CHAPTER 3: Modern Methods of Construction (MMC)

CONTENTS

FUNCTIONAL REQUIREMENTS

3.1 MODERN METHODS OF CONSTRUCTION (MMC)

Workmanship

i. All workmanship must be within the tolerances defined in Chapter 1 of this Manual.
ii. All work is to be carried out by a technically competent person in a workmanlike manner.
iii. Certification is required for any work completed by an approved installer.

Materials

i. All materials should be stored correctly in a manner that will not cause damage or deterioration of the product.
ii. All materials, products and building systems shall be appropriate and suitable for their intended purpose.
iii. The structure shall, unless specifically agreed otherwise with the Warranty provider, have a life of not less than 60 years. Individual components and assemblies, not integral to the structure, may have a lesser durability, but not in any circumstances less than 15 years.
iv. Whilst there is and can be no Policy responsibility and/ or liability for a roof covering performance life of 60 years or less, roof coverings shall be designed and constructed so they have an intended life of not less than 15 years.

Design

i. The design and specifications shall provide a clear indication of the design intent and demonstrate a satisfactory level of performance.
ii. Structural elements outside the parameters of regional Approved Documents must be supported by structural calculations provided by a suitably qualified expert.
iii. The construction must meet the relevant Regional Building Regulations.
iv. All MMC systems must be assessed and have a product approval by a recognised third-party assessment body.

Limitations of Functional Requirements

i. The Functional Requirements are limited by the recommendations applied to the specific areas covered in this chapter.
ii. These Functional Requirements do not and will not apply to create any policy liability for any remedial works carried out by the contractor or otherwise, nor to any materials used in those remedial works.

CHAPTER 3: Modern Methods of Construction (MMC)

3.1.1 Introduction

Modern Methods of Construction (MMC) are being used in the construction industry, particularly for housing, as they potentially represent savings in time and materials, and provide higher standards of quality than more conventional methods of construction.

Key points to note are:

- Off-site assembly means quick erection times on-site and a quick, weather tight construction achieved.
- The accurate setting out of foundations, etc. needs to be managed.
- MMC, particularly modular systems and large panel systems, will require advanced planning of the site for access, off-loading, installation and possibly storage of systems.
- The construction, design and layout of a typical system is planned in advance, so last-minute changes have to be avoided by good project management and what is known as a 'design freeze', imposed in advance of production commencing in the factory.
- The quality of the final product will rely on accurate assembly on-site by factory-trained or authorised Specialist Contractors.
- MMC take advantage of standardised construction, and may not be adaptable for complex architectural or planning design requirements. Additional testing may be necessary to ensure standards for durability and weather tightness can be achieved, e.g. incorporating flat roof drainage outlets through closed panel parapet extensions.

3.1.2 Suitability of systems and components

It is important to ensure that MMC, products or systems:

- Meet the requirements of British Standards or equivalent European Standards current at the time of application.
- Are materials/products or systems covered by a current approval from an independent third-party technical approval body which is accepted by the Warranty provider. This would be either a UKAS accredited or a European equivalent accredited organisation, such as ILAC (International Laboratory Accreditation Co-operation). Details of the testing body accreditation will need to be supplied, together with the certification document.
- Carry independent third-party testing that recognises UK Building Regulation requirements and additional Warranty standards. Details of the performance and the limitations of use of the material/product or system tested must be provided.
- Bear (Where a corresponding Euro Standard exists) a CE marking in accordance with the Construction Products Directive. This shall be supported by evidence of testing carried out on the product.

Construction methods that cannot meet the requirements of this Technical Manual must be approved in advance by the Warranty provider at the design stage, well before commencement on-site.

MMC, products or systems that have third-party approval will still need to be structurally approved on a site-by-site basis depending on the layout and loading of the component. Thermal properties and measures to prevent condensation will also require specific assessment depending on exposure, orientation, etc.

3.1.3 Types of Modern Methods of Construction (MMC)

MMC (this applies to systems and components) usually fall into the following categories:

- Volumetric or modular construction
- Panelised
- Hybrid (semi-volumetric)
- Site-based systems

Most MMC components are usually site-based, e.g. Insulated concrete formwork systems.

3.1.3.1 Volumetric

Volumetric construction (also known as modular construction) involves the 'off-site' production of three-dimensional units. Quality controlled systems of production in the factory should be in place and expected as part of any third-party approval.

Modules may be brought to site in a variety of different forms, ranging from a basic structural shell to one where all the internal and external finishes and services are already installed.

Volumetric construction can consist of timber frame, light gauge steel and concrete or composite constructions. External cladding may form part of the prefabricated system, with only localised on-site specialist sealing required.

Alternatively, traditional masonry cladding may need to be constructed; in this case, specific detailing for the support of claddings, cavity barriers and DPCs must be pre-agreed and checked by Site Managers.

3.1.3.2 Panelised

The panel units are produced 'off-site' in a factory under a quality controlled process, and assembled on-site to produce a three-dimensional structure. The panels may consist of wall, floor or roof units, sometimes referred to as cassettes.

3.1.3.3 Closed panels

These involve the factory installation of lining materials and insulation, and may be constructed of timber, steel frame or concrete panels. Panels can often include services, windows, doors and finishes.

3.1.3.4 Open panel systems

Open panel systems do not include insulation, lining boards, vapour control layers, etc. These are applied to the frame system on-site, together with the external cladding and internal finishing. Therefore, careful control of on-site finishing will be required, and the panels must be protected against the elements until weather tight. 'Conventional' timber frame panels are typically classed as 'open panel systems', and would normally arrive on-site with the sheathing board fixed but without insulation or internal boards. For Warranty purposes, these types of open panel systems can normally be classified as established or traditional construction, providing that such open panel systems have quality assured systems in place and are registered either with the Structural Timber Association or BM TRADA (see Chapter 7 of this Technical Manual for general guidance on conventional timber frame construction).

Note: Bespoke timber frame open panel systems that do not have such QA procedures will need either third-party accreditation or independent Structural Engineer supervision to be provided to monitor the installation, erection and completion (sign off) of the system. (See Chapter 7 Section 7.3).

Structurally Insulated Panels (SIPs) are a form of composite panel. Only systems with independent third-party approval will meet the requirements of the Technical Manual.

Rain screen systems should have third-party certification confirming satisfactory assessment, and comply with the requirements of the CWCT Standard for Systemised Building Envelopes, including the following sections:

- Part 1: Scope, terminology, testing and classification
- Part 2: Loadings, fixings and movement
- Part 3: Air, water and wind resistance
- Part 4: Operable components, additional elements and means of access
- Part 5: Thermal, moisture and acoustic performance
- Part 6: Fire performance
- Part 7: Robustness, durability, tolerances and workmanship
- Part 8: Testing

3.1.3.5 Hybrid

Again off-site manufactured, this combines both panelised and volumetric approaches, and typically volumetric units, e.g. student accommodation or hotel pods.

3.1.3.6 Sub-assemblies and components

This category covers factory-built sub-assemblies or components in an otherwise traditionally built structural form, typically schemes incorporating the use of floor or roof cassettes, precast concrete foundation assemblies, preformed service installations and cladding systems, etc.

3.1.3.7 Site-based systems

These are structural systems that fall outside the 'off-site manufactured' categories, such as Insulated Concrete Formwork (ICF). Only systems with independent third-party approval will meet the requirements of the Technical Manual. The acceptability of these systems relies heavily on the quality procedures in place for the installation of the system on-site, in accordance with third-party approval.

3.1.4 Suitability of systems to meet Warranty requirements

(Please also refer to the requirements in Chapter 2 of this Manual).

An independent third-party assessment of the system/product must recognise UK Building Regulation requirements and our additional Warranty standards.

Details of the performance and the limitations of use of the material/product or system testing must be provided to determine if the requirements of this Manual are met.

The independent assessment, e.g. a European Technical Assessment, must provide details of performance and testing carried out in the following areas to demonstrate acceptability to the Warranty provider:

- Structural integrity
- Performance in fire situations
- Resistance to water penetration (consider exposure rating of location), vapour permeability and dangerous substances
- Safety in use
- Acoustic characteristics
- Thermal and movement characteristics
- Compatibility of materials (interaction between components, structural or otherwise)
- Durability and longevity of materials (60 year lifespan in accordance with CML requirements)
- Maintenance issues

Structural performance must be identified against appropriate BS EN standards. The developer must provide actual structural calculations for each project on a case-by-case basis, and the design shall allow for robustness to disproportionate collapse.

Where the independent certification does not recognise our Warranty requirements, additional checks may be required to confirm the system is acceptable, e.g. the need to provide a drained cavity behind some insulated cladding systems and to external cladding systems on timber and steel-framed systems. Supporting evidence of testing undertaken to prove the system may be asked for.

Durability and weather tightness are key aspects of the Technical Manual requirements, and the track record of the MMC will need to be established.

Evidence of experience gained elsewhere, where environmental conditions may be significantly different, will need to be assessed, in comparison with conditions here in the UK.

Treatment of timber components will need to be assessed with regard to the species of timber used. The natural durability and the need for preservative treatment are dependent on the component's location in the construction and the Warranty requirement for durability. Treatment for insect attack in certain parts of the country will also be required.

Detailing is critical in providing integrity to the building, e.g. connections between a wall panel and a window unit. Supporting documentation must show the make-up of the tested system. When assessing projects, a particular design detail may not have been covered by the MMC certification, e.g. a balcony junction. This information must be made known at an early stage.

Certain components of a building have particular functions and may not be replaced by components that look similar but might structurally behave in a different manner. Similarly, a product with a third-party assessment for a particular use may not be acceptable in a different form of construction.

The continuation of Quality Management Systems from manufacture to erection on-site must be demonstrated. The level of supervision of the systems on-site is critical to meet the requirements of this Technical Manual.

3.1.5 Insulated concrete formwork

Insulated concrete formwork (or ICF) utilizes polystyrene (mainly) as a temporary formwork, with concrete poured into the formwork core at staged lifts to provide the structural 'wall' component to carry the loads of the building down to foundations, this can be both external and internal walls.

The insulation form work (usually either expanded or extruded polystyrene (EPS or XPS)) is left in place after the concrete has cured to form a permanent integral part of the insulation of the building. An external weather proof cladding system will be required as the ICF system alone is not proven to be resistant to weather.

For the purposes of this Technical Manual:

- The system proposed must have a current third party 'product approval'
- ICF systems will be acceptable for a maximum of 3 storeys in height (including the ground floor level) and must be accompanied with a full structural engineers design package.

3.1.5.1 Types of ICF structure:

The formwork is usually one of the following four formats; Blocks, planks, panels or composites with planks or panels tie devices are used to secure the 'outer and inner' components together.

It is expected that all ICF type structures are to be erected by the ICF manufacturer's approved contractors.

3.1.5.2 Weather proof envelope

Details of the type and construction of the external cladding system must be agreed with the Warranty surveyor before installation:

- The provision for a horizontal damp proof course must be appropriate for the type of ICF system.
- The design must allow for effectively preventing water penetration at window / door openings, mastic between the frame and the ICF will not suffice. The ICF manufacturer or the ICF association recommendations should be followed e.g. use of a compriband or similar third party product approved gasket dpc system around frame junctions. Particular attention should also be given to the joints between the windows and doors and the surrounding cladding system.
- The designer must provide details for prior approval of any lean too / flat roof abutments, parapets or balcony constructions to determine how water penetration at these junctions to the inside of the building will be prevented.
- Claddings:
  - Masonry / stone cladding: a minimum 50mm cavity will be required and the wall tie fixings taken into the concrete core.
  - Timber cladding: a drained and vented 19mm minimum cavity will be required. If open boarding, additional weather protection to the ICF may be required e.g. a render coat or a suitable breather membrane.
  - External wall insulation systems (including a cladding finish) require a third party 'product approval' stating it will provide a weather resistant cladding specifically for ICF structures and clearly state in which exposure zones it can be used. The method of fixing the EWI system may require both mechanical and bonded systems, Dot and Dab adhesive will not suffice.
  - Direct render cladding:
    - Only use a third party product approved render system which is accepted by the Warranty provider.
    - Any projects in a very severe exposure location must also have the render installers insurance backed guarantee.

3.1.5.3 Installation

The ICF system must be installed by the ICF manufacturers recommended contractors. The height of lifts (stages of filling with concrete) must be properly controlled to avoid distortion to the formwork and honeycombing in the concrete core (due to incorrect placement).

The installation of the formwork must ensure that after pouring the concrete core the requirements of Chapter 1 of our Technical Manual will be met.