC

Professional registration with the Engineering Council is based on demonstration of competence and commitment. The UK Standard for Professional Engineering Competence (UK-SPEC) describes the competence and commitment requirements that have to be met for registration as an Engineering Technician (EngTech), Incorporated Engineer (IEng) or Chartered Engineer (CEng). It includes examples of activities that could demonstrate achievement of the requirements, to enable individuals and employers to find out whether they or their staff can meet the registration requirements. Qualifications that exemplify the required knowledge and understanding are listed, however it should be noted that there are other ways of demonstrating achievement.

This document also explains the steps necessary to achieve professional registration; the requirement to maintain and enhance competence once registered; and the obligations to act with integrity and in the public interest that are placed on registrants through their membership of a licensed professional engineering institution.

A glossary of terms is included on page 36 and a matrix comprising requirements for all three titles is provided as an Annex.

Career development and progression

Registration in any category demonstrates valued recognition of an individual's engineering competence and commitment. However, experiential or other learning and professional development may also enable individuals to progress, from EngTech to IEng and from IEng to CEng, as their career develops. Evidence of competence and commitment is the key requirement for registration, and normally there will be a need for additional education and training before an individual can be registered for a different title.

Why register?

Professional registration underpins the systems and processes that ensure the current and future safeguarding of society. It provides employers, government and society, in the UK and overseas, with the confidence that professionally registered engineers and technicians possess and maintain the knowledge, skills and commitment required to meet the engineering and technological needs of today, whilst also catering for the needs of future generations.

Registration sets individual professionals apart from engineers and technicians who are not registered. It establishes their proven knowledge, understanding and competence. In particular, registration demonstrates a commitment to professional standards, and to developing and enhancing competence.

Employers of registered engineering professionals have the assurance of knowing that their employees have had their competence independently assessed, their credentials verified, and their commitment to Continuing Professional Development (CPD) established. They will have gained the recognition of their peers as meeting UK standards for knowledge and experience, which are internationally recognised. Maintaining registration requires continued membership of a professional engineering institution, which ensures that registrants are exposed to new developments in their profession, and provides opportunities to benefit from these. It also means that they are governed by a professional code of conduct, and receive assistance in determining their obligations under this code.

In some cases, evidence of employing registered engineering professionals will be necessary for the award of contracts, both in the UK and internationally.

Some employers use the framework offered by UK-SPEC as a basis for their own organisational needs, and rely on achievement of registration to demonstrate readiness for promotion.

Further benefits for individuals can be found at: **www.engc.org.uk/benefits** and for employers at: **www.engc.org.uk/informationfor/employers**

International context

Many Engineering Council registrants are nationals of, or working in, countries outside the UK. The standing of Engineering Technicians, Incorporated Engineers and Chartered Engineers as defined by UK-SPEC is widely recognised around the world. In some cases professional registration is required for particular work. Professional registration can therefore be helpful when applying for jobs and tendering for work abroad.

As well as reflecting the requirements of global engineering in UK-SPEC, the Engineering Council is active within a number of multilateral mutual recognition agreements with national engineering bodies in other countries. In particular, the organisation was a founder member of the Washington Accord, which since 1989 has extended well beyond the original six English-speaking countries. The Engineering Council has subsequently worked with international partners to develop the Sydney and Dublin Accords, the International Engineering Technologists Agreement and the International Professional Engineers Agreement. Together with the APEC Engineers Agreement, governance of these now sits within the International Engineering Alliance. In addition, the Engineering Council has worked within the European Federation of National Engineering Associations (FEANI) to strengthen the voice of engineers at the European level.

The Engineering Council continues to be committed to helping engineers and technicians whose registration was in the UK, to contribute to engineering in other countries, as well as to admitting to its register those who have developed their professional engineering competence in other countries and can demonstrate that they meet the UK Standard.

How to register

Professional registration is open to all engineers and technicians who can demonstrate competence and commitment to perform professional work to the necessary standard.

Anyone wishing to be registered must apply through one of the professional engineering institutions licensed by the Engineering Council. Institutions can provide advice about the process and typical timescales for the review. A list of institutions can be found at: **www.engc.org.uk/peis**

The assessment process is known as a professional review. The process starts with an application made in accordance with the requirements of the chosen institution. A detailed description of the format for this will be provided by the institution, but any claim of qualifications, experience or training will need formal documented evidence. When submitting details, applicants will need to show how this relates to the required competences and commitment.

To assist potential registrants, their advisers and professional review assessors in deciding the most appropriate category of registration, a matrix comparing requirements for all three titles is provided as Annex A.

Members of a Professional Affiliate (see glossary) that has an agreement with a licensed institution to process its members for registration may apply through the institution. For a current list of Professional Affiliates please see: **www.engc.org.uk/pas**

What is competence?

Competence is the ability to carry out a task to an effective standard. To achieve competence requires the right level of knowledge, understanding and skill, and a professional attitude. Competence is developed by a combination of formal and informal learning, and training and experience, generally known as initial professional development. However, these elements are not necessarily separate or sequential and they may not always be formally structured.

Pages 10 – 31 of this document set out the threshold generic competence and commitment standards for registration as an Engineering Technician, Incorporated Engineer or Chartered Engineer, and include some examples of the kind of evidence that would help to demonstrate these. The list of examples is not intended to be exhaustive. There may be other examples and local equivalents.

There are five generic areas of competence and commitment for all registrants, broadly covering:

A Knowledge and understanding

B Design and development of processes, systems, services and products

C Responsibility, management or leadership

D Communication and inter-personal skills

E Professional commitment

For each category of registration, the formal education qualification to demonstrate the necessary knowledge and understanding that underpins competence is also given. Applicants without exemplifying qualifications may demonstrate the required knowledge and understanding in other ways, and increasingly, workplace learning is contributing to this.

What is commitment?

Registered engineers and technicians demonstrate a personal and professional commitment to society, their profession and the environment. They are required to show that they have adopted a set of values and behaviours that will maintain and enhance the reputation of the profession. Specific evidence is required in the areas of:

- Complying with codes of conduct
- Managing and applying safe systems of work
- Undertaking engineering activities in a way that contributes to sustainable development
- Carrying out CPD necessary to maintain and enhance competence
- Actively participating within the profession.

This revision of UK-SPEC includes a requirement to exercise responsibilities in an ethical manner (see standard E5). The Statement of Ethical Principles developed by the Engineering Council and the Royal Academy of Engineering (**www.engc.org.uk/professional-ethics**) sets a standard to which members of the profession should aspire in their working habits and relationships. The values on which it is based should apply in every situation in which engineers and technicians exercise their judgement.

Further information on the required standards is available from a variety of sources. Each institution will have its own Code of Conduct, in line with the generic framework on page 33 of this document, and supporting guidance.

The Engineering Council has published a CPD Code for Registrants, (see page 9), as well as guidance on risk and sustainability (see page 34).

Assessment of competence and commitment

To become professionally registered, applicants must have their competence and commitment assessed through a process known as professional review. This is a peer review process, by registrants who are competent and trained to undertake this kind of assessment. Applicants are assessed against the standards listed in this document, which may be adapted by the institution to relate specifically to the particular technologies or industries with which it is concerned.

There is no prescribed time period for the development of competence and commitment – it depends on many factors such as prior qualifications or experience, job role and personal circumstances. Following a review of the documented evidence, the institution will decide whether the applicant is ready. For would-be Incorporated Engineers and Chartered Engineers, a formal interview with the assessors is always a part of the process. For those seeking to become registered Engineering Technicians, the assessment may be on the basis of documentary evidence. For all three titles, the institution will be able to advise how best to present evidence of training and experience. Where shortfalls in evidence emerge, institutions will usually be able to suggest ways in which they can be addressed. This may involve further training or additional experience.

On completion of the professional review, a decision will be made by the relevant committee of the institution. A positive decision will result in registration of the candidate as an Engineering Technician, Incorporated Engineer or Chartered Engineer. Retention of the title requires continued membership of the admitting institution or another licensed for that title, or a Professional Affiliate which has a registration agreement with an institution licensed for that title, and payment of an annual fee.

Maintaining and enhancing competence

Candidates applying for professional registration must be committed to maintaining and enhancing their competence. They will be required to show evidence that they have taken steps to ensure this, and that they intend to continue to do this in line with the CPD Code for Registrants. This is an important part of recognition as a registered engineer or technician, and it is important that anyone seeking registration recognises that this will entail obligations and an ongoing commitment.

CPD Code for Registrants

Engineering Technicians, Incorporated Engineers and Chartered Engineers should take all necessary steps to maintain and enhance their competence through Continuing Professional Development (CPD). In particular they should:

1 Take ownership of their learning and development needs, and develop a plan to indicate how they might meet these, in discussion with their employer, as appropriate.

2 Undertake a variety of development activities, both in accordance with this plan and in response to other opportunities which may arise.

3 Record their CPD activities.

4 Reflect upon what they have learned or achieved through their CPD activities and record these reflections.

5 Evaluate their CPD activities against any objectives which they have set and record this evaluation.

6 Review their learning and development plan regularly following reflection and assessment of future needs.

7 Support the learning and development of others through activities such as mentoring, and sharing professional expertise and knowledge.

Further information on CPD can be found on page 34.

THE ENGINEERING TECHNICIAN STANDARD

Engineering Technicians apply proven techniques and procedures to the solution of practical engineering problems.

Engineering Technicians are required to apply safe systems of work and are able to demonstrate:

- Evidence of their contribution to either the design, development, manufacture, commissioning, decommissioning, operation or maintenance of products, equipment, processes or services
- Supervisory or technical responsibility
- Effective interpersonal skills in communicating technical matters
- Commitment to professional engineering values.

The Competence and Commitment Standard for Engineering Technicians.	The examples given below are intended to help you identify activities you might quote to demonstrate the required competence and commitment for EngTech registration. These are not exhaustive. Moreover, you are not required to give multiple examples to demonstrate competence and commitment.
Engineering Technicians must be competent throughout their working life, by virtue of their education, training and experience, to:	Tell us about your career, education and training. Explain how the experience you have gained has made you more competent.
A Use engineering knowledge and understanding to apply technical and practical skills. This includes the ability to:	**The reviewers will be looking for evidence that you have the know-how to do the job, and were able to go beyond the immediate requirements and use your initiative and experience to solve a problem or improve a process.**
A1 Review and select appropriate techniques, procedures and methods to undertake tasks.	Describe: • an example of work you did that went well, the choices you made and the outcome • or something in your work that you were involved in which didn't quite work and explain why • or a technique, procedure or method you improved upon and explain why.

A2	Use appropriate scientific, technical or engineering principles.	Drawing from your direct experience, this might be an explanation of how a piece of equipment, system or mechanism works.
B	**Contribute to the design, development, manufacture, construction, commissioning, operation or maintenance of products, equipment, processes, systems or services.** In this context, this includes the ability to:	**Explain how you contribute to one or more of these activities.**
B1	Identify problems and apply appropriate methods to identify causes and achieve satisfactory solutions.	Show an example of how you have used measurement, monitoring and assessment to: • identify the source of a problem • or to identify an opportunity • or to propose a solution.
B2	Identify, organise and use resources effectively to complete tasks, with consideration for cost, quality, safety, security and environmental impact.	Illustrate how you make decisions about: • what information, material, component, people or plant to use • or how to introduce a new method of working • or what precautions you took. Describe how you have contributed to best practice methods of continuous improvement, eg ISO 9000.
C	**Accept and exercise personal responsibility.** This includes the ability to:	**Describe an experience or instance where you have had to accept personal responsibility for seeing a process through to completion within agreed targets.**
C1	Work reliably and effectively without close supervision, to the appropriate codes of practice.	Your evidence should show how you identified and agreed what had to be done and to what standards on a typical project.
C2	Accept responsibility for work of self or others.	Your evidence could include: minutes of meetings; site notes and instructions; Variation Orders; programmes of work; specifications, drawing and reports; or appraisals. Activity not associated with your job can contribute evidence.
C3	Accept, allocate and supervise technical and other tasks.	

D	**Use effective communication and interpersonal skills.** This includes the ability to:	**You will need to show you can: contribute to discussions; make a presentation; read and synthesise information; or write different types of documents.**
D1	Use oral, written and electronic methods for the communication in English[1] of technical and other information.	Your evidence could include: letters; reports; drawings; emails; minutes, including of progress meetings; appraisals; work instructions; and other task planning and organising documents. Your application itself will be relevant.
D2	Work effectively with colleagues, clients, suppliers or the public, and be aware of the needs and concerns of others, especially where related to diversity and equality.	Show examples of how this has occurred, and your role at the time. Describe your role as part of a team. Describe a situation where you put your awareness into practice.
E	**Make a personal commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment.**	**Your commitment will be to become part of the profession and uphold the standards to which all members subscribe. You need to show that you have read and understood your institution's Code of Conduct.**
E1	Comply with the Code of Conduct of your institution.	The professional review involves demonstration of, or discussion of, your position on typical ethical challenges.
E2	Manage and apply safe systems of work.	Provide evidence of applying current safety requirements, such as risk assessment and other examples of good practice you adopt in your work. You will need to show that you have received a formal safety instruction relating to your workplace (such as a CSCS safety test in the UK), or an update on statutory regulations. In the UK an example would be COSHH requirements.
E3	Undertake engineering work in a way that contributes to sustainable development. This could include an ability to: • Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously.	Show examples of methodical assessment of risk in specific projects; actions taken to minimise risk to society or the environment.

1 Any interviews will be conducted in English, subject only to the provisions of the Welsh Language Act 1993 and any Regulations which may be made in implementation of European Union directives on free movement of labour.

E4 Carry out and record CPD necessary to maintain and enhance competence in own area of practice including: • Undertake reviews of own development needs • Plan how to meet personal and organisational objectives • Carry out planned (and unplanned) CPD activities • Maintain evidence of competence development • Evaluate CPD outcomes against any plans made • Assist others with their own CPD.	This means demonstrating that you have actively sought to keep yourself up to date, perhaps by studying new standards or techniques, or made use of magazines, lectures organised by professional engineering institutions, and other opportunities to network in order to keep abreast of change.
E5 Exercise responsibilities in an ethical manner.	Give an example of where you have applied ethical principles as described in the Statement of Ethical Principles on page 33. Give an example of where you have applied/upheld ethical principles as defined by your organisation or company, which may be in its company or brand values.

Education

Knowledge and understanding are important components of professional competence. The following qualifications exemplify the required knowledge and understanding for Engineering Technicians:

- An Advanced/Modern Apprenticeship or other work-based learning programme approved by a licensed professional engineering institution

- or a qualification, approved by a licensed professional engineering institution, in engineering or construction set at level 3 (or above) in the Qualifications and Credit Framework/National Qualifications Framework† for England and Northern Ireland; or at level 6 (or above) in the Scottish Credit and Qualifications Framework; or at level 3 (or above) in the Credit and Qualifications Framework for Wales

- or equivalent qualifications approved by a licensed professional engineering institution.

Many qualifications may be acceptable as evidence that part or all of the necessary competence has been acquired. Please check the Engineering Council's searchable database of approved qualifications and programmes for information about current approved status: **www.engc.org.uk/techdb**

Many potential Engineering Technicians have not had the advantage of formal training, but are able to demonstrate that they have acquired the necessary competence through substantial working experience. Thus individuals without the types of qualifications described above may apply for an Individual Route assessment. This process, administered by the applicant's institution, includes assessment of prior learning and of current performance. Evidence of employer recognition of competences and relevant skills may be helpful.

Applicants should consult their institution for advice on the most appropriate option.

† See document of amendments at **http://www.engc.org.uk/engcdocuments/internet/Website/2017_Standards_Amendments.pdf** for updates.

Professional development

This is the other key part of developing competence. It is how potential Engineering Technicians learn to apply their knowledge and understanding and begin to apply professional judgement. It can happen at the same time as some of the formal education or training referred to above, for example through an apprenticeship scheme.

Many organisations run well-established apprenticeship or employer training and development schemes. While these schemes are of course geared to the specific needs of their organisations, they are frequently designed to help individuals on the way to registration, and may have been approved by one or more of the professional engineering institutions.

Potential Engineering Technicians in organisations without schemes of this type will need to develop profiles of competence and professional activity to help them prepare for registration. In some cases employers will use occupational standards or competence frameworks in determining job descriptions and staff development, and these may assist in developing a competence profile. Otherwise, aspiring registrants should use the competence and commitment statements and seek advice and guidance from the relevant institution, which may be able to put them in touch with a mentor to assist them through the process and help them address any gaps in their development.

Those seeking Engineering Technician registration should maintain a detailed record of their professional development, responsibilities and experience, verified by supervisors or mentors, to provide best evidence for the professional review (see page 8).

EngTech

THE INCORPORATED ENGINEER STANDARD

Incorporated Engineers maintain and manage applications of current and developing technology, and may undertake engineering design, development, manufacture, construction and operation.

Incorporated Engineers are able to demonstrate:

- The theoretical knowledge to solve problems in developed technologies using well proven analytical techniques
- Successful application of their knowledge to deliver engineering projects or services using established technologies and methods
- Responsibility for project and financial planning and management together with some responsibility for leading and developing other professional staff
- Effective interpersonal skills in communicating technical matters
- Commitment to professional engineering values.

The Competence and Commitment Standard for Incorporated Engineers.	The examples given below are intended to help you identify activities you might quote to demonstrate the required competence and commitment for IEng registration. These are not exhaustive. Moreover, you are not required to give multiple examples to demonstrate competence and commitment.
Incorporated Engineers must be competent throughout their working life, by virtue of their education, training and experience, to:	
A Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.	
A1 Maintain and extend a sound theoretical approach to the application of technology in engineering practice. This could include an ability to: • Identify the limits of own personal knowledge and skills • Strive to extend own technological capability • Broaden and deepen own knowledge base through new applications and techniques.	Engage in formal learning. Learn new engineering theories and techniques in the workplace, at seminars, etc. Broaden your knowledge of engineering codes, standards and specifications.

A2	Use a sound evidence-based approach to problem-solving and contribute to continuous improvement. This could include an ability to: • Use market intelligence and knowledge of technological developments to promote and improve the effectiveness of engineering products, systems and services • Contribute to the evaluation and development of continuous improvement systems • Apply knowledge and experience to investigate and solve problems arising during engineering tasks and implement corrective action.	Manage/contribute to market research, and product and process research and development. Involvement with cross-disciplinary working. Conduct statistically sound appraisal of data. Use evidence from best practice to improve effectiveness. Apply root cause analysis.
B	**Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and re-cycle engineering processes, systems, services and products.**	
B1	Identify, review and select techniques, procedures and methods to undertake engineering tasks. This could include an ability to: • Establish users' requirements for improvement • Select a review methodology • Fully exploit and implement current technology • Review the potential for enhancing engineering practices, products, processes, systems and services, using evidence from best practice • Establish an action plan to implement the results of the review.	Contribute to the marketing of and tendering for new engineering products, processes and systems. Contribute to the specification and procurement of new engineering products, processes and systems. Develop decommissioning processes. Set targets, and draft programmes and action plans. Schedule activities.

B2	Contribute to the design and development of engineering solutions. This could include an ability to: • Contribute to the identification and specification of design and development requirements for engineering products, processes, systems and services • Identify operational risks and evaluate possible engineering solutions, taking account of cost, quality, safety, reliability, appearance, fitness for purpose, security, intellectual property (IP) constraints and opportunities, and environmental impact • Collect and analyse results • Carry out necessary tests.	Contribute to theoretical and applied research. Manage/ contribute to value engineering and whole life costing. Work in design teams. Draft specifications. Find and evaluate information from a variety of sources, including online. Develop and test options. Identify resources and costs of options. Produce detailed designs. Be aware of IP constraints and opportunities.
B3	Implement design solutions and contribute to their evaluation. This could include an ability to: • Secure the resources required for implementation • Implement design solutions, taking account of critical constraints, including due concern for safety and sustainability • Identify problems during implementation and take corrective action • Contribute to recommendations for improvement and actively learn from feedback on results.	Follow the design process through into product manufacture. Operate and maintain processes, systems etc. Contribute to reports on the evaluation of the effectiveness of the designs, including risk, safety and life cycle considerations. Contribute to product improvement. Interpret and analyse performance. Contribute to determining critical success factors.
C	**Provide technical and commercial management.**	
C1	Plan for effective project implementation. This could include an ability to: • Identify factors affecting the project implementation • Carry out holistic and systematic risk identification, assessment and management • Prepare and agree implementation plans and method statements • Secure the necessary resources and confirm roles in project team • Apply the necessary contractual arrangements with other stakeholders (client, subcontractors, suppliers, etc).	Manage/contribute to project planning activities. Produce and implement procurement plans. Contribute to project risk assessments. Collaborate with key stakeholders. Plan programmes and delivery of tasks. Identify resources and costs. Prepare and agree contracts/work orders.

C2	Manage tasks, people and resources to plan and budget. This could include an ability to: • Operate appropriate management systems • Work to the agreed quality standards, programme and budget, within legal and statutory requirements • Manage work teams, coordinating project activities • Identify variations from quality standards, programme and budgets, and take corrective action • Evaluate performance and recommend improvements.	Manage/contribute to project operations. Manage the balance between quality, cost and time. Manage contingency processes. Contribute to the management of project funding, payments and recovery. Satisfy legal and statutory obligations. Manage tasks within identified financial, commercial and regulatory constraints.
C3	Manage teams and develop staff to meet changing technical and managerial needs. This could include an ability to: • Agree objectives and work plans with teams and individuals • Identify team and individual needs, and plan for their development • Reinforce team commitment to professional standards • Manage and support team and individual development • Assess team and individual performance, and provide feedback.	Carry out/contribute to staff appraisals. Plan/contribute to the training and development of staff. Gather evidence from colleagues of the management, assessment and feedback that you have provided. Carry out/contribute to disciplinary procedures.
C4	Manage continuous quality improvement. This could include an ability to: • Ensure the application of quality management principles by team members and colleagues • Manage operations to maintain quality standards • Evaluate projects and make recommendations for improvement.	Promote quality. Manage/contribute to best practice methods of continuous improvement, eg ISO 9000, EFQM, balanced scorecard. Carry out/contribute to quality audits. Monitor, maintain and improve delivery. Identify, implement and evaluate changes to meet quality objectives.
D	**Demonstrate effective interpersonal skills.**	
D1	Communicate in English[2] with others at all levels. This could include an ability to: • Contribute to, chair and record meetings and discussions • Prepare communications, documents and reports on technical matters • Exchange information and provide advice to technical and non-technical colleagues.	Reports, letters, emails, drawings, specifications and working papers (eg meeting minutes, planning documents, correspondence) in a variety of formats. Engaging or interacting with professional networks.

2 Any interviews will be conducted in English, subject only to the provisions of the Welsh Language Act 1993 and any Regulations which may be made in implementation of European Union directives on free movement of labour.

D2 Present and discuss proposals. This could include an ability to: • Prepare and deliver appropriate presentations • Manage debates with audiences • Feed the results back to improve the proposals • Contribute to the awareness of risk.	Presentations, records of discussions and their outcomes.
D3 Demonstrate personal and social skills. This could include an ability to: • Know and manage own emotions, strengths and weaknesses • Be aware of the needs and concerns of others, especially where related to diversity and equality • Be confident and flexible in dealing with new and changing interpersonal situations • Identify, agree and work towards collective goals • Create, maintain and enhance productive working relationships, and resolve conflicts.	Records of meetings. Evidence from colleagues of your personal and social skills. Contribute to productive working relationships. Apply diversity and anti-discrimination legislation.
E Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.	
E1 Comply with relevant codes of conduct. This includes an ability to: • Comply with the rules of professional conduct of own institution • Manage work within all relevant legislation and regulatory frameworks, including social and employment legislation.	Contribute to the affairs of your institution. Work with a variety of conditions of contract.
E2 Manage and apply safe systems of work. This could include an ability to: • Identify and take responsibility for own obligations for health, safety and welfare issues • Manage systems that satisfy health, safety and welfare requirements • Develop and implement appropriate hazard identification and risk management systems and culture • Manage, evaluate and improve these systems • Apply a sound knowledge of health and safety legislation.	Undertake formal health and safety training. Work with health and safety legislation and best practice. In the UK, examples include HASAW 1974, CDM regulations, OHSAS 18001:2007 and company safety policies. Carry out safety audits. Identify and minimise hazards. Assess and control risks. Deliver health and safety briefings and inductions.

E3 Undertake engineering activities in a way that contributes to sustainable development. This could include an ability to: • Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously • Provide products and services which maintain and enhance the quality of the environment and community, and meet financial objectives • Understand and encourage stakeholder involvement in sustainable development • Use resources efficiently and effectively.	Carry out/contribute to environmental impact assessments. Carry out/contribute to environmental risk assessments. Manage best practice environmental management systems, eg ISO 14000. Manage best practice risk management systems eg ISO 31000. Work within environmental legislation. Adopt sustainable practices. Contribute to social, economic and environmental outcomes.
E4 Carry out and record CPD necessary to maintain and enhance competence in own area of practice including: • Undertake reviews of own development needs • Plan how to meet personal and organisational objectives • Carry out planned (and unplanned) CPD activities • Maintain evidence of competence development • Evaluate CPD outcomes against any plans made • Assist others with their own CPD.	Keep up to date with national and international engineering issues. Maintain CPD plans and records. Involvement with the affairs of your institution. Evidence of your development through on-the-job learning, private study, in-house courses, external courses and conferences.
E5 Exercise responsibilities in an ethical manner.	Give an example of where you have applied ethical principles as described in the Statement of Ethical Principles on page 33. Give an example of where you have applied/upheld ethical principles as defined by your organisation or company, which may be in its company or brand values.

Education

Knowledge and understanding are important components of professional competence. Formal education is the usual, though not the only, way of demonstrating the necessary knowledge and understanding, and the following qualifications exemplify the required knowledge and understanding for Incorporated Engineers:

- An accredited Bachelors or honours degree in engineering or technology
- or a Higher National Diploma or a Foundation Degree in engineering or technology, plus appropriate further learning to degree level*
- or an NVQ4 or SVQ4 which has been approved for the purpose by a licensed professional engineering institution, plus appropriate further learning to degree level*.

*See **www.qaa.ac.uk** for qualification levels and HE reference points.

The Engineering Council website provides searchable databases of accredited programmes. Please check the Engineering Council website:
www.engc.org.uk/courses

Applicants who do not have exemplifying qualifications may demonstrate the required knowledge and understanding in other ways, but must clearly demonstrate they have achieved the same level of knowledge and understanding as those with exemplifying qualifications.

Ways to demonstrate this include:

- Taking further qualifications, in whole or in part, as specified by the institution to which they are applying
- Completing appropriate work-based or experiential learning
- Writing a technical report, based on their experience, and demonstrating their knowledge and understanding of engineering principles
- Until 2011, taking Engineering Council examinations.

Applicants should consult their institution for advice on the most appropriate option.

Professional development

This is the other key part of developing competence. It is how potential Incorporated Engineers learn to apply their knowledge and understanding and begin to apply professional judgement. It can happen at the same time as some of the formal education referred to above, for example through an industrial placement during a higher education course, through a Higher Apprenticeship scheme or alongside part-time study.

Many larger employers run well-established apprenticeship or graduate training and development schemes. While these schemes are of course geared to the specific needs of their organisations, they are frequently designed to help apprentices and graduates on the way to registration, and may have been approved or accredited by one or more of the professional engineering institutions.

Potential Incorporated Engineers in organisations without schemes of this type will need to develop profiles of competence and professional activity to help them prepare for registration. In some cases employers will use occupational standards or competence frameworks in determining job descriptions and staff development, and these may assist in developing a competence profile. Otherwise aspiring registrants should use the competence and commitment statements and seek advice and guidance from the relevant institution, which may be able to put them in touch with a mentor to assist them through the process and help them address any gaps in their development.

Those seeking Incorporated Engineer registration should maintain a detailed record of their professional development, responsibilities and experience, verified by supervisors or mentors, to provide best evidence for the professional review (see page 8).

THE CHARTERED ENGINEER STANDARD

Chartered Engineers develop solutions to engineering problems using new or existing technologies, through innovation, creativity and change and/or they may have technical accountability for complex systems with significant levels of risk.

Chartered Engineers are able to demonstrate:

- The theoretical knowledge to solve problems in new technologies and develop new analytical techniques
- Successful application of the knowledge to deliver innovative products and services and/or take technical responsibility for complex engineering systems
- Accountability for project, finance and personnel management and managing trade-offs between technical and socio-economic factors
- Skill sets necessary to develop other technical staff
- Effective interpersonal skills in communicating technical matters.

The Competence and Commitment Standard for Chartered Engineers.	The examples given below are intended to help you identify activities you might quote to demonstrate the required competence and commitment for CEng registration. These are not exhaustive. Moreover, you are not required to give multiple examples to demonstrate competence and commitment.
Chartered Engineers **must be competent throughout their working life, by virtue of their education, training and experience, to:**	
A Use a combination of general and specialist engineering knowledge and understanding to optimise the application of existing and emerging technology.	
A1 Maintain and extend a sound theoretical approach in enabling the introduction and exploitation of new and advancing technology. This could include an ability to: • Identify the limits of own personal knowledge and skills • Strive to extend own technological capability • Broaden and deepen own knowledge base through research and experimentation.	Engage in formal post-graduate academic study. Learn and develop new engineering theories and techniques in the workplace. Broaden your knowledge of engineering codes, standards and specifications.

A2	Engage in the creative and innovative development of engineering technology and continuous improvement systems. This could include an ability to: • Assess market needs and contribute to marketing strategies • Identify constraints and exploit opportunities for the development and transfer of technology within own chosen field • Promote new applications when appropriate • Secure the necessary intellectual property (IP) rights • Develop and evaluate continuous improvement systems.	Lead/manage market research, and product and process research and development. Cross-disciplinary working involving complex projects. Conduct statistically sound appraisal of data. Use evidence from best practice to improve effectiveness.
B	**Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems.**	
B1	Identify potential projects and opportunities. This could include an ability to: • Establish and help develop solutions to meet users' requirements • Consider and implement new and emerging technologies • Enhance engineering practices, products, processes, systems and services • Use own knowledge of the employer's position to assess the viability of opportunities.	Involvement in the marketing of and tendering for new engineering products, processes and systems. Involvement in the specification and procurement of new engineering products, processes and systems. Set targets, and draft programmes and action plans. Schedule activities.
B2	Conduct appropriate research, and undertake design and development of engineering solutions. This could include an ability to: • Identify and agree appropriate research methodologies • Allocate and manage resources • Develop the necessary tests • Collect, analyse and evaluate the relevant data • Undertake engineering design • Prepare, present and agree design recommendations, with appropriate analysis of risk, and taking account of cost, quality, safety, reliability, appearance, fitness for purpose, security, intellectual property (IP) constraints and opportunities, and environmental impact.	Carry out formal theoretical research. Evaluate numerical and analytical tools. Carry out applied research on the job. Lead/manage value engineering and whole life costing. Lead design teams. Draft specifications. Develop and test options. Identify resources and costs of options. Produce concept designs, and develop these into detailed designs. Be aware of IP constraints and opportunities.

B3	Manage implementation of design solutions, and evaluate their effectiveness. This could include an ability to: • Ensure that the application of the design results in the appropriate practical outcome • Implement design solutions, taking account of critical constraints, including due concern for safety and sustainability • Determine the criteria for evaluating the design solutions • Evaluate the outcome against the original specification • Actively learn from feedback on results to improve future design solutions and build best practice.	Follow the design process through into product or service realisation and its evaluation. Prepare and present reports on the evaluation of the effectiveness of the designs, including risk, safety and life cycle considerations. Manage product improvement. Interpret and analyse performance. Determine critical success factors.
C	**Provide technical and commercial leadership.**	
C1	Plan for effective project implementation. This could include an ability to: • Systematically review the factors affecting the project implementation including safety and sustainability considerations • Define a holistic and systematic approach to risk identification, assessment and management • Lead on preparing and agreeing implementation plans and method statements • Ensure that the necessary resources are secured and brief the project team • Negotiate the necessary contractual arrangements with other stakeholders (client, subcontractors, suppliers, etc).	Lead/manage project planning activities. Produce and implement procurement plans. Carry out project risk assessments. Collaborate with key stakeholders, and negotiate agreement to the plans. Plan programmes and delivery of tasks. Identify resources and costs. Negotiate and agree contracts/work orders.
C2	Plan, budget, organise, direct and control tasks, people and resources. This could include an ability to: • Set up appropriate management systems • Define quality standards, programme and budget within legal and statutory requirements • Organise and lead work teams, coordinating project activities • Ensure that variations from quality standards, programme and budgets are identified, and that corrective action is taken • Gather and evaluate feedback, and recommend improvements.	Take responsibility for and control project operations. Manage the balance between quality, cost and time. Manage risk register and contingency systems. Manage project funding, payments and recovery. Satisfy legal and statutory obligations. Lead/manage tasks within identified financial, commercial and regulatory constraints.

C3	Lead teams and develop staff to meet changing technical and managerial needs. This could include an ability to: • Agree objectives and work plans with teams and individuals • Identify team and individual needs, and plan for their development • Reinforce team commitment to professional standards • Lead and support team and individual development • Assess team and individual performance, and provide feedback.	Carry out/contribute to staff appraisals. Plan/contribute to the training and development of staff. Gather evidence from colleagues of the management, assessment and feedback that you have provided. Carry out/contribute to disciplinary procedures.
C4	Bring about continuous improvement through quality management. This could include an ability to: • Promote quality throughout the organisation and its customer and supplier networks • Develop and maintain operations to meet quality standards • Direct project evaluation and propose recommendations for improvement.	Plan and implement best practice methods of continuous improvement, eg ISO 9000, EFQM, balanced scorecard. Carry out quality audits. Monitor, maintain and improve delivery. Identify, implement and evaluate changes to meet quality objectives.
D	**Demonstrate effective interpersonal skills.**	
D1	Communicate in English[3] with others at all levels. This could include an ability to: • Lead, chair, contribute to and record meetings and discussions • Prepare communications, documents and reports on complex matters • Exchange information and provide advice to technical and non-technical colleagues.	Reports, letters, emails, drawings, specifications and working papers (e.g. meeting minutes, planning documents, correspondence) in a variety of formats. Engaging or interacting with professional networks.
D2	Present and discuss proposals. This could include an ability to: • Prepare and deliver presentations on strategic matters • Lead and sustain debates with audiences • Feed the results back to improve the proposals • Raise the awareness of risk.	Presentations, records of discussions and their outcomes.

3 Any interviews will be conducted in English, subject only to the provisions of the Welsh Language Act 1993 and any Regulations which may be made in implementation of European Union directives on free movement of labour.

D3	Demonstrate personal and social skills. This could include an ability to: • Know and manage own emotions, strengths and weaknesses • Be aware of the needs and concerns of others, especially where related to diversity and equality • Be confident and flexible in dealing with new and changing interpersonal situations • Identify, agree and lead work towards collective goals • Create, maintain and enhance productive working relationships, and resolve conflicts.	Records of meetings. Evidence from colleagues of your personal and social skills. Take responsibility for productive working relationships. Apply diversity and anti-discrimination legislation.
E	**Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.**	
E1	Comply with relevant codes of conduct. This includes an ability to: • Comply with the rules of professional conduct of own institution • Lead work within all relevant legislation and regulatory frameworks, including social and employment legislation.	Work with a variety of conditions of contract. Demonstrate initiative in and commitment to the affairs of your institution.
E2	Manage and apply safe systems of work. This could include an ability to: • Identify and take responsibility for own obligations for health, safety and welfare issues • Ensure that systems satisfy health, safety and welfare requirements • Develop and implement appropriate hazard identification and risk management systems and culture • Manage, evaluate and improve these systems • Apply a sound knowledge of health and safety legislation.	Undertake formal health and safety training. Work with health and safety legislation and best practice. In the UK, examples include HASAW 1974, CDM regulations, OHSAS 18001:2007 and company safety policies. Carry out safety audits. Identify and minimise hazards. Assess and control risks. Evaluate the costs and benefits of safe working. Deliver strategic health and safety briefings and inductions.

E3 Undertake engineering activities in a way that contributes to sustainable development. This could include an ability to: • Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously • Use imagination, creativity and innovation to provide products and services which maintain and enhance the quality of the environment and community, and meet financial objectives • Understand and secure stakeholder involvement in sustainable development • Use resources efficiently and effectively.	Carry out environmental impact assessments. Carry out environmental risk assessments. Plan and implement best practice environmental management systems, eg ISO 14000. Manage best practice risk management systems eg ISO 31000. Work within environmental legislation. Adopt sustainable practices. Achieve social, economic and environmental outcomes.
E4 Carry out and record CPD necessary to maintain and enhance competence in own area of practice including: • Undertake reviews of own development needs • Plan how to meet personal and organisational objectives • Carry out planned (and unplanned) CPD activities • Maintain evidence of competence development • Evaluate CPD outcomes against any plans made • Assist others with their own CPD.	Keep up to date with national and international engineering issues. Maintain CPD plans and records. Involvement with the affairs of your institution. Evidence of your development through on-the-job learning, private study, in-house courses, external courses and conferences.
E5 Exercise responsibilities in an ethical manner.	Give an example of where you have applied ethical principles as described in the Statement of Ethical Principles on page 33. Give an example of where you have applied/upheld ethical principles as defined by your organisation or company, which may be in its company or brand values.

Education

Knowledge and understanding are important components of professional competence. Formal education is the usual, though not the only, way of demonstrating the necessary knowledge and understanding, and the following qualifications exemplify the required knowledge and understanding for Chartered Engineers:

- An accredited Bachelors degree with honours in engineering or technology, plus either an appropriate Masters degree or Engineering Doctorate (EngD) accredited by a professional engineering institution, or appropriate further learning to Masters level*;

- or an accredited integrated MEng degree.

*See **www.qaa.ac.uk** for qualification levels and HE reference points.

The Engineering Council website provides a searchable database of accredited programmes. Please check the Engineering Council website: **www.engc.org.uk/courses**

Applicants who do not have exemplifying qualifications may demonstrate the required knowledge and understanding in other ways, but must clearly demonstrate they have achieved the same level of knowledge and understanding as those with exemplifying qualifications.

Ways to demonstrate this include:

- Taking further qualifications, in whole or in part, as specified by the institution to which they are applying

- Completing appropriate work-based or experiential learning

- Writing a technical report, based on their experience, and demonstrating their knowledge and understanding of engineering principles

- Until 2011, taking Engineering Council examinations.

Applicants should consult their institution for advice on the most appropriate option.

Professional development

This is the other key part of developing competence. It is how potential Chartered Engineers learn to apply their knowledge and understanding and begin to apply professional judgement. It can happen at the same time as some of the formal education referred to above, for example through an industrial placement during a higher education course, or alongside part-time study.

Many larger employers run well-established graduate training and development schemes. While these schemes are of course geared to the specific needs of their organisations, they are frequently designed to help graduates on the way to registration and may have been accredited by one or more of the institutions.

Potential Chartered Engineers in organisations without schemes of this type will need to develop profiles of competence and professional activity to help them prepare for registration. In some cases employers will use occupational standards or competence frameworks in determining job descriptions and staff development, and these may assist in developing a competence profile. Otherwise aspiring registrants should use the competence and commitment statements and seek advice and guidance from the relevant institution, which may be able to put them in touch with a mentor to assist them through the process and help them address any gaps in their development.

Those seeking Chartered Engineer registration should maintain a detailed record of their professional development, responsibilities and experience, verified by supervisors or mentors, to provide best evidence for the professional review (see page 8).

CEng

PROFESSIONAL AND ETHICAL BEHAVIOUR

Statement of Ethical Principles†

This Statement of Ethical Principles, published by the Engineering Council and the Royal Academy of Engineering, lists four fundamental principles to guide engineers and technicians in achieving the high ideals of professional life:

- Accuracy and rigour
- Honesty and integrity
- Respect for life, law and the public good
- Responsible leadership: listening and informing

These express the beliefs and values of the profession and are amplified in the Statement of Ethical Principles: **www.engc.org.uk/professional-ethics**

Guidelines for Institution Codes of Conduct†

All registrants are expected to observe the requirements of the Code of Conduct of the institution they have joined.

The Code of Conduct of each licensed professional engineering institution should place a personal obligation on its members to act with integrity and in the public interest. It should be worded in such a way as to encourage members to act in accordance with the Statement of Ethical Principles. Institutions shall ensure that they have appropriate disciplinary processes in place to deal with breaches of their Codes of Conduct.

Specifically, Codes of Conduct should oblige members to:

1 Act with due skill, care and diligence and with proper regard for professional standards.
2 Prevent avoidable danger to health or safety.
3 Act in accordance with the principles of sustainability, and prevent avoidable adverse impact on the environment and society.
4 Maintain and enhance their competence, undertake only professional tasks for which they are competent, and disclose relevant limitations of competence.
5 Accept appropriate responsibility for work carried out under their supervision.
6 Treat all persons fairly and with respect.
7 Encourage others to advance their learning and competence.
8 Avoid where possible real or perceived conflict of interest, and advise affected parties when such conflicts arise.
9 Observe the proper duties of confidentiality owed to appropriate parties.
10 Reject bribery and all forms of corrupt behaviour, and make positive efforts to ensure others do likewise.
11 Raise a concern about a danger, risk, malpractice or wrongdoing which affects others ('blow the whistle'), and support a colleague or any other person to whom you have a duty of care who in good faith raises any such concern.*
12 Assess and manage relevant risks and communicate these appropriately.
13 Assess relevant liability, and if appropriate hold professional indemnity insurance.
14 Notify the Institution if convicted of a criminal offence or upon becoming bankrupt or disqualified as a Company Director.
15 Notify the Institution of any significant violation of the Institution's Code of Conduct by another member.

*Included August 2015.

† See document of amendments at **http://www.engc.org.uk/engcdocuments/internet/Website/2017_Standards_Amendments.pdf** for updates.

Guidance on Risk

This guidance, published by the Engineering Council, lists six principles to guide and motivate professional engineers and technicians in identifying, assessing, managing and communicating about risk.

1 Apply professional and responsible judgement and take a leadership role
2 Adopt a systematic and holistic approach to risk identification, assessment and management
3 Comply with legislation and codes, but be prepared to seek further improvements
4 Ensure good communication with the others involved
5 Ensure that lasting systems for oversight and scrutiny are in place
6 Contribute to public awareness of risk

For more information please see: **www.engc.org.uk/risk**

Guidance on Sustainability

This guidance, published by the Engineering Council, lists six principles to guide and motivate professional engineers and technicians when making decisions for clients, employers and society which affect sustainability.

1 Contribute to building a sustainable society, present and future
2 Apply professional and responsible judgement and take a leadership role
3 Do more than just comply with legislation and codes
4 Use resources efficiently and effectively
5 Seek multiple views to solve sustainability challenges
6 Manage risk to minimise adverse impact to people or the environment

For more information please see: **www.engc.org.uk/sustainability**

Professional engineering institutions may use these documents to assist them in developing guidance for their members.[†]

Continuing Professional Development (CPD) Policy Statement

In addition to the CPD Code for Registrants published earlier in this document, in 2013 the Engineering Council published a policy statement about CPD. A supporting explanatory note for professional engineering institutions is available at: **www.engc.org.uk/cpd**

CPD is understood across most professions as the systematic acquisition of knowledge and skills, and the development of personal qualities, to maintain and enhance professional competence. All members of professional engineering institutions have an obligation to undertake CPD, and to support the learning of others. For Engineering Council registrants, this obligation underpins the value of the professional titles of Engineering Technician, Incorporated Engineer, Chartered Engineer and ICT Technician, as well as serving society and enabling it to have confidence in the engineering profession.

[†] See document of amendments at **http://www.engc.org.uk/engcdocuments/internet/Website/2017_Standards_Amendments.pdf** for updates.

CPD has several purposes, which will vary in relation to registrants' circumstances, their needs and their career progression. Very often registrants will do CPD to assure their continuing competence in their current job. At other times, CPD may be done to enable a different role within or outside their organisation (which may have more management content or which may not be a pure engineering role). Equally, CPD may help them follow a longer term career development plan, or to enhance their professionalism in a wider context than a specific job role. The focus of registrants' learning may therefore be on different areas of competence at different times.

CPD can also take a variety of different forms. At its heart is informal learning through the challenges and opportunities of working life, and interaction with others (eg colleagues, customers, suppliers) including professionals from other disciplines. However, this may be supplemented by structured activities such as courses, distance learning programmes, private study, preparation of papers and presentations, mentoring, involvement in professional body activities, or relevant voluntary work. (This list is not intended to be exhaustive). Individual registrants are best placed to determine their needs and how to meet them. Often, employers or experienced colleagues will play a significant part in this, but individuals should be responsible and proactive in seeking professional development opportunities.

While most engineering professionals undertake CPD, this is often on a casual basis, without any deliberate planning, recording of activities, or conscious reflection. Whatever its purpose or nature, learning through CPD should be reflective and should relate to specific objectives even if these are only to maintain their professional engineering competence. Having a regularly reviewed development plan will facilitate learning, although there will always be a place for unplanned activities. Registrants should record both their CPD activities and what they have learned or achieved through them, and relate this to any planned objectives. Doing this will help them to determine their future needs and plan accordingly, as part of a cyclical process. It will also encourage an outcome-based approach which is more appropriate to professional learning than relying solely on quantitative measures such as hours or points.

One of the main functions of a professional body is promoting and supporting the professional development of its members. The professional engineering institutions licensed by the Engineering Council advise and support their members on CPD in a number of ways, such as providing guidance, resources and mentoring programmes. A number provide CPD planning and recording systems, and review their members' CPD from time to time. They should in future strengthen their support by reviewing a random sample of their professionally active registrants' CPD records each year and providing appropriate feedback. The sample need not include retired registrants or those on career breaks for any reason (eg maternity or paternity leave, parenthood, unemployment etc).

Glossary

APEC: Asia Pacific Economic Cooperation	An agreement in place between a number of APEC countries for the purposes of recognising substantial equivalence of professional competence in engineering. **www.ieagreements.com/apec**
Chartered Engineer (CEng)	One of the professional titles available to individuals who meet the required standard of competence and commitment. **www.engc.org.uk/ceng**
Competence	The ability to carry out a task to an effective standard. Its achievement requires the right level of knowledge, understanding and skill, as well as a professional attitude. It is part of the requirement (along with commitment) that must be demonstrated in order for an individual to be admitted to the Engineering Council's register at the relevant level.
Continuing Professional Development (CPD)	The systematic acquisition of knowledge and skills, and the development of personal qualities, to maintain and enhance professional competence. All members of professional engineering institutions have an obligation to undertake CPD, and to support the learning of others. **www.engc.org.uk/cpd**
Dublin Accord	Similar to the Washington Accord, for Engineering Technicians (see below). **www.ieagreements.com/Dublin**
Engineering Council	The UK regulatory body for the engineering profession that sets and maintains internationally recognised standards of professional competence and ethics, and holds the UK register of professional engineers and technicians. **www.engc.org.uk**
Engineering Technician (EngTech)	One of the professional titles available to individuals who meet the required standard of competence and commitment. **www.engc.org.uk/engtech**
Exemplifying qualification	An educational or vocational qualification that demonstrates the knowledge, understanding and skills to meet or partly meet the requirement for registration in a particular category. Other qualifications may be permitted if they achieve (or exceed) the same level.
FEANI	The European Federation of National Engineering Associations of which the Engineering Council is the UK partner. **www.feani.org**
Incorporated Engineer (IEng)	One of the professional titles available to individuals who meet the required standard of competence and commitment. **www.engc.org.uk/ieng**
National Vocational Qualification (NVQ)	Qualifications developed and accredited according to criteria set out nationally, and that are achieved through assessment and training. In Scotland, they are known as Scottish Vocational Qualification (SVQ). To achieve an NVQ, candidates must prove that they have the ability (competence) to carry out their job to the required standard. NVQs are based on National Occupational Standards that describe the 'competences' expected in any given job role.
Professional Affiliate	An incorporated body/engineering institution which is closely associated with, but not licensed by, the Engineering Council. It may enter into an agreement with a professional engineering institution to process its members for registration. For a list of Professional Affiliates see: **www.engc.org.uk/pas**
Professional development	The process by which an individual gains professional competence. It may take place through formal and informal learning, and workplace training and experience.
Professional engineering institution	Membership organisation which is licensed by the Engineering Council to assess candidates for professional registration. Some institutions also have a licence to accredit degree programmes and/or company training schemes. For a list see: **www.engc.org.uk/peis**
Professional registration	The process whereby an individual is admitted to the Engineering Council's Register as an Engineering Technician, Incorporated Engineer or Chartered Engineer based on the individual demonstrating, via a peer review process by a licensed professional engineering institution, that he/she has met the profession's standards of commitment and competence. Award of the EngTech, IEng or CEng title permits the use of the relevant post-nominal.
Professional review	A peer assessment process to decide whether an individual has met the requirements for registration. It is a holistic assessment of the applicant's competence and commitment against the relevant sections of UK-SPEC. For candidates seeking IEng or CEng registration, this will include a professional review interview (PRI). Some PEIs include an interview for EngTech candidates.
Professional review interview (PRI)	Part of the professional review process undertaken by registrant peers who are trained and competent to do so. It is mandatory for IEng and CEng candidates. For EngTech candidates, the interview is at the discretion of the institution.

Quality Assurance Agency for Higher Education (QAA)	Safeguards standards and drives improvement in the quality of UK higher education across all subjects. The QAA works closely with the Engineering Council and professional engineering institutions to support the Engineering disciplines. **www.qaa.ac.uk**
QCF †	Qualifications and Credit Framework. For HE reference points see: **www.qaa.ac.uk**
Royal Academy of Engineering (RAEng)	The UK's national academy for engineering that works to advance and promote excellence in engineering. RAEng provides analysis and policy support relating to business and education, invests in the UK's research base to underpin innovation, and works to improve public awareness and understanding of engineering. **www.raeng.org.uk**
Royal Charter	A formal document issued by the monarch granting rights and powers to an individual or an organisation.
SCQF	The Scottish Credit and Qualifications Framework. For HE reference points see: **www.scqf.org.uk**
Sydney Accord	Similar to the Washington Accord, for Incorporated Engineers (in the UK) or Engineering Technologists (see below). **www.ieagreements.com/sydney**
UK-SPEC: The UK Standard for Professional Engineering Competence	The UK standard which sets out the competence and commitment requirements for registration with the Engineering Council as an Engineering Technician, Incorporated Engineer or Chartered Engineer. **www.engc.org.uk/ukspec**
Washington Accord	An international agreement among bodies responsible for accrediting engineering degree programmes, recognising the substantial equivalence of such programmes for entry to the practice of engineering. In the UK this is at Chartered Engineer status. **www.ieagreements.com/Washington-Accord**

† See document of amendments at **http://www.engc.org.uk/engcdocuments/internet/Website/2017_Standards_Amendments.pdf** for updates.

Table of competence and commitment standards for EngTech, IEng and CEng

Engineering Technician			Incorporated Engineer			Chartered Engineer		
Engineering Technicians apply proven techniques and procedures to the solution of practical engineering problems. Engineering Technicians are required to apply safe systems of work and are able to demonstrate: • Evidence of their contribution to either the design, development, manufacture, commissioning, decommissioning, operation or maintenance of products, equipment, processes or services • Supervisory or technical responsibility • Effective interpersonal skills in communicating technical matters • Commitment to professional engineering values.			Incorporated Engineers maintain and manage applications of current and developing technology, and may undertake engineering design, development, manufacture, construction and operation. Incorporated Engineers are able to demonstrate: • The theoretical knowledge to solve problems in developed technologies using well proven analytical techniques • Successful application of their knowledge to deliver engineering projects or services using established technologies and methods • Responsibility for project and financial planning and management together with some responsibility for leading and developing other professional staff • Effective interpersonal skills in communicating technical matters • Commitment to professional engineering values.			Chartered Engineers develop solutions to engineering problems using new or existing technologies, through innovation, creativity and change and/or they may have technical accountability for complex systems with significant levels of risk. Chartered Engineers are able to demonstrate: • The theoretical knowledge to solve problems in new technologies and develop new analytical techniques • Successful application of the knowledge to deliver innovative products and services and/or take technical responsibility for complex engineering systems • Accountability for project, finance and personnel management and managing trade-offs between technical and socio-economic factors • Skill sets necessary to develop other technical staff • Effective interpersonal skills in communicating technical matters.		
	The Competence and Commitment Standard for Engineering Technicians. **Engineering Technicians** must be competent throughout their working life, by virtue of their education, training and experience, to:	**The examples given below are intended to help you identify activities you might quote to demonstrate the required competence and commitment for EngTech registration. These are not exhaustive. Moreover, you are not required to give multiple examples to demonstrate competence and commitment.** Tell us about your career, education and training. Explain how the experience you have gained has made you more competent.		**The Competence and Commitment Standard for Incorporated Engineers.** **Incorporated Engineers** must be competent throughout their working life, by virtue of their education, training and experience, to:	**The examples given below are intended to help you identify activities you might quote to demonstrate the required competence and commitment for IEng registration. These are not exhaustive. Moreover, you are not required to give multiple examples to demonstrate competence and commitment.**		**The Competence and Commitment Standard for Chartered Engineers.** **Chartered Engineers** must be competent throughout their working life, by virtue of their education, training and experience, to:	**The examples given below are intended to help you identify activities you might quote to demonstrate the required competence and commitment for CEng registration. These are not exhaustive. Moreover, you are not required to give multiple examples to demonstrate competence and commitment.**
A	**Use engineering knowledge and understanding to apply technical and practical skills.** This includes the ability to:	**The reviewers will be looking for evidence that you have the know-how to do the job, and were able to go beyond the immediate requirements and use your initiative and experience to solve a problem or improve a process.**	A	**Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.**		A	**Use a combination of general and specialist engineering knowledge and understanding to optimise the application of existing and emerging technology.**	

Engineering Technician			Incorporated Engineer			Chartered Engineer		
A1	Review and select appropriate techniques, procedures and methods to undertake tasks.	Describe: • an example of work you did that went well, the choices you made and the outcome • or something in your work that you were involved in which didn't quite work and explain why • or a technique, procedure or method you improved upon and explain why.	**A1**	Maintain and extend a sound theoretical approach to the application of technology in engineering practice. This could include an ability to: • Identify the limits of own personal knowledge and skills • Strive to extend own technological capability • Broaden and deepen own knowledge base through new applications and techniques.	Engage in formal learning. Learn new engineering theories and techniques in the workplace, at seminars, etc. Broaden your knowledge of engineering codes, standards and specifications.	**A1**	Maintain and extend a sound theoretical approach in enabling the introduction and exploitation of new and advancing technology. This could include an ability to: • Identify the limits of own personal knowledge and skills • Strive to extend own technological capability • Broaden and deepen own knowledge base through research and experimentation.	Engage in formal post-graduate academic study. Learn and develop new engineering theories and techniques in the workplace. Broaden your knowledge of engineering codes, standards and specifications.
A2	Use appropriate scientific, technical or engineering principles.	Drawing from your direct experience, this might be an explanation of how a piece of equipment, system or mechanism works.	**A2**	Use a sound evidence-based approach to problem-solving and contribute to continuous improvement. This could include an ability to: • Use market intelligence and knowledge of technological developments to promote and improve the effectiveness of engineering products, systems and services • Contribute to the evaluation and development of continuous improvement systems • Apply knowledge and experience to investigate and solve problems arising during engineering tasks and implement corrective action.	Manage/contribute to market research, and product and process research and development. Involvement with cross-disciplinary working. Conduct statistically sound appraisal of data. Use evidence from best practice to improve effectiveness. Apply root cause analysis.	**A2**	Engage in the creative and innovative development of engineering technology and continuous improvement systems. This could include an ability to: • Assess market needs and contribute to marketing strategies • Identify constraints and exploit opportunities for the development and transfer of technology within own chosen field • Promote new applications when appropriate • Secure the necessary intellectual property (IP) rights • Develop and evaluate continuous improvement systems.	Lead/manage market research, and product and process research and development. Cross-disciplinary working involving complex projects. Conduct statistically sound appraisal of data. Use evidence from best practice to improve effectiveness.
B	**Contribute to the design, development, manufacture, construction, commissioning, operation or maintenance of products, equipment, processes, systems or services.** In this context, this includes the ability to:	**Explain how you contribute to one or more of these activities.**	**B**	**Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and re-cycle engineering processes, systems, services and products.**		**B**	**Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems.**	

Engineering Technician			Incorporated Engineer			Chartered Engineer		
B1	Identify problems and apply appropriate methods to identify causes and achieve satisfactory solutions	Show an example of how you have used measurement, monitoring and assessment to: • identify the source of a problem • or to identify an opportunity • or to propose a solution.	**B1**	Identify, review and select techniques, procedures and methods to undertake engineering tasks. This could include an ability to: • Establish users' requirements for improvement • Select a review methodology • Fully exploit and implement current technology • Review the potential for enhancing engineering practices, products, processes, systems and services, using evidence from best practice • Establish an action plan to implement the results of the review.	Contribute to the marketing of and tendering for new engineering products, processes and systems. Contribute to the specification and procurement of new engineering products, processes and systems. Develop decommissioning processes. Set targets, and draft programmes and action plans. Schedule activities.	**B1**	Identify potential projects and opportunities. This could include an ability to: • Establish and help develop solutions to meet users' requirements • Consider and implement new and emerging technologies • Enhance engineering practices, products, processes, systems and services • Use own knowledge of the employer's position to assess the viability of opportunities.	Involvement in the marketing of and tendering for new engineering products, processes and systems. Involvement in the specification and procurement of new engineering products, processes and systems. Set targets, and draft programmes and action plans. Schedule activities.
B2	Identify, organise and use resources effectively to complete tasks, with consideration for cost, quality, safety, security and environmental impact.	Illustrate how you make decisions about: • what information, material, component, people or plant to use • or how to introduce a new method of working • or what precautions you took. Describe how you have contributed to best practice methods of continuous improvement, eg ISO 9000.	**B2**	Contribute to the design and development of engineering solutions. This could include an ability to: • Contribute to the identification and specification of design and development requirements for engineering products, processes, systems and services • Identify operational risks and evaluate possible engineering solutions, taking account of cost, quality, safety, reliability, appearance, fitness for purpose, security, intellectual property (IP) constraints and opportunities, and environmental impact • Collect and analyse results • Carry out necessary tests.	Contribute to theoretical and applied research. Manage/contribute to value engineering and whole life costing. Work in design teams. Draft specifications. Find and evaluate information from a variety of sources, including online. Develop and test options. Identify resources and costs of options. Produce detailed designs. Be aware of IP constraints and opportunities.	**B2**	Conduct appropriate research, and undertake design and development of engineering solutions. This could include an ability to: • Identify and agree appropriate research methodologies • Allocate and manage resources • Develop the necessary tests • Collect, analyse and evaluate the relevant data • Undertake engineering design • Prepare, present and agree design recommendations, with appropriate analysis of risk, and taking account of cost, quality, safety, reliability, appearance, fitness for purpose, security, intellectual property (IP) constraints and opportunities, and environmental impact.	Carry out formal theoretical research. Evaluate numerical and analytical tools. Carry out applied research on the job. Lead/manage value engineering and whole life costing. Lead design teams. Draft specifications. Develop and test options. Identify resources and costs of options. Produce concept designs, and develop these into detailed designs. Be aware of IP constraints and opportunities.

Engineering Technician			Incorporated Engineer			Chartered Engineer		
			B3	Implement design solutions and contribute to their evaluation. This could include an ability to: • Secure the resources required for implementation • Implement design solutions, taking account of critical constraints, including due concern for safety and sustainability • Identify problems during implementation and take corrective action • Contribute to recommendations for improvement and actively learn from feedback on results.	Follow the design process through into product manufacture. Operate and maintain processes, systems etc. Contribute to reports on the evaluation of the effectiveness of the designs, including risk, safety and life cycle considerations. Contribute to product improvement. Interpret and analyse performance. Contribute to determining critical success factors.	**B3**	Manage implementation of design solutions, and evaluate their effectiveness. This could include an ability to: • Ensure that the application of the design results in the appropriate practical outcome • Implement design solutions, taking account of critical constraints, including due concern for safety and sustainability • Determine the criteria for evaluating the design solutions • Evaluate the outcome against the original specification • Actively learn from feedback on results to improve future design solutions and build best practice.	Follow the design process through into product or service realisation and its evaluation. Prepare and present reports on the evaluation of the effectiveness of the designs, including risk, safety and life cycle considerations. Manage product improvement. Interpret and analyse performance. Determine critical success factors.
C	**Accept and exercise personal responsibility.** This includes the ability to:	**Describe an experience or instance where you have had to accept personal responsibility for seeing a process through to completion within agreed targets.**	**C**	**Provide technical and commercial management.**		**C**	**Provide technical and commercial leadership.**	

Engineering Technician			Incorporated Engineer			Chartered Engineer		
C1	Work reliably and effectively without close supervision, to the appropriate codes of practice.	Your evidence should show how you identified and agreed what had to be done and to what standards on a typical project.	**C1**	Plan for effective project implementation. This could include an ability to: • Identify factors affecting the project implementation • Carry out holistic and systematic risk identification, assessment and management • Prepare and agree implementation plans and method statements • Secure the necessary resources and confirm roles in project team • Apply the necessary contractual arrangements with other stakeholders (client, subcontractors, suppliers, etc).	Manage/contribute to project planning activities. Produce and implement procurement plans. Contribute to project risk assessments. Collaborate with key stakeholders. Plan programmes and delivery of tasks. Identify resources and costs. Prepare and agree contracts/work orders.	**C1**	Plan for effective project implementation. This could include an ability to: • Systematically review the factors affecting the project implementation including safety and sustainability considerations • Define a holistic and systematic approach to risk identification, assessment and management • Lead on preparing and agreeing implementation plans and method statements • Ensure that the necessary resources are secured and brief the project team • Negotiate the necessary contractual arrangements with other stakeholders (client, subcontractors, suppliers, etc).	Lead/manage project planning activities. Produce and implement procurement plans. Carry out project risk assessments. Collaborate with key stakeholders, and negotiate agreement to the plans. Plan programmes and delivery of tasks. Identify resources and costs. Negotiate and agree contracts/work orders.
C2	Accept responsibility for work of self or others.	Your evidence could include: minutes of meetings; site notes and instructions; Variation Orders; programmes of work; specifications, drawing and reports; or appraisals. Activity not associated with your job can contribute evidence.	**C2**	Manage tasks, people and resources to plan and budget. This could include an ability to: • Operate appropriate management systems • Work to the agreed quality standards, programme and budget, within legal and statutory requirements • Manage work teams, coordinating project activities • Identify variations from quality standards, programme and budgets, and take corrective action • Evaluate performance and recommend improvements.	Manage/contribute to project operations. Manage the balance between quality, cost and time. Manage contingency processes. Contribute to the management of project funding, payments and recovery. Satisfy legal and statutory obligations. Manage tasks within identified financial, commercial and regulatory constraints.	**C2**	Plan, budget, organise, direct and control tasks, people and resources. This could include an ability to: • Set up appropriate management systems • Define quality standards, programme and budget within legal and statutory requirements • Organise and lead work teams, coordinating project activities • Ensure that variations from quality standards, programme and budgets are identified, and that corrective action is taken • Gather and evaluate feedback, and recommend improvements.	Take responsibility for and control project operations. Manage the balance between quality, cost and time. Manage risk register and contingency systems. Manage project funding, payments and recovery. Satisfy legal and statutory obligations. Lead/manage tasks within identified financial, commercial and regulatory constraints.

Engineering Technician			Incorporated Engineer			Chartered Engineer		
C3	Accept, allocate and supervise technical and other tasks.	Your evidence could include: minutes of meetings; site notes and instructions; Variation Orders; programmes of work; specifications, drawing and reports; or appraisals. Activity not associated with your job can contribute evidence.	**C3**	Manage teams and develop staff to meet changing technical and managerial needs. This could include an ability to: • Agree objectives and work plans with teams and individuals • Identify team and individual needs, and plan for their development • Reinforce team commitment to professional standards • Manage and support team and individual development • Assess team and individual performance, and provide feedback.	Carry out/contribute to staff appraisals. Plan/contribute to the training and development of staff. Gather evidence from colleagues of the management, assessment and feedback that you have provided. Carry out/contribute to disciplinary procedures.	**C3**	Lead teams and develop staff to meet changing technical and managerial needs. This could include an ability to: • Agree objectives and work plans with teams and individuals • Identify team and individual needs, and plan for their development • Reinforce team commitment to professional standards • Lead and support team and individual development • Assess team and individual performance, and provide feedback.	Carry out/contribute to staff appraisals. Plan/contribute to the training and development of staff. Gather evidence from colleagues of the management, assessment and feedback that you have provided. Carry out/contribute to disciplinary procedures.
			C4	Manage continuous quality improvement. This could include an ability to: • Ensure the application of quality management principles by team members and colleagues • Manage operations to maintain quality standards • Evaluate projects and make recommendations for improvement.	Promote quality. Manage/ contribute to best practice methods of continuous improvement, eg ISO 9000, EFQM, balanced scorecard. Carry out/contribute to quality audits. Monitor, maintain and improve delivery. Identify, implement and evaluate changes to meet quality objectives.	**C4**	Bring about continuous improvement through quality management. This could include an ability to: • Promote quality throughout the organisation and its customer and supplier networks • Develop and maintain operations to meet quality standards • Direct project evaluation and propose recommendations for improvement.	Plan and implement best practice methods of continuous improvement, eg ISO 9000, EFQM, balanced scorecard. Carry out quality audits. Monitor, maintain and improve delivery. Identify, implement and evaluate changes to meet quality objectives.
D	**Use effective communication and interpersonal skills.** This includes the ability to:	**You will need to show you can: contribute to discussions; make a presentation; read and synthesise information; or write different types of documents.**	**D**	**Demonstrate effective interpersonal skills.**		**D**	**Demonstrate effective interpersonal skills.**	

Engineering Technician			Incorporated Engineer			Chartered Engineer		
D1	Use oral, written and electronic methods for the communication in English[1] of technical and other information	Your evidence could include: letters; reports; drawings; emails; minutes, including of progress meetings; appraisals; work instructions; and other task planning and organising documents. Your application itself will be relevant.	**D1**	Communicate in English[1] with others at all levels. This could include an ability to: • Contribute to, chair and record meetings and discussions • Prepare communications, documents and reports on technical matters • Exchange information and provide advice to technical and non-technical colleagues.	Reports, letters, emails, drawings, specifications and working papers (eg meeting minutes, planning documents, correspondence) in a variety of formats. Engaging or interacting with professional networks.	**D1**	Communicate in English[1] with others at all levels. This could include an ability to: • Lead, chair, contribute to and record meetings and discussions • Prepare communications, documents and reports on complex matters • Exchange information and provide advice to technical and non-technical colleagues.	Reports, letters, emails, drawings, specifications and working papers (e.g. meeting minutes, planning documents, correspondence) in a variety of formats. Engaging or interacting with professional networks.
D2	Work effectively with colleagues, clients, suppliers or the public, and be aware of the needs and concerns of others, especially where related to diversity and equality.	Show examples of how this has occurred, and your role at the time. Describe your role as part of a team. Describe a situation where you put your awareness into practice.	**D2**	Present and discuss proposals. This could include an ability to: • Prepare and deliver appropriate presentations • Manage debates with audiences • Feed the results back to improve the proposals • Contribute to the awareness of risk.	Presentations, records of discussions and their outcomes.	**D2**	Present and discuss proposals. This could include an ability to: • Prepare and deliver presentations on strategic matters • Lead and sustain debates with audiences • Feed the results back to improve the proposals • Raise the awareness of risk.	Presentations, records of discussions and their outcomes.
			D3	Demonstrate personal and social skills. This could include an ability to: • Know and manage own emotions, strengths and weaknesses • Be aware of the needs and concerns of others, especially where related to diversity and equality • Be confident and flexible in dealing with new and changing interpersonal situations • Identify, agree and work towards collective goals • Create, maintain and enhance productive working relationships, and resolve conflicts.	Records of meetings. Evidence from colleagues of your personal and social skills. Contribute to productive working relationships. Apply diversity and anti-discrimination legislation.	**D3**	Demonstrate personal and social skills. This could include an ability to: • Know and manage own emotions, strengths and weaknesses • Be aware of the needs and concerns of others, especially where related to diversity and equality • Be confident and flexible in dealing with new and changing interpersonal situations • Identify, agree and lead work towards collective goals • Create, maintain and enhance productive working relationships, and resolve conflicts.	Records of meetings. Evidence from colleagues of your personal and social skills. Take responsibility for productive working relationships. Apply diversity and anti-discrimination legislation.

1 Any interviews will be conducted in English, subject only to the provisions of the Welsh Language Act 1993 and any Regulations which may be made in implementation of European Union directives on free movement of labour.

Engineering Technician			Incorporated Engineer			Chartered Engineer		
E	**Make a personal commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment.**	**Your commitment will be to become part of the profession and uphold the standards to which all members subscribe. You need to show that you have read and understood your institution's Code of Conduct.**	**E**	**Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.**		**E**	**Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.**	
E1	Comply with the Code of Conduct of your institution.	The professional review involves demonstration of, or discussion of, your position on typical ethical challenges.	**E1**	Comply with relevant codes of conduct. This includes an ability to: • Comply with the rules of professional conduct of own institution • Manage work within all relevant legislation and regulatory frameworks, including social and employment legislation.	Contribute to the affairs of your institution. Work with a variety of conditions of contract.	**E1**	Comply with relevant codes of conduct. This includes an ability to: • Comply with the rules of professional conduct of own institution • Lead work within all relevant legislation and regulatory frameworks, including social and employment legislation.	Work with a variety of conditions of contract. Demonstrate initiative in and commitment to the affairs of your institution.
E2	Manage and apply safe systems of work.	Provide evidence of applying current safety requirements, such as risk assessment and other examples of good practice you adopt in your work. You will need to show that you have received a formal safety instruction relating to your workplace (such as a CSCS safety test in the UK), or an update on statutory regulations. In the UK an example would be COSHH requirements.	**E2**	Manage and apply safe systems of work. This could include an ability to: • Identify and take responsibility for own obligations for health, safety and welfare issues • Manage systems that satisfy health, safety and welfare requirements • Develop and implement appropriate hazard identification and risk management systems and culture • Manage, evaluate and improve these systems. • Apply a sound knowledge of health and safety legislation.	Undertake formal health and safety training. Work with health and safety legislation and best practice. In the UK, examples include HASAW 1974, CDM regulations, OHSAS 18001:2007 and company safety policies. Carry out safety audits. Identify and minimise hazards. Assess and control risks. Deliver health and safety briefings and inductions.	**E2**	Manage and apply safe systems of work. This could include an ability to: • Identify and take responsibility for own obligations for health, safety and welfare issues • Ensure that systems satisfy health, safety and welfare requirements • Develop and implement appropriate hazard identification and risk management systems and culture • Manage, evaluate and improve these systems • Apply a sound knowledge of health and safety legislation.	Undertake formal health and safety training. Work with health and safety legislation and best practice. In the UK, examples include HASAW 1974, CDM regulations, OHSAS 18001:2007 and company safety policies. Carry out safety audits. Identify and minimise hazards. Assess and control risks. Evaluate the costs and benefits of safe working. Deliver strategic health and safety briefings and inductions.

Engineering Technician			Incorporated Engineer			Chartered Engineer		
E3	Undertake engineering work in a way that contributes to sustainable development. This could include an ability to: • Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously.	Show examples of methodical assessment of risk in specific projects; actions taken to minimise risk to society or the environment.	**E3**	Undertake engineering activities in a way that contributes to sustainable development. This could include an ability to: • Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously • Provide products and services which maintain and enhance the quality of the environment and community, and meet financial objectives • Understand and encourage stakeholder involvement in sustainable development • Use resources efficiently and effectively.	Carry out/contribute to environmental impact assessments. Carry out/ contribute to environmental risk assessments. Manage best practice environmental management systems, eg ISO 14000. Manage best practice risk management systems eg ISO 31000. Work within environmental legislation. Adopt sustainable practices. Contribute to social, economic and environmental outcomes.	**E3**	Undertake engineering activities in a way that contributes to sustainable development. This could include an ability to: • Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously • Use imagination, creativity and innovation to provide products and services which maintain and enhance the quality of the environment and community, and meet financial objectives • Understand and secure stakeholder involvement in sustainable development • Use resources efficiently and effectively.	Carry out environmental impact assessments. Carry out environmental risk assessments. Plan and implement best practice environmental management systems, eg ISO 14000. Manage best practice risk management systems eg ISO 31000. Work within environmental legislation. Adopt sustainable practices. Achieve social, economic and environmental outcomes.
E4	Carry out and record CPD necessary to maintain and enhance competence in own area of practice including: • Undertake reviews of own development needs • Plan how to meet personal and organisational objectives • Carry out planned (and unplanned) CPD activities • Maintain evidence of competence development • Evaluate CPD outcomes against any plans made • Assist others with their own CPD.	This means demonstrating that you have actively sought to keep yourself up to date, perhaps by studying new standards or techniques, or made use of magazines, lectures organised by professional engineering institutions, and other opportunities to network in order to keep abreast of change.	**E4**	Carry out and record CPD necessary to maintain and enhance competence in own area of practice including: • Undertake reviews of own development needs • Plan how to meet personal and organisational objectives • Carry out planned (and unplanned) CPD activities • Maintain evidence of competence development • Evaluate CPD outcomes against any plans made • Assist others with their own CPD.	Keep up to date with national and international engineering issues. Maintain CPD plans and records. Involvement with the affairs of your institution. Evidence of your development through on-the-job learning, private study, in-house courses, external courses and conferences.	**E4**	Carry out and record CPD necessary to maintain and enhance competence in own area of practice including: • Undertake reviews of own development needs • Plan how to meet personal and organisational objectives • Carry out planned (and unplanned) CPD activities • Maintain evidence of competence development • Evaluate CPD outcomes against any plans made • Assist others with their own CPD.	Keep up to date with national and international engineering issues. Maintain CPD plans and records. Involvement with the affairs of your institution. Evidence of your development through on-the-job learning, private study, in-house courses, external courses and conferences.

Engineering Technician			Incorporated Engineer			Chartered Engineer		
E5	Exercise responsibilities in an ethical manner.	Give an example of where you have applied ethical principles as described in the Statement of Ethical Principles on page 33. Give an example of where you have applied/upheld ethical principles as defined by your organisation or company, which may be in its company or brand values.	**E5**	Exercise responsibilities in an ethical manner.	Give an example of where you have applied ethical principles as described in the Statement of Ethical Principles on page 33. Give an example of where you have applied/upheld ethical principles as defined by your organisation or company, which may be in its company or brand values.	**E5**	Exercise responsibilities in an ethical manner.	Give an example of where you have applied ethical principles as described in the Statement of Ethical Principles on page 33. Give an example of where you have applied/upheld ethical principles as defined by your organisation or company, which may be in its company or brand values.

Mixed Sources
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Working Group 01 - Engineers

Annex H - EngC/RAEng Statement of Ethical Principles

Operating under a Royal Charter, the Engineering Council is the UK regulatory body for the engineering profession. It sets and maintains the internationally recognised standards of professional competence and commitment, which are detailed in the UK Standard for Professional Engineering Competence (UK-SPEC).

The Engineering Council also holds the national register of professional Engineering Technicians (EngTech), Incorporated Engineers (IEng), Chartered Engineers (CEng) and ICT Technicians (ICT*Tech*). Holders of these titles must be members of a professional engineering institution licensed by the Engineering Council or in some cases a Professional Affiliate. In order to achieve registered status individuals will have demonstrated to their institution that they possess a range of technical and personal competences and are committed to keeping these up to date, and to acting with integrity in the public interest. The award and retention of these titles ensures that employers, government and wider society - both in the UK and overseas - can have confidence in the knowledge, experience and commitment of engineers and technicians on the register. The Engineering Council publishes more detailed Guidance on Sustainability, Risk, Security and Whistleblowing.

As the UK's national academy for engineering, the Royal Academy of Engineering brings together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

The Academy provides analysis and policy support to promote the UK's role as a great place to do business. It takes a lead on engineering education and invests in the UK's world-class research base to underpin innovation. The Academy works to improve public awareness and understanding of engineering, and is a national academy with a global outlook.

The Royal Academy of Engineering has four strategic challenges:

- Make the UK the leading nation for engineering innovation
- Address the engineering skills crisis
- Position engineering at the heart of society
- Lead the profession

Engineering Council

ROYAL ACADEMY OF ENGINEERING

ENGINEERING COUNCIL
ROYAL ACADEMY OF ENGINEERING

STATEMENT OF ETHICAL PRINCIPLES

for the engineering profession

www.engc.org.uk/professional-ethics

Engineering Council

ROYAL ACADEMY OF ENGINEERING

Statement of Ethical Principles

The Engineering Council and the Royal Academy of Engineering have jointly created a Statement of Ethical Principles for all engineering professionals[1].

Engineering professionals work to enhance the wellbeing of society. In doing so they are required to maintain and promote high ethical standards and challenge unethical behaviour. There are four fundamental principles for ethical behaviour and decision-making. These are set out below, together with examples of how each should be applied.

Engineering professionals should read this Statement in conjunction with their relevant Code of Conduct or Licence to Practise. The Statement by itself is not prescriptive: it is neither a Regulation nor a Standard.

1 Honesty and integrity

Engineering professionals have a duty to uphold the highest standards of professional conduct including openness, fairness, honesty and integrity. They should:

- act in a reliable and trustworthy manner
- be alert to the ways in which their work and behaviour might affect others and respect the privacy, rights and reputations of other parties and individuals
- respect confidentiality
- declare conflicts of interest
- avoid deception and take steps to prevent or report corrupt practices or professional misconduct
- reject bribery and improper influence

2 Respect for life, law, the environment and public good

Engineering professionals have a duty to obey all applicable laws and regulations and give due weight to facts, published standards and guidance and the wider public interest. They should:

- hold paramount the health and safety of others and draw attention to hazards
- ensure their work is lawful and justified
- recognise the importance of physical and cyber security and data protection
- respect and protect personal information and intellectual property
- protect, and where possible improve, the quality of built and natural environments
- maximise the public good and minimise both actual and potential adverse effects for their own and succeeding generations
- take due account of the limited availability of natural resources
- uphold the reputation and standing of the profession

3 Accuracy and rigour

Engineering professionals have a duty to acquire and use wisely the understanding, knowledge and skills needed to perform their role. They should:

- always act with care
- perform services only in areas in which they are currently competent or under competent supervision
- keep their knowledge and skills up to date
- assist the development of engineering knowledge and skills in others
- present and review theory, evidence and interpretation honestly, accurately, objectively and without bias, while respecting reasoned alternative views
- identify, evaluate, quantify, mitigate and manage risks
- not knowingly mislead or allow others to be misled

4 Leadership and communication

Engineering professionals have a duty to abide by and promote high standards of leadership and communication. They should:

- be aware of the issues that engineering and technology raise for society, and listen to the aspirations and concerns of others
- promote equality, diversity and inclusion
- promote public awareness and understanding of the impact and benefits of engineering achievements
- be objective and truthful in any statement made in their professional capacity
- challenge statements or policies that cause them professional concern

[1]In this Statement, "engineering professionals" means "professional engineers and those technicians, tradespeople, students, apprentices and trainees engaged in engineering". Non-engineers managing or teaching engineering professionals should be made aware of this Statement

Working Group 01 - Engineers

Annex I - Principal Designer in CDM Regulations

Construction (Design and Management) Regulations 2015.

Extract from CDM Regulations:

> **Principal Designer role:**
>
> A principal designer can be an organisation or individual who is appointed by the client to take the lead in planning, managing, monitoring and coordinating health and safety during the pre-construction phase (design and planning stage) of a project involving, or likely to involve, more than one contractor.
>
> A principal designer is the designer as defined in the regulations with control over the pre-construction phase who has the relevant skills, knowledge and experience and where they are an organisation, the organisational capability to carry out all the functions of the role. However, they do not have to carry out actual design work on the project.
>
> A principal designer has an important role in influencing how the risks to health and safety should be managed and incorporated into the wider management of a project. Design decisions taken during the pre-construction phase can have a significant effect on whether a project is delivered in a way that secures health and safety. The principal designer's role involves close cooperation with the client and principal contractor, and coordinating the work of others in the project team to ensure that significant and foreseeable risks are managed throughout the design process.
>
> A principal designer must be appointed in writing by the client. The principal designer should be appointed by the client as early as possible in the design process, and where practicable, at the concept stage of the project.

WG1 experience of the Principal Designer role in practice:

Principal Designers must

- plan, manage, monitor and coordinate health and safety in the pre-construction phase. In doing so they must take account of relevant information (such as an existing health and safety file) that might affect design work carried out both before and after the construction phase has started
- help and advise the client in bringing together pre-construction information, and provide the information designers and contractors need to carry out their duties
- work with any other designers on the project to eliminate foreseeable health and safety risks to anyone affected by the work and, where that is not possible, take steps to reduce/control those risks
- ensure that everyone involved in the pre-construction phase communicates and cooperates, coordinating their work wherever required
- liaise with the Principal Contractor keeping them informed of any risks that need to be controlled during the construction phase

The Specialist Principal Designer is independent from each designer and contractor and can provide independent health and safety advice throughout the project to the client and each party in the clients team. Further complications arise if the project is to be procured on a design and build basis, where the design team are commonly novated by the client or directly appointed by the PC under their T&C's of their contract. In this scenario a direct appointment of a specialist Principal Designer (CDM) ensures the role remains independent. This brings benefits of avoiding potential conflicts of interest, enables greater emphasis on ensuring the PC is communicated with and consulted, brings greater emphasis on timely consideration of hazards and risk assessment etc.

Clients are in fact free to appoint their lead designers to the Principal Designer role, but only where that designer has the necessary skills and knowledge to fulfil the role and of course are willing to take the role. Often a concept designer(s) are appointed to create innovative solution and the CDM PD role is best covered by a separate appointment.

Working Group 01 - Engineers

Annex J - Bowtie Analysis – Fire in HRRB prepared for Engineering Council by Sheryl Hurst, Risktec Solutions Ltd, 2018

TÜVRheinland®

Risktec

Report

Bowtie Analysis – Fire in HRRB

Prepared for Engineering Council

Document Number: ENGC-01-R-01

Issue: 1.0

Date: 31st October 2018

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EXECUTIVE SUMMARY AND CONCLUSIONS

This report presents the results of a bowtie workshop considering the scenario of 'Fire in a Higher Risk Residential Building (HRRB)' and involving members of the Engineering Council's Competence Steering Group, Building a Safer Future, Working Group 1: Engineers.

The full range of potential causes and ultimate consequences of fire were considered, and it was assumed that the HRRB in question was occupied, however the resulting bowtie would also be applicable during earlier stages of a building project.

The workshop output is presented in the form of a detailed bowtie diagram, illustrating the full range of causes of a fire in an HRRB, the potential consequences and the existing and potentially desirable prevention and mitigation measures. All the prevention and mitigation barriers claimed on the bowtie are also presented in tabular form, sorted by responsible party or barrier owner.

It is concluded that bowtie analysis is a practical technique which generates output that provides an easily understood overview, and may therefore be a viable approach to assessing the significant risks associated with HRRBs as part of a safety case framework.

The bowtie diagram provides a template and reference point for fire risk management that can evolve with the lifecycle of the building, allowing knowledge and information to be transferred as the building transitions from early through detailed design, to construction and commissioning, and into occupancy.

ISSUE RECORD

Issue	Date	Author Name	Reviewer Name	Approver Name	Revision History
1.0	31-10-18	S Hurst	A Lidstone	S Lewis	First formal issue to client

DISTRIBUTION

Ms K Turff	Engineering Council, London, UK
Mr G Adams	Engineering Council, London, UK
File	Risktec Solutions Limited, Warrington, United Kingdom

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FIGURES

ABBREVIATIONS

Abbreviation	Description	Abbreviation	Description
ALARP	As Low As Reasonably Practicable	BSRIA	Building Services Research and Information Association
HRRB	Higher Risk Residential Building	IET	Institution of Engineering and Technology
IMechE	Institution of Mechanical Engineers	IRG	Industry Response Group
IStructE	Institution of Structural Engineers	MHCLG	Ministry of Housing, Communities and Local Government
MOC	Management of Change	NFCC	National Fire Chiefs Council
QRA	Quantitative Risk Assessment	WG1	Working Group 1
WG5	Working Group 5		

1 INTRODUCTION

1.1 Background

Multi-occupancy higher risk residential buildings (HRRBs) have the potential for significant consequences, with a large number of people concentrated in a small space exposed to foreseeable events such as fire. In her independent review of UK building regulations and fire safety following the Grenfell Tower fire (Ref. 1), Dame Judith Hackitt identifies deep flaws in the current system and proposes that the key principle of risk ownership and management needs to be applied alongside a simpler, outcomes-based regulatory framework.

In September 2018, Sheryl Hurst from Risktec Solutions Ltd. (Risktec) was invited to give a presentation to the Engineering Council's Competence Steering Group, Building a Safer Future, Working Group 1: Engineers, about how a goal setting, safety case approach to risk management might be applied to HRRBs.

The presentation discussed:

- what a safety case is;
- what a safety case might look like;
- the process of creating and maintaining a safety case;
- the key safety case objective of demonstrating that risks are reduced to As Low As Reasonably Practicable (ALARP) levels; and
- two different examples of detailed risk assessment, namely Quantitative Risk Assessment (QRA) and bowtie analysis, that might be applied to significant hazards.

As a result of the presentation and discussion, it was agreed that bowtie analysis may be a practical, pragmatic way of implementing a safety case framework for HRRBs. Risktec was therefore asked to facilitate and record a bowtie workshop considering the scenario of 'fire in a HRRB' and involving members of the steering group. This report presents the results of that workshop.

1.2 Objectives

The objectives of the workshop and resulting bowtie analysis were to:

- Collect together, into one overarching document, the disparate measures which prevent or mitigate a fire and are put in place or influenced by design and engineering teams, developers, building owners, building management companies, building occupants, local authorities, emergency services, etc.
- Guard against loss of knowledge, or failure to communicate information, as a building transitions from early through detailed design, to construction and commissioning, and into occupancy.
- Avoid an impenetrable safety case document containing a large amount of technical language and numerical analysis that may not be accommodated easily within the industry.
- Instead produce a bowtie diagram that is understood easily, that spans disciplines, transcends obstacles and can evolve with the lifecycle of the building.
- Provide an opportunity for representatives from a range of engineering institutions to work collaboratively together towards a common goal.

The workshop output will be shared with the members of Working Group 1 and its Industry Response Group (IRG), together with the working group's conclusions on the practicality of the approach and the value gained by conducting bowtie analysis for HRRBs.

2 BOWTIE ANALYSIS METHDOLOGY

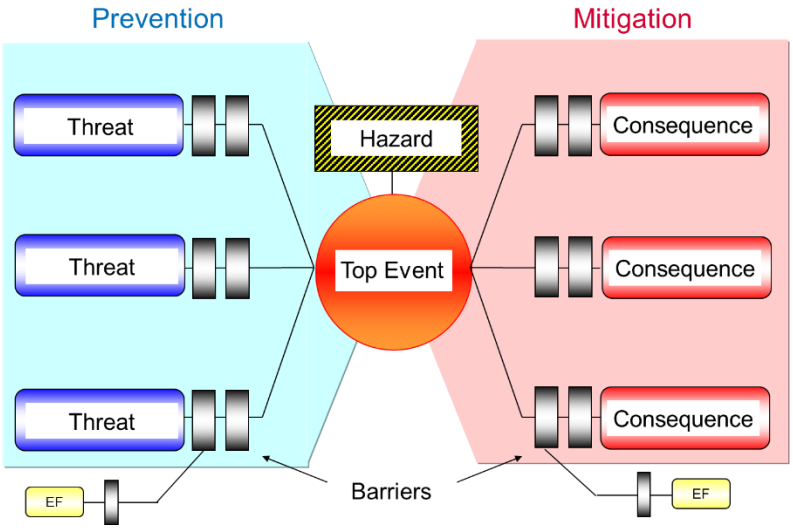
2.1 The Bowtie Diagram

Bowtie analysis (Figure 1) is based on the principle that hazards have the potential to cause harm and if control is lost, an unwanted event will occur (shown at the centre of the bowtie). The analysis involves identifying the causes of the unwanted event (shown as 'threats' on the left side of the bowtie) and the potential consequences (shown on the right) which could result if the unwanted event is allowed to develop unchecked.

For each threat, there may be one or more prevention barriers which either prevent the threat from occurring at all, reduce the likelihood of its occurrence, or prevent it from resulting in the unwanted event. Similarly, between the unwanted event in the centre of the bowtie and each of the ultimate consequences, there will be one or more mitigation barriers which either prevent the consequence from occurring at all, or reduce its likelihood or severity.

The analysis also identifies mechanisms (known as 'escalation factors') by which the prevention or mitigation barriers may be undermined and made ineffective, and the safeguards which, in turn, manage these escalation factors.

Figure 1: Bowtie Diagram



The bowtie diagram therefore provides a snapshot of how a particular hazardous event is prevented and mitigated in a logical, structured fashion, and displaying this overview on a single diagram promotes discussion which makes it easy to identify gaps and weaknesses, e.g. a lack of barriers or a particularly significant threat or consequence.

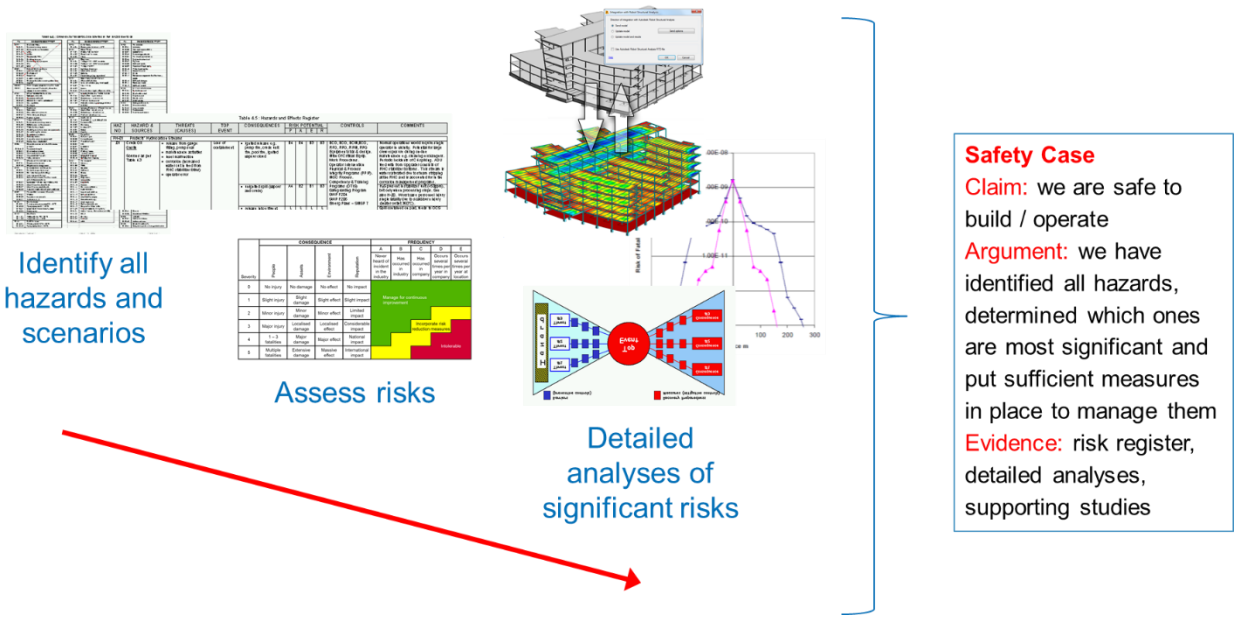
2.2 Bowties in the Context of a Safety Case

A safety case needs to demonstrate that all hazards have been identified, their risks assessed and controls put in place to manage those risks. Usually this would be in the form of some sort of hazard inventory or risk register (Figure 2), with a risk matrix used to score the risks and therefore rank the hazards. More resources would, naturally, be directed at analysing and demonstrating control of the hazards which contribute most to the overall risk. This analysis may take the form of QRA, structural analysis, bowtie analysis, etc. So, in the context of a safety case, bowties tend to be developed for the most significant hazards/risks to document, systematically and in detail, the range of prevention/mitigation measures in place to manage those most significant scenarios, and to identify weaknesses/gaps that need to be addressed.

There is a limit to the amount of detailed information that can be included on the bowtie without compromising its use as a communication tool and a means of understanding, on a single diagram, how the hazard is managed. The bowtie will, therefore, through links to supporting critical documents, processes and responsibilities (see Section 3.3), serve as a 'headline' document showing the complete range of causes

and barriers, and providing signposts to evidence (e.g. detailed structural analysis, etc.) to support the claimed effectiveness of each individual barrier.

Figure 2: Bowties and Safety Cases



3 WORKSHOP DETAILS

3.1 Workshop Timing and Participants

The workshop was conducted on Monday 29th October at the Engineering Council's offices in London. Participants are summarised in Table 1 below.

Table 1: Workshop Participants

Name	Position	Organisation
George Adams	WG1 Chair	Engineering Council
James Breach	Policy	MHCLG
Brian Cox	CBSD Member	IMechE
Emma Fairman	Committee & Project Support Executive	Engineering Council
Sheryl Hurst	Facilitator	Risktec
Christopher Jones	IET Member	IET/Preface Ltd.
Tassos Kougionis	Principal Consultant	BSRIA
Chris O'Regan	IStructE Fellow	IStructE
Adreena Parkin	WG5 Chair	NFCC
Katy Turff	WG1 Secretariat	Engineering Council

3.2 Workshop Scope

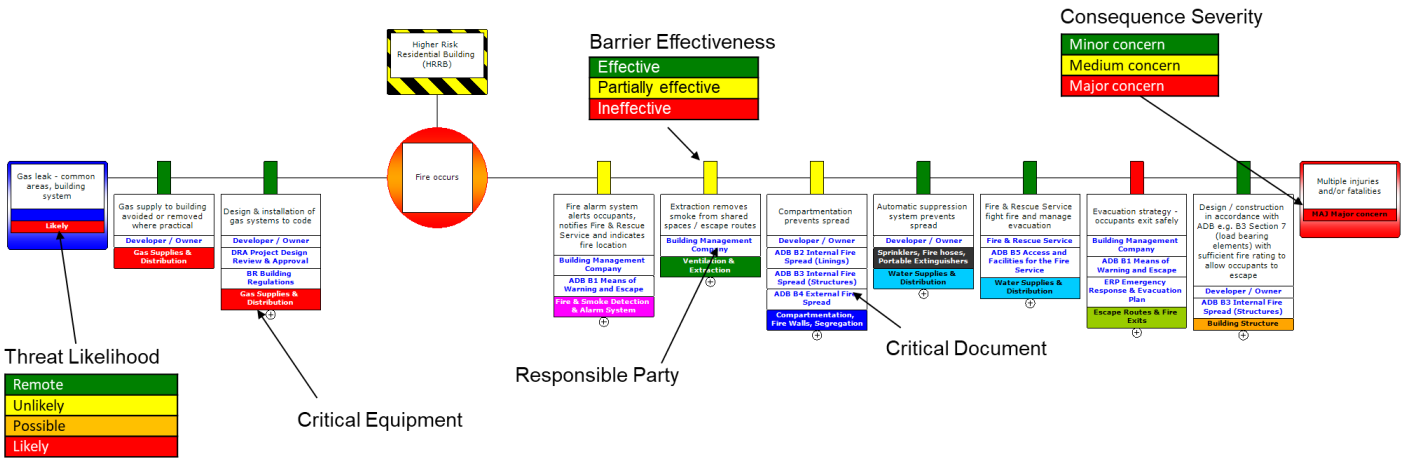
The scope of the workshop was to conduct a bowtie analysis for the significant hazard of 'fire in a HRRB'. The full range of potential causes and ultimate consequences of fire were considered.

It was assumed that the HRRB in question was existing and occupied, given that the vast majority of HRRBs that will fall under the recommended safety case approach will be in this category. However, the resulting bowtie would also be applicable during earlier stages of a building project (see Section 4.2).

3.3 Additional Information (Metadata)

Depending on the uses that the bowtie will be put to, further, more detailed information can be overlaid onto the bowtie diagram to support the analysis. Figure 3 shows the additional information that was solicited during the bowtie workshop.

Figure 3: Bowtie Additional Information



Each threat (cause) was labelled with a relative likelihood to show those threats which are more or less likely to occur. Note that the likelihood is the inherent likelihood of the *threat occurring*, and not the likelihood of

the threat *resulting* in a building fire (which would also require all the preventive barriers to fail). This inherent threat likelihood therefore gives an indication of how important the preventive barriers are for each threat; the more likely a threat is to occur, the more reliance is placed on the barriers to prevent that threat from leading to a fire.

Critical equipment is highlighted to indicate which prevention or mitigation barriers rely on systems or components of the building (Table 2).

Table 2: Critical Equipment

Critical Equipment
Building Security Systems
Building Structure
Compartmentation, Fire Walls, Segregation
Escape Routes & Fire Exits
Fire & Smoke Detection & Alarm System
Gas Supplies & Distribution
Lightning Protection
Power Supplies & Distribution Systems
Safety Signage
Sprinklers, Fire hoses, Portable Extinguishers
Ventilation & Extraction
Water Supplies & Distribution
Wet/Dry Risers, Fire Fighting Lift

Identifying critical items of equipment allows for owners (e.g. Project or Management Company) to identify standards of performance that have to be achieved by these items. Such standards may include functionality, reliability and survivability targets. By defining the standards based on hazard scenarios, and by having in place measures to assure that the standards of performance are achieved operationally, assurance is given that risks are being effectively managed throughout the HRRB's lifetime.

Critical documents (Table 3) are referenced where they provide relevant information about the barrier (although note that compliance with a referenced document may not be mandatory in all cases, provided equivalent measures are taken).

Table 3: Critical Documents

Code	Description
Approved Document	
ADA	Approved Document A
ADB B1	Approved Document B Part 1 - Means of Warning and Escape
ADB B2	Approved Document B Part 2 - Internal Fire Spread (Linings)
ADB B3	Approved Document B Part 3 - Internal Fire Spread (Structures)
ADB B4	Approved Document B Part 4 - External Fire Spread
ADB B5	Approved Document B Part 5 - Access and Facilities for the Fire Service
ADK	Approved Document K
ADM	Approved Document M
Regulations / Regulatory Documents	
FSO	Regulatory Reform (Fire Safety Order) / Fire Risk Assessment

Code	Description
ESR	Electrical Supply Regulations
BR	Building Regulations
CDM	CDM Regulations 2015 / O&M Manual
TS	Technical Submissions
Developer / Project Documents	
DRA	Project Design Review & Approval
PC	Procurement Controls
PMOC	Project's Management of Change Process
Building Management Company Documents	
MCMOC	Management Company's MOC Process
ERP	Emergency Response & Evacuation Plan
FRA	Fire Risk Assessment
IR	Inspection Records

The expected effectiveness of each prevention or mitigation barrier is indicated by the coloured vertical bar as shown in Figure 3. Barriers may be only partially effective or ineffective if they are unlikely to be present or, even if present, they may not prevent the threat leading to the fire, or may not prevent the ultimate consequence from arising from the fire.

Each barrier was assigned an owner to indicate who would be likely to have overall responsibility for ensuring that the barrier is in place and maintained in an effective state. As discussed in Section 4.2, for a building project at the design stage, responsibility for most barriers will rest with the developer and/or project design team, but as the building progresses towards occupation responsibility for some barriers will be transferred to the building management company. The bowtie presented in this report reflects this latter situation, i.e. an existing, occupied building.

The additional information shown was based on group consensus during the workshop; depending on the circumstances for a specific project or building, the effectiveness ratings, critical equipment, critical documents and responsibilities may differ from those shown in this report.

4 WORKSHOP RESULTS

The workshop output is recorded as a detailed bowtie diagram, with supporting information, illustrating the causes of a fire in an HRRB, the potential consequences and the existing and potentially desirable prevention and mitigation measures. The complete bowtie is presented, branch by branch, in Appendix A. Appendix B presents a list of all the prevention and mitigation barriers claimed on the bowtie, sorted by responsible party or barrier owner.

All threat and consequence branches (except one, see below) have a range of barriers, spanning design and occupation/operational risk control measures, with critical equipment and supporting documents highlighted and barrier owners assigned. Some barriers are legal requirements, or are established good practice and would be expected for a HRRB, and are indicated as such by having a relatively high effectiveness rating (i.e. they are likely to be present and effective or at least partially effective). Other barriers may be desirable or 'nice to have' but are less common and tend to be assigned a low effectiveness rating. When the bowtie is applied to actual buildings (see Section 4.1), these less effective, nice to have barriers could be the focus for discussions around what further steps are required to reduce risks to ALARP levels.

One consequence branch (social/psychological impact of a building fire) was not developed during the workshop; this scenario is believed to be being addressed by an alternative working group and so has been referred back to the IRG.

4.1 Use of the Bowtie Analysis Results

Ultimately the future use of the bowtie presented here is to be decided by the working group/IRG; the workshop was intended as a test case to trial the methodology but also to generate a bowtie diagram that might be used as a template or checklist for specific building projects or existing HRRBs when assessing their management of fire risk.

For example, the bowtie in Appendix A may be used as an audit checklist for an existing HRRB or new HRRB project, to verify that the full range of fire prevention and mitigation measures as depicted in the diagram are either in place or planned to be in place. The bowtie could also be used to question if there are any building-specific escalation factors present that would weaken the effectiveness of the barriers and hence require to be mitigated against by design or operational measures.

The bowtie diagram can be customised to reflect the audit findings, amending the barrier effectiveness and including additional barriers where extra steps have been/are being taken. Recommendations may be made where barriers are found to be ineffective or missing. The bowtie in Appendix A presents the working group's expectations and, therefore, where barriers do not exist for an actual HRRB or project it would be good practice to investigate whether the barrier, or its equivalent, could be introduced. In this way, the bowtie presented in this report is a template illustrating expected fire risk management measures.

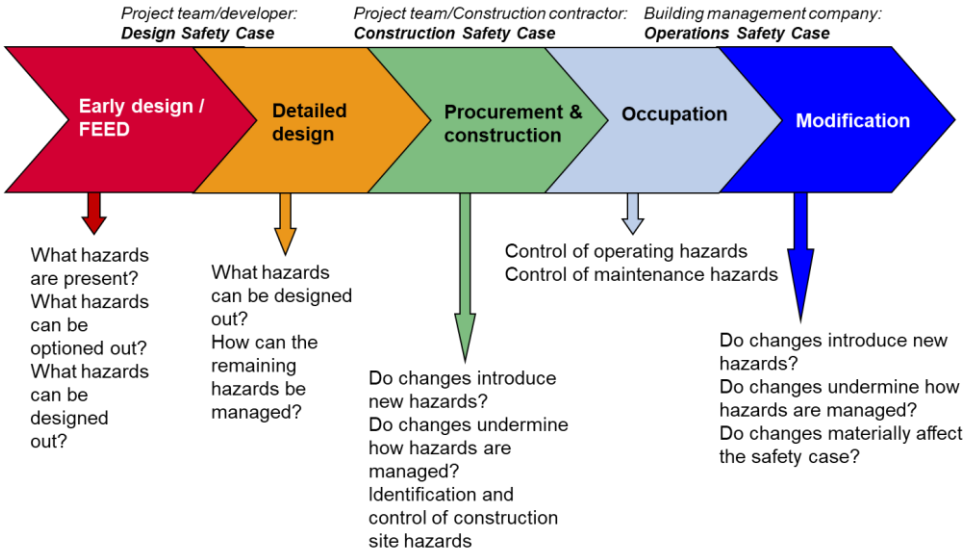
The list of barriers in Appendix B can also be used as a checklist, focussing in this case on the prevention and mitigation measures that are the responsibility of a single party. For example, the building management company could use the list to confirm the presence and quality of its barriers and supporting documentation as part of the building fire risk assessment required under the Regulatory Reform (Fire Safety) Order 2005.

4.2 Application of the Bowtie Through the Building Lifecycle

The bowtie generated in the workshop assumed an existing, occupied building. However, the same bowtie would be applicable to a new building project. In that case, the emphasis would be on design barriers and responsibilities of the developer, project team, etc. rather than operational barriers and the responsibilities of the future building management company and building occupants. The developer/project team could use the diagram in Appendix A and/or the list of barriers in Appendix B to confirm that all fire-related barriers have been considered as early as possible during the design.

At the early stage of a project (Figure 4), there is much more potential to eliminate or 'design out' hazards so a bowtie developed during early design may identify significant, effective barriers which greatly improve the inherent safety of the building. Conversely, once a building becomes occupied, the scope for risk reduction relies more heavily on operational, procedural controls and there is limited potential to change the design. A bowtie analysis conducted for the first time on an existing, aged building, may determine that some of the design stage barriers are either absent or ineffective, and alternative measures may be required to reduce the risk.

Figure 4: Building Lifecycle



As a building ages, there may be progressive degradation of barriers. This is illustrated on the bowtie in Appendix A by the use of escalation factors to highlight how uncontrolled modifications could undermine design barriers such as compartmentation; this specific escalation factor arises many times across the bowtie. Applying the bowtie to an existing building should therefore alert those responsible for managing and maintaining the building to the importance of having processes in place to properly plan and manage modifications.

Revisiting the bowtie analysis periodically through the lifecycle of a building will help to ward off progressive degradation; conducting a health check of bowtie barriers should provide an early warning of problems and allow for remedial action to be taken.

5 CONCLUSIONS

A bowtie analysis workshop was conducted by the Engineering Council's Competence Steering Group, Building a Safer Future, Working Group 1: Engineers on 29th October 2018, to assess the causes, consequences, prevention and mitigation of fire in a typical, existing, occupied HRRB.

The workshop output is presented in the form of a detailed bowtie diagram. A full range of barriers has been identified for all threat and consequence branches (except social/psychological impact of a building fire, which is the remit of a different working group). All barriers have critical equipment and supporting documents highlighted and barrier owners assigned. A table listing all the prevention and mitigation measures, sorted by responsible party, is also provided.

It is important that the designers, project team and management company recognise where their highest exposures lie. For the current bowtie diagram it is noted that a frequently occurring threat for fire within an apartment (arising from human action) also has the fewest and least effective barriers in place. Also, unusually in comparison to major hazard industries where bowties have been used traditionally, the threat branches overall each have a relatively low number of barriers and this places a greater reliance on the mitigation (right side) barriers rather than preventive measures.

It is therefore concluded that the objectives of the workshop have been met, specifically:

- the various measures which prevent or mitigate fire in an HRRB have been collected together, into one overarching bowtie diagram;
- the bowtie provides a template and reference point for fire risk management that can evolve with the lifecycle of the building, allowing knowledge and information to be transferred as the building transitions from early through detailed design, to construction and commissioning, and into occupancy;
- the bowtie diagram and tabulated supporting information is easily understood and may discourage development of a large, impenetrable safety case document;
- representatives from a range of engineering institutions participated in the workshop and contributed to the final bowtie diagram.

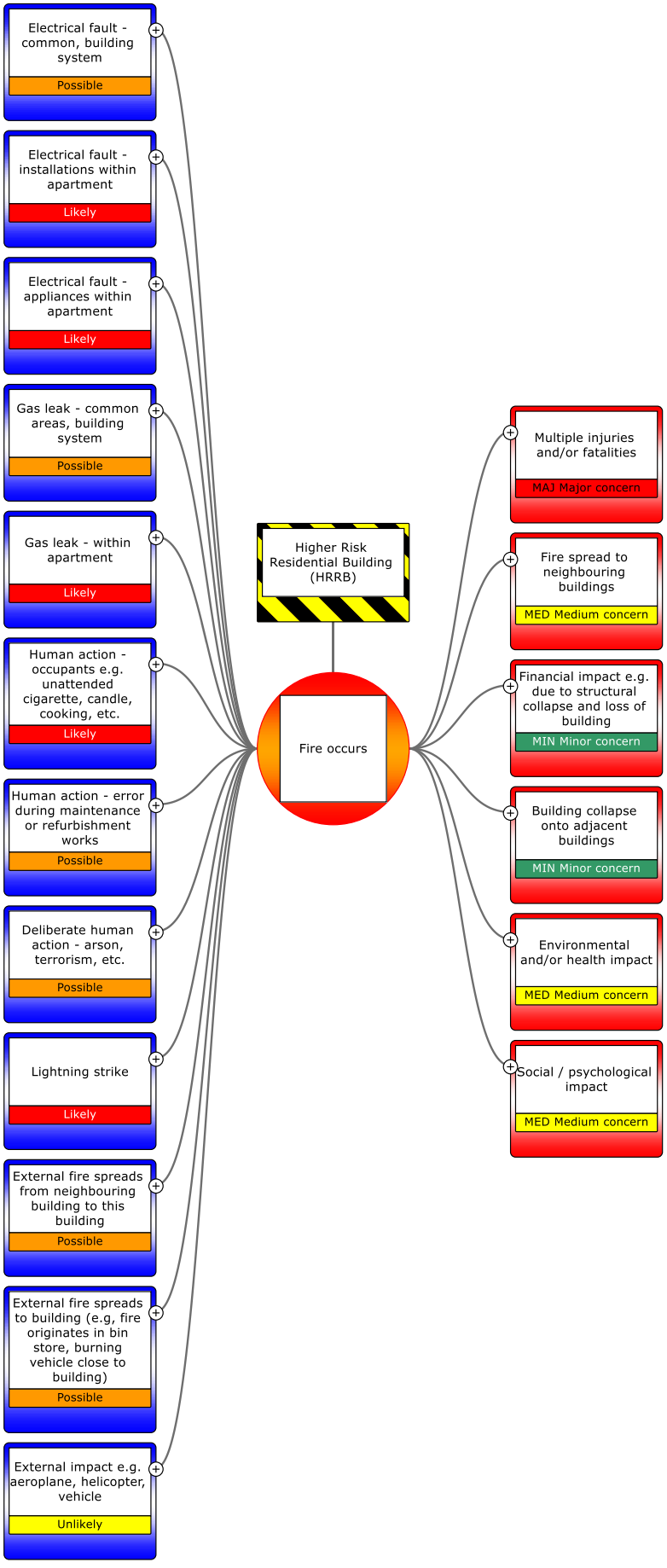
Ultimately the future use of the bowtie will be decided by the working group/IRG, however suggestions include:

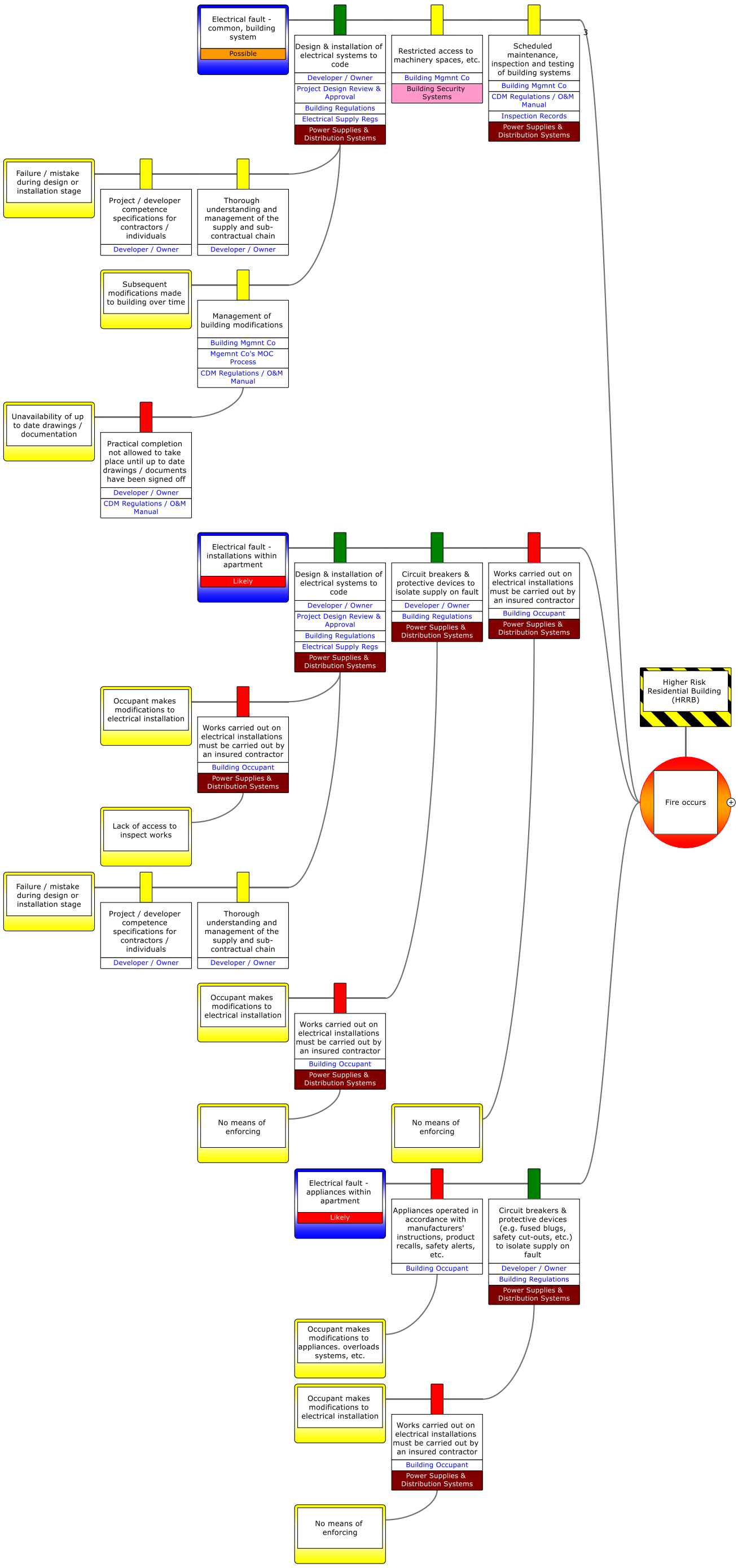
- as a template of expectations / good practice, for individual projects or existing buildings to use as a starting point, to develop their own bowtie analysis of their fire risk management provision;
- as an audit checklist for verifying arrangements comply with expectations and raising recommendations where expectations are not met;
- to highlight the importance of management of changes and modifications which may otherwise undermine the effectiveness of fire prevention or mitigation barriers;
- to conduct a periodic health check through the lifecycle of a building to avoid progressive degradation, provide an early warning of potential problems and allow for remedial action to be taken.

6 REFERENCES

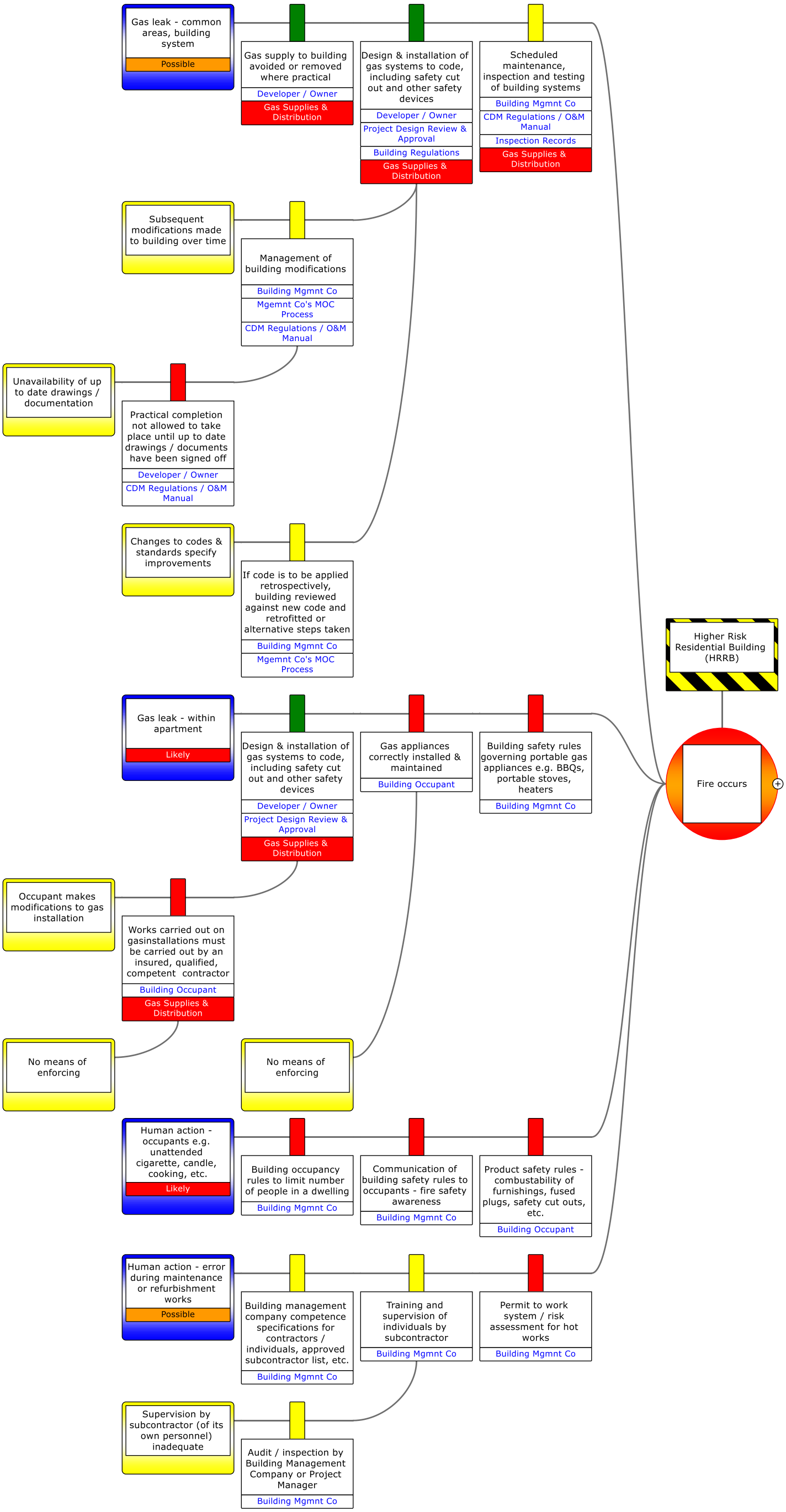
1. Building a Safer Future – Independent Review of Building Regulations and Fire Safety: Final Report, May 2018.

Appendix A DETAILED BOWTIE DIAGRAM – FIRE IN A HRRB

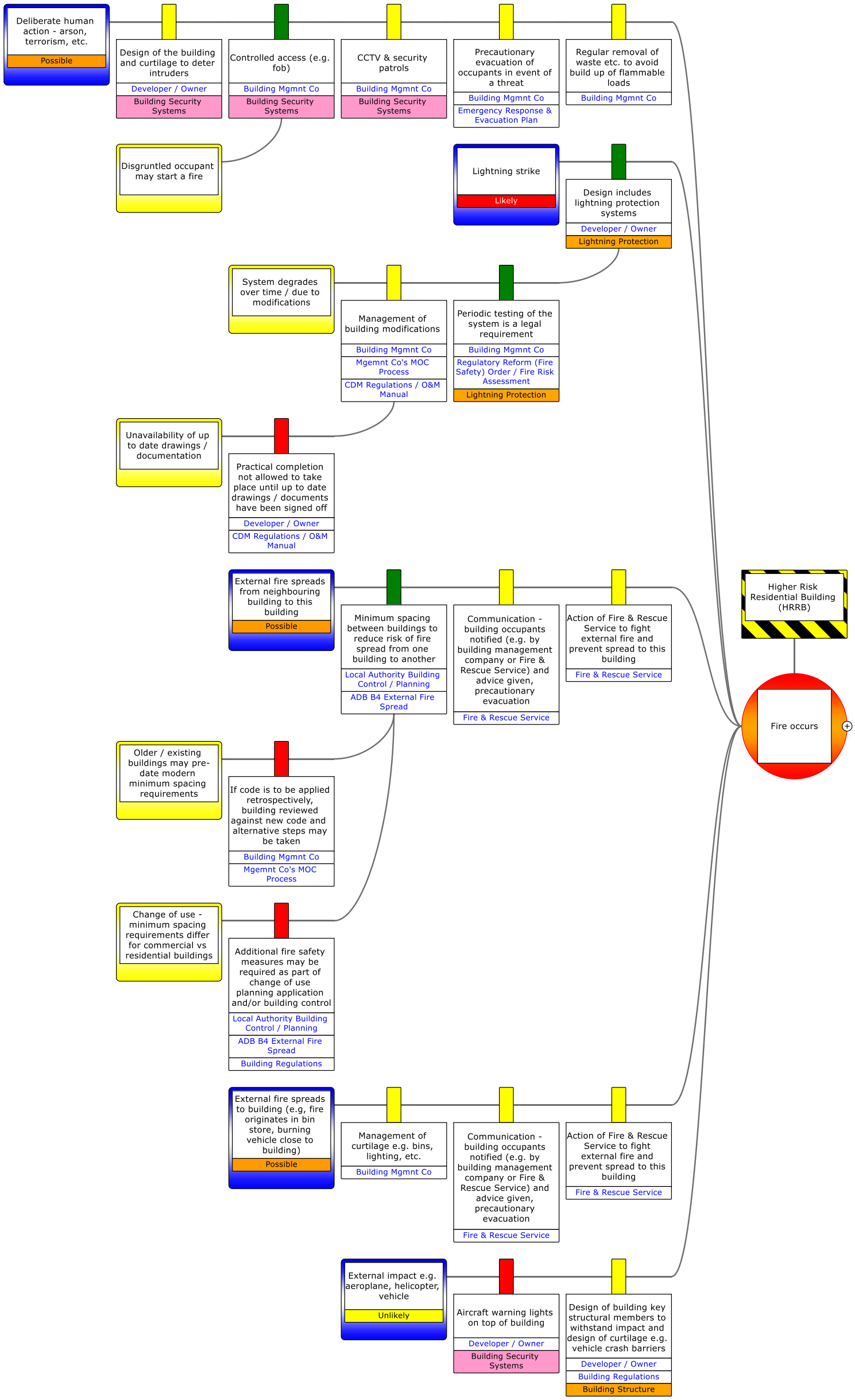




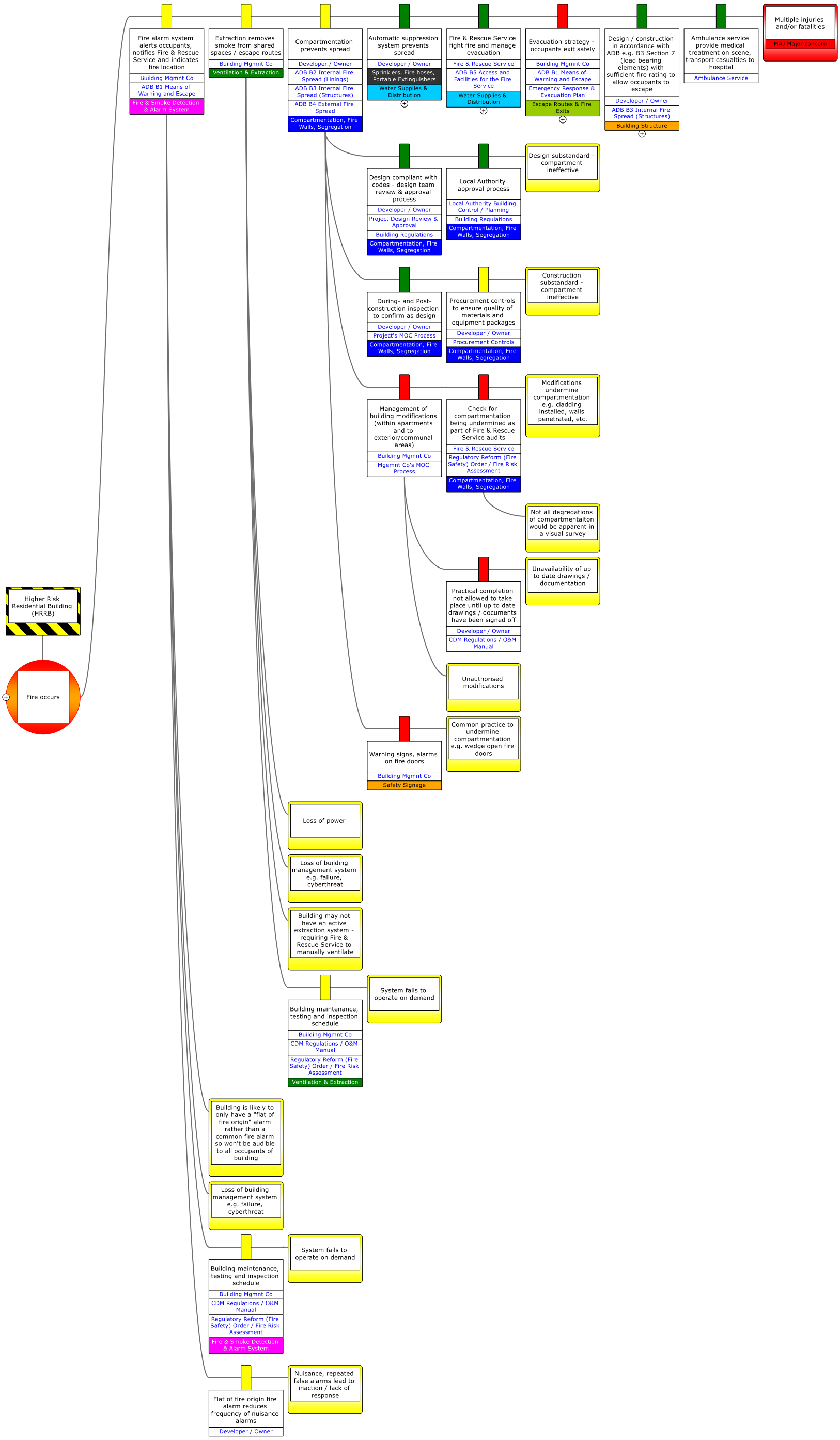
Threat Branches 1, 2 and 3 all barriers fully expanded



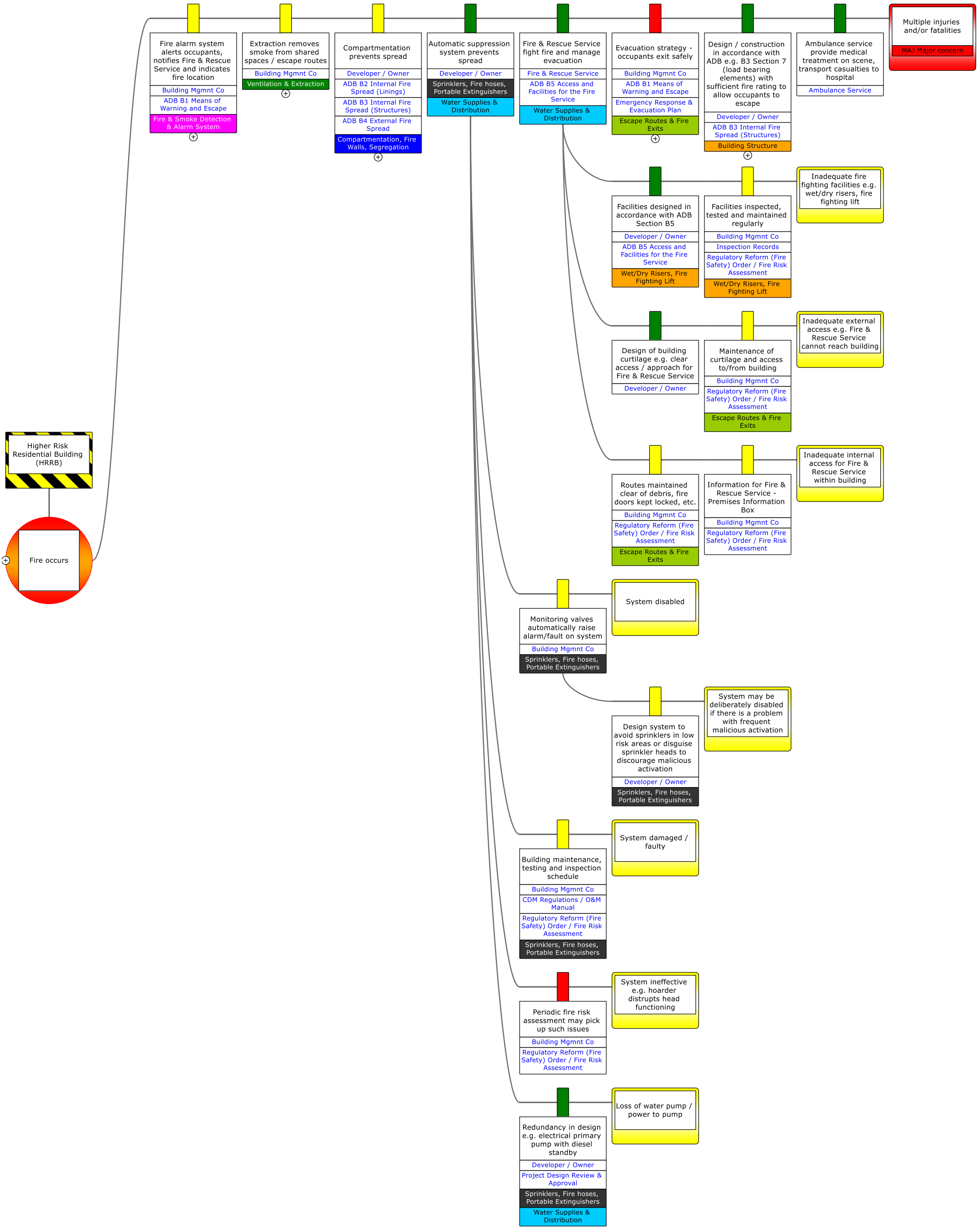
Threat Branches 4 to 7, all barriers fully expanded



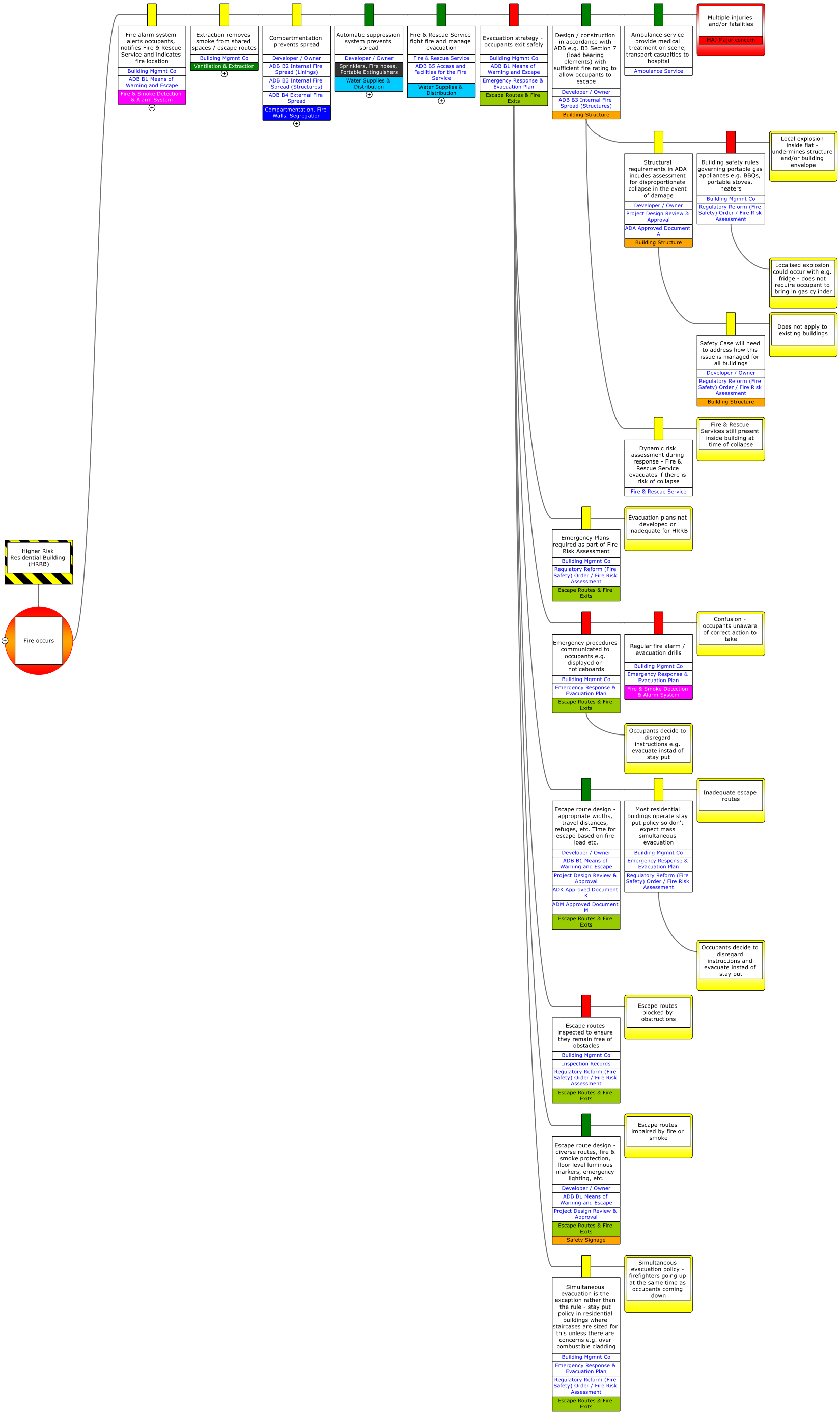
Threat Branches 8 to 12, all barriers fully expanded



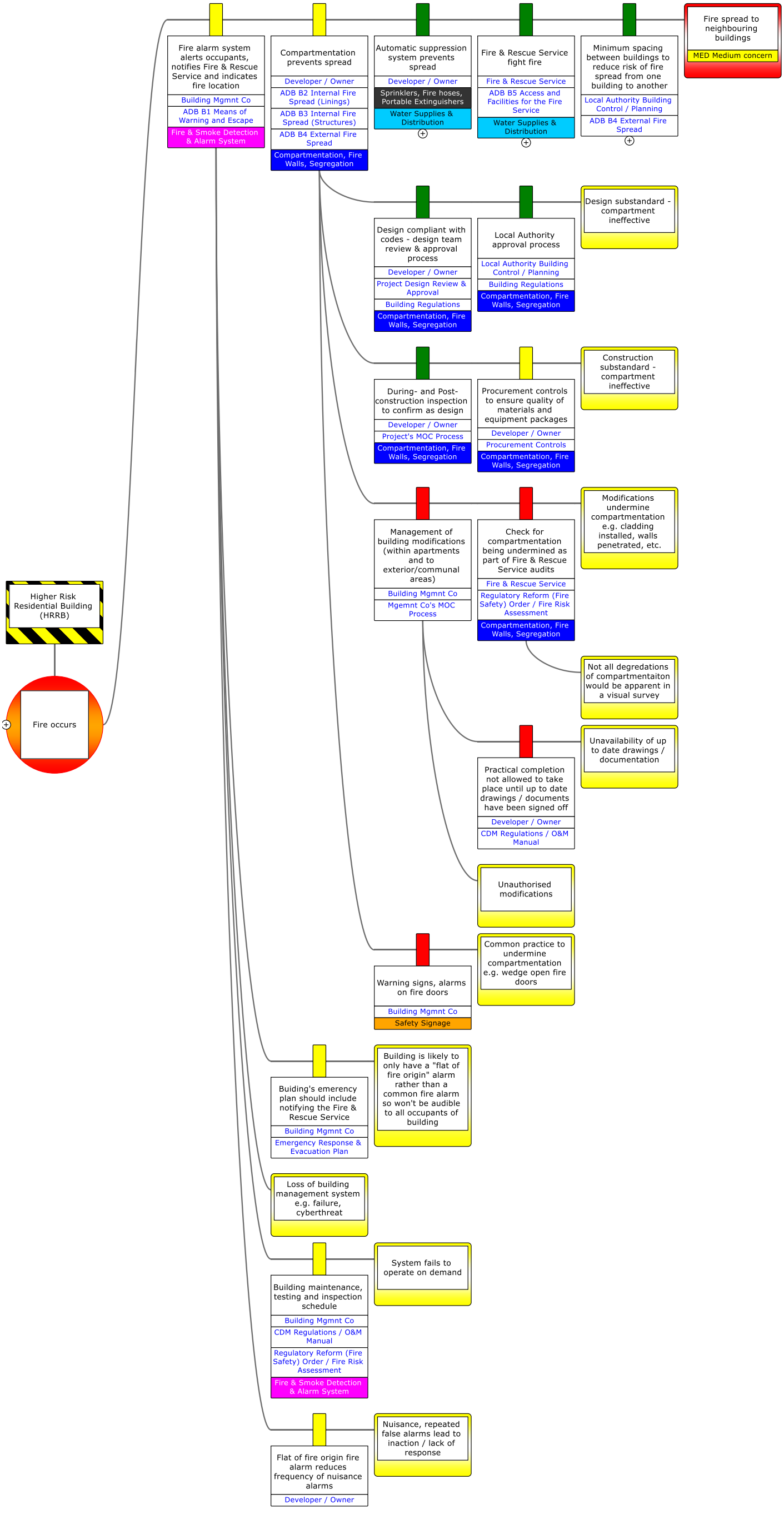
Consequence Branch 1, Barriers 1, 2 and 3 fully expanded



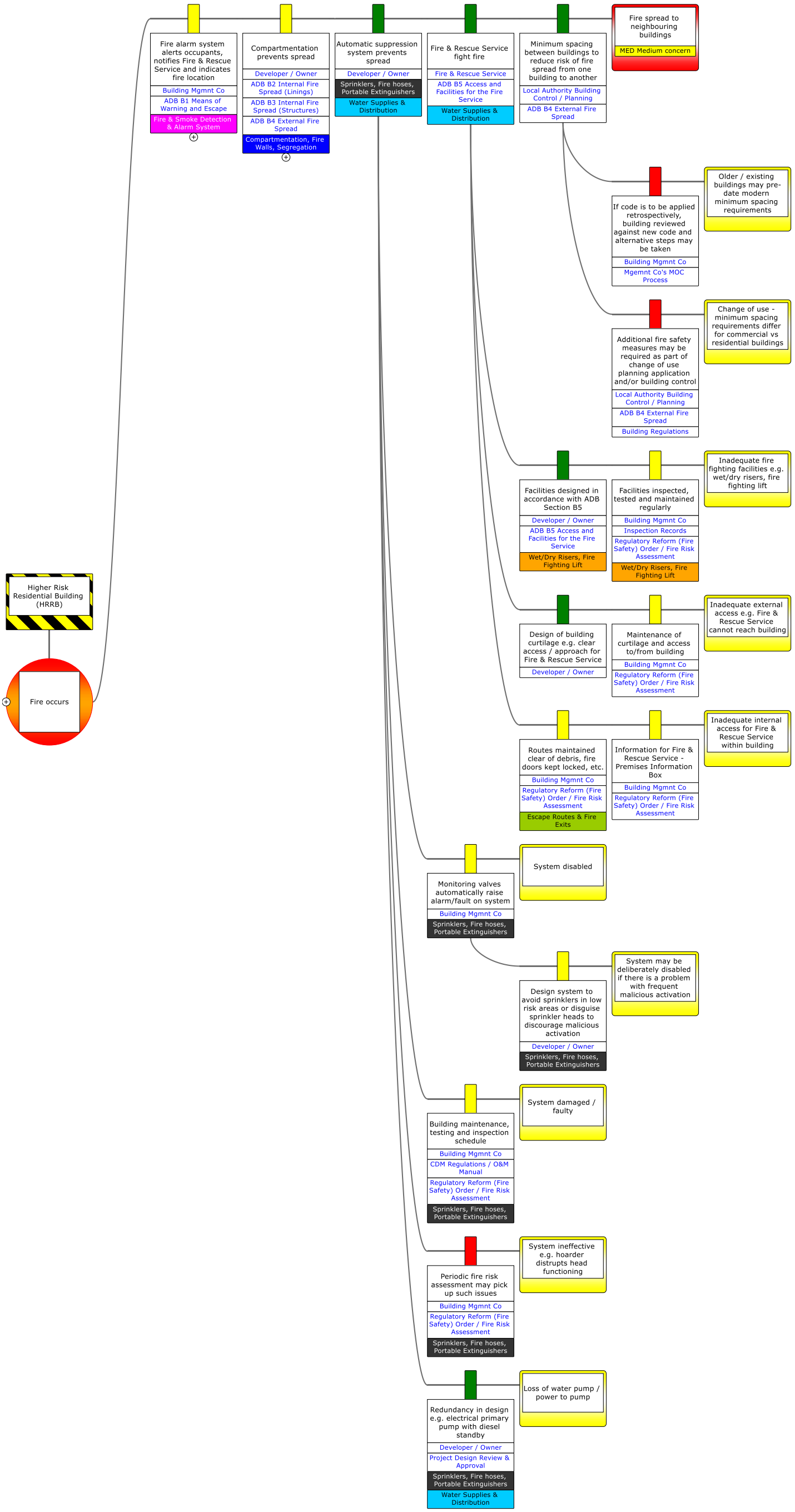
Consequence Branch 1, Barriers 4 and 5 fully expanded



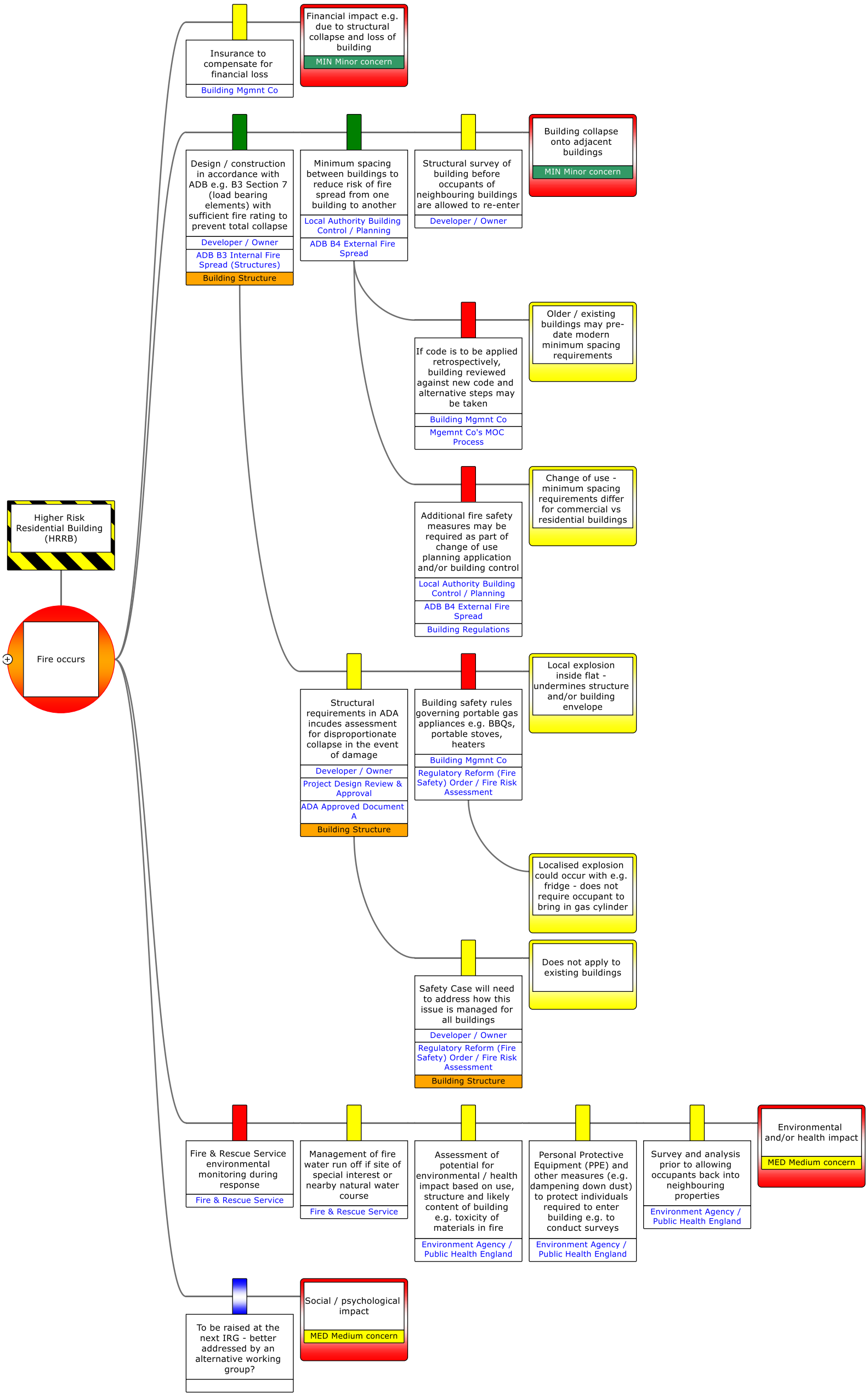
Consequence Branch 1, Barriers 6 and 7 fully expanded



Consequence Branch 2, Barriers 1 and 2 fully expanded



Consequence Branch 2, Barriers 3, 4 and 5 fully expanded



Consequence Branches 3 to 6, all Barriers fully expanded

Appendix B FIRE IN A HRRB – PREVENTION AND MITIGATION MEASURES

Accountable	Barrier	No	Effectiveness
Ambulance Service	Ambulance service provide medical treatment on scene, transport casualties to hospital		Effective
Building Mgmnt Co	Audit / inspection by Building Management Company or Project Manager		Partially Effective
Building Mgmnt Co	Building's emergency plan should include notifying the Fire & Rescue Service		Partially Effective
Building Mgmnt Co	Building maintenance, testing and inspection schedule	**5**	Partially Effective
Building Mgmnt Co	Building management company competence specifications for contractors / individuals, approved subcontractor list, etc.		Partially Effective
Building Mgmnt Co	Building occupancy rules to limit number of people in a dwelling		Ineffective
Building Mgmnt Co	Building safety rules governing portable gas appliances e.g. BBQs, portable stoves, heaters	**3**	Ineffective
Building Mgmnt Co	CCTV & security patrols		Partially Effective
Building Mgmnt Co	Communication of building safety rules to occupants - fire safety awareness		Ineffective
Building Mgmnt Co	Controlled access (e.g. fob)		Effective
Building Mgmnt Co	Emergency Plans required as part of Fire Risk Assessment		Partially Effective
Building Mgmnt Co	Emergency procedures communicated to occupants e.g. displayed on noticeboards		Ineffective
Building Mgmnt Co	Escape routes inspected to ensure they remain free of obstacles		Ineffective
Building Mgmnt Co	Evacuation strategy - occupants exit safely		Ineffective
Building Mgmnt Co	Extraction removes smoke from shared spaces / escape routes		Partially Effective
Building Mgmnt Co	Facilities inspected, tested and maintained regularly	**2**	Partially Effective
Building Mgmnt Co	Fire alarm system alerts occupants, notifies Fire & Rescue Service and indicates fire location	**2**	Partially Effective
Building Mgmnt Co	If code is to be applied retrospectively, building reviewed against new code and alternative steps may be taken	**3**	Ineffective
Building Mgmnt Co	If code is to be applied retrospectively, building reviewed against new code and retrofitted or alternative steps taken		Partially Effective
Building Mgmnt Co	Information for Fire & Rescue Service - Premises Information Box	**2**	Partially Effective
Building Mgmnt Co	Insurance to compensate for financial loss		Partially Effective
Building Mgmnt Co	Maintenance of curtilage and access to/from building	**2**	Partially Effective
Building Mgmnt Co	Management of building modifications	**3**	Partially Effective
Building Mgmnt Co	Management of building modifications (within apartments and to exterior/communal areas)	**2**	Ineffective
Building Mgmnt Co	Management of curtilage e.g. bins, lighting, etc.		Partially Effective
Building Mgmnt Co	Monitoring valves automatically raise alarm/fault on system	**2**	Partially Effective
Building Mgmnt Co	Most residential buidings operate stay put policy so don't expect mass simultaneous evacuation		Partially Effective
Building Mgmnt Co	Periodic fire risk assessment may pick up such issues	**2**	Ineffective
Building Mgmnt Co	Periodic testing of the system is a legal requirement		Effective
Building Mgmnt Co	Permit to work system / risk assessment for hot works		Ineffective
Building Mgmnt Co	Precautionary evacuation of occupants in event of a threat		Partially Effective
Building Mgmnt Co	Regular fire alarm / evacuation drills		Ineffective
Building Mgmnt Co	Regular removal of waste etc. to avoid build up of flammable loads		Partially Effective
Building Mgmnt Co	Restricted access to machinery spaces, etc.		Partially Effective
Building Mgmnt Co	Routes maintained clear of debris, fire doors kept locked, etc.	**2**	Partially Effective
Building Mgmnt Co	Scheduled maintenance, inspection and testing of building systems	**2**	Partially Effective
Building Mgmnt Co	Simultaneous evacuation is the exception rather than the rule - stay put policy in residential buildings where staircases are sized for this unless there are concerns e.g. over combustible cladding		Partially Effective
Building Mgmnt Co	Training and supervision of individuals by subcontractor		Partially Effective
Building Mgmnt Co	Warning signs, alarms on fire doors	**2**	Ineffective
Building Occupant	Appliances operated in accordance with manufacturers' instructions, product recalls, safety alerts, etc.		Ineffective
Building Occupant	Gas appliances correctly installed & maintained		Ineffective
Building Occupant	Product safety rules - combustability of furnishings, fused plugs, safety cut outs, etc.		Ineffective
Building Occupant	Works carried out on electrical installations must be carried out by an insured contractor	**4**	Ineffective
Building Occupant	Works carried out on gas installations must be carried out by an insured, qualified, competent contractor		Ineffective
Developer / Owner	Aircraft warning lights on top of building		Ineffective
Developer / Owner	Automatic suppression system prevents spread	**2**	Effective
Developer / Owner	Circuit breakers & protective devices (e.g. fused plugs, safety cut-outs, etc.) to isolate supply on fault		Effective
Developer / Owner	Circuit breakers & protective devices to isolate supply on fault		Effective
Developer / Owner	Compartmentation prevents spread	**2**	Partially Effective
Developer / Owner	Design & installation of electrical systems to code	**2**	Effective
Developer / Owner	Design & installation of gas systems to code, including safety cut out and other safety devices	**2**	Effective

Accountable	Barrier	No	Effectiveness
Developer / Owner	Design / construction in accordance with ADB e.g. B3 Section 7 (load bearing elements) with sufficient fire rating to allow occupants to escape		Effective
Developer / Owner	Design / construction in accordance with ADB e.g. B3 Section 7 (load bearing elements) with sufficient fire rating to prevent total collapse		Effective
Developer / Owner	Design compliant with codes - design team review & approval process	**2**	Effective
Developer / Owner	Design includes lightning protection systems		Effective
Developer / Owner	Design of building curtilage e.g. clear access / approach for Fire & Rescue Service	**2**	Effective
Developer / Owner	Design of building key structural members to withstand impact and design of curtilage e.g. vehicle crash barriers		Partially Effective
Developer / Owner	Design of the building and curtilage to deter intruders		Partially Effective
Developer / Owner	Design system to avoid sprinklers in low risk areas or disguise sprinkler heads to discourage malicious activation	**2**	Partially Effective
Developer / Owner	During- and Post-construction inspection to confirm as design	**2**	Effective
Developer / Owner	Escape route design - appropriate widths, travel distances, refuges, etc. Time for escape based on fire load etc.		Effective
Developer / Owner	Escape route design - diverse routes, fire & smoke protection, floor level luminous markers, emergency lighting, etc.		Effective
Developer / Owner	Facilities designed in accordance with ADB Section B5	**2**	Effective
Developer / Owner	Flat of fire origin fire alarm reduces frequency of nuisance alarms	**2**	Partially Effective
Developer / Owner	Gas supply to building avoided or removed where practical		Effective
Developer / Owner	Practical completion not allowed to take place until up to date drawings / documents have been signed off	**5**	Ineffective
Developer / Owner	Procurement controls to ensure quality of materials and equipment packages	**2**	Partially Effective
Developer / Owner	Project / developer competence specifications for contractors / individuals	**2**	Partially Effective
Developer / Owner	Redundancy in design e.g. electrical primary pump with diesel standby	**2**	Effective
Developer / Owner	Safety Case will need to address how this issue is managed for all buildings	**2**	Partially Effective
Developer / Owner	Structural requirements in ADA incudes assessment for disproportionate collapse in the event of damage	**2**	Partially Effective
Developer / Owner	Structural survey of building before occupants of neighbouring buildings are allowed to re-enter		Partially Effective
Developer / Owner	Thorough understanding and management of the supply and sub-contractual chain	**2**	Partially Effective
Environment Agency / Public Health England	Assessment of potential for environmental / health impact based on use, structure and likely content of building e.g. toxicity of materials in fire		Partially Effective
Environment Agency / Public Health England	Personal Protective Equipment (PPE) and other measures (e.g. dampening down dust) to protect individuals required to enter building e.g. to conduct surveys		Partially Effective
Environment Agency / Public Health England	Survey and analysis prior to allowing occupants back into neighbouring properties		Partially Effective
Fire & Rescue Service	Action of Fire & Rescue Service to fight external fire and prevent spread to this building	**2**	Partially Effective
Fire & Rescue Service	Check for compartmentation being undermined as part of Fire & Rescue Service audits	**2**	Ineffective
Fire & Rescue Service	Communication - building occupants notified (e.g. by building management company or Fire & Rescue Service) and advice given, precautionary evacuation	**2**	Partially Effective
Fire & Rescue Service	Dynamic risk assessment during response - Fire & Rescue Service evacuates if there is risk of collapse		Partially Effective
Fire & Rescue Service	Fire & Rescue Service environmental monitoring during response		Ineffective
Fire & Rescue Service	Fire & Rescue Service fight fire		Effective
Fire & Rescue Service	Fire & Rescue Service fight fire and manage evacuation		Effective
Fire & Rescue Service	Management of fire water run off if site of special interest or nearby natural water course		Partially Effective
Local Authority Building Control / Planning	Additional fire safety measures may be required as part of change of use planning application and/or building control	**3**	Ineffective
Local Authority Building Control / Planning	Local Authority approval process	**2**	Effective

Accountable	Barrier	No	Effectiveness
Local Authority Building Control / Planning	Minimum spacing between buildings to reduce risk of fire spread from one building to another	**3**	Effective

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Working Group 02 – Installers

Annex B – Working Group Terms of Reference

Working Group Two was established to agree a comprehensive and coherent framework for assuring competence levels for those installing and maintaining fire safety and other safety-critical systems for Higher-risk Residential Buildings, and any enhanced levels of competence that may be necessary.

The Group is led jointly by Build UK and the Fire Sector Federation, working on a comprehensive framework of competences for those installing fire safety and other safety-critical systems following the proposal on p.135, of the Building a Safer Future report.

WG2 will initially focus on those Fire Safety Systems that meet the following criteria:

- Active systems that seek to suppress or support the suppression of fire and its products
- Passive materials, products and systems that seek to control fire growth and spread and
- Detection, alarm and control systems that seek to alert and integrate actions to support escape, suppress or mitigate ignition and control fire development.

Each working group has been tasked with:

- A process for agreeing and monitoring competence frameworks
- A process for agreeing and monitoring accreditation and reaccreditation
- The period within which competence should be reassessed
- The method for demonstrating or proving competence
- Whether the competence requirements for those working on HRRBs should also be extended to cover other multi-occupancy residential buildings and to institutional residential buildings
- A programme of fire and system safety CPD and
- Identifying exemplars from other sectors and internationally.

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Working Group 02 – Installers

Annex C – Implementation Plan

WG2 Need to agree the following action plan and agree times scales			
Phase one – Addressing fundamental issues			
Recommendation – Assurance of Competency Route	**Action**	**Responsible party**	**Other parties**
Continue to gather evidence and data on different installer sectors	Produce a list of all installers expected to work on a HRRB	WG2	Early Adopters Group
	Review specific evidence and undertake mapping of Accredited Third Party Certification of individuals Consider how accredited third party certification of individuals schemes for persons could fit into the proposed framework.	WG2	Industry
	Continue gathering evidence from installer sectors on their competence framework	WG2	Industry
	Each installer sector needs to check if something different is needed for HRRB's	WG2	Industry
Agree Level 2 qualification as the minimum qualification standard required for fire systems installers.	Standard set by Sector Skills Body (SSB) in agreement with other industry bodies.	WG2	Awarding Bodies, Build UK, FSF, SSBs
Agree to follow agreed 'educational' terminology when developing training and qualifications.	Glossary of educational terms to be developed.	Ofqual/ Institute for Apprenticeships and Technical Education	
	CITB to develop a directive/guidance around language usage in relation to construction sector training and qualification in consultation with other on-CITB sectors.	CITB, non-CITB sector bodies (e.g. electrical, mechanical, plumbing)	Awarding Bodies, WG2
	Develop a directive/ guidance around language usage in relation to fire sector training and qualifications.	Awarding Bodies	FSF, WG2

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	Training providers and industry to recognise and adopt the agreed language.	WG2	Awarding bodies, SSBs
Training not equivalent to Level 2 or 3 qualification should be mapped or converted into the required qualification.	Work with affected sectors to turn training in to Level 2 or 3 qualifications.	WG2	Awarding Bodies, SSBs
Where a Level 2 qualification does not exist, one should be developed.	CSCS and partner schemes to identify the active and passive fire occupations where there isn't a Level 2 qualification.	CSCS, relevant partner schemes	
	Work with sectors which do not have a Level 2 qualification to identify best practice and agree how to meet the agreed standard.	WG2	Awarding Bodies, Build UK, FSF, SSBs
Cards featuring the CSCS logo should only be available to applicants demonstrating that they hold a minimum Level 2 or 3 qualification.	CSCS and partner schemes to start issuing new cards to operatives with a minimum Level 2 or 3 qualification.	CSCS, relevant partner schemes	WG2
	CSCS and industry to agree their position for holders of training and qualifications no longer recognised in addition to new training as a result of the implementation plan.	CSCS relevant partner schemes	Industry, WG2
Agreement made for UKAS, or other equivalent body, to audit CSCS.	Regular audit process proposal presented and approved by the CSCS Board	CSCS	UKAS, WG2, CITB, EngC, BAFE
Where they do not exist, industry to develop technical standards for installers, which competence can be assessed against.	Identify which active and passive systems have technical standards for installers and which do not	WG2	
	Develop technical standards for installers, for systems which do not have them	Relevant sectors	BSI, WG2
	Develop accredited third party certification schemes for assessing competence to the agreed industry standards	Relevant sectors	BSI, WG2
	Implement accredited third party certification schemes for assessing competence to the agreed industry standards	Relevant sectors	BSI, WG2
Phase two – Standardising content			
Recommendation – Assurance of Competency Route	**Action**	**Responsible party**	**Other parties**
Review fire safety content in all relevant Level 2 or 3 qualifications and update	Relevant SSB to systematically update National Occupational Standards (NOS) with the required content.	SSB	WG2

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training delivered.	Where other qualifications exist, the relevant sector and Awarding Bodies to update the required content	WG2	Awarding Bodies, Industry, SSBs
	WG2 to identify current training lacking the required fire safety content.	WG2	
	Industry to develop fire safety video content to be taught.	WG2	Industry
	Relevant SSBs and Awarding Bodies to update existing Level 2 or 3 qualifications with industry agreed content.	WG2	Awarding Bodies, Industry, SSBs
For each system, update the relevant qualifications in the following areas: • product interactions between relevant systems (including system failures) • additional training required specifically for HRRBs	Identify training requiring updates to product interactions.	WG2	WG12
	Industry to develop product interaction content to be taught.	WG2	WG12
	Update training to include a module on product/system interaction.	WG2	Awarding Bodies, Industry, SSBs
	Ensure suitable fire and additional HRRB safety questions are included in the Health, Safety and Environment test for all cards carrying the CSCS logo.	CITB, CSCS	
Occupational Work Supervision NVQ Level 3	WG2 scope expanded to agree common training for task supervisors	WG2	
	Map Occupational Work Supervision to other supervisory modules in Level 3 qualifications	WG2	SSB
	Update supervisory modules which do not meet the agreed standard	WG2	SSB, Industry,Awarding Bodies
Agree a robust industry-wide programme for CPD, in the form of refresher training and the maintenance of individual skills	Principles for CPD, in the form of refresher training and the maintenance of individual skills, to be agreed	WG2	
	Each sector to agree its CPD / refresher training	WG2	Industry
	Framework for implementation of CPD agreed	WG2	Industry
Support assessors	Investigate further industry requirements to support the knowledge and skills of industry assessors	WG2	Awarding Bodies, Industry, SSBs

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Early Adopters Group to undertake robust trial using CSCS/ partners schemes smart technology to ensure right operatives on site to undertake the right job.	Early Adopters Group to undertake a trial to assess their ability to understand an operative's skills, qualifications and experience via the information provided by CSCS and partner scheme smart card technology. To identify areas for improvement and opportunities for expansion.	Early Adopters Group	Early Adopters Group, CSCS and partner schemes, Industry, WG2
Phase three – Wider implementation			
Recommendation – Assurance of Competency Route	**Action**	**Responsible party**	**Other parties**
Rollout across wider construction industry.	CSCS in collaboration with partner schemes to produce a list of other installer occupations without a Level 2 qualification.	CSCS, partner schemes	WG2
	Use CSCS list of occupations to engage with industry. Prioritise the rollout of the programme based on this list.	CSCS, Industry	
	"Educational terminology" to be used as guidelines for other sectors.	WG2	Awarding Bodies, Industry, SSBs
	Repeat phase one and two processes for other occupations.	WG2	Awarding Bodies, Industry, SSBs
	Raise awareness of CSCS logo to domestic audience (householders and domestic contractors)	Industry Response Group	Government, Industry

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SPREADSHEET GUIDANCE:		Does a level 2 NVQ exist? Yes/No responses. If no NVQ, list alternate training (and level) under the qualification name column.	Please list the course title including: Level NVQ Other qualification standard	Does a level 3 NVQ exist? Yes/No responses. If no NVQ, list alternate training (and level) under the qualification name column.	Please list the course title including: Level NVQ Other qualification standard	Does an apprenticeship exist? If yes, please list at what level.	Please list the course title including: Level NVQ Other qualification standard	If no level 2 or 3 NVQ exists and no apprenticeship is available, please list what other training is available that covers the installation of this system. This could be manufacturers training, 3PC training or anything else. Please list the course title, the level (if appropriate) and who supplies the training.	If there is NVQ level training available, please list any suplimentary training that would help (but is note required) to develop an installers understanding. Please list the course title, the level (if appropriate) and who supplies the training.	Please list the organisation(s) who endorse this training.	What is the occupation listed on the CSCS for the installation of this product or system? Please list the title, the level and the colour of the card where relevant.	Is there any refresher or CPD training associated with the installation of this system? Are there any renewal requirements specific to this product or system? Please list how often the training is is and who provides the training.	What British Standards (BS), International Standards (ISO), European Norms (EN) or Publicly Available Standards (PAS) are associated with the installation of this product or system?	Please list any third party accredited companies that provide third party certification of these systems or of individuals who install these systems. Please detail whether the company is UKAS accredited and whether the certification relates to the product or the installer of the product.	Is there a reason to remove this system? Some refer to the same thing and some are not clear in what they refer to. If we chose to remove any systems from the original list, we need to document and explain any changes.
Fire Safety System	**Active or Passive**	**NVQ - Level 2?**	**Qualification Name**	**NVQ - Level 3**	**Qualification Name**	**Apprenticeship**	**Apprenticeship Name**	**Training (if no qualification)**	**Training (if additional to qualification)**	**Endorsed by**	**CSCS card occupation**	**CPD or renewal requirements**	**British / International Standards Numbers**	**Third Party accreditation/approval of technical competence and installation**	**Keep or remove?**
Automatic Water Sprinklers	Active	Yes	Level 2 NVQ in Mechanical Engineering Services - Heating and Ventilating Installation Level 2 NVQ Diploma in Heating and Ventilating Industrial and Commercial Installation	Yes	Level 3 NVQ in Mechanical Engineering Services Heating and Ventilating Installation Level 3 NVQ Diploma in Heating and Ventilating Industrial and Commercial Installation	No longer awarded	The level 3 NVQ is no longer awarded and is being replaced in England with Building Services Engineering Installer Apprenticeship Standard Replacements in Wales & NI: TBA Being replaced by: Building Services Engineering Installer Apprenticeship (Level 2) and Building Services Engineering Craftsperson (Level 3)	N/A		BESA & Building Services Engineering Skills Partnership	Engineering Services SKill.Lcard Skilled WorkerLevel 2 Advanced Craft - Level 3		BS 9251:2014 BS EN 16925:2018 BS EN 12845:2015/A (PUBLIC COMMENT)	IFCC Ltd FIRAS LPCB All BAFSA Members must hold TPC	Keep
			IQ Level 2 Certificate in fire sprinkler installation (QCF)					N/A	BAFSA - Fire Sprinkler installation, Level 2 Certificate in Fire Sprinkler Installation, IQ - 601/6460/8	BAFSA,BESA, XACT & Building Services Engineering Skills Partnership					
Emergency Lighting	Active	No		No		Yes - Level 3	Apprenticeship: Fire, Emergency and Security Apprenticeship Standard (3 year apprenticeship with End Point Assessment) - Fire & Emergency Light Pathway	UKAS, CertSure, FIA, Tavcom, ICEL/LIA			ECS Emergency & Security Systems Installer - Level 3		BS EN 50172:2004 BS 5266-8:2004 BS EN 60598-1:2008 BS EN 60598-2-22:1998	BAFE SP 203-4, BSI Kite Mark for Emergency Lighting, NICEIC Defined Scope in Emergency Lighting Installations.	Keep
Smoke Control Systems	Active	No		No		No				SCA			BS EN: 12101, BS9999, BS9991, and BS7346	IFC Certification SDI 19 scheme for installers of smoke control systems	Remove?
Gaseous Suppression Systems	Active	No		No		No		Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	Foundation Course in Passive Fire Protection		Passive Fire Protection		BS ISO 20338 BS ISO 14520-2:2006	BAFE SP203-3 LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep?
Portable Fire Extinguishers	Active	No		No		No		IFEDA, BFC, BAFE exams/certificates as identified in BS5306 parts 3 & 8				3 year refresher training needed to retain BAFE technician status (part of BAFE SP101)	BS 5306-8	BAFE SP101	Remove? - Consider CSCS definition of something that "materially affects the building"
Water Hydrants and Hose	Active	No		No		No		Manufacturers' training					BS EN 694:2001 BS 336:1989 BS EN 671-1:2001 BS EN 671-2:2001		Keep
Water Risers Wet and Dry	Active	Yes	Level 2 NVQ in Mechanical Engineering Services - Heating and Ventilating Installation Level 2 NVQ Diploma in Heating and Ventilating Industrial and Commercial Installation	Yes	Level 3 NVQ in Mechanical Engineering Services Heating and Ventilating Installation Level 3 NVQ Diploma in Heating and Ventilating Industrial and Commercial Installation	No longer awarded	The NVQ is being replaced in England with Building Services Engineering Installer (L2) and Building Services Engineering Craftsperson (L3) Apprenticeship Standards Replacements in Wales & NI: TBA Building Services Engineering Installer Apprenticeship (L2) and Building Services Engineering Craftsperson (L3)		IFEDA training – Dry riser course	BESA & Building Services Engineering Skills Partnership	Engineering Services SKill.Lcard Skilled Worker - Level 2 Advanced Craft - Level 3		BS 9990:2015	New BAFE Scheme SP105	Keep
Water mist sprinklers	Active	No		No		No		Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	Foundation Course in Passive Fire Protection	BAFSA,XACT	Passive Fire Protection		FM 5560	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Remove? - covered under automatic water sprinklers
Fire Detection and Alarm systems	Active	Yes	NVQ Level 2 Providing Electronic Security and Emergency Systems	Yes	NVQ Level 3 Providing Electronic Security and Emergency Systems • The FIA AO Level 3 in Fire Detection and Alarm Design Theory and Regulatory Requirements	Yes - Level 3	Apprenticeship – Fire Pathway - Fire, Emergency and Security Apprenticeship Standard (3 year apprenticeship with end point assessment)Fire Pathway	FIA, BFC, IFEDA, FPA, CertSure, Tavcom		BAFE	ECS/FIA Fire Detection and Alarm Systems Designer/ Installer/Commissioner/Maintainer (Blue and Gold)		BS 5839-1/6 BS 7671 BS EN 54-2:1997+A1:2006	1. BAFE SP203-1 2. LPS 1014 (Fire)	Keep
Fire curtains	Active	Yes	NVQ Level 2 Diploma in Specialist Installation Occupations (Door, Gate and Shutter Systems - Installation/Repair)	No		No					Labourer (Formally listed as a CRO, now agreed as laboring occupation)		ISO/TC 92/SC 2 N 714 (PROPOSAL)	LPCB - BRE, FIRAS - Exova, IFC – UKAS accredited	Keep
Fire resisting construction compartment walls and floors (including lift shafts)	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	ASFP and IFE	Passive Fire Protection			LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire door furniture	Passive	Yes	NVQ Level 2 Diploma in Specialist Installation Occupations (Door, Gate and Shutter Systems - Installation/Repair)	No		No		N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	ASFP and IFE	Door+K16+J15:L15+I15:L15 +G15:L15+K16+J15:L15+E 15:L15+K+J15:L15		BS EN 1634-1	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire doors/doorsets	Passive	Yes	NVQ Level 2 Diploma in Specialist Installation Occupations (Door, Gate and Shutter Systems - Installation/Repair)	No		No		N/A	Timber Fire Door - Installation, Repair & Maintenance	DHF and BRE	Door systems Engineer - Installation & Repair	BRE academy and DHF Fire Door inspection course - 6 hours	BS EN 1634-1	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire protection to floors (profiled metal deck, timber joist etc)	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	ASFP and IFE	Passive Fire Protection		BS EN 13381-7:2019 BS EN 13381-8:2013	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire protection to structural frame (Concrete, Steel & Structural Timber) etc)	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	ASFP and IFE	Pasive Fire Protection		BS 8414-2:2015+A1:2017 BS ISO 834-11:2014	LPCB - BRE, FIRAS - Exova, IFC – UKAS accredited	Keep
Fire resisting air transfer grilles	Passive	Yes	NVQ Level 2 in Mechanical Engineering Services - Heating and Ventilating Ductwork Installation NVQ Level 2 Diploma in Heating and Ventilating - Ductwork Installation	Yes	NVQ Level 3 in Mechanical Engineering Services - Heating and Ventilating Ductwork Installation NVQ Level 3 Diploma in Heating and Ventilating Ductwork Installation	No longer awarded	The level 3 NVQ is no longer awarded and is being replaced by Building Services Engineering Ductwork Craftsperson apprenticeship standard.	N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	1. CFA - Construction Fixing Association 2. Damper Manufacture 3. Manufacture Company Own Product - CPD accreditations	Advanced craft	Yes - Installer CPD certificate once one has passed the training.	BS EN 1634-1	TPC by LPCB, LPS1531 Exova Warrinton accredited and FIRAS Scheme	Keep
Fire resisting ducts and dampers	Passive	Yes	NVQ Level 2 in Mechanical Engineering Services - Heating and Ventilating Ductwork Installation NVQ Level 2 Diploma in Heating and Ventilating - Ductwork Installation NVQ Level 2 in Passive Fire Protection	Yes	NVQ Level 3 in Mechanical Engineering Services - Heating and Ventilating Ductwork Installation NVQ Level 3 Diploma in Heating and Ventilating Ductwork Installation	No longer awarded	The level 3 NVQ is no longer awarded and is being replaced by Building Services Engineering Ductwork Craftsperson apprenticeship standard.	N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	1. CFA - Construction Fixing Association 2. Damper Manufacture 3. Manufacture Company Own Product - CPD accreditations	Advanced craft Passive Fire Protection	Yes - Installer CPD certificate once one has passed the training.	BS 9999 BS EN 15650:2010 BS ISO 21925-1:2018	TPC by LPCB, LPS1531 Exova Warrinton accredited and FIRAS Scheme	Keep
Fire Resisting Glazing	Passive	Yes	NVQ Level 2 Diploma in Fire Resistant Glazing	Yes	NVQ Level 3 Diploma in Fire Resistant Glazing	No		N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	Glass and Glazing Federation (GGF)	Fire Resistant Glazier		BS EN 12150 BS EN 14449	IFC, FIRAS	Keep
Fire resisting suspended ceilings	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		Yes - Level 2	Passive Fire Protection Apprenticeship Scheme	N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	ASFP and IFE	Passive Fire Protection		BS EN 13964	The Loss Prevention Certification Board (LPCB) UKAS accredited third party	Keep
Fire shutters e.g. metal roller shutters	Passive	Yes	NVQ Level 2 Diploma in Specialist Installation Occupations (Door, Gate and Shutter Systems - Installation/Repair)	No		No		N/A	Fire Doors & Shutters Training Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	DHF and BRE	Door systems Engineer - Installation & Repair		BS EN 1634-1	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire-stopping (penetration seals, linear joint seals and cavity barriers)	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A		ASFP	Pasive Fire Protection		BS EN 1366-4:2006 (+A1:2010) BS 9999	LPCB - BRE, FIRAS - Exova, IFC – UKAS accredited	Keep
Protective External Cladding, Rainscreens and Insulation	Passive	Yes	NVQ Level 2 Diploma in Cladding and Rainscreen NVQ Level 2 Insulation and Building Treatments (Construction) - External Wall	No		Yes - NVQ Level 2	External Wall Insulation	N/A		CITB	Specialist Cladding & Rainscreen Operative External Wall Insulation installer		BS 8414		Keep
Roofing & Cladding	Passive	Yes	NVQ Level 2 Diploma in Cladding Occupations (Construction - Roof sheeting & cladding)	Yes	NVQ Level 3 Diploma in Cladding Occupations (Construction - Roof & wall sheeting & cladding)	Yes - NVQ Level 2	Diploma in Cladding Occupations (Construction - Roof sheeting & Cladding)	N/A	Foundation Course in Passive Fire Protection	ASFP and IFE	Specialist Cladding & Rainscreen Operative Roof Sheeter & Cladder (blue or gold)	CITB Specialist Applied Skills Programme – Building Envelope Operative (Gains a VQ level 2, 18 month programme)	Depends on the type of roofing and cladding	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Roofing - Roof Slater and Tiler	Passive	Yes	NVQ Level 2 Diploma in Roofing Occupations (RQF): Roof Slater, Roof Tiler, Roof Slater & Tiler	Yes	NVQ Level 3 Diploma in Roofing Occupations (RQF): Roof Slater, Roof Tiler, Roof Slater & Tiler	Yes - Multiple levels	Level 2 Diploma in Roofing operations NVQ Level 2 Diploma in Roof Slating & Tiling NVQ Level 3 Diploma in Roofing Occupations – Roof Slater & Tiler	N/A			Roof Slater and Tiler - New Roof (blue) Roof Slater & Tiler - Re Roof (blue and gold)	CITB Specialist-Applied Skills Programme – Pitched Roofing Installation Operative (Gains a VQ level 2, 18 month programme)	BS 5534 BS 8000-6: 2013		Keep
Roofing - Reinforced Bitumen Membrane	Passive	Yes	NVQ Level 2 Diploma in Waterproof Membrane Roofing Systems –Reinforced Bitumen Membrane Roofing	No		Yes - NVQ Level 2	NVQ Level 2 Construction Diploma in Built-up Felt Roofing NVQ Level 2 Diploma in Waterproof Membrane Roofing systems – Reinforced Bitumen Membrane Roofing	N/A			Built Up Felt Roofer	Basic Competency Programme (BCP/Manufacturers Training)	BS 8217:2005		Keep
Roofing - Single Ply	Passive	Yes	NVQ Level 2 Diploma in Waterproof Membrane Roofing Systems – Single Ply Membrane Roofing	No		Yes - NVQ Level 2	Specialist Applied Skills (SAP) – NVQ Level 2 Diploma in Waterproof Membrane Roofing Systems – Single Ply Membrane Roofing	N/A			Single Ply Roofer		BS 6229		Keep
Roofing - Liquids	Passive	Yes	NVQ Level 2 Diploma in Waterproof Membrane Roofing Systems – Liquid Applied Membrane Roofing Systems	No		Yes - Level 2	CITB Specialist-Applied Skills Programme - Liquid Roofing Operative (Gains a VQ level 2, 18 month programme).	N/A			Liquid Waterproofing Operative	Basic Competency Programme (BCP/Manufacturers Training)			Keep
Roofing - Lead, Hard and Soft Metal Roofing Operative	Passive	Yes	NVQ Level 2 Diploma in roofing Occupations – Fully Supported Lead and Hard Metal Roofer & Cladder	No		Yes - Level 3	CITB Specialist-Applied Skills Programme - Lead Roofing Operative (Gains a VQ level 2, 18 month programme)	N/A			Roofer - Specialist Lead Worker		BS EN 501: 1994 ,BS EN 502 :2013, BS EN 504 :2000 , BS EN 505 :2013, BS EN 507 :2000, BS EN 988 :1997, BS 6915 :2001, BS EN 12588:2006, BS EN 14782		Keep
Roofing - Mastic Asphalt	Passive	No		Yes	NVQ Level 3 Diploma in Mastic Asphalting	Yes - Level 3	Level 3 NVQ Diploma in Mastic Asphalting	N/A			Mastic Asphalting (gold)		BS 8218:1998		Keep

Smoke control ducts and dampers	Passive	Yes	NVQ Level 2 in Mechanical Engineering Services - Heating and Ventilating Ductwork Installation NVQ Level 2 Diploma in Heating and Ventilating - Ductwork Installation NVQ Level 2 in Passive Fire Protection	Yes	NVQ Level 3 in Mechanical Engineering Services - Heating and Ventilating Ductwork Installation NVQ Level 3 Diploma in Heating and Ventilating Ductwork Installation	No longer awarded	The level 3 NVQ is no longer awarded and is being replaced by Building Services Engineering Ductwork Craftsperson apprenticeship standard.	N/A	Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	1. CFA - Construction Fixing Association 2. Damper Manufacture 3. Manufacture Company Own Product - CPD accreditations	Advanced craft Skill card - Ductwork erector/installer Passive Fire Protection	Yes - Installer CPD certificate once one has passed the training.	BS EN 1366-8	TPC by LPCB, LPS1531 Exova Warrinton accredited and FIRAS Scheme	Keep
Structural Columns and Beams	Passive	No		No		No		Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection		ASFP	Passive Fire Protection		BS EN 13381-4:2013	LPCB - BRE, FIRAS - Exova, IFC – UKAS accredited	Remove? - These are not really products that are installed. Greater clarity needed on what this covers?
Fire resisting construction: composite floors	Passive	No		No		No		Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	Foundation Course in Passive Fire Protection		Passive Fire Protection			LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep?
Fire resisting construction: active barrier systems	Passive	No		No		No		Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	Foundation Course in Passive Fire Protection		Passive Fire Protection			LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep?
Fire stopping and penetration seals - Ablative coated stone wool batts	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Foundation Course in Passive Fire Protection	ASFP	Passive Fire Protection		EN 1366 Series BS EN 13162:2012 (+A1:2015) BS476 Part 20 and EN 1366-3	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire stopping and penetration seals - Bags / Pillows	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Foundation Course in Passive Fire Protection	ASFP	Passive Fire Protection		EN 1366 Series BS EN 1366-3:2009	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire stopping and penetration seals - Mortar	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Foundation Course in Passive Fire Protection	ASFP	Passive Fire Protection		EN 1366 Series BS476: Part 20 EN1366-3	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire stopping and penetration seals - Pipe closures	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Foundation Course in Passive Fire Protection	ASFP	Passive Fire Protection		EN 1366 Series	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire stopping and penetration seals - Plugs	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Foundation Course in Passive Fire Protection	ASFP	Passive Fire Protection		EN 1366 Series	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire stopping and penetration seals - Fire barriers	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Foundation Course in Passive Fire Protection	ASFP	Passive Fire Protection		BS EN 1366-12:2014/A2 (UNPUBLISHED)	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire stopping and penetration seals - Curtain wall seals	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Foundation Course in Passive Fire Protection	ASFP	Passive Fire Protection		BS EN 13830:2015	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire stopping and penetration seals - Cable transits and sleeves	Passive	Yes	NVQ Level 2 Diploma in associated industrial services occupations - passive fire protection (construction)	No		No		N/A	Foundation Course in Passive Fire Protection	ASFP	Passive Fire Protection		EN 1366 Series	LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Keep
Fire-retardant systems	Passive	No		No		No		Institution of Fire Engineers Level 2 Certificate in Passive Fire Protection & Level 3 Certificate in Passive Fire Protection	Foundation Course in Passive Fire Protection		Passive Fire Protection			LPCB - BRE (The Loss Prevention Certification Board) FIRAS - Exova (Fire Certification Scheme) IFC - UKAS accredited	Remove - what does this cover?

Annex B – WG3 Recommendations for 'Fire Engineering' core knowledge across other disciplines.

Recommended 'Fire Engineering' competencies	**Reasoning**	**How can it be implemented?**
General. In line with Angus Law's comments to an early meeting of the CSG, WG3 recommends that there are 3 vital 'facets' that need to be covered in each of the WG's reports as follows: 1. Professionalism & ethics (statement of ethics etc). 2. Core Knowledge and Competencies that need to be considered as common to all disciplines. 3. Discipline-specific knowledge/competency.	Item 2 here can be considered akin to 'foundation' knowledge for Fire Engineering (a little like the 'foundation' mathematics which is required of undergraduates studying for different engineering degrees. **In this respect, WG3 will be making its own recommendation as follows for Fire Engineers:** • Any Fire Engineer should be bound and held to account by a code of conduct and ethics. • A minimum standard of relevant competence should be required for a Fire Engineer. • Professional registration with an appropriate body licensed by the Engineering Council, should be made a requirement for those carrying out Fire Engineering work on an 'in scope' building. • A preparedness for whistleblowing should be accepted and expected.	
WG1 – Engineers. a) Awareness of legal responsibilities and accountability set by duties under Building Act and CDM etc. b) Core definitions and principles relating to fire safety in buildings e.g. i. What is compartmentation? ii. Inter-reliance of B1 to B5 issues c) WG3 expects that WG1 will recommend that designs/construction to be signed off by a registered engineer.		
WG2 – Installers. a) Importance of fire compartmentation for anything that is M&E related.	i.e. don't just do 'what you did on the last job' that you think was the same.	

b) Importance of checking that the installation meets the requirements of the project-specific specification. c) WG3 expects that WG1 will recommend that designs/construction to be signed off by a registered engineer.		
WG3 – Fire Engineers. *[see the content of this document]*		
WG4 – Fire Risk Assessors. **a)** Request to see and be able to understand the building fire strategy (i.e. interrelation of B1 to B5 aspects). **b)** Be able to identify whether the Fire Risk Assessor needs to ask the Responsible Person for a Fire Strategy report for the Fire Risk Assessor to do a suitable and sufficient Fire Risk Assessment.	*"I have to be able to understand how this building has been designed to do an acceptable Fire Risk Assessment".* *e.g. cause and effects for smoke control system.*	
WG5 – Fire Safety Enforcement Officers. a) Understand interplay between Building Regulations, Approved Document B, Fire Safety Order and guidance in support of the FSO. E.g. i. Building Act – sets duties for compliance. ii. Building Regs – sets functional/prescriptive (i.e. new Reg 7) legislative requirements for duty holders. iii. Approved Documents and British Standards etc – guidance which, if followed, may evidence compliance with requirements, but may not be sufficient in some circumstances. iv. Understanding properly justified alternative approaches to AD/BS guidance. b) Knowing when it is appropriate to bring in a Fire Engineer for peer review. c) Be able to understand the fire strategy in relation to B1-B5 rather		

than simply 'measuring' it against AD/BS guidance.		
WG6 – Building Control/Building Standards Inspectors. a) Being able to assess the competency of those providing Fire Engineering solutions and carrying out any fire safety work that is subject to Building Regulations approval. b) Understand interplay between Building Regulations, national design guidance (e.g. the Approved Document B), Fire Safety Order and guidance in support of the FSO. E.g. **i.** Building Act – sets duties for compliance. **ii.** Building Regs – sets functional/prescriptive (i.e. new Reg 7) technical requirements for duty holders. iii. Approved Documents and British Standards etc – guidance which, if followed, may evidence compliance with requirements but may not be sufficient in some circumstances. iv. Acceptance of properly justified alternative approach to AD/BS guidance. c) Knowing when it is appropriate to bring in a Fire Engineer for peer review. d) Be able to understand the fire strategy in relation to B1-B5 rather than simply 'measuring' it against AD/BS guidance.		
WG7 – Building Designers / Architects. a) Core definitions and principles relating to fire safety in buildings e.g. i. What is compartmentation? ii. Inter-reliance of B1 to B5 issues b) Understand interplay between Building Regulations, Approved Document B, Fire Safety Order and guidance in support of the FSO. E.g. **i.** Building Act – sets duties for	The competencies required of an Architect are by necessity broad and detailed to help deliver a 'fire safe' building and they will need the assistance of competent professionally qualified fire engineers to do this. These recommendations are made by WG3 on the basis that WG3's recommendations for involvement	RIBA to work with the Institution of Fire Engineers (IFE) on an IFE-accredited 'FAQ course' on understanding of fire engineering for designers.

compliance. **ii.** Building Regs – sets functional/prescriptive (i.e. new Reg 7) legislative requirements for duty holders. iii. Approved Documents and British Standards etc – guidance which, if followed, may evidence compliance with requirements but may not be sufficient in some circumstances. iv. Understanding of properly justified alternative approach to AD/BS guidance. c) Be able to understand the fire strategy in relation to B1-B5 rather than simply 'measuring' it against AD/BS guidance. d) To be able to interpret the contents of the fire safety strategy and use the technical information therein to produce an architectural concept that delivers acceptable fire safety (especially means of escape and fire-fighting access and facilities) e) To be able to use the fire safety strategy as a key reference source for producing specifications for elements having a fire protection function (both passive and active fire protection) **f)** Being able to transfer the key components of the fire strategy onto plan drawings. **g)** Understand difference between certification, test and classification reports and product datasheets.	of a Fire Engineer at RIBA Stage 1 will be implemented.	
WG8 – Building Safety co-ordinators. a) Core definitions and principles relating to fire safety in buildings e.g. i. What is compartmentation? ii. Inter-reliance of B1 to B5 issues b) Understand interplay between Building Regulations, Approved Document B, Fire Safety Order and guidance in support of the FSO. E.g. **i.** Building Act – sets duties for compliance. **ii.** Building Regs – sets functional/prescriptive (i.e. new Reg 7) technical		

requirements for duty holders. iii. Approved Documents and British Standards etc – guidance which, if followed, may evidence compliance with requirements but may not be sufficient in some circumstances. iv. Understanding of properly justified alternative approach to AD/BS guidance. c) Understand the need for a building fire strategy and how that building fire strategy works.		
WG9 – Site Supervisors. a) Core definitions and principles relating to fire safety in buildings e.g. i. What is compartmentation? ii. Inter-reliance of B1 to B5 issues b) Understand the need for a building fire strategy and how that building fire strategy works. c) Understand interplay between Building Regulations, Approved Document B, Fire Safety Order and guidance in support of the FSO. E.g. **i.** Building Act – sets duties for compliance. **ii.** Building Regs – sets functional/prescriptive (i.e. new Reg 7) legislative requirements for duty holders. iii. Approved Documents and British Standards etc – guidance which, if followed, may evidence compliance with requirements but may not be sufficient in some circumstances.	Assuming (as referenced by WG9 that this is a "clerk of works on steroids"). Also, this is not seen by WG3 as a substitution of appropriate inspection by a Fire Engineer which will be needed to ensure that the works comply with the fire strategy.	Will this really be a "Clerk of Works on steroids" if the Site Supervisor is employed by the person (contractor) he/she is supervising?
WG10 – Project Managers. a) Core definitions and principles relating to fire safety in buildings e.g. i. What is compartmentation? ii. Inter-reliance of B1 to B5 issues b) understanding of the duties of the members of the project team relating to design and construction c) ability to understand the scope and appreciate the importance of the Fire	Whilst not considered to need competencies related to Fire Engineering, a Project Manager has to have a 'feel' for what is needed across a wider range of disciplines and the liaison that is required between disciplines to get the job done.	

Engineer's input to the project.		
WG11 – Procurement **a)** When procuring professionals then understand the competencies required of those professionals as per the WG competencies outputs. **b)** Understand key principles of testing and certification of fire safety products/systems.	Could be choosing Professionals (early in the project) as well as materials, products and systems (later in the project).	Procurement professionals will need training/CPD e.g. fire door and fire damper testing and certification by an appropriate provider such as ASFP or FIA.
WG12 – Products a) Organisations involved in the manufacture and supply of fire safety products and systems or that supply products which may need to have a fire performance classification need to understand what they need to do to ensure that their product has been suitably tested and certified for the market into which they are selling that product. b) Understand the need to make testing, classification and certification information available to Fire Engineers and other professionals involved in the project. c) Ensure that product data sheets and marketing literature do not make potentially misleading claims for fire performance, and that what claims are made can be supported using appropriate evidence of fire performance.	This is all about: a) Testing properly b) Certifying properly c) Marketing properly Fire Engineers, and other professionals in the disciplines represented by the other WGs need full and proper information. For example, BRE's 'Regulatory Testing' web site lists the references of reports of BS8414 cladding test. It has proven difficult to obtain some of these test and classification reports.	

Annex C – UKSPEC for Chartered Engineers working in discipline for Fire Engineering (as published by the IFE). Versions also published by IFE for IEng and EngTech registrants..

THE INSTITUTION OF FIRE ENGINEERS
FOUNDED 1918 • INCORPORATED 1924

IPD OBJECTIVES FOR CHARTERED ENGINEERS

These IPD Objectives are based on the Engineering Council generic competencies and set out the related skills and knowledge of the discipline of fire engineering.

You are **not** expected to be fully competent in **all** of these objectives. You must, however, have broad based experience and responsibility in one or more aspects of fire engineering as well as some knowledge of related aspects.

OBJECTIVE		RANGE		EVIDENCE EXAMPLES
A	Use a combination of general and specialist fire engineering knowledge and understanding to optimise the application of existing and emerging technology.	**A.1**	Maintain and extend a sound theoretical approach in enabling the introduction of new and advanced technology and other relevant developments.	• Identify and accept limits of personal knowledge and have a clear appreciation of how to extend capabilities by exploiting available sources of information and additional experience. • Be conversant with key information resources in the field such as professional journals, the Internet and major seminars. • Remain abreast of key developments in the field of Fire Engineering, such as changes in Regulations or major innovations and to be aware of key research/experimental programmes likely to have an influence in the field.
		A.2	Engage in the creative and innovative development of engineering technology and continuous improvement systems	• Demonstrate an ability to take clear cognisance of client, user and community needs in determining the functional objectives of the intended fire safety solutions. • Employ creativity and initiative in identifying possible fire safety solutions to achieve the objectives. • Assess marketing needs and make a key contribution to marketing strategies. • Identify constraints and explore opportunities for the development and transfer of technology whilst remaining aware of issues relating to the value of intellectual property. • Assess the potential impact of emerging technologies, processes and procedures that may not be limited to within the Fire Engineering field but that may include developments in other engineering disciplines. • Demonstrate a willingness to consider possible opportunities for the application of such developments within Fire Engineering designs. • Demonstrate a willingness and ability to extend his or her knowledge base into related disciplines or fields. Promote co-operation across engineering discipline boundaries to enable the development of future potential opportunities that could result in better value and/or better performing Fire Engineering solutions.

OBJECTIVE		RANGE		EVIDENCE EXAMPLES
B	Apply appropriate theoretical and practical methods to the analysis and solution of fire engineering problems	**B.1**	Identify potential projects and opportunities	• Use personal experience, an understanding of the employer's commercial position and available Fire Engineering resources to identify potential projects or opportunities and consider their viability. • In terms of potential projects, possess an ability to identify potential project complexities and problems and be able to exercise original thought in determining a response to new Fire Engineering challenges that the project may introduce.
		B.2	Conduct appropriate research, and undertake design and development of engineering solutions	• Select the most appropriate engineering tools and aids to test the potential of design concepts and to determine design parameters for potential solutions. Such tools may include, but would not be limited to, physical or computer models, analytical or empirical calculation procedures, statistical analysis, risk assessment techniques, cost benefit analysis and value engineering assessment. • Analyse potential concepts, including an assessment of the impact of factors such as performance, reliability and maintainability. • Select suitable media and/or tools for demonstrating potential solutions to clients.
		B.3	Manage implementation of design solutions, and evaluate their effectiveness	• Prepare documented proposals that clearly identify and describe the fire safety solutions that have been engineered to satisfy the functional objectives of the project. • Ensure that any testing or proving requirements are discussed and that any potential problem areas are highlighted with options for modifications or adaptions identified as necessary. • Take corrective action to overcome shortcomings or omissions that are identified with the proposals. • Determine the impact on Fire Engineering design solutions of factors such as construction, installation, commissioning, life-cycle implications, technical support, training of users and shifting user needs. • Participate in consultation with affected parties on evaluation of the issues that affect them and how resolution of these issues will impact on Fire Engineering design. • Design and evaluate the effectiveness of agreed resolutions ensuring that improvements, modifications or rectifying actions are practicable and still meet the functional strategic objectives.

OBJECTIVE		RANGE		EVIDENCE EXAMPLES
C	Provide technical and commercial leadership	**C.1**	Plan for effective project implementation	• Identify the factors affecting project implementation • Prepare and develop project proposals and negotiate contractual arrangements with customers, suppliers and partners to secure the employer's commercial position. • Analyse and organise the necessary resource provision required to execute the work.
		C.2	Plan, budget, organise, direct and control tasks, people and resources	• Set work objectives and priorities including milestone outputs, project deadlines, quality standards and budgets. • Organise project teams and exercise leadership over other engineers, technical and other personnel as appropriate. • Monitor and/or audit tasks to ensure that work is executed as planned and determine what corrective actions are necessary as appropriate.
		C.3	Lead teams and develop staff to meet changing technical and managerial needs.	• Agree objectives and work plans with teams and individuals • Contribute to the identification of the training needs for teams and individuals in order to respond to changing technical and managerial requirements as well as to further their professional progression. • Develop external and work-experience related training plans for teams and individuals and identify and procure appropriate training activities and resources. Undertake reviews of training effectiveness.
		C.4	Bring about continuous improvement through quality management	• Promote quality throughout the organisation and its customer and supplier networks • Contribute to the development of systems for quality management and foster the acceptance of the principles of quality control throughout the organisation. • Perform work to appropriate quality standards and apply quality control and assurance techniques.
D	Demonstrate effective interpersonal skills	**D.1**	Communicate in English with others at all levels	• Develop good personal relationships that are appropriate to the level of communication being used and communicate effectively in a manner that the circumstances of the project dictate. • Ensure effective 2-way communication in discussions and be prepared to liase with colleagues, peers and experts within and beyond the employer's organisation. • Respond effectively and efficiently to all received communication, howsoever it is received.
		D.2	Present and discuss proposals	• Select the most appropriate medium for clearly clarifying Fire Engineering Design objectives and select the most suitable method of communication using, words, images, audio and video as necessary. • Communicate fluently in written and oral expression at an experienced professional standard and prepare and present lectures, reports and published papers at professional level. • Feed back results to improve the proposals
		D.3	Demonstrate personal and social skills	• Establish fire engineering teams capable of working towards collective goals and create, maintain and enhance effective working relationships. • Be aware of the needs and concerns of others • Develop the team, the individuals within the team and yourself to enhance performance. • Provide negotiation, conflict resolution and counselling within the team and provide a conduit through which ideas, convictions and attitudes can be exchanged and conveyed. • Demonstrate confidence and flexibility in dealing with new and changing interpersonal situations

OBJECTIVE		RANGE		EVIDENCE EXAMPLES
E	Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment	**E.1**	Comply with relevant Codes of Conduct	• Comply with rules of professional conduct of the IFE • Apply professional skill in the interests of the employer and client for whom you act in professional matters. • Give evidence, express opinions or make statements in an objective manner and on the basis of adequate knowledge. • Work constructively within all relevant legislation and regulatory frameworks, including social and employment legislation
		E.2	Manage and apply safe systems of work	• Take account of potential professional risks and liabilities and accept responsibility for them. • Consider and implement as necessary appropriate occupational health, safety and welfare requirements. • Develop and implement appropriate hazard identification and risk management systems • Manage, evaluate and improve these systems
		E.3	Undertake engineering activities in a way that contributes to sustainable development	• Promote the considerations and actions required in engineering practice to improve, sustain and restore the environment. • Be aware of the wise use of non-renewable resources through waste minimisation, recycling and the development of alternatives where possible. • Strive to achieve the beneficial objectives of Fire Engineering design whilst striving to minimise the consumption of raw materials and energy, and by designing sustainable management procedures. • Take account of life-cycle implications with respect to how Fire Engineering designs will impact on the environment. • Understand and secure stakeholder involvement in sustainable development • Use resources efficiently and effectively
		E.4	Carry out and record continuing professional development necessary to maintain and enhance competence in own areas of practice	• Undertake reviews of own development needs • Plan how to meet personal and organisational objectives • Carry out planned (and unplanned) CPD activities • Maintain evidence of competence development • Evaluate CPD outcomes against any plans made • Assist others with their own CPD

OBJECTIVE		RANGE		EVIDENCE EXAMPLES
		E5	Exercise responsibilities in an ethical manner	Give an example of where you have applied ethical principles as described in the Engineering Council Statement of Ethical Principles. Full details of this statement are provided in the EngC UK-SPEC document, however, examples of such ethical principles might include: • Recognising where an issue falls outside of your area of competence and managing its resolution appropriately. • Preventing avoidable danger to health and safety. • Treating all persons fairly and with respect. • Accepting appropriate responsibility for work carried out under your supervision. • Observing the proper duties of confidentiality owed to appropriate parties. • Raising a concern about a danger, risk, malpractice or wrongdoing which affects others ("blow the whistle") or supporting a colleague or any other person to whom you have a • duty of care who in good faith raises such a concern. • Rejecting bribery and all forms of corrupt behaviour, and making positive efforts to ensure others do likewise. Give an example of where you have applied/upheld ethical principles as defined by your organisation or company, which may be in its company or brand values.

Annex D – Knowledge headings for Fire Engineering as laid out by the BS87974 series of standard