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Built environment – Overarching framework for building safety competence of individuals – Specification

BSI Flex 8670: v2.0 2020-12

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Contents

Foreword

Publishing information

This BSI Flex was sponsored by the Ministry of Housing, Communities and Local Government (MHCLG). Its development was facilitated by BSI Standards Limited and it was released under licence from The British Standards Institution.

Acknowledgement is given to Richard Harral (Technical Director, CABE), as the technical author, as well as individuals, including those responding to public consultation, and to the following organizations and their representatives, as well as individuals who contributed as members of the Advisory Group:

- BSI Built Environment Competence Standards Group
- Build UK
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- Construction Industry Training Board
- Construction Products Association
- Electrical Contractors' Association
- Engineering Council
- Fire Sector Federation
- Health and Safety Executive
- Institute of Workplace and Facilities Management
- Local Authority Building Control
- Ministry of Housing, Communities and Local Government
- National Fire Chiefs Council
- Royal Institution of British Architects
- United Kingdom Accreditation Service

Acknowledgement is also given to the members of Working Group 0 and the Competence Steering Group (CSG) who have supported the development of this standard in earlier form and to all those who contributed to the Raising the Bar and Setting the Bar reports on which this standard draws.

The agile BSI Flex development process enables a specification to be rapidly developed, and on an iterative basis, in order to fulfil an immediate need in industry. This BSI Flex can be considered for further development as a PAS or British Standard or constitute part of the UK input into the development of a European or International Standard.

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- The introduction has been significantly reduced to focus on core issues relevant to BSI Flex 8670, with the intention that guidance on broader issues of competence, competence management, safety culture and behaviour change will be developed through separate projects.
- The scope and text have been revised to make it clearer that BSI Flex 8670 is intended for use in the development of competence frameworks for individuals rather than being intended as a framework against which individuals will be directly assessed. In addition, we have sought to clarify that organizational competence is out of scope.
- The requirements of the specification have been re-drafted so that they can be used as a template for building safety in any type or scale of building, including higher-risk buildings. To help achieve this, the text is clearer on the expectation that the core competencies within BSI Flex 8670 will be contextualized to roles, function and tasks, and can be further contextualized in relation to particular types of buildings, or buildings with specific characteristics.
- The core competences have been reviewed and strengthened, and the process for demonstrating conformity simplified and clarified.
- Annex E (a list of common terminology relating to building safety) has been omitted at this stage with the intention to undertake further development outside the scope of this standard.

Use of this document

The provisions of this BSI Flex are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

Please note that the content in this release is part of an iterative process and changes from time to time with subsequent iterations.

It has been assumed in the preparation of this BSI Flex that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

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0 Introduction

0.1 Background

Recent building failures in the UK have highlighted the need for improved building safety competence. These events include the tragic Grenfell Tower fire (and the subsequent exposure of systemic fire safety problems in many other buildings), as well as the structural failures in Edinburgh schools.

This BSI Flex has been produced in response to specific recommendations to improve building safety competence made in Dame Judith Hackitt's Independent Review of Building Regulations and Fire Safety. The review published two reports:

- Building a Safer Future, Independent Review of Building Regulations and Fire Safety: Final Report[1]
- Building a Safer Future, Independent Review of Building Regulations and Fire Safety: Interim Report[2]

Both the interim and final reports identified serious shortfalls in the competence of individuals involved in the delivery of buildings where residents might be considered at higher risk. The review concluded that a number of actions were needed to improve, sustain and assure the building safety competence of those individuals involved in the design, manufacture, construction, inspection, maintenance and management of buildings, including:

- That the construction and fire safety sector should develop leadership in delivering building safety; work with and learn from good practice in other sectors; and develop continuous improvement approaches to competence levels.
- Professional and accreditation bodies within the construction and fire sector should develop proposals for the role and remit of an overarching body to provide oversight of competence requirements and support the delivery of competent people working on higher-risk buildings.

In response to these recommendations, the Industry Response Group established the Competence Steering Group (CSG) to develop proposals in relation to building safety competence. This work resulted in publication of two reports: *Raising the Bar – Interim Report*[3] in August 2019 and *Setting the Bar – Final Report*[4] in October 2020.

This BSI Flex is only one part of a broader framework for competence of individuals in the built environment established in response to the recommendations in the Independent Review of Building Regulations and Fire Safety, and CSG reports. As outlined in the scope, this standard is intended for use as a template against which the structure and content of any built environment competence framework can be assessed. The aim of that assessment is to provide assurance that the competence and behaviours required to deliver safe buildings are properly addressed within those frameworks.

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[1] Report available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707785/Building_a_Safer_Future_-_web.pdf

[2] Report available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/668831/Independent_Review_of_Building_Regulations_and_Fire_Safety_web_accessible.pdf

[3] http://cic.org.uk/admin/resources/raising-the-barinterimfinal-1.pdf

[4] http://cic.org.uk/admin/resources/setting-the-bar-9-final-1.pdf

Whilst this BSI Flex has been specifically developed with the above in mind, the requirements of this specification have been drafted to have wider application and relevance in modern construction and property markets throughout the UK and beyond.

This BSI Flex does not replace existing competence frameworks or qualification pathways which will need to continue to reflect the full range of competences required for particular roles or disciplines.

0.2 Objectives

This BSI Flex is intended to achieve four overarching objectives:

- set core requirements for behavioural and building safety competence for all persons working in the built environment in order to improve industry culture and safety outcomes throughout the building life cycle.
- drive adoption of consistent good practice in the development and use of competence assessment frameworks across the built environment.
- enable consistent and objective evaluation of different sector-specific competence frameworks against common criteria by regulators, clients and employers.
- support development of suitable mechanisms to provide robust assessment of individual competence.

This BSI Flex is also intended to meet the following specific objectives:

- support development of a robust oversight, monitoring and feedback process for sector-specific competence frameworks;
- support development of competence frameworks for key duty-holding or appointed roles in managing safety;
- identify core building safety competences that are likely to be common to all relevant sector-specific competence frameworks;
- identify requirements and good practice in the structure and application of sector-specific competence frameworks;
- enable bodies to objectively compare sector-specific frameworks and assure their adequacy;
- support commonality and consistency in building safety competence across sector-specific frameworks;
- establish as far as possible common language, definitions and terminology across sector-specific frameworks;
- establish core requirements for sector-specific frameworks so that individuals are competent in their understanding and application of rules, regulations, guidance and standards; and
- support individuals and organizations working in the built environment to move away from a “qualify once/practice for life” approach to competence, by adopting an approach based on validation and periodic revalidation.

0.3 Competence and competence frameworks

0.3.1 General

Competence and competence-based assessment is widely understood and adopted across most industries. Competence is used as a key tool in describing job roles, job specifications,

interviewing candidates for employment or promotion and in managing performance. It is also commonly used to assess eligibility for qualification, membership, registration, certification or licensing in specific disciplines or roles.

It is common for legislation aimed at protecting people to set requirements for dutyholders to check the competence of persons undertaking works. This specification enables this principle to be extended more broadly so that competence assessment also includes those whose work impacts on the safety of buildings in order to protect residents and building users once the building is occupied.

This BSI Flex sets out core requirements against which sector-specific competence frameworks can be developed or assessed in relation to building safety, including:

- core requirements for the information, structure and procedural components of sector-specific competence frameworks;
- core behavioural competences to support industry in the development of a strong safety culture; and
- core competence requirements for building safety, which should be identifiable within sector-specific frameworks where relevant to the role, function or task covered by that framework.

Sector-specific frameworks should also consider what competences are needed to manage the competence of others including appointing suitable specialists where necessary. The need to obtain specialized advice or services is likely to arise in the execution of any major building work but is equally relevant to persons managing occupied buildings who may need to commission competent individuals on an ad-hoc basis to maintain safety.

The majority of a typical building's life will consist of being maintained or refurbished whilst in occupation, which means that managing building safety during this period is as important as during initial construction. As existing buildings significantly outnumber new construction projects, residual risks will be mainly found in this existing stock. Sector-specific frameworks should as a result be structured to maintain a balance of competence between new build and maintenance or renovation work where relevant.

NOTE This BSI Flex is not intended for use as a competence framework against which individuals can be directly assessed. The core competence requirements within this specification should be interpreted in the context of the role, function or task relevant to each sector-specific framework.

0.3.2 What is competence?

Competence is primarily concerned with human behaviour and is multi-dimensional, multi-faceted, inherently non-discrete and context dependent. Competence is therefore defined in many different ways across different industries. This is necessary to reflect the specific circumstances and meet the specific needs of the individuals and organizations that employ individuals operating in those industries.

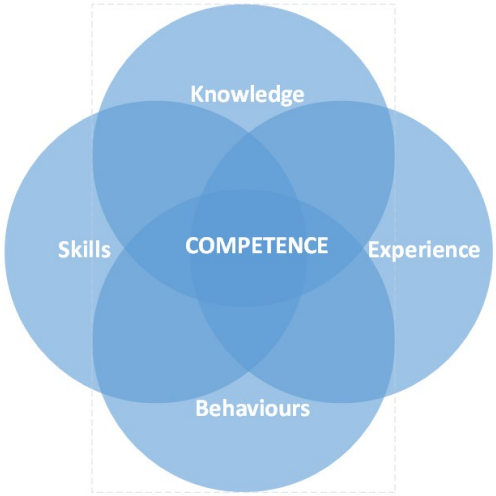
The work undertaken by individuals in the built environment is particularly diverse and encapsulates a wide range of roles including installers, skilled and unskilled trades, managers, construction professionals, finance, administration, procurement specialists and manufacturing disciplines.

For an individual to be considered competent, sector-specific competence frameworks should require that individuals have the appropriate skills, knowledge and experience, combined with appropriate behaviours, to be able to fulfil their defined role, function or activity and carry out appropriate tasks. This is sometimes referred to in shorthand as SKEB.

Behavioural competence, when combined with existing skills, knowledge and experience, will engender a sense of individual responsibility and accountability, as part of an effective and strong safety culture.

NOTE See Figure 1.

Figure 1 – Competence is a combination of Skills, Knowledge, Experience and Behaviours (SKEB)



NOTE An assessment of skills, knowledge, experience and behaviours typically determines whether an individual has the general competences relating to the role and tasks they undertake – it cannot ensure that every decision or action they take will be correct.

0.3.3 Skills knowledge and experience

Competence is primarily derived from an accumulation of learning and experience which help in the development of skills. This includes both formal and informal activities such as education and training combined with practical experience. Gaining practical experience is often best undertaken under supervision until such time as an individual is proven to be competent to work independently. The continuing growth of competence requires further education and training etc. but also mentoring and reflection.

As competence is an assessment of the total accumulation of learning and experience there is no prescribed order in which those activities take place, although it is preferable for training to be provided first so that experience can be gained safely.

Knowledge, which can be gained as formal or personal knowledge, is considered an essential building block of competence leading to the development of skills.

- **Formal knowledge**, also referred to as codified knowledge, is subject to quality control by editors, peer review and debate and is given status by incorporation into educational programmes, technical qualifications, examinations and knowledge-based courses. A degree or technical certificate are examples of codified knowledge.
- **Personal knowledge** has been defined as the cognitive resource which an individual brings to a situation that enables them to think and perform. Personal knowledge is largely acquired through a combination of formal and non-formal learning and workplace experience.
- **Skills** refer to the techniques and approaches that are employed to implement the knowledge that has been acquired and allow competence to be demonstrated and

developed. As knowledge is applied, understanding develops. Understanding has been defined as being able to apply the right knowledge appropriately in a variety of contexts.

Competence is not limited to technical or theoretical matters. Individuals working in the built environment are frequently involved in highly complex supply chains involving multi-disciplinary and cross-disciplinary teams, often engaging specialists for relatively short periods.

Successful outcomes require collaborative leadership and communication, a range of interpersonal and digital skills, and adherence to ethical principles. Even when working independently these are necessary attributes to facilitate work being undertaken safely and to provide confidence that individuals are capable of communicating effectively with clients, building users and residents.

In assessing competence, it is expected that a candidate would be able to demonstrate how knowledge and understanding developed from experience are put to practical use through the application of skills.

0.3.4 Behavioural competence and ethics

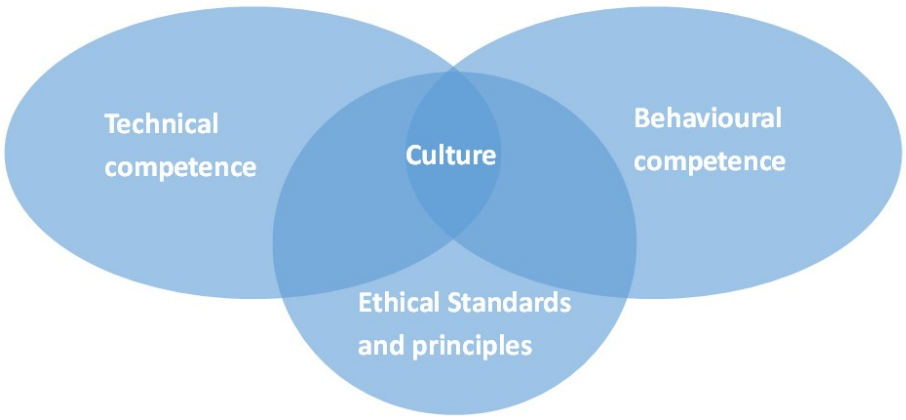
Clients, organizations and people working in the specification, design, manufacture, procurement, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings (including the manufacture of their components and systems) are often subject to high levels of competition and intense cost and time pressures. It is recognized that these pressures can, if unchecked, lead to the development of business models, customs and practices which increase risk to co-workers and to the public and can incentivize unethical or undesirable behaviours. These can have significant implications on quality which can impact building safety.

As a result, and in alignment with the findings of Dame Judith Hackitt's Independent Review of Building Regulations and Fire Safety, there is an accepted need for improvement in the culture of individuals and organizations working in the built environment to contribute to safe outcomes. Criticisms following the Grenfell Tower fire included that the industry had a culture of indifference which promoted a "race to the bottom" where price and profit were placed ahead of safety.

Culture in this context is generally understood to mean the organizational, commercial and individual behaviours and norms found in the built environment. Culture tends to be derived from a combination of technical competence (primarily having the appropriate skills and knowledge) combined with behavioural competence (how people act and conduct themselves) and with reference to accepted ethical standards and principles (what is adjudged to be right).

Behaviours are typically described as the way in which one acts or conducts oneself, especially towards other people. In many respects, how people or organizations behave is the most tangible and visible representation of industry and organizational culture. Culture can vary considerably both within and between organizations and recognizable groups, roles or functions.

Figure 2 – Industry culture is a combination of technical competence, behavioural competence and ethical standards.



The safety culture of an organization is understood to be the product of individual and group values, attitudes, perceptions, competences and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization's management.

NOTE This BSI Flex focuses on frameworks for individual competence. Organizational competence and capability is derived from the combination of individual competence within or deployed by an organization and is a separate topic of substance but is mentioned above to provide broader context.

0.3.5 Sector-specific competence frameworks

Competence frameworks developed to enable assessment for particular roles, functions, activities or tasks are referred to as sector-specific competence frameworks. There are no limits to the number of competence frameworks that can be developed.

For most competence frameworks:

- elements of competence overlap and are interdependent;
- elements can be assessed separately or together; and
- it is recognized that development of competence is not necessarily a linear or formally structured path, but should be one that can be reported, recorded and assessed.

Competence frameworks typically include the following elements so that they deliver the right outcomes and provide a suitable framework for assessment:

- a clear description of their purpose, principles and objectives;
- an explanation as to which aspects of the built environment and to which roles the framework applies;
- an explanation as to what types of built environment activity are relevant to those roles;
- requirements for prior learning or experience in relation to specific roles;
- the competence standards to be met in demonstrating necessary skills, knowledge, experience and behaviours;
- how different levels of competence are managed;
- requirements relating to validation and revalidation;
- requirements for maintaining competence; and

- requirements relating to understanding limits of competence.

0.3.6 Validation and revalidation

One problem identified within the built environment is that, historically, professionals and tradespeople have “qualified once” and then continued to practice for life without any formal periodic re-assessment of competence.

Many organizations including professional bodies and certification schemes have sought to address this through setting requirements for continuing professional development (CPD). However, effective competence systems in other industries typically adopt approaches incorporating both validation and revalidation as a more robust approach to providing ongoing assurance of competence.

In this context, validation is the process by which an individual is first assessed as being competent to fulfil a specific role. This may give access to registration, a licence to practice or the ability to work in a given role and will typically follow a period of monitored and supervised development.

Revalidation is a periodic re-assessment of competence which provides assurance that the necessary skills, knowledge, experience and behaviours have been maintained or developed such that the individual remains competent to fulfil the specified role. The process for revalidation needs to be proportionate, reasonable, effective and robust.

The time period between revalidations will vary depending on a number of factors including (but not exclusively):

- an assessment of risk relating to the role – the higher the risks, the more frequently revalidation may need to be undertaken;
- the adequacy or otherwise of measures available to sustain and maintain competence; and
- the rate of change of skills and knowledge relevant to the role – if good practice is changing quickly, more frequent revalidation may be necessary.

Effective revalidation processes should be suitably robust in assessing that competence is maintained or developed relevant to the current role, function or task undertaken and at least to the same level as the initial validation process. It may also use a wider range of experiential evidence including training, learning and development activities undertaken in the intervening period.

0.3.7 Maintaining and developing competence

Competence is perishable over time and requires positive action to maintain. This includes building on and refreshing skills, knowledge and understanding, identifying specific requirements relevant to work being undertaken and keeping abreast of changes in context such as regulation or technology.

Maintaining competence, also known as CPD, includes informal and formal activities. This can include activities such as training and refresher courses, toolbox talks and mentoring or supervision and formal learning.

CPD is best undertaken as part of a planned programme of activity or personal development plan, relevant to the individual’s responsibility and career path and should be recorded. Employers might consider adopting a framework for assessing the effectiveness of CPD undertaken by their employees and contracted individuals, as this is good practice.

To aid in consistency, it is beneficial for competence frameworks to set out expectations for maintaining competence for the different roles and grades of activity to which they apply.

This not only includes the type, scale and complexity of the work being undertaken when measured against established Skills, Knowledge and Experience, but also any new context or standards affecting Behavioural requirements.

0.3.8 Limits of competence

It is vital that people do not act beyond the limits of their competence. In doing so, it is possible that they will expose themselves and potentially other people to a wide range of risks. This includes risk of death or injury, litigation, prosecution and breach of contract (amongst others).

Competence frameworks and training and development regimes should consider how best to establish the right conditions so that individuals are able to take reasonable steps in managing limits of competence. This includes:

- making provision so that people are aware of how to manage the limits of their own competence – and in particular that they are able to identify when they have been tasked with or are about to undertake something that exceeds their ability to do so safely;
- enabling a culture where it is seen as the right thing to do to flag concerns about limits of competence and where individuals have authority to act to mitigate risks;
- competence in managing limits of competence of self and others under direct supervision including taking mitigating actions (such as providing additional training) or managing risks (i.e. by reallocating work to suitably competent people); and
- awareness of when and how to check that third parties who are procured, appointed or contracted to undertake work are in themselves competent to manage limits of their own competence and those working under their supervision and that they have appropriate tools and resources to do so.

A positive culture of both disclosure and trust are required such that people and organizations are willing to acknowledge and manage the limits of their competence.

0.4 Mapping and benchmarking against this specification

0.4.1 General

It is recognized that there are many existing competence frameworks which have been developed prior to this standard.

Conformity with this BSI Flex may be demonstrated through a process of mapping or benchmarking rather than through direct adoption of the structure and terminology of this BSI Flex.

Mapping and benchmarking can also be used in the development of new sector-specific competence frameworks to help achieve alignment with the requirements of this BSI Flex.

The recommended approach to mapping and benchmarking against this framework involves the following:

a) clearly identifying the scope of the sector-specific framework, including the roles, tasks, sector and context;

b) creating a mapping template listing the requirements set out in Clause 4, Clause 5 and Clause 6 of this BSI Flex and any applicable annex; and

c) reviewing the sector-specific framework to verify that:

   1) the requirements described in Clause 4, Clause 5 and Clause 6 of this BSI Flex have been met;

2) recording how and where this evidence of conformity is set out in the sector-specific framework;
3) analysing any areas where the sector-specific framework does not address the requirements of this specification;
4) amending the framework as necessary to demonstrate conformity; or
5) clearly justifying any exemptions or divergence from the requirements, taking into account the context, roles and functions covered by the sector-specific framework.

In undertaking this mapping process, careful consideration will need to be given to how each sector-specific framework interacts with other individuals, organizations, roles, functions and tasks in any way which could affect safety or quality. This will aid in breaking down siloed competence and help ensure sector-specific frameworks cover collaborative competence where roles or activities interface.

0.4.2 Informative annexes

The following informative annexes are provided to support the development of core competence for building safety in sector-specific competence frameworks:

- Annex B (Informative) Fire safety in buildings
- Annex C (informative) Structural safety in buildings
- Annex D (informative) Public health standards in buildings

These annexes are intended to provide a broad description of the scope of common building safety considerations. They can be used as a starting point to identify relevant areas of building safety competence (including interfaces with other roles, functions or activities) that could affect building safety outcomes.

This can then be used to identify any gaps in existing sector-specific frameworks which need to be addressed or to establish the scope of building safety competence required of new sector-specific frameworks.

The annexes are not intended as comprehensive and should not be relied upon as the sole source of evaluation of scope of building safety competence.

Conformity with the annexes is not a requirement of this specification but it is recommended that consideration be given to their content.

1 Scope

This BSI Flex specifies requirements for sector-specific competence frameworks for individuals working in the built environment. It is intended to support the development of an overarching framework for oversight of building safety competence of individuals including encouraging the development and application of core building safety competences in practice. Organizational and team competence is discussed as the context within which individual competence needs to be assured but is itself out of scope of this BSI Flex.

It is broadly relevant to any sector-specific competence framework relating to roles involving the specification, design, manufacture, procurement, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings.

This includes technical and non-technical roles, and individuals working under their own authority as well as under the supervision of other competent individuals. It is also intended to span a wide range of levels of competence from basic awareness to very detailed application by subject specialists.

This standard is not intended to replace existing professional, technical or vocational training or competence frameworks and does not set out all of the specific requirements for any given sector-specific framework.

However, where individuals are being assessed for building safety competence it is expected that the sector-specific frameworks against which they are assessed will demonstrate conformity with the core requirements and core competences set out in this standard relevant to the role, function or task being undertaken.

The requirements and competences set out in the specification are relevant to all types of built environment activity but are intended to be contextualized within sector-specific competence frameworks or to allow assessment in relation to specific types of buildings or activities e.g. higher-risk buildings.

This BSI Flex is of particular relevance to organizations with ownership or responsibility for the development, maintenance or application of sector-specific competence frameworks for built environment roles, functions or tasks. This includes but is not limited to individuals involved in the specification, design, manufacture, procurement, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings.

This BSI Flex is also relevant to regulated or duty-holding roles with statutory responsibilities such as:

- principal designers;
- principal contractors;
- designers;
- contractors;
- building safety managers; and
- building control professionals.

NOTE 1 The list above is not exhaustive therefore this British Standard may be relevant to other groups or roles.

NOTE 2 Responsibility for ensuring that sector-specific frameworks are kept up to date rests with the authors of those frameworks given that the scope of regulation and duty-holding roles is likely to change over time.

This BSI Flex is intended to be used by professional groups, trade associations, trades or any other group from relevant built environment actors looking to develop or achieve recognition for a relevant competence framework. It is anticipated that those frameworks will then be subject to review by a committee on industry competence working under the aegis of the Building Safety Regulator.

This BSI Flex will be of specific interest to assessment bodies who might be tasked with assessment of competence of individuals against any sector-specific competence framework.

2 Normative references

There are no normative references in this BSI Flex.

3 Terms and definitions

For the purposes of this BSI Flex, the following terms and definitions apply.

3.1 building safety
any matter relevant to protecting the safety of people in and around buildings (including but not limited to fire safety, structural safety, public health and public safety) and pertaining to the specification, design, manufacture, procurement, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings

3.2 competence/competences
combination of skills, knowledge, experience and behaviour that enable an individual to make decisions on an informed basis that results in safe outcomes for defined functions

3.3 competence assessment
systematic methods of gathering data under standardized conditions to reach a conclusion regarding the competence and commitment of an individual

[SOURCE: http://www.managementstudyguide.com/ what-is-assessment.htm, modified]

3.4 competence framework
procedures and requirements for the assessment and maintenance of a set of agreed skills, knowledge, experience and behaviours required for an individual undertaking a role, function, activity or task in order to perform their work to predetermined standards and expectations and maintain or improve their performance over time

3.5 competence maintenance
relevant, planned and recorded activities undertaken to maintain skills, knowledge and behaviours (including development to reflect new technology and changing statutory requirements) so that they remain adequate for an individual to be considered competent

3.6 competence management
systematic identification, development, assessment, deployment and maintenance of the skills, knowledge, experience and behaviours competences required to fulfil responsibilities and to perform activities to recognized or defined standards of competence

3.7 competency/competencies
task level description of skills, knowledge, experience and behaviours required to undertake a defined task effectively

3.8 construction product
product, substance or collection thereof that has been manufactured, refined or processed and declared by its manufacturer for an intended end use either for temporary and/or permanent inclusion in building or civil engineering works, refurbishment or maintenance

3.9 continuing professional development (CPD)
activities undertaken by individuals to maintain and develop competence including formal and informal learning, self-assessment, obtaining feedback and identifying areas for improvement

3.10 experience
knowledge or skill acquired by a period of practical experience of something, especially that gained in a particular profession, discipline, role or function

3.11 formal learning
organized and structured learning objectives

3.12 golden thread of information
concept of developing, collecting, organizing, sharing, storing, making available, revising and amending information relating to building safety through the life cycle of a building's specification, design, manufacture, procurement, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition

3.13 higher-risk buildings
buildings subject to enhanced regulatory requirements in scope of the new, more stringent regulatory regime, as defined in legislation and including those previously referred to as Higher-Risk Residential Buildings (or HRRBs)

3.14 informal learning
self-directed learning or learning from experience

NOTE For example, mentoring or shadowing in the workplace

3.15 knowledge
information, technical knowledge and 'know-how' that an individual needs to have and to understand in order to successfully carry out the duties that make up the occupation

3.16 prior learning
formal or informal learning used as a reference point for the likely knowledge and skills required to competently undertake a specific role

3.17 recognition of prior learning
process by which formal and informal learning and experience gained are assessed

3.18 revalidation
formal process of re-assessing an individual's competence on a periodic basis to check that competence has been maintained and, if necessary, developed against a sector-specific competence framework

3.19 sector-specific competence framework
competence framework developed to enable assessment of competence in a specific role, trade or discipline or relevant to execution of a specific task

3.20 skills
practical application of knowledge needed to successfully undertake the duties that make up the occupation acquired through formal and informal job training or experience

3.21 validation
formal process of assessing an individual's competence for the first time against a sector-specific competence framework

4 Requirements for sector-specific competence frameworks

*COMMENTARY ON **CLAUSE 4***

It is recognized that sector-specific frameworks will differ in structure and content. To enable effective interaction between roles, sectors and disciplines, sector-specific frameworks should be effectively coordinated and need to include some common requirements, consistent language and a holistic approach to building safety. This should take into account interactions and interfaces with other related activities.

4.1 Competence frameworks for building safety

All sector-specific frameworks shall demonstrate:

a) how requirements relating to the framework and its application as set out in Clauses **4.2** to **4.13** have been met;

b) how the behavioural competence and ethical standards set out in Clause **5** have been met; and

c) how the core building safety competences set out in Clause **6** have been met.

4.2 Overview

Sector-specific competence frameworks shall:

a) set out clearly their intended purpose;

b) explain the background to the development of the framework;

c) explain relevant principles and concepts relating to competence, competence management, validation and revalidation;

d) provide an overview of the use and application of the framework;

e) state how, when and by whom the sector-specific competence framework has been assessed and approved; and

f) state how, when and by whom the framework will be reviewed.

4.3 Relevant sectors in scope

Sector-specific competence frameworks shall:

a) define the industrial sector/s to which they apply;

b) identify any specific types of organization within which individuals are likely to be subject to competence assessment against the sector-specific framework; and

c) state any specific exclusions to a) and b).

4.4 Roles in scope

Sector-specific competence frameworks shall:

a) define the specific roles, functions, activities and tasks against which the framework can be used to assess competence;

b) signpost where further information on statutory roles and duty-holding responsibilities can be found; and

c) state any specific exclusions to a).

4.5 Types of building operations and/or building work in scope

Sector-specific competence frameworks shall:

a) define the types of building or sectors relevant to the competences required by the framework;

b) define the types of activity to which the framework is relevant; and

NOTE For instance, any or all of building work, design, manufacturing, construction, maintenance or operation.

c) state any exclusions to a) or b).

4.6 Regulatory or legislative requirements for competence assessment

Sector-specific competence frameworks shall:

a) identify and explain regulatory or statutory regimes relevant to the need for competence of individuals to be assessed against the framework; and

NOTE This relates to legal requirements for individuals to have their competence assessed, not regulatory or statutory regimes relevant to the individual's role.

b) signpost where further information on these regulatory or statutory regimes can be found.

4.7 Specific roles against which the framework enables assessment

Sector-specific competence frameworks shall:

a) define the different roles and any grades associated with those roles against which competence assessment might be undertaken; and

b) set out procedural requirements for competence assessment against each role and grade.

NOTE Grades in this context reflect different seniority, authority or responsibility relating to a specific role within organizational or discipline-specific hierarchies, e.g. junior surveyor / senior surveyor; or supervisor, installer etc.

4.8 Prior learning

Sector-specific competence frameworks shall define any requirements for prior learning required as part of the competence assessment process. They shall:

a) set out any requirement for prior learning including but not limited to:

   1) training;

   2) formal qualification;

   3) academic or vocational education; and

   4) experience.

b) define the procedure for assessing equivalence to prior learning requirements where applicants do not possess the formal qualification or learning required; and

c) map prior learning requirements to learning levels in the relevant national qualification framework.

NOTE The review of an individual's recognized prior learning can be undertaken by independent training providers to ascertain what additional educational input may be required for them to meet the expected standard of competence.

4.9 Competence levels and standards

Sector-specific competence frameworks shall set out:

a) general areas of competence and specific competencies

b) the level or standard of competence which shall be met for each role, function, activity or task covered by the framework; and

c) how levels or standards of competence (or competence levels) have been developed and defined.

NOTE Levels of competence can be expressed in various ways, but sector-specific frameworks should explain how these levels relate to measurable characteristics. It is good practice to use reference to a relevant recognized national or international qualification framework in developing and defining levels of competence.

4.10 Validation

Sector-specific competence frameworks shall set out:

a) the process for individuals to achieve validation against the framework;

b) the process for appeal against the outcome of a validation process;

c) requirements for organizations undertaking assessment of individual competence for validation purposes; and

d) where lists can be found of organizations, schemes or bodies which have been approved to undertake validation.

NOTE ISO/IEC 17024:2012 Conformity assessment – General requirements for bodies operating certification of persons *can serve as the basis for the recognition of organizations undertaking the assessment of individual competence.*

4.11 Revalidation

NOTE It is considered good practice that revalidation should occur at least once within every five-year period, even if there is no regulatory requirement to do this. Sector-specific frameworks might also require more frequent revalidation due to changes in acceptable practice, or where new codes, standards or regulations have introduced new expectations.

Sector-specific competence frameworks shall set out:

a) defined time periods for revalidation;

NOTE 1 This may vary in relation to different roles covered by a single framework.

b) how candidates are expected to achieve revalidation;

c) the process for appeal against the outcome of a revalidation process;

d) requirements for organizations undertaking assessment of individual competence for validation purposes; and

e) where information can be found to identify organizations, schemes or bodies which have been approved to undertake revalidation.

NOTE 2 Sector-specific frameworks should indicate where to find lists of organizations, schemes or bodies which have been reviewed in line with guidance issued by the Building Safety Regulator to undertake validation or revalidation.

4.12 Requirements for maintaining competence

Sector-specific competence frameworks shall:

a) set out the requirements for individuals to maintain and develop the currency of their competence for the role, function or task they undertake;

b) define expectations in terms of the activity required to maintain competence including but not limited to:

   1) time periods;

   2) learning levels;

   3) types of learning (e.g. formal or informal); and

   4) subject area.

c) set out procedures or requirements for monitoring of competence; and

d) set out procedures for sanctioning failure to conform with requirements for CPD.

4.13 Ability to check the competence of individuals validated against the framework

Sector-specific competence frameworks shall set out:

a) how and where information on the validation, revalidation or assessment of individuals shall be held;

b) what information on individuals determined competent under this framework should be held;

c) which of the information held should be publicly accessible;

d) details of how dutyholders or members of the public should be able to check the competence status of an individual validated in accordance with the sector-specific competence framework, e.g. through publicly accessible registers;

e) complaint handling and disciplinary procedures; and

f) sanctioning procedures to deal with false or inaccurate declarations.

5 Core behavioural and ethical competence for sector-specific frameworks

All sector-specific frameworks shall incorporate or be able to demonstrate alignment with the core behavioural and ethical competences set out in Table 1.

NOTE Informative text on key behavioural and ethical practice is provided in Annex A.

Table 1 – Ethical principles, standards and conduct

Core competence	Indicative competence
a) Act ethically and contribute to safe outcomes	1) Be aware of ethical principles and their importance in ensuring safe outcomes, including: i) respect for life, the law, environment and public good; ii) honesty and integrity; iii) accuracy and rigour; and iv) responsibility for direction, conduct and communication. *NOTE Informative text on these ethical principles is provided in Annex A.* 2) Act to incorporate ethical principles and standards into day to day work to improve outcomes. 3) Be aware of and comply with relevant codes or standards of conduct. 4) Demonstrate sound judgement including anticipating, identifying, analysing and solving problems to support safe and effective outcomes.
b) Leadership, teamwork and communication: • demonstrate commitment to strong safety culture; • collaborate effectively and collectively, as part of a team; and • communicate effectively.	1) Leadership at the top and visible commitment at all levels to contribute to strong safety culture 2) Act collaboratively with others and demonstrate effective team working skills 3) Communicate effectively within and between teams, organizations and individuals 4) Listen and provide effective feedback 5) Where necessary, effectively communicate technical information to non-technical audiences. 6) Communicate effectively through use of or verbal, written, drawn or graphic information.
c) Individual and organizational competence: • manage own competence; • manage competence of others; and • maintain competence and contribute to learning culture.	1) Identify limits of own competence and competence of others (including organizations) particularly in relation to building safety. 2) Act to maintain own (and contribute to organizational) competence including undertaking self-assessment and personal development activities. 3) Act to manage competence of others (when required) including fulfilling dutyholder obligations, seeking specialist advice as necessary, and managing competence in

	making appointments or allocating tasks within teams. 4) Contribute to and support a learning culture including recording, monitoring, analysing and acting to improve outcomes.
d) Personal responsibilities and accountability: • understand personal role and responsibilities with particular reference to safety; and • accept and manage accountability for individual and organizational actions.	1) Exercise personal accountability and take responsibility for own actions and for the actions of those under their supervision or direction. 2) Identify where boundaries of responsibility lie and communicate these effectively with others. 3) Anticipate, identify and challenge unsafe or inappropriate behaviours including acting to escalate concerns through reporting or whistleblowing mechanisms. 4) Identify and provide feedback on poor process, equipment, procedures or quality.
e) Duty of care to others including building occupants: • duty of care to co-workers; • duty of care to public and building occupants; and • duty to communicate with persons outside the project team and respond to concerns.	1) Be aware of legal and moral duties and obligations to act in protecting safety of self and colleagues whilst undertaking work. 2) Be aware of duty of care to residents, building occupants, first responders and people in the vicinity of buildings and act to meet or exceed those obligations. 3) Be aware of obligations to consult, listen and respond to occupants or others who are or could be affected by work and respond appropriately. 4) Communicate effectively and responsibly with relevant authorities, residents or members of the public on matters of safety and risk.

6 Core competence for building safety

*COMMENTARY ON **CLAUSE 6***

The core competences represent the shared understanding necessary so that individuals working on buildings are able to act responsibly and contribute to safe outcomes which protect the health of occupants.

These core competences are considered likely to be relevant to all sector-specific frameworks used to assess or develop competence of individuals. They are grouped under four key headings as illustrated in Figure 3:

- *Building safety principles and standards.*
- *Managing building safety.*
- *Knowledge management and communication.*
- *Building as systems, construction products and quality.*

6.1 General

All sector-specific competence frameworks shall address each of the core competences (See Figure 3) as they relate to the particular roles, functions, activities and tasks covered by that framework. To demonstrate conformity with this specification, sector-specific competence frameworks shall:

a) demonstrate how all of the core competence requirements in Tables **2–5** have been addressed;

b) require that all individuals have as a minimum, awareness (remembering key facts and understanding core concepts) of all relevant core competences, and how they relate to their individual or sector-specific role, function or activity; and

c) identify and assess where individuals require higher levels of competence e.g. when they are working on higher-risk or more complex buildings.

NOTE 1 The indicative competences in each table are non-exhaustive examples, some or all of which might be relevant to the context of any given sector-specific framework. Frameworks should include these common competences where relevant. Otherwise, sector-specific frameworks should add, subtract or amend indicative competences in order to address the core competence, taking into account the context, roles, functions, tasks or activities covered by that framework.

NOTE 2 The tables in this clause are expressed in terms of core competence and indicative competence. As defined in Clause 3, competences and indicative competences are descriptors of capability at a role or function level – it is for sector-specific frameworks to set out more specific requirements at an activity or task level (referred to as competency or competencies) where appropriate.

Figure 3 – Core competence requirements

6.2 Building safety principles and standards

All sector-specific competence frameworks shall stipulate requirements for competence that meet or exceed the threshold set out in Table 2 where relevant to role, function, activity or task.

Table 2 – Building safety principles and standards

Core competence	Indicative competence
a) Be aware of and contribute to development and application of fire safety strategies, practices and technological systems in buildings	1) Understand relevant foundation principles of fire safety, including: principles of fire chemistry including ignition and heat transfer; the impact of structure and materials on fire performance; human behaviour and escape requirements; methods of fire suppression and how to limit fire growth and fire spread. 2) Be aware of and apply fire safety design concepts and strategies, that enable safe use and occupancy of a building. 3) Be aware of and apply mitigation and control functionalities of fire protection technologies and systems that detect, alert, confine fire growth and effluents, suppress ignition and fire, ventilate and secure escape or reduce fire spread; and reduce risks involved in firefighting and rescue.
b) Be aware of and contribute to fire safety in buildings through legislative controls	1) Demonstrate knowledge of the purpose and application of regulatory and legal frameworks to protect people and property from fire through fire safety requirements, including: statutes, regulations and advisory documentation. 2) Contribute to compliance with statutory requirements to aid warning, escape, containment of fire and to support extinction. 3) Be aware of and comply with requirements for exchange of fire safety information.
c) Contribute to the maintenance of fire safety in buildings during occupation	1) Be aware of functional requirements to be managed by audits, inspections and risk assessments that ensure means of escape and fire protection systems in buildings (including physical and technological means) remain available throughout a building's whole life appropriate to occupancy, use, construction and level of fire risk. 2) Be aware of the need to maintain compartmentation and function of fire protection system when undertaking works to existing buildings.
d) Contribute to establishing and maintaining structural safety in buildings	1) Be aware of the key principles of structural design and construction, including characteristics of typical systems, typical behaviours under load and in the event of fire.

Table 2 – Building safety principles and standards	
Core competence	**Indicative competence**
	2) Be aware of requirements of building regulations, codes and standards in relation to structural stability of primary structure, secondary structure and fixings; and contribute to compliance. 3) Be aware of functional maintenance requirements for structural safety and contribute to commissioning or undertaking of assessment, inspection, or maintenance tasks, including reviews taking into account contemporary regulatory standards. 4) Be aware of how and when to respond to events which can affect structural safety; and procure competent specialist advice when necessary.
e) Contribute to protecting public health and public safety from risks in buildings	1) Be aware of and contribute to compliance with all relevant requirements of building regulations for public health and public safety. *NOTE This includes but is not limited to regulatory requirements covering:* *a) radon, methane and site contamination including asbestos.* *b) waste and grey water drainage.* *c) electrical safety including lightning protection.* *d) gas supply and combustion appliance safety including carbon monoxide detection and the provision of devices and information for identifying and isolating gas supply.* *e) ventilation.* *f) moisture, damp and condensation risk.* *g) water supply and storage including hot water safety and public health risks, such as Legionella.* *h) overheating and heating failure.* *i) stairs, glazing, guarding and balustrading safety.* 2) Be aware of and contribute to compliance with other legislative requirements relevant to public health and public safety. 3) Be aware of management, maintenance or replacement requirements for building fabric or systems to protect the general public and their health and contribute as necessary to the provision or exchange of information, inspection, and maintenance activities.

6.3 Managing building safety

All sector-specific competence frameworks shall stipulate requirements for competence that meet or exceed the threshold as per Table 3 where relevant to role, function, activity or task.

Table 3 – Managing building safety

Core competence	Indicative competence
a) Be aware of and, where relevant, fulfil roles, responsibilities and duties critical to building safety.	1) Understand the relationship between key roles and responsibilities. *NOTE For example, but not exclusively:* *a) Client;* *b) Accountable persons;* *c) Principal designer;* *d) Principal Contractor;* *e) Designer;* *f) Contractor;* *g) Building Safety Manager; and* *h) Responsible Persons.* 2) Be aware of obligations to raise, escalate or flag risks to life safety during the design, manufacture, construction, maintenance or management process including whistleblowing, mandatory reporting regimes and legislation such as the Public Interest Disclosure Act. 3) Be aware of boundaries of own jurisdiction and the scope of the specific building safety responsibilities or systems under own control.
b) Be aware of relevant risk assessment processes and contribute to or participate effectively in risk assessment activities, including: • fire risk assessment; • safety case development; • design risk management.	1) Assess, and, where required, develop and implement control measures to mitigate risk posed by threats to life safety: i) identify risk and safety issues; ii) gather, analyse, use and share data to inform risk assessment; and iii) use risk assessment to guide actions, decisions and activities and where required develop and implement control measures to mitigate risks posed to life safety 2) Contribute to, use, or undertake fire risk assessment. 3) Contribute to or use safety case to identify and manage risks arising from design, specification, construction, occupation, operation or installation and/or maintenance.
c) Be aware of actions necessary to minimize risk that safety is compromised in the course of routine occupation, operation, installation and maintenance	1) Be aware of and, where relevant, act to support and encourage good housekeeping and fire safety practices amongst residents.

Table 3 – Managing building safety	
Core competence	**Indicative competence**
and, where relevant, take appropriate actions to manage building safety.	2) Promote, contribute to or provide effective training and education on fire safety matters to community and residents as required. 3) Apply, coordinate and control factors affecting building fabric or systems to maintain compartmentation and prevent fire spread. 4) Be aware of links between actions of building users/residents and building safety taking into account human factors.
d) Contribute to activities relating to the commissioning and procurement of a building or construction project, including pricing, purchasing and other commercial activities so as to minimize the risk that building safety outcomes and performance are compromised by decisions about cost.	1) Be aware of safety implications of procurement pathways, cost management, pricing, purchasing, change control and product selection sufficient to: i) identify where commissioning and procurement decisions impact on holistic building safety performance; ii) identify where use of alternative products, solutions or systems has potential to affect holistic life safety building performance; and iii) take mitigating actions to ensure life safety is not adversely affected by cost management, specification or commercial decisions. 2) In procuring services or supply of goods, check and assure competence of any person undertaking activities linked to safety during specification, design, construction, occupation, operation, installation and maintenance and to take mitigating actions where necessary.
e) Understand how to obtain suitable insurance, warranty or other protections enabling routes of recourse to address life safety defects.	Be aware of legal and ethical requirements to ensure routes of recourse to address building safety defects and where relevant act or contribute to obtaining: 1) public, professional, property and business insurance; 2) warranties on building products, systems or work.

6.4 Knowledge management and communication

All sector-specific competence frameworks shall stipulate requirements for competence that meet or exceed the threshold as set out in Table 4 where relevant to role, function, activity or task.

Table 4 – Knowledge management and communication

Core competence	Indicative competence
a) Contribute to the commissioning, development, use, management, distribution, maintenance and presentation of information about the buildings design, construction, operation, maintenance and refurbishment throughout the building life cycle. Obtain, record, update, share, safeguard and keep secure information about the building.	1) Be aware of the importance of and requirements for documented building safety information at a project, premises and organizational level. 2) Capture, issue and maintain life safety information; identify records that should be kept and how those should be retained; manage how others that may require the life safety information will be able to obtain it or make it available; contribute to golden thread of information, including but not limited to: • utilizing digital systems which can include building information modelling standards and systems, building management systems and digital records; • safety management systems; • safety case; • health and safety file; • fire risk assessment and emergency plan; • as-designed/as-built information; • building safety strategies; • building maintenance information and scheduling; • testing and commissioning information; • lifecycle and replacement data; • HRB records and certificates; • data protection and cyber security; • management of deleterious materials including asbestos; and • information relating to temporary works. 3) Conduct suitable research to obtain information, or identify and highlight missing information, relevant to building safety, especially in existing buildings.

Table 4 – Knowledge management and communication	
Core competence	**Indicative competence**
b) Effectively communicate issues relating to risk or safety with residents, clients and members of project or management teams.	1) Be aware of requirements/obligations and duties to communicate, consult and respond to residents, emergency services or persons otherwise affected by building and building work, dutyholders, clients and project team members. 2) Communicate effectively with a wide range of stakeholders through use of verbal, written and drawn or graphic information. 3) Explain in a balanced, proportionate and factual manner where risks to life safety have been identified and the potential consequences and make clear recommendations for potential mitigating measures.

6.5 Buildings as systems, construction products and materials

All sector-specific competence frameworks shall stipulate requirements for competence that meet or exceed the threshold as set out in Table 5 where relevant to role, function, activity or task.

Table 5 – Buildings as systems, construction products and quality

Core competence	Indicative competence
a) Coordinate building design, management or construction activities to ensure holistic building safety.	1) Be aware of the building as a system and make appropriate selections for intended use so that products and systems function individually and together to maintain building safety. 2) Be aware of the importance of installation quality on product and system performance and put in place quality assurance and management processes. 3) Be aware of, and act to set appropriate requirements for, product durability over time taking building use into account. 4) Integrate consideration of location and context in product performance and selection, e.g. proximity to boundary, boundary conditions (fire resistance, water resistance) size, distance, exposure to wind and rain, geometry. 5) Identify linked requirements for installation to enable products and components to work effectively and safely as part of a system, e.g. structural support, cavity barrier, acoustic insulation, watertightness, lightning protection.
b) Be aware of product and system characteristics and act as necessary to apply standards, testing, assessment and maintenance procedures for building materials, products, components, assemblies and systems to minimize risks to safety throughout the building lifecycle.	1) Use testing, certification and product information alongside design intent, as-built design and construction data to inform design, construction and management decisions. 2) Understand maintenance requirements for products and systems, and where relevant, act to plan, procure or manage maintenance of building fabric, fire protection or life safety systems through building life cycle. 3) Be aware of need for replacement of products and systems at the end of their life cycle and act to manage procurement or undertake work in a way which maintains building safety.

Annex A (informative)
Behavioural competence and ethical standards

A.1 General behavioural competence

This Annex provides informative text on the core requirements for behavioural competence and ethical standards recommended by this specification. This informative text is intended to aid in identifying behaviours or standards that are relevant to a given role, function or task when developing or reviewing sector-specific frameworks.

Behavioural competences are intended to promote good standards of conduct and ethical behaviour, whilst making sure as far as possible that poor conduct and risky behaviours are not tolerated and are challenged.

The outcome from instilling these behavioural competences is a positive safety culture throughout the supply chain and at all stages of specification, design, manufacture, procurement, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings. This relates to all aspects of quality and safety of products, workmanship, completed building work, subsequent maintenance and building operation management.

There are five key behaviour sets, as illustrated in Figure A.1, necessary to demonstrate suitable behavioural competence:

- ethical principles, standards and conduct;
- leadership, teamwork and communication;
- individual and organizational competence;
- personal responsibility and accountability; and
- duty of care to others including building occupants.

Figure A.1 – Core components of the built environment safety culture

In combination, these core behavioural competences can mitigate risks from bad practice and incentivize good behaviours. The competences are discussed in more detail in the rest of this Annex.

A.2 Ethical principles, standards and conduct

A.2.1 General

It is important that behavioural competence frameworks are supported by clearly defined ethical principles and standards relevant to the roles, functions, activities and tasks they cover. These are central to and interlinked with all other behavioural competences.

Ethics are defined as the moral principles and standards which underpin sound judgement and provide people with the moral authority to take responsibility for their actions and the actions of others. Ethics enable complex judgements to be made about what is right and what is wrong and help balance commercial considerations with wider duties to society and other people.

Critically, ethical standards and principles help to guide people to make the right decision when guidance, regulations or experience cannot do so. In this way ethics help people where there is ambiguity, lack of clarity or decisions need to be made without reference to others.

Core ethical principles include:

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

NOTE These ethical standards are based on the Engineering Statement of Ethical Principles.

In practice, the core ethical principles are relevant to all individuals and most commonly found in codes of conduct and personal performance standards. To be effective these ethical principles need to be integrated into academic and vocational training, and re-enforced by induction and onboarding processes, strong organizational leadership, reflected in management procedures and supported by on the job training, e.g. toolbox talks and CPD.

A.2.2 to **A.2.5** set out in more detail behaviours that support ethical conduct. These can be used as a starting point for sector-specific frameworks to assess and develop more specific competencies relevant to the role, function and tasks covered by that framework.

A.2.2 Respect for life, law, the environment and public good

All those involved in the specification, design, manufacture, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings have a duty to be familiar with all applicable laws and regulations and give due weight to facts, published standards and guidance and the wider public interest. This includes acting to:

a) hold paramount the health and safety of others and draw attention to hazards;

b) ensure their work is lawful, ethical and justified;

c) recognize the importance of physical and cyber security and data protection;

d) respect and protect personal information and intellectual property;

e) protect, and aim to improve, the quality of built and natural environments;

f) maximize the public good and minimize both actual and potential adverse effects for their own and succeeding generations; and

g) take due account of the limited availability of natural resources.

A.2.3 Honesty and integrity

All those involved in the specification, design, manufacture, procurement, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings have a duty to uphold the highest standards of personal conduct including openness, honesty and integrity. This includes:

a) acting in a reliable and trustworthy manner and treat others with equality and fairness;

b) being 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;

c) respecting confidentiality;

d) declaring and managing conflicts of interest;

e) avoiding deception and taking steps to prevent or report corrupt practices or professional misconduct; and

f) rejecting bribery and improper influence.

A.2.4 Accuracy and rigour

All those involved in the specification, design, manufacture, procurement, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings have a duty to acquire and use wisely the understanding, knowledge and skills needed to perform their role or task. This includes:

a) always acting with care;

b) performing services only in areas in which they are currently competent or under competent supervision;

c) keeping their knowledge and skills up to date;

d) assisting the development of knowledge and skills in others;

e) presenting and reviewing theory, evidence and interpretation honestly, accurately, objectively and without bias, while respecting reasoned alternative views;

f) identifying, evaluating, quantifying, mitigating and managing risks; and

g) not knowingly misleading or allowing others to be misled.

A.2.5 Responsibility for direction, conduct and communication.

All those involved in the specification, design, manufacture, procurement, specification, design, construction, inspection, assessment, management, operation, maintenance, refurbishment and demolition of buildings have a duty to abide by and promote high standards of personal conduct, communicate clearly and provide direction as appropriate, setting the example for others to follow. This includes:

a) being aware of and seeking to effectively communicate the issues that the built environment raises for society;

b) communicating as unambiguously and openly as possible to avoid misinterpretation;

c) promoting equality, diversity and inclusion, and respect the views of others;

d) promoting public awareness and understanding of the impact and benefits of new areas of learning, achievements and innovation in industry;

e) being objective and truthful in any statement made in their personal or professional capacity; and

f) challenging statements or policies that cause them personal or professional concern.

A.3 Behavioural competencies

A.3.1 Leadership, teamwork and communication

Building safety extends beyond workplace safety cultures to include consideration of safety for all those who will interact with a building across its lifespan. This requires a change in behaviour to recognize and act on these longer-term responsibilities.

Strong and visible commitment to prioritize building safety is required from senior management to develop and sustain effective safety cultures within organizations. This requires leadership at the top, but leadership on safety is also required at every level throughout the organization, including within teams and by individuals in positions of responsibility.

Safety culture also requires projects and management practices where collaboration and teamwork are encouraged. People have to be empowered to take action where they have concerns and there has to be a safety positive culture where those concerns are listened to and acted upon.

In addition, communication has to be effective in all directions within and between organizations to identify and manage safety risks.

A.3.2 Individual and organizational competence

To act safely, people have to clearly understand the limits of their personal and organizational competence and act responsibly in ensuring they undertake activities within these limits. This includes regularly undertaking assessment or self-assessment activities to identify areas where improvement is required and for these to be translated into personal development plans and activities to maintain or develop competence.

It is also important that competence frameworks support a learning culture which constantly monitors, analyses and acts to improve competence and safety outcomes. This can be facilitated by ensuring people remain equipped with the right competence to make sound decisions which include:

- understanding when decisions have to be made and how to exercise authority in making those decisions;
- listening to and identifying concerns and responding appropriately;
- the ability to analyse likely problems that will be encountered in a logical, structured manner in order to identify necessary actions;
- the ability to identify risks, the consequences of action or inaction, and factor these into decisions;
- the ability to make timely and appropriate decisions and judgements even in the face of ambiguity or uncertainty; and
- knowing what is needed to escalate matters where they are unable to make decisions or judgements themselves.

A.3.3 Individual responsibility and accountability

It is important that competent individuals clearly understand how their actions can impact on others and what is expected of them in taking responsibility for those actions. This includes potential impacts on work colleagues and the general public both during and after they have fulfilled their role.

To achieve this, competence assessment processes can include requirements for candidates to demonstrate how they take personal responsibility, including:

- taking responsibility for their own actions and the actions of those under their supervision or direction;
- understanding their role and responsibilities in keeping others safe;
- knowledge and understanding of legal duties and responsibilities relevant to their role; and
- the ability to identify where boundaries of responsibility lie and communicate this effectively to/with others.

A.3.4 Duty of care to others including building occupants

A positive safety culture requires that everyone with individual responsibility for safety in the built environment understands that buildings have the potential to cause harm to others throughout the building's lifecycle, including during occupation. It is important that individuals and organizations recognize where they have a duty of care to protect people's safety and act accordingly. This includes:

- ensuring competence to design, construct, maintain and manage buildings safely;
- understanding the importance of effective consultation and communication with clients, residents and others likely to be affected by buildings or building work; and
- consideration of factors affecting diversity and inclusion for individuals who will occupy or be affected by the building or building work.

Annex B (informative)
Fire safety in buildings

*COMMENTARY ON **ANNEX B***

This annex provides an overview of fire safety considerations in buildings which are relevant to the development or review of sector-specific competence frameworks. It offers an overview of fire safety considerations and should not be seen as comprehensive but be used as a starting point to develop an understanding of how fire safety considerations are relevant to any given discipline, role or task.

B.1 Expectations in terms of fire safety competence

B.1.1 There are many specialized roles relating to fire safety which require high levels of competence. However, it is equally important to recognize that most roles have the potential to impact on fire safety. To make sure that fire safety risks are appropriately managed across the building's life cycle it is critical to identify the varying levels of awareness and competence for which all individuals involved in work in the built environment have responsibility. This includes:

a) any individual involved in the manufacture, distribution, procurement or specification of products or systems;

b) designers, including sub-contracted designers;

c) contractors, including installers and subcontractors;

d) accountable and responsible persons, building managers, operatives and administrators; and

e) those involved in the audit, inspection, maintenance or upkeep of buildings.

B.1.2 Fire safety risks tend to be cumulative – that is, small elements of risk can add up to become a major hazard if left unmanaged. To promote building safety, it is necessary for all participants to clearly understand:

a) the specific responsibilities for fire safety associated with their role or task;

b) how their role interfaces with other fire safety considerations and other disciplines; and

c) how to communicate and manage risk within and between building owners, user organizations and teams.

B.2 Interaction with other key fire safety roles

In looking at the scope of any sector-specific competence frameworks it is necessary to consider how their discipline, role or tasks interact with the other key fire safety actors at different stages of development and management activity.

The aim should be to put measures in place so that the roles and responsibilities of these individuals are clearly understood. Competence assessment criteria can then be set so that scope boundaries and interfaces are coordinated, assigned, acknowledged and managed. A good starting point would be to map interactions with the list of key individuals as per a) to f)**.**

a) Resident representation, including:

   1) residents;

   2) residents' associations, panels and representatives;

   3) ombudsmen;

   4) individual residents and households;

   5) tenants; and

6) leaseholders and persons responsible under legislation.

b) Regulators, including:
   1) Building safety regulator;
   2) building control bodies;
   3) Health and Safety Executive;
   4) building control inspectors; and
   5) fire safety regulators.

c) Fire safety specialisms, including:
   1) fire engineers;
   2) fire risk assessors;
   3) fire and rescue service; and
   4) any other persons appointed as a fire safety specialist, e.g. passive fire protection, active fire safety systems.

d) Dutyholders or persons described in legislation, including:
   1) Clients and property owners;
   2) Accountable Person;
   3) Responsible Person;
   4) Principal Designer;
   5) Principal Contractor;
   6) Designers;
   7) Contractors; and
   8) Building Safety Managers and facility managers.

e) Consultants and representatives, including:
   1) architects, designers and planning advisors;
   2) engineers, specifiers and technical specialists including fire, structural, electrical, mechanical, public health, lightning protection and façade engineers;
   3) cost consultants and project managers;
   4) construction managers and advisers;
   5) freeholder or building owner/managing agent;
   6) health and safety professionals; and
   7) surveyors.

f) Construction, contractors and subcontractors, including:
   1) main contractors;
   2) subcontractors;
   3) contractors and subcontractors with contractual design responsibility; and
   4) specialist installers of fire safety products, materials or systems.

B.3 Characteristics of buildings relevant to fire safety

B.3.1 General

B.3.1.1 From a regulatory perspective, fire safety is primarily interested in the protection of life from death or serious injury from fire rather than vulnerability of the building to loss from fire spread. Buildings presenting the highest fire risk to life or loss of property are not necessarily the most complex types of buildings but are premises where life safety risks are considered to be elevated.

B.3.1.2 While sector-specific competence frameworks can promote awareness of statutory definitions of higher-risk buildings, it is also important to promote understanding of the characteristics that make any building higher-risk in terms of occupant safety. These characteristics are fundamental to establishing effective fire safety strategies which influence the design and construction of a building, and subsequently determine the way in which the building needs to be managed to remain safe in occupation.

B.3.1.3 Higher-risk building types include:

a) blocks of flats or houses with multiple dwellings (two or more dwellings);

b) student accommodation;

c) residential care homes;

d) secure residential institutions (e.g. prison, detention centre); and

e) temporary accommodation (e.g. a hotel, hostel, guest house, hospital, hospice).

The common factors in these buildings are:

1) premises primarily used for residential purposes;

2) premises where people sleep, are less alert or less mobile; and

3) premises over 18 m or more than six storeys, i.e. tall buildings where escape is more protracted or difficult.

NOTE It is anticipated that in many areas higher-risk buildings will be defined in legislation.

B.3.2 Key characteristics of higher-risk buildings

B.3.2.1 General

Key characteristics that influence whether a building is considered higher-risk are listed in **B.3.2.2** to **B.3.2.5**.

NOTE This list is not exhaustive.

While there are many other factors that can affect life safety risk, it is important that the reasons for buildings being classified as higher-risk are understood and taken into account in setting specific competence requirements.

B.3.2.2 Height

Higher buildings require more time if they have to evacuate in the event of an emergency and are more difficult logistically for the emergency services to operate within i.e. to fight a fire in. This is especially so if the fire involves spread of flame in external walls or other features, or if the building has limited internal access and egress routes, making it difficult to assist in evacuation or provide medical assistance.

Taller buildings are also often more difficult to maintain and inspect; might have been altered, adapted and changed over periods for different uses, and may contain inherently

weak but difficult to identify construction and materials, all of which can impact on the ability to control fire spread

B.3.2.3 Physical constraints on construction

Other physical constraints that can impact on fire safety include restricted or limited access for emergency services, waste management arrangements, internal circulation arrangements (e.g. corridors without natural light) and staircase and lift provision.

High buildings may also have fire-engineered control systems such as integrated suppression and smoke control, which require higher levels of operating expertise, maintenance and management.

B.3.2.4 Occupancy and use

Buildings where people are likely to sleep are generally considered to be higher-risk because of the additional time it takes for sleeping people to become aware of and react to a fire, and because there is often a longer intervening period between a fire starting, being detected and the emergency services being made aware of the need to intervene (be that through an emergency call or other automated fire detection system).

Who occupies a building also has a significant impact on life safety risk. A building with residential premises might be part of a larger multi-use complex, and the way in which the residents manage or are supported to manage their occupancy risk (which might involve health, behavioural or personal constraints) is key to life safety outcomes.

More vulnerable individuals, including older and disabled people who may need physical assistance to evacuate, or individuals who require supervision to react to a fire, such as children or visitors, are likely to present higher-risk. These risks might be exacerbated because the design of the building limits means of escape meaning that particular attention needs to be given to escape provision in buildings including, but not limited to, schools, hospitals, care homes, sheltered housing and hospitality and entertainment venues. These human factors can present difficulties requiring personal emergency evacuation plans to facilitate and manage safe escape from the premises.

Industrial and commercial premises can also present elevated fire safety risks depending on the use of the building.

B.3.2.5 Familiarity

Where people are regular users or permanent residents of a building it is important that they have access to information and, where appropriate, receive training in how to stay safe and manage fire safety risks. They need to be made familiar with their own responsibility, and procedures for evacuation in the event of a fire.

Buildings where people are temporary residents (e.g. hotels, hostels) or occasional users require different strategies for fire safety to account for lack of familiarity with how to stay safe in the event of a fire. Typically, this involves trained staff or other assistance, enhanced communication systems, more stringent fire precautions and enhanced signage to support adequate means for escape.

B.3.2.6 Fire strategy

Having a fire strategy in place is key to successfully managing building fire safety. In some cases, reducing the economic loss may add a dimension of fire control beyond life safety and this will be part of the strategy. The safety case and fire strategy are usually integrated and may in the case of a new purpose-designed building be planned from the concept through the whole life use of a building.

B.4 Key fire safety risk factors

The key factors that affect fire safety and which need to be considered in developing or assessing sector-specific frameworks for buildings vary at different stages of the development process.

It is important that individuals are competent to manage fire safety risks related to their discipline, role or task at these different stages. Even where individuals are only involved for a short period or discrete part of a building's development or management, it is important that they understand how their personal activity relates to safety throughout the building lifecycle. This includes awareness of how fire safety forms part of a holistic approach to building safety.

Clauses **B.5**, **B.6** and **B.7** set out common fire safety risks which need to be considered in order to help inform the development of specific competencies within frameworks or their supporting assessment criteria. It is important that these are considered in a cross-cutting manner as design strategies are just as important to the building manager and first responders as operational management strategies are to the building designer.

It is important to manage the integration of any fire safety installations and maintenance matters within mixed use units, which could be integral to the building, (and building safety) but potentially under different ownership /management.

B.5 Design, specification and product selection for fire safety

B.5.1 The design of a building is critical to fire safety in two primary ways:

a) For new buildings, the design process enables a holistic approach to fire safety to be integrated throughout all aspects of the building's fabric and services – this requires competent designers acting collaboratively to achieve safe standards of performance that can be sustained across the building's lifecycle

b) For existing buildings, it is important to understand how the original building was designed to be occupied safely; what changes have occurred since it was originally built; and how this has affected the way in which the building needs to be operated and maintained to remain safe.

B.5.2 Design includes the selection, specification, coordination and integration of building products to form systems contributing to the overall safety of the building. It is important that all aspects of the buildings are evaluated with respect to their impact on fire safety, including (but not limited to):

a) means of escape – the physical arrangement of staircases, waiting areas, preventing smoke and fire spread, etc so that people can escape the building, aided or unaided, quickly and safely to a safe place in the event of fire;

b) shape, size and layout – particularly in relation to ensuring ease of access and support for firefighting services;

c) materials, products and systems – performance in relation to fire needs to be clearly understood; appropriate products need to be used in the right place; assemblies need to work safely as systems and be compatible with other systems; certification and test information needs to be understood to inform choice and product changes monitored for system compatibility;

d) passive fire protection and compartmentation – buildings are designed so that the materials and construction selected help to contain a fire and prevent its spread both on the outside and within the building by ensuring effective compartmentation;

e) active fire protection systems and firefighting services are designed to detect and give warning of fire or smoke, actively suppress fire, provide information and services to firefighters to assist fire suppression and control combustion products to enable escape and rescue;

f) human factors relating to fire safety including the causes of fires and human behaviour once alerted to the event of fire; and.

g) operational considerations affecting how first responders and firefighters will be able to intervene.

B.5.3 It is preferable that designs exceed the minimum requirements set out in building regulations where possible. Alternative approaches to delivering fire safety other than those set out in statutory guidance are often acceptable but rely on fire-engineered solutions that require high levels of competence to assess and integrate into the building design. Other commonly adopted building standards include BS 9991 for residential buildings, BS 9999 for non-residential buildings and BB 100 for schools.

B.5.4 Design work is undertaken by a wide range of individuals and businesses all of which need to be competent in ensuring their design delivers fire safety taking into account the performance of any other connected or interrelated part of the building. This includes architects, engineers, interior designers, quantity surveyors and specialist consultants, contractors or subcontractors undertaking design activities. It is important that design work is considered in line with the CDM Regulations 2015 which states that:

"*A designer is an organisation or individual whose business involves preparing or modifying designs for construction projects, or arranging for or instructing, others to do this. Designs include drawings, design details, specifications, bills of quantity and design calculations.*"

B.5.5 There are number of key fire safety risks recognized during the design stage which need to be managed including:

a) individuals undertaking design work without realizing they have the responsibilities of a designer;

b) designers exceeding limits of their own competence by undertaking work for which they are not qualified;

c) failure to adequately address regulatory requirements and take into account good practice recommendations for fire safety;

d) designers relying on assumptions of performance rather than using evidence to assure performance;

e) designers relying overly on the competence of others to identify and resolve fire safety issues in the buildings design;

f) failure to accurately record fire safety strategies and key decision affecting the fire performance of the buildings;

g) failure to properly coordinate design with other designers and to assess holistic performance including resolving complex ownership and management within, for example, mixed-use developments; and

h) failure to properly manage waste and storage needs in a way which avoids fire safety being compromised.

B.5.6 It is important that consideration is therefore given as to what competence is required for any given discipline, role or task and where competence is exceeded, to engage a suitably competent person, to manage the following key aspects of fire safety design:

a) ability to comply with or exceed minimum technical requirements for fire safety;

b) ability to understand the fire performance of materials, products and systems and make effective choices to promote holistic fire safety in the resultant design;

c) ability to coordinate activities with other designers to enable holistic building safety; and

d) the need to manage and maintain records and distribute drawings, schedules, specifications etc to maintain the golden thread of information through the building life cycle.

B.5.7 These considerations are just as critical when undertaking design work for minor alterations or major refurbishment of existing buildings. Competency of designers is important when undertaking this type of work so that they are able to audit how those changes might affect the building's safety, taking into account the original design intent and any other changes which have taken place in the interim.

B.5.8 Competency of designers is important in assessing and managing fire safety risks which arise from interactions at the construction stage, particularly where changes to the design are proposed for cost management purposes. Equally, it is important that designers also recognize where specialist or more competent advice is required in assessing the impact of these changes on building safety and appoint a suitably competent person to assess impacts on fire safety and ratify the amended design.

B.6 Construction works to new or existing buildings

B.6.1 Construction work is highly complex and involves a large number of suppliers, trades, disciplines and organizations to coordinate their activities in order to deliver the intent set out in the design.

B.6.2 The construction phase involves a wide range of individuals and organizations including designers, cost consultants, contractors, subcontractors and regulators all of whom need to understand their role in maintaining fire safety standards through the building process.

B.6.3 It is recognized that there are many opportunities for fire safety standards to be compromised during the construction or refurbishment process. Key risks include:

a) products being omitted or incorrectly installed reducing fire safety performance, e.g. cavity barriers upside down, fire doors being incorrectly installed with the wrong frames or furniture or in the wrong location;

b) products being poorly installed, e.g. inadequate seals around frames or inadequate number of fixings;

c) products being substituted for poorer performing alternatives which compromise fire safety performance;

d) products being substituted without reviewing impact on holistic fire safety performance, or performance of adjacent, connected or dependent systems;

e) incorrect or inadequate commissioning of fire safety systems;

f) inadequate or poor management of interfaces between follow-on trades impacting fire safety performance;

g) damage to compartmentation, e.g. holes made for services without adequate fire stopping or systems during construction or refurbishment or maintenance works compromising fire safety performance;

h) cost-cutting or value engineering exercises being undertaken without adequate re-assessment of impacts on fire safety design intent and performance;

i) design work undertaken by individuals who are not competent as designers;

j) re-design or changes to specification being undertaken without proper understanding of original fire safety design intent or which could compromise the fire safety performance of the building as a whole;

k) inadequate quality management and oversight of work quality;

l) multiple levels of sub-contracting affecting ability to effectively communicate requirements;

m) fragmented supply chains impacting ability to manage the golden thread of information through the project lifecycle to completion of work; and

n) failure to provide appropriate temporary fire safety and prevention measures.

B.6.4 In isolation or combination these risks can significantly affect overall building safety outcomes. If repeated multiple times over a building's life cycle, fire safety can become severely compromised.

B.6.5 These risks can be mitigated by strong links and effective communication between and within the design and construction phases of projects with design intent clearly recorded and passed on to the construction team. Wherever possible, it is preferable for buildings to be constructed in line with the original design intent to avoid the risk of reduced fire safety performance involved in re-design during the construction phase.

Where changes do occur to layout, materials, products or systems, these changes are re-evaluated in terms of any potential impact on fire safety and where necessary additional mitigation is provided. While changes during construction do not always result in a worse building and may be inconsequential as far as fire safety goes, the culture of doing this without proper recording or scrutiny allows for unsafe construction to occur.

B.6.6 Managing competence of site staff, subcontractors and operatives is also essential with work being undertaken by, or under the direct supervision of, competent individuals who take responsibility for the quality and safety of the work. While some defects in critical fire safety measures can be found during construction or during regulatory audits there are many elements that are hidden, difficult to check and could have catastrophic consequences if they do not perform as intended. Cavity barriers and fire stopping or sealing around breaches in compartmentation are examples of this.

B.6.7 Sector-specific competence frameworks might benefit from considering carefully what type and level of competence are required to address and mitigate these risks. This might include:

a) the ability to appoint, check, manage and assure competence of those involved in the construction process;

b) suitable knowledge of construction technology, systems and products and their relevance to achieving the right level of fire safety performance;

c) knowledge of and the ability to execute or manage work to comply with or exceed regulatory requirements;

d) awareness and effective management practices so that fire risks are controlled while work is being undertaken and when work is left in an incomplete state (e.g. overnight);

e) the ability to manage cost and time in a way which does not impact on safety;

f) the ability to effectively plan works so that the right materials and products are available in the right place at the right time;

g) the ability to manage quality of work is correctly installed to the required standard;

h) the ability to identify any emerging fire safety risks and take action to correct underperformance;

i) the ability to manage changes in construction so that they do not compromise fire safety including knowing when to commission revaluation against design intent; and

j) the need to hand over fire safety information in a format useable by the client/building owner or operator.

B.7 Management, operation, maintenance and alteration

B.7.1 The management and operation of a building once in occupation is key to maintaining fire safety. At the time of occupation, there is a need for those responsible for the building's management to understand their obligations. Preventing death or serious injury from fire is the cornerstone of good fire safety practice and underpin the key requirements and expectations of the management dutyholder. This includes:

a) duty to take general fire precautions; such as managing waste storage and disposal to reduce the risk of fire spread;

b) risk assessment;

c) how relevant principles of prevention are to be applied;

d) fire safety arrangements;

e) elimination or reduction of risks from dangerous substances;

f) firefighting and fire detection;

g) emergency routes and exits;

h) procedures for serious and imminent danger and for danger areas;

i) additional emergency measures in respect of dangerous substances;

j) maintenance;

k) safety assistance;

l) provision of information to employees;

m) provision of information to employers and the self-employed from outside undertakings;

n) training;

o) cooperation and coordination; and

p) general duties of employees at work.

B.7.2 Typically the work of the fire service is not to identify and rectify building deficiencies that may have occurred during the design and construction phases although it is common for these deficiencies to cause issues which need to be dealt with. Instead, the Fire Services primary role is to determine whether the building remains safe to be occupied taking these factors into account.

B.7.3 As well as complying with the requirements of Fire Services, once a building is occupied, there are other regulatory considerations for management which include housing (for instance, use of the Housing Health and Safety Rating System) and environmental

health legislation, some of which have some consideration for fire. It is important that the management of a building is aware of:

a) what elements of regulation and legislation apply to the building;

b) the extent to which they are legally responsible;

c) what actions they need to take in order to be compliant;

d) who else is legally responsible (in some cases they may be solely responsible or there may need to be an element of cooperation and coordination as specified in the FSO); and

e) have suitable competence to put plans in place to fulfil the actions identified above and then enact them.

B.7.4 There are a number of key operations which need to be undertaken by competent individuals to promote continued fire safety. Many of these operations will be required by applicable fire safety legislation, but the following are all considered at the very least to be essential practice:

a) Regular inspection and maintenance of fire safety systems including (but not limited to):

   1) passive protection, e.g. compartmentation, fire doors;

   2) active fire protection systems, including sprinklers or other means of fire suppression, smoke control and alarm and evacuation alert systems;

   3) facilities for firefighting services, e.g. wet and dry risers, firefighting lifts and access in the area surrounding the building; and

   4) management of fire risk mitigation, including waste management and inspection of individual dwellings.

b) Engagement with residents including (but not limited to):

   1) developing and managing resident engagement strategies;

   2) listening to and acting on concerns raised;

   3) ensuring competence of any individuals working on the buildings including consideration of how to manage work commissioned directly by occupants; and

   4) ensuring safety of maintenance and alteration works.

c) Managing safety information and process which includes:

   1) regular review and update of the safety case, building safety strategy and fire strategy;

   2) ensuring the golden thread of building information is maintained through the building life cycle; and

   3) liaising with regulators and the fire and rescue service as and when necessary.

B.7.5 In particular, consideration of competence requirements that promote awareness (and where necessary higher levels of competence) in relation to the following fire safety risks which commonly arise during occupation and use may be beneficial:

a) compromise of access for firefighting services to the building, e.g. due to the way in which the building's immediate environment is used and managed;

b) compromise of fire compartmentation as a result of work undertaken to the building by residents or tradesmen. This includes:

1) breaching compartment walls to run new services such as cables or pipes; and
2) alterations to fire doors including their replacement or adjustment/interference with door closers.

c) failure to adequately maintain fire alarm and detection systems;

d) failure to inspect critical safety systems, including but not limited to smoke control systems, firefighting equipment, dry and wet risers and firefighting lifts;

e) failure to manage or control potential sources of fire including through poor waste management and storage or flammable materials left in corridors and on escape routes (e.g. mobility scooters); and

f) failure to check competence of consultants, designers, contractors and installers employed in maintenance and management of the building.

B.7.6 Management is often used as a tool to compensate for building deficiencies or as part of a risk mitigation programme. This is often because it is perceived to be cheaper and easier to introduce than physical risk controls such as compartmentation or fire doors and the like. Understanding the limitations of such measures and that failures are more likely to occur where people are required to be part of fire safety solutions, is an important part of undertaking management functions.

B.7.7 For the reasons outlined above, it is important that the management of buildings, at all levels, is undertaken by those who are competent to do so.

Annex C (informative)
Structural safety in buildings

C.1 General

C.1.1 This annex provides an overview of structural safety considerations in buildings including higher-risk buildings. It is not intended to be comprehensive but can be used as a starting to point to develop an understanding of how structural safety considerations are relevant to any given discipline, role or task.

C.1.2 It is important that structural design is undertaken by someone who is suitably qualified and experienced and competent to meet the technical demands of the project. It is recognized that appointing a single engineer to coordinate structural design tasks can further improve safety.

C.2 Expectations in terms of structural safety competence

C.2.1 The primary aim for structural safety regimes is to avoid structural failure which can pose a significant threat to life safety both for people within a building and for those in the building's vicinity. While catastrophic structural failures are rare, their impacts can be severe including multiple loss of life. It is also important to consider the structural design for temporary loads, temporary conditions and temporary works.

C.2.2 Any structural failure can pose a threat to the safety of persons within and around the building. This includes localized collapse, the risk of parts of buildings falling off internally (e.g. ceilings) and externally (e.g. copings or elements of cladding systems) and failure of secondary structural elements such as guarding or balustrades which can put people at risk of falling.

C.2.3 Structural failure may also occur as a result of other events such as fire, extreme weather or vehicles colliding with the building. Risks can be reduced by increasing the robustness of the structural solution in new construction or where buildings are altered. Buildings need to be designed, inspected and maintained so that the risk of structural failure from these events is recognized and minimized. Where such events do occur the likely performance of the building needs to be understood so that steps can be taken to mitigate subsequent risks. For instance:

a) knowing how long the structure of a building will remain stable in the event of a fire (which may require specialist advice from fire engineers) will enable fire and rescue services to gauge how safe it is for residents or firefighters to remain within a building; and

b) understanding that when the structure has been affected, e.g. by a car colliding with a structural column in a car park the building manager knows how to commission specialist assessment of the extent of any damage.

C.2.4 The design, manufacture, erection and assembly of structural systems, including checking and site supervision require high levels of competence, often in very specialized areas of activity. It is important that, given the many risks associated with structural failure the undertaking of structural fabrication, design, installation, inspection and acceptance of work is reserved for individuals whose competence is assured.

C.2.5 However, there are many other roles in the design, construction and management of buildings which can impact on structural safety, including actions by residents and users of buildings. It is important that there is a common understanding amongst non-structural specialists of how their role relates to ensuring and maintaining structural safety.

C.2.6 It is also important that people are aware of how structural design, fabrication, installation or maintenance relate to other aspects of building safety including fire safety. It is

particularly important to recognize that unauthorized modifications to a building either during construction or when in use can create severe risks and that all modifications are to be reviewed and approved by a suitably competent person.

C.3 Key risks associated with structural safety

C.3.1 Structural failures are generally well recorded, particularly where there has been a risk to life safety, actual harm or loss of life. Failures are subject to evaluation and review, and it is generally accepted that the main cause of structural failure fall into six main categories:

a) where the structure is not robust enough or stable enough to withstand the loads that act on it – this can be as a result of design or fabrication failures, or both;

b) where the quality of construction is inadequate including failure to adhere to structural design requirements, improper or erroneous use of materials or poor-quality workmanship and supervision;

c) where the materials used are defective e.g. where an error in manufacturing quality or damage in transit affect structural performance;

d) where inferior materials are substituted during the procurement or construction process;

e) where possible but unlikely problems in use are not fully accounted for in the design of the structure resulting in lack of resilience in real world conditions – for instance impact by a vehicle, flooding or an explosion; and

f) where the structure is subject to failure due to fatigue or corrosion – this includes the structure being overstressed due to movement and exposure to conditions (such as water penetration) which may cause decay.

C.3.2 It is important that competence frameworks identify interactions with potential structural failure and require suitable competence to mitigate these risks. This includes:

a) Potential risk of explosion which can cause localized structural failure. This includes storage of fuel or explosive materials (such as LPG gas cannisters); careful design, installation and maintenance of gas supplies; and management of processes which could generate an explosive atmosphere (e.g. where dust is generated).

b) Ensuring adequate fixing and support design including for external cladding systems taking into account system requirements, height and exposure. Inspection and management regimes for critical fixings are usually required to enable continued safety.

C.4 Structural characteristics of higher-risk buildings

C.4.1 The way in which higher-risk buildings have been defined is explained in **B.3.2**. Typically, these are taller or larger buildings, or buildings where occupancy or use increase risk to occupants. They will normally contain large numbers of people on a continual basis such as residential buildings or an occasional basis such as stadia.

C.4.2 The structural characteristics of the building will largely depend on the:

a) location in which it is built including ground conditions (geology) and exposure to the elements (to wind and weather);

b) likely loads that will be applied to the building during the construction process and resulting from its use; and/or

c) technologies used in its construction taking context and use into account.

C.4.3 Structural characteristics include:

a) foundations – the elements of structure which transfer load from the superstructure to the ground;

b) superstructure or primary structure – the main frame, load-bearing wall system or other fundamental supports of the building;

c) secondary structure – load-bearing elements connected to the superstructure supporting the remaining elements of building fabric; and

d) fixings – elements connecting primary and secondary structure and attaching other non-loadbearing elements of the building to the structure, e.g. fixing for cladding systems, windows, guarding and balustrades.

C.4.4 There are many different technologies which can be used to fulfil these roles including (but not exclusively) in situ concrete, pre-cast concrete, hot rolled steelwork, cold rolled steelwork, aluminium, structural timber systems and masonry (brick or block) structures. Often a number of these different systems will be combined.

C.4.5 A building's structure will perform differently in the event of fire or under load, e.g. from high winds and in terms of durability depending on which of these technologies are adopted. A competent designer will include combinations of these loads, and the associated risks, when devising the safety case and assessing structural performance.

C.4.6 Understanding how these different structural systems age, their vulnerability to deterioration over time (e.g. corrosion resulting from water ingress, concrete decay or reaction to fire) and how they need to be inspected and maintained are critical to maintaining building safety. The ability to inspect all parts of a structure which are subject to weather effects is part of a good design.

C.4.7 Consideration therefore needs to be given to how the minimum levels of competence in the following respects are relevant to any sector-specific competence framework:

a) ability to identify different structural systems;

b) awareness of basic characteristics of different structural systems in terms of performance in response to fire, water penetration and decay;

c) awareness of how own role interacts or can impact on structural safety;

d) awareness of events which can affect structural safety and how to respond to those events; and

e) how and when to commission and procure competent expert advice or assessment to maintain structural safety.

C.5 Design and specification for structural safety

C.5.1 Regulations typically require that buildings are designed in accordance with current design codes (or the design codes applicable at the time they were built). These design codes include a range of safety factors to ensure that there is sufficient redundancy in the design to deal with most likely events. However, this will only be the case where the design is undertaken by suitable competent people, and the construction work is undertaken in accordance with that design.

C.5.2 Compliance with codes and regulations are minimum requirements and there will be some case where these standards need to be exceeded to achieve satisfactory performance in more extreme circumstances.

C.5.3 Since 1968 structural design requirements in regulation have progressively integrated requirements to address the risk of major structural failure in the form of progressive or disproportionate collapse – in other words, the failure of one part of a building's structure

does not lead to other parts of the structure collapsing. A structure properly designed and constructed in line with the codes of practice cited in national building regulations and their supporting statutory guidance can address these issues.

C.5.4 Structural safety requires competence of the engineers who are designing and fabricating the structure. Structural design is becoming increasingly complex and frequently uses advanced analytical techniques to improve structural efficiency.

C.5.5 At the same time, many elements of detailed structural design are undertaken by specialist subcontractors, including connection details of foundations and structural frames, design of temporary works, façade engineering and the design and specification of fixtures for safety critical elements such as guarding, balustrades and cladding systems. An important safety issue is for the Principal Contractor to check that there are clear responsibilities and lines of communication for all those in the supply chain and that subcontractors are suitably competent to undertake design work.

C.5.6 While it is critical that major elements of structure are designed properly, a number of structural failures with life safety implications have been identified relating to secondary structural elements and even fixings for other elements of building systems. This includes:

a) use of incorrect glazing in glazed balustrade systems; and

b) failure to correctly design fixings for rendered and rainscreen cladding systems taking into account height and likely wind loads.

NOTE Further examples of deficiencies and failures can be found on the CROSS website (www.structural-safety.org).

C.5.7 Structural design is an integrated part of the building as a system and needs to be coordinated with:

a) fire strategies so that the structural integrity is maintained in the event of a fire to enable people to evacuate and to support emergency operations;

b) protecting structural elements of the building (e.g. encasement and compartmentation) to enable the above and other elements of the fire safety strategy; and

c) measures to avoid corrosion or decay – this includes assessing designs for interstitial condensation within the structural layer.

d) service layouts to avoid buildability issues which may reduce margins of safety.

C.5.8 Consideration of the level and type of competence required to directly undertake structural design includes:

a) understanding limits of competence in undertaking structural design tasks or work; associated with structural safety;

b) ability to identify where specialist advice is needed;

c) ability to identify interfaces between structural design and other disciplines relevant to building safety, e.g. fire safety or managing condensation risk; and

d) ability to procure and manage competence of others appointed to undertake structural design work.

C.6 Construction

C.6.1 It is important that the construction phase of work, whether new build, extension or maintenance focuses on delivering structural solutions that perform in line with the structural design. As many elements of design are undertaken by specialist subcontractors during the construction period it is vital that:

a) contracting organizations are capable of assessing and managing subcontractor's competence to undertake design work and that there is a clear chain of communications setting out responsibilities;

b) contracting organizations are competent in making sure that any changes to structural design are referenced back to the overall structural designer and the implications of those changes are properly evaluated for both structural and fire safety, e.g. a change of specification for grade of steelwork may require a change in the level of fire protection required; and

c) temporary works are designed by competent persons and suitably managed to maintain structural integrity during the construction phase.

C.6.2 Managing quality of fabrication, installation and construction work is also critical. It is important contracting organizations and the people they employ are competent to:

a) review and coordinate structural design information developed during the construction phase;

b) review proposals for supervision on site;

c) check quality and suitability of materials (being wary of substitutions) arriving and being used on site to meet structural safety requirements;

d) establish, programme and manage a programme of site inspections to review quality of installation at critical phases, e.g. compliance of reinforcement prior to pouring concrete;

e) undertake suitable quality testing as and when required, e.g. of weld strengths or concrete strength to achieve compliance with specifications; and

f) manage variations in structural design or installation so that structural safety is not compromised.

C.6.3 It is important that accurate records, including photographs, are retained during construction to be passed onto building operators for management purposes.

C.7 Management, operation, maintenance and alteration

C.7.1 Buildings have a potentially long life and can certainly be expected to last at least 60 years. For buildings to remain structurally safe over this time period requires:

a) periodic inspection to understand the condition of the building structure and identify any works required;

b) maintenance and remedial work to address any issues which may lead to damage to the structure;

c) careful management of change of use, alteration, extension or modifications to the building so that that structural integrity is not reduced over time; and

d) retention of information relevant to the building structural safety including through use of digital systems and building information management systems where appropriate.

C.7.2 Where significant alterations or extensions to a building are undertaken these need to be carried out with the same care in design and construction expected of new building work.

C.7.3 Care also needs to be taken with minor alterations, particularly those which involve creating holes or routes within the building (for instance, installing new cables) or which could impact on fire protection or water tightness. Cumulative small changes can result in more serious damage to the building structure, e.g. holes drilled through reinforced concrete can sever reinforcement as well as allow water to enter leading to corrosion of reinforcement.

C.7.4 The building's structure also needs to be understood as being subject to change over time. Many forms of structure are vulnerable to corrosion or decay, particularly if water (including interstitial condensation) is allowed to enter into the structural layers. Structural elements can also suffer from fatigue, although this more commonly affects secondary or ancillary elements such as brise soleil.

C.7.5 Periodic inspection of the building structure by a competent person is therefore critical with frequency of inspection based on risk, e.g. based on the condition of the structure, as well as in response to incidents which could affect structural safety. These include:

a) where a structural element fails which may indicate wider structural issues, e.g. a piece of cladding detaching and falling from the building;

b) evidence of structural movement such as severe cracking or sagging of members;

c) collision or physical event which may cause damage to the building structure, e.g. collision of a car with a column or structural wall;

d) where there is evidence of likely water penetration e.g. localized flooding, water from firefighting, evidence of failure in water tightness of cladding systems, evidence of extensive damp or mould; and

e) damage from an extreme environmental effect such as very high wind.

C.7.6 Structural inspection can be undertaken by a variety of means. Drone technology now enables extensive visual inspection of the exterior of buildings without the need for costly scaffolding or access equipment. This can be combined with the use of thermal imaging cameras to detect in gaps insulation which could, for example, cause condensation issues or indicate water ingress into cladding systems.

C.7.7 Often it will be necessary to seek specialist advice on structural issues to understand whether there is material risk requiring mitigation. It is recommended that buildings owners and managers enter into flexible arrangements with suitably competent persons such that inspections and advice can be obtained in a timely manner.

C.7.8 Sector-specific competence frameworks for those individuals managing or responsible for operating buildings might need to consider suitable competence in relation to:

a) knowledge and ability to discuss the fundamental nature of the building's structural design;

b) awareness and ability to respond and manage risks arising from building work being undertaken or events which could impact on structural integrity;

c) requirements for and ability to manage or obtain assurance of competence of individuals undertaking work which could impact on structural safety;

d) awareness and ability to plan and manage suitable inspection regimes to maintain structural integrity and safety; and

e) awareness and ability to respond to resident concerns relating to structural condition.

C.7.9 For those sector-specific frameworks covering individuals undertaking work on higher-risk buildings the following considerations may be particularly relevant:

a) ensuring competence to undertake design work including using competent persons for design of fixings to non-load-bearing elements;

b) awareness of potential interactions and impacts on structural integrity of work to be undertaken;

c) competence to manage quality of design, fabrication and installation; and

d) ability to identify risks, raise concerns and take mitigating actions in relation to structural safety.

Annex D (informative)
Public health and public safety in buildings

D.1 Introduction

D.1.1 This annex provides an overview of public health and public safety considerations in buildings (including higher-risk buildings) relevant to the development or review of sector-specific competence frameworks. Public health considerations include the primary risks arising from the environment which people occupy which may give rise to ill health while public safety relates to risks that may give rise to injury.

D.1.2 This annex is not intended to be comprehensive but can be used as a starting point to develop an understanding of how public health and public safety considerations are relevant to any given discipline, role or task.

D.2 Expectations in terms of public health and public safety competence

D.2.1 Fire and structural safety risks are regarded as being the most likely types of risk to give rise to catastrophic failure where a single event can result in serious loss of life. However, fire and structural safety are not the only factors which need to be considered in ensuring buildings are safe. There are also a wider range of risks relevant to buildings, including higher-risk buildings, which need to be managed.

D.2.2 This is not to say that buildings classified as higher-risk are inherently more dangerous – this will not be the case where risks to public health and public safety are properly managed. It is important however to be aware of the way in which the nature of higher-risk buildings can make the impact of these risks more severe or indicate that a problem found in one location may be found in many other locations (due to the repetitive nature of design in multi-story buildings). In particular, higher-risk buildings tend to be tall and/ or accommodate a significant number of people in a single location.

D.2.3 Relevant risk factors in buildings include:

a) Height and scale – a problem in a taller or larger building is more likely to affect a significant number of people, and as height increases the risks from a number of public safety factors may also increase e.g. managing flue gas emission from combustion appliances (such as boilers) is much more complex in a tall building than in a two-storey house.

b) Shared services – where multiple dwellings share building services and systems a single failure can affect many more people, e.g. a shared water supply system can support the development of Legionnaires' disease if not properly managed, or shared flues can pass carbon monoxide from one dwelling to another.

c) Shared spaces – communal areas within buildings can create different risks. In addition, with a number of occupants accessing shared services and common areas, there are more opportunities for the actions of one occupant to create increased risks for others. There may also be differing attitudes to risk or a wider range of risk as a result of vulnerability of the occupants.

D.2.4 The following clauses set out common types of public health and public safety risk. It is important that sector-specific frameworks consider where activities relevant to any discipline, role or task could interface with these (or any other risks that are identified) and require suitable awareness of them as well as identifying what level of competence is required to mitigate those risks. This includes, where relevant:

a) knowledge and ability to comply with or exceed requirements of the building regulations and supporting statutory guidance;

b) knowledge and ability to comply with other legislation and follow relevant guidance appropriately;

c) awareness of interface of activities with other potential sources of public safety risk and how to mitigate these; and

d) awareness of need to identify and escalate risks where necessary.

D.3 Key public health and public safety risks

D.3.1 Radon, methane and site contaminants

D.3.1.1 The ground on which a building stands can in itself be a source of risk which needs to be managed. There are a wide range of solid, liquid or gaseous contaminants typically resulting from:

a) contamination, e.g. where a site has had previous industrial use including factories and land used for waste landfill; or in rural areas where land has been exposed to pesticides, fertilizers and oil spill.

b) geological factors including naturally occurring heavy metals such as cadmium and arsenic; and naturally occurring gases which can enter the building such as methane (which poses a risk of explosion and fire), carbon dioxide or radon (which poses a long-term life safety risk, and which could cause cancer).

D.3.1.2 For new works or extensions, suitable desktop and site surveys need to be undertaken to identify, develop risk management strategies and mitigate risks from contamination – this also usually involves engagement with a building control body, the local planning authority and the environment agency.

D.3.1.3 These risks need to be identified and where necessary remediation measures put in place which can include containment or removal of contaminated soil. Buildings may also need to be designed and built with barriers to prevent gas or liquids from entering the building in combination with creation of ventilation pathways with stack effect to remove ground gas; or in the case of radon use of active extraction systems such as sump pumps.

D.3.1.4 Extensive guidance on managing these risks is available to support designers and contractors and anyone undertaking design or construction works to be competent to identify where action is required including seeking suitable specialist advice.

D.3.1.5 It is important that building managers and owners are aware of these risks; how they relate to the buildings they manage and have in place the right inspection and maintenance requirements so that mitigation measures remain effective once the building is occupied.

D.3.2 Asbestos

D.3.2.1 The use of asbestos has been banned since 1999 but is frequently found in various forms in buildings erected or altered prior to that date. Management and removal of asbestos are carefully regulated so that building users and workers are kept safe. Legal duties (under the 1974 Health and Safety at Work Act and the Control of Asbestos Regulations) on those persons in control of buildings and those working on premises are designed so that risks from asbestos in situ are minimized.

D.3.2.2 Essential practice in managing asbestos safely includes recording the location of all asbestos on the basis that it only remains in place if it is maintained in good condition, not vulnerable to damage and is regularly inspected where accessible. Effective management also involves sealing off any asbestos that is not accessible for inspection with the seals inspected regularly. Competent and suitably trained persons are the only individuals suitable to carry out works related to asbestos and need to have access to asbestos location

information before work starts. Written permits to work are recommended. In particular, it is important that:

a) designers and building managers are familiar with asbestos risks and how to identify and manage asbestos-containing material. It is recommended that building managers attend a suitable training course on duty to manage asbestos and refresher and update courses on a regular basis;

b) workers know-how to recognize suspect materials and the next steps to take to minimize risk to themselves and others;

c) specialists in higher-risk work such as remediation or removal of asbestos have the appropriate higher competence levels to remain legally compliant; and

d) where asbestos was installed as a fire/heat protection, consideration is given to replacing this protection with material delivering the same or better protection if the asbestos is to be removed.

D.3.3 Ventilation, damp and moisture

D.3.3.1 It is important that buildings are designed and built so that:

a) there is adequate ventilation to maintain healthy indoor air quality;

b) there is provision to purge ventilate where there is an urgent need to remove noxious fumes or gases;

c) the habitable spaces are not subject to damp; and

d) moisture does not penetrate the building in a way which can damage the structure or fabric of the building or contribute to damp forming or unhealthy indoor air quality.

D.3.3.2 Poor ventilation and moisture ingress often lead to poor air quality or the formation of damp. Damp problems are often the result of condensation within the fabric of the building (interstitial condensation), resulting from poor design or construction practice or from poor installation of energy efficiency measures.

D.3.3.3 Poor indoor air quality and damp can have serious health implications including contributing to premature death. Treatment of ill health caused or exacerbated by poor indoor air quality and damp is a significant long-term burden and cost to the health service and welfare system. Ensuring that habitable accommodation has adequate air quality and is not subject to moisture ingress is therefore a key area of competence for designers; persons constructing, installing or commissioning relevant elements of a building; and an area where building managers need to be competent in understanding, identifying and responding appropriately to indications of air quality issues or damp.

D.3.3.4 Minimum standards to address these issues are set out in building regulations, code and standards and associated statutory guidance but consideration needs to be given to site-specific environmental factors such as security (fear of opening windows) and pollution (proximity to busy roads) which can seriously affect ventilation and require additional mitigation.

D.3.3.5 Moisture within the fabric can be indicative of water penetration from failed cladding, failed or blocked gutters and downpipes or compromised building watertightness due for example to failed parapets and copings. Damaged membranes at foundation level allowing rising damp and can contribute not only to damp but damage to the buildings structure with the potential for more significant structural failure.

D.3.4 Overheating and heating failure

D.3.4.1 Buildings are also potentially very dangerous if they are prone to overheating, or if people are exposed to long periods of unhealthy cold temperatures. In both cases, more vulnerable people (the very young, older people and people with underlying health conditions) are likely to be more affected, including being at risk of premature death.

D.3.4.2 Overheating risk to health occurs where properties are subject to sustained periods where temperatures do not allow the human body to re-stabilize temperature. Overheating risk varies from occupant to occupant and dwelling to dwelling but most frequent causes include lack of or inadequate ventilation; excessive solar gain from windows on exposed elevations; excessive heat gain from building services; lack of thermal mass to absorb heat or inability to take advantage of overnight cooling.

D.3.4.3 Higher-risk buildings are potentially more vulnerable to overheating because they are often tall buildings with single aspect flats which do not benefit from cross ventilation, but which may be exposed to a lot of heat gain from the sun; in some cases, they are higher-risk due to their occupants being more vulnerable, e.g. care homes.

D.3.4.4 Solutions to overheating at the design stage include undertaking suitable overheating analysis; introducing mitigating measures such as external solar shading (where that is permitted by current regulations) or heat reflective glazing; reducing glazed areas on exposed elevations; increasing ventilation rates and using stack effect or insulating internal building services to reduce heat gain.

D.3.4.5 Dealing with overheating in occupation may involve introducing control measures as above where this is possible; addressing barriers to use of ventilation; or provision of comfort cooling as a management procedure. Ultimately, very vulnerable persons may need to be moved to alternative accommodation.

D.3.4.6 Where heating systems fail, are not working properly or are inadequate there is a serious risk to health from people spending extended periods of time living with internal temperatures below 13°c. This is recognized as leading to significantly increased risk of cardio vascular and respiratory illness and premature death.

D.3.4.7 Building designers, managers and maintainers need to have suitable competence in relation to avoiding overheating and excess cold where this relates to the activities they undertake.

D.3.5 Water supply, hot water storage, drainage systems and waste

D.3.5.1 It is important that water supply and drainage systems in all buildings are designed, installed and maintained to protect public health. Considerations for higher-risk uildings tend to be considerably more complex than systems in smaller or lower buildings. As these services are shared, problems that occur can affect a large number of people, including risk of bacteriological infections such as Legionella or other water-borne pathogens. Undertaking design, installation and maintenance of these systems requires suitably competent people. In high-rise buildings there are also significant risks arising from the pressures generated in hydraulic systems, requiring specific competences of designers, installers and those who maintain or work on those systems.

D.3.5.2 It is important that fresh-water supplies provide water that is healthy to drink and does not become contaminated. It is also important that water supply systems have adequate pressure to reach higher up parts of buildings, and that there are no leaks which could contribute to damp problems or damage the building structure and fabric. Adequate water pressure is also required in charged/full wet risers where these are installed.

D.3.5.3 Water systems are understood to pose a number of risks to health and safety including. It is important that:

a) hot-water cylinders are maintained to be safe, particularly where they are pressurized cylinders;

b) systems and distribution pipework are able to withstand both the operating pressure and the temperature of hot water they carry to avoid deformation, leakage or failure;

c) water systems, including cisterns and tanks within dwellings, are designed and installed to resist likely temperatures and pressures and should be adequately supported;

d) hot-water outlets (taps) in some locations are installed so that temperature at delivery does not exceed 48°c; and

e) these factors are understood and managed at design, construction and occupation stages.

D.3.5.4 Drainage systems include grey water systems (from sinks and appliances) and foul water systems (from toilets etc), both of which need to work so that waste water is disposed of safely. Grey water and foul water pose potentially serious public health risk including spreading serious disease if they are defective.

D.3.5.5 As drainage systems are shared within tall or larger residential buildings, if they become damaged or blocked they can affect a large number of people and put them at risk of living in unsanitary conditions.

D.3.5.6 Drainage systems need to be watertight and maintain air tightness in critical locations (typically referred to as traps) to prevent foul air re-entering dwellings -– this includes the potential for viruses to spread between dwellings. Drainage of foul and grey water is typically via vertical pipework referred to as ‘stacks’ which require air intake either at the top or by admittance valves adjacent to sanitary appliances to prevent suction in the pipework.

D.3.5.7 In taller buildings, care needs to be taken in avoiding too many bends or sweeps in vertical pipework, and consideration has to be given to much higher pressure and velocity of discharge into the pipe at height. It is advisable to introduce higher levels of acoustic protection around shared stack pipes, particularly at low levels within the building.

D.3.5.8 The design of grey water and foul water systems require adequate access for cleaning, rodding and removal of blockages. They also require regular inspection and maintenance both above ground (within the building) and below ground (sewers) as required.

D.3.5.9 Storage and disposal of solid waste (rubbish) in all building but particularly in higher-risk buildings also needs to be given serious consideration. A build-up of waste represents a potential source of ignition and can compromise both escape routes, compartmentation and access for firefighting services. Poor waste management can also create public health risks, including promoting spread of disease and providing a habitat for vermin.

D.3.6 Gas supply, combustion devices and carbon monoxide

D.3.6.1 Many individual dwellings have gas, oil or LPG boilers. While some higher-risk buildings have communal heating systems, it is also common for individual flats or dwellings to have their own boilers, many of which are connected to gas supplies.

D.3.6.2 Gas systems within need to be fitted in accordance with relevant gas fitting regulations so that pipework is suitably robust (not easily damaged); located to avoid the risk of gas building up in voids (which can give rise to explosions if ignited) but also located outside of critical protected escape routes. It is important that voids have appropriate access

points for inspection and maintenance and that pipework is also suitably protected from frost and resistant to decay.

D.3.6.3 Boilers require regular maintenance and inspection to remain safe and the waste gas from combustion needs to be discharged safely. In some tall buildings this is by way of internal shared ducts, in other buildings direct to the outside. It is important that combustion gases are not expelled in a location where they can re-enter the building; and in shared ducts there is sufficient buoyancy for waste gases to rise to the outside. It is also essential that shared duct systems are properly commissioned and then regularly maintained so that combustion gases cannot be transferred from one dwelling to another. This can lead to carbon monoxide and other toxic gases entering dwellings and can cause death by asphyxiation. Where such leakage occurs, it is generally an ongoing effect and not an isolated single occurrence and can therefore lead to longer term exposure to carbon monoxide with associated health impairment.

D.3.6.4 Boilers and cookers also need sufficient oxygen supply to avoid partial combustion which can give rise to release of excessive carbon dioxide and highly toxic carbon monoxide. Carbon monoxide detectors might be required adjacent to some types of boilers/combustion devices and need regular checking. It is critical that all boiler flues and inlets are installed by competent persons so that adequate oxygen supplies and avoid any risk of combustion gases leaking back into the property. It is also essential that all combustion appliances are regularly serviced and maintained by a competent person. Building safety managers will need to put in place management systems to ensure that these tasks are undertaken and that any remedial actions required are carried out without delay.

D.3.6.5 Wherever gas installation takes place, it is important that the work does not breach fire compartmentation, with any penetrations of fire compartments made good using appropriate techniques and materials to meet the correct fire rating for that element. Extraction systems (including cooking extraciton) which pass through multiple compartments represent a particular hazard and require suitable containment as well as regular cleaning and maintenance regimes.

D.3.7 Electrical safety and lightning protection

D.3.7.1 Electricity can kill or severely injure individuals and also poses a serious risk to building safety as a potential cause of fire, including as a result of the building being struck by lightning. It is important that electrical work is always be carried out by suitably competent persons. Inspection and testing by a suitably competent electrician is important to manage safety, prior to occupation of a new building or following work to an existing building.

D.3.7.2 Inspection and testing by a suitably competent electrician is also vital in existing buildings and for existing electrical systems so that any deterioration and faults are identified and rectified before serious problems can occur. This includes switch gear, distribution boards, cables and other parts of an installation being assessed and replaced as and when necessary.

D.3.7.3 Higher-risk and multi-storey buildings tend to contain vertical risers with high voltage and high amperage/current distribution boards. It is important that access to these risers is strictly controlled, and the fire compartmentation of the riser and of the cable management systems maintained to prevent it providing a vertical path for fire within the building.

D.3.7.4 Most large and higher-risk buildings, including mixed use developments often include complex life safety systems such as pressurization, smoke ventilation and firefighting lifts, which require dual supplies, standby generator backup and changeover switchgear systems. These systems require a high level of specific electrotechnical knowledge, skills and experience to enable correct operation in the event of an emergency. It is important that

they are installed, inspected, tested and/or maintained only by a suitably competent electrician working for a competent organization.

D.3.7.5 Many buildings will also require lightning protection systems designed to protect occupants and the building. Reducing risks to occupants involves isolating step and touch risks in the event of a lightning strike and providing signage identifying any exposed areas (such as roof or unshielded ground areas) to be evacuated during thunderstorms. It is important that the lightning protection itself is designed by a suitably competent person and takes account of the need for separation from other conductive materials, adequate surge protection to electrical installations and suitable bonding of exposed metallic structures such as external cladding or balcony balustrades (particularly in buildings over 60 m in height).

NOTE Detailed information about registration/certification requirements for accredited electrical enterprises and the qualifications and experience requirements for the individuals whom they employ is set out in the Electrotechnical Assessment Specification document, available from the Institute of Engineering and Technology (IET) website: https://electrical.theiet.org/bs-7671/building-regulations/electrotechnical-assessment-specification/

D.3.8 Guarding, balustrades, staircases and glazing safety

D.3.8.1 , Slips, trips and falls represent the most frequent source of injury or serious injury in buildings. Staircases are a particular source of risk, but in taller buildings any slip, trip or fall can prove fatal if there is inadequate protection against falls.

D.3.8.2 Guidance on safe staircase design is provided in building regulations, and relevant British Standards codes of practice. The key features are:

a) adequate and even rise and going (tread) of the stair;

b) a reasonable pitch (steepness);

c) nosings at the front edge of stairs which prevent the foot from slipping and provide a visual contrast to help define the edge of each step;

d) Selection of suitable materials to minimize risk of slips[5]

e) adequate handrail to allow person to arrest a fall before it goes out of control;

f) adequate guarding to prevent falling over the side of a stair;

g) adequate headroom;

h) breaks in long flights of stairs to enable people to arrest their fall; and

i) lighting that enables people to see steps and landing clearly.

D.3.8.3 Staircases require maintainance and subject to periodic inspection. The risk of pedestrian slips, trips and falls is an important factor to be considered when designing and refurbishing buildings, as well as when planning activities within existing buildings. The choice of floor surface, as well as the design of entrances, stairs, storage and lighting can have a significant influence on the risk of slips, trips and falls.

D.3.8.4 It is important that wherever reasonably practicable, floor surfaces are free from defects, obstructions and substances that could pose a risk of slips, trips and falls. Suitable installation and maintenance of floor surfaces and the provision of adequate storage can help keep walkways clear of obstructions and other trip hazards. A pedestrian's toe clearance can be lower than 10 mm during normal walking gait and so even small obstructions and/or changes in level can present a trip hazard. Where reasonably practicable, remove potential trip hazards. However, in situations where it is not reasonably practicable to remove the trip hazard, pro-active measures are necessary to mitigate the risk

[5] More information at https://www.hse.gov.uk/slips/architects.htm

that they pose. Mitigation measures may include redirecting pedestrian traffic to avoid the trip hazard or making the trip hazard easily noticeable by providing good lighting and using contrasting colours to highlight the trip hazard. When assessing the risk and deciding on the most appropriate interventions, it is important to consider the type of pedestrian activity within the area. For example, making the trip hazard more noticeable may not be sufficient if pedestrians are carrying objects that will obscure/block their view.

D.3.8.5 Changes in level cannot be avoided on stairs, but measures should still be taken to manage the risk. Inconsistent stair dimensions has been shown to increase the risk of falls and so it is important to make sure the rise and going (height and depth) of each tread is consistent throughout the entire flight. National building regulations provide detailed specifications for minimum standards of safety in stair design. Typically, this includes recognition that good lighting and the installation of non-slip stair nosings in a colour that contrasts with the treads and adjacent floor surfaces will significantly reduce the risk of missteps and the provision of suitable and sufficient handrails will help to arrest any falls.

D.3.8.6 Floor surfaces do not tend to be slippery when they are clean and dry, but some floors can become very slippery in the presence of small amounts of surface contamination. The design of the building (e.g. the installation of canopies over entrances) and careful planning of the activities within the building can help to reduce the likelihood of floor surface contamination. However, in some environments it may not be reasonably practicable to keep the floor surface clean and dry at all times. It is therefore important to assess the likelihood of the surface becoming contaminated and in areas that are considered susceptible to contamination (e.g. at entrances) install a suitable slip resistant floor surface.

D.3.8.7 Guarding and balustrades to balconies, walkways and external spaces are critical to safety particularly in taller buildings. Guidance on safe design of balustrades and guarding is provided in building regulations and relevant British Standard codes of practice.

D.3.8.8 Balustrades need to be capable of resisting considerable weight by being firmly fixed back to the building's structure, and strong enough to prevent failure. Effective balustrades and guarding will be high enough to prevent someone falling over them easily (with the top rail above the typical centre of gravity) and designed so as not to be easily climbable by children.

D.3.8.9 Where glazed balustrades are used care needs to be taken so that if the glazing fails there is still adequate protection from falling. It is important that replacement glazing is carefully specified to ensure it is suitable in these locations.

D.3.8.10 Glazing throughout the building can also pose a danger, particularly in common parts where people congregate. The main risks are colliding with the glass causing it to break and cause injury. Requirements are set out in building regulations for areas of glazing which need to be resistant to breaking or break safely to help reduce the likelihood of injury. Correct specification is critical in undertaking any works to replace glazing so that the right type of safety glass is used – as well as, for example, toughened or laminated glass, this can include fire rated glazing which is critical to longer term fire safety in some locations.

D.3.9 Summary

D.3.9.1 Design and installation of many aspects of buildings have life safety implications, and particualarly for higher-risk buildings require a high level of competence to make sure that the building is safe. The same level of individual competence is required in undertaking any work once the building is occupied, whether that is modification, maintenance or replacement. Competence will need to evolve in response to technological innovation and as regulatory requirements and standards change.

D.3.9.2 It is critical that designers, contractors and building managers acknowledge the limits of their competence and seek specialist advice or assistance whenever necessary given the wide range of competence required to address all of the possible public health and public safety issues.

D.3.9.3 It is particularly important that building managers are diligent in ensuring the competence of those who carry out work to the building once it is occupied, taking into account how this affects safety over time. In doing so they also need to proactively consider the wider range of potential impacts on safety that any building work may have.

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