Introduction to MetStructures

**MetStructures Limited** formed in 2017 following decades of experience in the Hot Rolled and Cold Formed Construction markets.

“We are a construction company providing **Design**, **Manufacturing** and **Installation** services for a wide range of structures across many market sectors.

Our in-house teams are ready to support your project anywhere in the UK and Ireland, providing a **full consultation from conception, design and pricing, offsite manufacturing and panel assembly, installation and completion on site**.

We offer a wide scope of works including:

- Hot Rolled Fabricated Steelwork
- Light Gauge Steel Framing
- Flooring Systems
- Stairs and Handrailing
- Mezzanines
- SFS

The following Technical Manual provides details of our Light Gauge Steel Framing system specifically developed for the residential, hotel, care and student accommodation sectors.

The system has been fully assessed by the SCI and NHBC for structural designs up to 15 storeys in accordance with BS EN 1993-1-3.
The MetStructures Framing System is a structural solution for walls, floors and roofs formed from light gauge steel shaped sections and trapezoidal decking with concrete cover.

MetStructures profiles are 1.2mm to 3.2mm in gauge, roll formed from pre-coated galvanised coil. Sections are factory assembled into load-bearing wall panels consisting of a ‘U’ base track and ‘C’ vertical studs set at regular centres with ledgers at head to suit the application. The MetStructures system can be used to form structures up to a maximum of fifteen storeys in height dependent upon loading, geometry and usage.

Load bearing light gauge steel framing is based on balloon construction providing separate storey height frames. Vertical gravity loads from roof and floors span onto load bearing walls down to supporting foundations or podium. Lateral wind loads applied to the external envelope are taken by roofs and floors using plate action, then into braced walls or cores down to the supporting foundation or podium.

This construction is most effectively used within simple repetitive structural wall arrangements between storeys, regular floor spans and direct load paths. More complicated structures can also be accommodated using transfer members (e.g. hot rolled beams) or structures for indirect load paths.

Vertical studs are assembled into panels within the ‘U’ head and base track. All joints are assumed to be pinned for simple analysis. Panels are braced with diagonal flat straps (as required by design) and sheathing board may be factory applied to the external walls.
Panels are bolted together on site through pre-punched holes and either anchored to the supporting foundation or screw fixed to panels below. All connections are designed and checked for disproportionate collapse tying requirements derived from the intended use and size of the building. Temporary props are fitted for stability during construction.

Floors are generally formed from composite concrete decking which is seated on the perimeter profiles at the tops of the load-bearing wall panels. The deck is then temporarily propped (if required) and secured using self-piercing, self-drilling screws. Reinforcement is laid as per design requirements for fire and disproportionate collapse resistance. Mesh or fibre reinforcement may be used to minimise cracking of the slab.

Once the floor has adequately cured, construction of the next level begins and loading out of the floor with plasterboard / bathroom pods, etc. takes place.

Where joisted cassette floors are used they are formed in the factory from deeper ‘C’ sections at regular centres with ‘U’ profile end tracks and noggins as required to prevent twist and lateral movement. A working platform of minimum 18mm OSB is provided. The joists are designed with pinned end connections and effective lengths dependent upon the restraints available from finishes and noggins.

The roof may also be formed from composite concrete decking but can alternatively employ timber or light steel frame trusses or joists. In all instances, floors and roofs are to provide adequate diaphragmatic resistance to distribute lateral loads back to the buttressing side wall bracing systems.
INTENDED USE & RANGE OF APPLICATION

The system is suitable for use on most construction projects including but not limited to:

- Residential
- Student Accommodation
- Hotels & Hospitality
- Retirement Living
- Dwelling Houses
- Government

The system’s application is currently limited to an absolute maximum of fifteen storeys. Depending on the structural requirements and building type, lower limits may be applicable. Additionally, as a building product, elements of the framing system can be used for special constructions such as features, bulkheads and soffits.

When such items are to be built in a cold frame environment (uninsulated or exposed to possible water ingress), special considerations such as additional protective coatings may be required and the lifetime of the construction reduced in accordance with the guidance given by the SCI P262 document (The Steel Construction Institute, 2009), BS EN ISO 12944-2:1998 (BSI, 1998) and BS EN ISO 9223:2012 (BSI, 2012).

BUILDING ENGINEERING PHYSICS

The MetStructures framing system may be used within a wide range of building applications.

Building engineering physics and fire resistant design requirements are readily integrated to suit each application. This ensures that the MetStructures framed building meets the ratings outlined by the client specification and building regulations for environmental performance, user comfort and safety.

1.3.1 / WARM FRAME & RAPID DRY ENVELOPE (RDE)

Internal lining boards (vapour check and fire restraint boards by specification)

MetStructures steel studs. Mineral wool insulation by others to specification requirements

Factory fitted external sheathing board

Brick-tie channels fixed to studs through insulation and boards

External insulation

External facing brickwork

Figure 5. Indicative warm frame wall build-up
Design life of galvanised steel sections in common building applications

<table>
<thead>
<tr>
<th>Product application</th>
<th>Environmental conditions</th>
<th>Predicted design life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walls and floors in warm frame applications</td>
<td>No risk of water ingress or condensation</td>
<td>250 years</td>
</tr>
<tr>
<td>Non-load bearing stud partitions</td>
<td>Warm internal environment and no risk of water ingress</td>
<td>250 years</td>
</tr>
<tr>
<td>Infill external walls in multi-storey buildings</td>
<td>Warm frame and no risk of water ingress</td>
<td>250 years</td>
</tr>
<tr>
<td>Roof structures (insulated)</td>
<td>Low risk of condensation</td>
<td>200 years</td>
</tr>
<tr>
<td>Suspended ground floors (with over-site membrane)</td>
<td>Low risk of water ingress; some risk of condensation</td>
<td>100 years</td>
</tr>
<tr>
<td>Roof structures ( uninsulated)</td>
<td>Some risk of condensation</td>
<td>100 years</td>
</tr>
<tr>
<td>Purlins and side rails supporting metal cladding</td>
<td>Low risk of condensation; some dust and pollution</td>
<td>60 years</td>
</tr>
<tr>
<td>Sub-frames to over-cladding panels</td>
<td>Low risk of water ingress; some risk of condensation</td>
<td>60 years</td>
</tr>
<tr>
<td>Suspended ground floors (without over-site membrane)</td>
<td>Low risk of water ingress; higher risk of condensation</td>
<td>50 years</td>
</tr>
</tbody>
</table>

Note: All values are for Z275 (total weight of zinc coating on both surface = 275g/m²)

The BRE Report “Thermal Insulation: Avoiding Risks” (BRE REP 262, 2002) discusses aspects of insulations relevant to external light steel frame walls. A vapour control layer should be provided unless a condensation risk analysis is carried out. This should be fixed on the warm side of the wall insulation and should cover the external wall including base rails, head rails, studs and lintel and cill reveals. The vapour control layer should be of 500g polyethylene or vapour control plasterboard as recommended in the NHBC 6.10-D6 (NHBC, 2018). Insulation should continue 150mm below the base rail of the steel wall to minimize thermal bridging. Insulation with an integral facing on one side only, e.g. a foil facing, should have the facing on the cavity side. The facing should not be used as the vapour control layer. Service pipes, conduits, etc. within walls should be on the warm side of the insulation. Design and specification of the wall build-up beyond the steel frame is the responsibility of the architect or other nominated specialist. In applications where the steel is not in a warm frame construction, special considerations may be required to ensure the longevity of the steel.

Openings for windows, doors, flues, vents, etc. are formed by design within the framed panels and the weights, position and connections are considered in the structural calculations and drawings.

The system adheres to the principles of Rapid Dry Envelope (RDE) where the building is made watertight quickly and to a high standard to release works on site for internal trades.
1.3.3 ACOUTIC PERFORMANCE

The MetStructures Framing System standard details have been developed with the guidance of the Robust Details in mind however it is envisaged that pre-completion testing will be required on all schemes. Additionally, the project acoustician should review all details for compliance in advance of construction.

Framed construction relies on boarding performance as well as structural isolation to achieve a good acoustic performance. Between dwellings, this may be achieved by using twin skin walls or other enhanced wall constructions.

The desired acoustic level can be attained via the addition of layers of board as well as some bespoke layers designed to satisfy only acoustic issues such as resilient bars to reduce sound transfer, acoustic matt or specialist backing boxes.

Approved document E describes two methods of demonstrating compliance:

- The use of ‘Robust Details’ (Robust Details Ltd, 2014)
  This method relies on specific defined build-ups provided by Robust details to demonstrate compliance based on known combinations.

- Pre-completion testing
  This method tests elements of the building on site (such as separation of walls and floors) prior to handover of the building to demonstrate a test compliance against target values.

Part E of the building regulations defines the minimum requirements for floors and walls that separate one dwelling from another, between internal walls and floors from another dwelling or communal space.

Acoustic performance must additionally satisfy any regional guidance and suitability requirements which must be defined by the design team at the start of the project.

Fire resistance of light gauge steel systems is provided by single or multiple layers of boarding fixed to the flange of the studs or joists. This may be either fixed directly or via secondary resilient bars. Manufacturers of such boarding systems have tested their boards to protect light steel frame systems for insulation, integrity and load resistance to relevant codes of practice. Typically, over 90 minutes’ resistance may be achieved for each element using multiple layers of 15mm boards.

Fire resistance of the composite concrete deck floor is provided by reinforcing the concrete with adequate cover. Supporting channels at the head of the walls also need to be fire protected to achieve the required rating.

Cavity stopping systems should also be employed as required by the relevant building regulations.

Further details may be sought from SCI Technical Information Sheet ED016 (The Steel Construction Institute, 2012).
Composite concrete decks may either be designed with adequate thickness to meet minimum mass requirements or with a requirement for an acoustic floor build-up to be provided on top depending on the project requirements. At junctions between compartments, flanking insulation must be provided to prevent sound transfer through the cavity. Insulation provided 600mm above and below floors, and at either side of walls is good practice.

**Figure 7.** Flanking detail across party wall

**Figure 8.** Twin-party wall to separating floor interface detail
1.3.4 / THERMAL PERFORMANCE

All stud and track sections should be maintained within the ‘warm frame’ of the building, with insulation wrapped around the outside.

Furthermore, specific thermal and dew point calculations should be carried out (generally available free of charge from the insulation supplier) to ensure that heat transfer across the façade is limited to an acceptable value and that no condensation will form within the stud zone during normal operation of the building. There are various methods of establishing thermal performance of buildings which are based on either elemental methods – by calculating U values of a wall construction – or on a whole building assessment e.g. SAP or NHER.

The thermal performance of the system also depends on the cladding that is being utilised and the positioning of the insulation. The requirements are covered by part L of the buildings regulations – Conservation of fuel and fire.

Cold bridging across the façade at interfaces, such as balconies, must also be avoided by application of structural thermal breaks.

1.3.5 / CLADDING

All buildings are designed on a project-specific basis for which detailed structural calculations and drawings are produced.

In all applications, the system is sheathed to the internal face with plasterboard to the architect’s specification and to the outside with factory applied sheathing board, additional insulation boards are further site applied subject to specification requirement. Façade treatments are considered and typically consist of but are not limited to:

- Traditional Single Skin Facing Brick/Blockwork
- Direct Applied and Cavity Insulated Render Systems
- Board Based Cladding Systems
- Lightweight Metal Panels
- Timber Cladding
- Insulated Panel Systems
- Brick Slip Systems
The following details provide an illustration of the typical facade treatments which may be applied to the MetStructures framing system. Further cladding finishes may be applied; for more information contact MetStructures.

**1.3.5.1 TYPICAL WALL BUILD-UPS**

All applied finishes to be in line with specification requirements.

---

**Figure 9.** Rendered Blockwork

- Lining boards
- Insulation
- Concrete Floor
- Lining boards & Insulation
- Ceiling line

---

**Figure 10.** Facing Brick

- Lining boards
- Insulation
- Concrete Floor
- Lining boards & insulation
- Ceiling line

---
All applied finishes to be in line with specification requirements.

Figure 11.
Brick Slip System

Figure 12.
Insulated Render with Cavity

All applied finishes to be in line with specification requirements.
1.3.5.1/ TYPICAL WALL BUILD-UPS, Continued

All applied finishes to be in line with specification requirements

Figure 13. Metal Rainscreen

Figure 14. Board Rainscreen
All applied finishes to be in line with specification requirements
CASE STUDY: HINTON ROAD, BOURNEMOUTH

- Student accommodation
- Light gauge steel frame with composite concrete and metal deck floor slabs
- Light gauge steel roof cassettes with OSB3 boarding
- Gross internal floor area 2740m²

Features of the construction and site:
- Bay feature windows
- Limited site access for construction
- Large floor spans achieved using hot rolled steel
1.4.2  

**DETAILED DESIGN**

Detailed design can commence once the architectural design has reached a frozen construction issue. At this point, the MetStructures team will allocate a dedicated project engineer and designer and a design commencement meeting to review the scheme and details should be arranged. This meeting should also be used to discuss phasing and build sequence.

It is critical to the success of the project to have adequate information to design the structure at this stage — although the project may be weeks from site, key decisions on the load paths and structure of the building are made up-front which would be costly to change at later stages. Information required includes sub-contractor packages such as the lift interfaces and curtain wall support requirements.

The construction issue intent drawings are then assessed against any previous schemes to ensure any changes are captured and understood. A detailed engineering scheme is then produced, and final foundation/podium gravity loads are calculated to enable the project engineer to complete their designs. The MetStructures engineer will complete an analysis for the scheme and design all structural members in accordance with relevant design codes. Full calculations are also produced which can be issued to building control or nominated checking engineers. We will work with the design team to ensure elements such as service routes, etc. are accommodated where possible.

At the same time, the MetStructures design team begin work producing an accurate and data-rich Building Information Model (BIM). Once the engineer’s specifications have been included, general arrangement drawings are taken from the model and issued for design team approval.

While the approval process is underway, the designers continue to model all of the detailed connections of each member and further enrich the model ready for manufacture. Design team comments are then incorporated, and construction GA's are issued.

Once the model has been thoroughly QA checked, for each phase, the fabrication data is issued to the MetStructures rolling mills and panel assembly drawings are created.

---

1.4.1  

**CONCEPT DESIGN SUPPORT & REVIEW**

Based on the architect's drawings, MetStructures will review the architectural intent for the building and provide an indicative structural scheme to demonstrate how the building might be formed in the system. This will identify the required load-bearing walls and column locations etc and indicative sizing of key members.

Specific details can also be assessed (e.g. architectural features) to develop structural solutions which work with the system.

The scheme can then be quoted, and the MetStructures site team can assess the logistics requirements. Subject to agreement, foundation loads may be provided at this stage to enable assessment of the groundworks requirements.

The MetStructures team can attend design team meetings to assist with the development of the frame design.

---

**PROJECT SERVICES**

MetStructures can assist with your structural frame requirements right from conception to completion on site. Early sub-contractor involvement from MetStructures helps to ensure the smooth running of projects, enabling the system’s features to be best applied to the design in hand.

MetStructures offer the following services:

**1.4.1**  

**CONCEPT DESIGN SUPPORT & REVIEW**

Based on the architect's drawings, MetStructures will review the architectural intent for the building and provide an indicative structural scheme to demonstrate how the building might be formed in the system. This will identify the required load-bearing walls and column locations etc and indicative sizing of key members.

Specific details can also be assessed (e.g. architectural features) to develop structural solutions which work with the system.

The scheme can then be quoted, and the MetStructures site team can assess the logistics requirements. Subject to agreement, foundation loads may be provided at this stage to enable assessment of the groundworks requirements.

The MetStructures team can attend design team meetings to assist with the development of the frame design.

**1.4.2**  

**DETAILED DESIGN**

Detailed design can commence once the architectural design has reached a frozen construction issue. At this point, the MetStructures team will allocate a dedicated project engineer and designer and a design commencement meeting to review the scheme and details should be arranged. This meeting should also be used to discuss phasing and build sequence.

It is critical to the success of the project to have adequate information to design the structure at this stage — although the project may be weeks from site, key decisions on the load paths and structure of the building are made up-front which would be costly to change at later stages. Information required includes sub-contractor packages such as the lift interfaces and curtain wall support requirements.

The construction issue intent drawings are then assessed against any previous schemes to ensure any changes are captured and understood. A detailed engineering scheme is then produced, and final foundation/podium gravity loads are calculated to enable the project engineer to complete their designs. The MetStructures engineer will complete an analysis for the scheme and design all structural members in accordance with relevant design codes. Full calculations are also produced which can be issued to building control or nominated checking engineers. We will work with the design team to ensure elements such as service routes, etc. are accommodated where possible.

At the same time, the MetStructures design team begin work producing an accurate and data-rich Building Information Model (BIM). Once the engineer’s specifications have been included, general arrangement drawings are taken from the model and issued for design team approval.

While the approval process is underway, the designers continue to model all of the detailed connections of each member and further enrich the model ready for manufacture. Design team comments are then incorporated, and construction GA's are issued.

Once the model has been thoroughly QA checked, for each phase, the fabrication data is issued to the MetStructures rolling mills and panel assembly drawings are created.

---

16 | www.metstructures.uk.com | 0121 389 1603
1.4.3 / MANUFACTURE

Working to the agreed build sequence wall panels, accessories and any supplementary steelwork are manufactured and assembled within the MetStructures associated works.

Each panel is thoroughly checked for dimensional accuracy, correctness and quality before being signed off for delivery to the project site.

1.4.4 / INSTALLATION

MetStructures work with the main contractor’s site team to ensure a successful build program. Tight site logistics can be catered for with just in time deliveries, but it is preferable to store panels and decking on site. Craneage is required to lift panels, beams, columns and decking into place.

Once the slab has been checked to tolerance and handed over, the panel erection begins with the perimeter walls, generally working from one corner of the building. Wall panels are placed, plumbed, temporary propped anchored into place and bolted to adjacent panels. Site fitted beams and columns are bolted in to the adjacent columns and walls. Walls and beams come pre-fitted with ledger angles for the decking which is placed between elements and screwed into place. Temporary propping is placed and fixed before reinforcement is then laid as required. Once fully checked and signed off, the slab can be poured.

Once adequately cured, the next floor can begin.

The walls are generally pre-boarded in the factory and therefore, by fitting the windows, a weather-tight shell is provided to allow first fix of follow on trades while the upper floors are still being built.

The MetStructures engineer and designer will visit site as required to ensure the structure is being built in accordance with the design and any site reports produced will be made available to the client.

1.4.5 / OPERATION & MAINTENANCE

The system requires minimal maintenance as long as it is enclosed within the warm frame of the building.

As such, the building façade should be regularly checked for any deterioration or damage, as should the internal linings of the structure. Any damage should be repaired as soon as possible in line with system supplier details.

Any damage to the frame should be reported to MetStructures immediately for structural assessment to ensure a safe structure. This includes fire damage.
MetStructures operate a typical 12-14 week preconstruction period, though lead times for design, supply and installation vary from project to project and are dependent on both size and complexity. The following programme example based on the RIBA plan of work is given for typical guidance only and should not be read or used as a project specific programme.
2. SYSTEM OVERVIEW

2.1 / DESIGN LIFE

With reference to the publication ‘P262 Durability of Light Steel Framing in Residential Building’ (The Steel Construction Institute, 2009) and when the framing is fully insulated in a ‘Warm Frame Environment’, the design life of the sections may be up to 250 years as long as water ingress is fully prevented and the structure is correctly maintained.

The durability of zinc-based coatings is a function of duration of wetness and composition of the atmosphere. When the structure is built to the required standards, properly ventilated and maintained, moisture is not permitted to access the galvanised light gauge steel through either direct contact or humidity (interstitial condensation). The correct specification and application of façade treatments, cavity ventilation/closing products, vapour control and breather membranes, plasterboards, insulation and thermal breaks mean there should be no risk to the framing from contact with any moisture that presents a risk to the integrity of the zinc coating.

2.2 / MAINTENANCE

Maintenance of the framing system during construction is possible with a visual inspection of the sections and it is highly recommended that any water present on the sections during construction be fully removed before sheathing boards are applied.

Post construction inspections cannot normally be done visually without damage to finishes and intrusive inspections may not be appropriate during the life time of the building. However, it is recommended that inspections of both the interior and exterior of the building be made on an annual basis and as part of a wider building maintenance strategy with particular regard to any damage that may affect the integrity or performance of the sections including but not limited to:

- Cracking of internal plasterboard or external finishes
- Damage to external finishes from impact that exposes the steel frame
- Modifications to the building that expose or change the framing system
- Areas of water damage (particularly around gutters, penetrations & down pipes)
- Visual staining
- Evidence of rust

2.3 / DISPOSAL

All steel sections can be fully reused or recycled on decommissioning of the building. A competent structural engineer should be engaged to provide a disassembly or demolition plan.

In general terms, the system can be deconstructed by reversal of the construction process:

- Once finishes have been adequately removed, roof cassette panels can be unbolted from the structure and lifted off. Holes may be cut out of the OSB decking to allow slinging chains to loop around the joists for lifting.
- Concrete roofs/floors will need to be cut into segments, have their disproportionate collapse ties cut and have suitable anchor points fitted to them before they can be unbolted and lifted off.
- Wall panels will then be able to be unbolted from adjacent panels and have the screw connections removed from their base before being lifted off.

2.4 / SUSTAINABILITY

Recycling of steel is an efficient and widely completed process. At end of the buildings working life MetStructures framing systems can be 100% recycled and reprocessed into new structural steel components.

When appropriately applied to schemes with environmental targets to achieve, the MetStructures system can be incorporated to building designs with low or zero carbon ratings and achieve BREEAM grades of up to Excellent. Utilising modern methods of construction and offsite assembly techniques waste is also reduced, further enhancing sustainable credentials.
The vertical studs are typically 100mm width, with varying gauges depending upon loading conditions, and placed at 300, 400 or 600mm centres. Noggins at mid-span may also be a requirement to reduce minor axis buckling. All the studs are tied together with horizontal base and head members. Bracing straps are to be fixed to certain wall panels to give racking resistance. Once the ground floor walls have been positioned, plumbed, propped and fixed, the flooring system can be installed and will restrain the top of the walls.

Openings within the wall panels for windows and doors etc. are formed by reinforcing the jamb studs as required (either using stronger sections, ‘boxing’ with tracks or doubling up on members) and providing stud and track arrangements as lintels and cills.
The flooring system may consist of either composite concrete decking or joisted floor cassettes. The floor system is supported on the face of internal and external walls and/or beams in most instances but may also run over the top of such elements. Once the floor system has been fully installed, it can be used as a safe working platform, loaded out and the next level wall panels can be erected.

The composite concrete deck floor system consists of a CMF MetFloor decking profile which is laid between supporting profiles which are factory bolted to each load bearing wall. The ends of the decking are crushed to avoid any requirement for closer angles.

The lightweight galvanised joisted floor system consists of steel joists, typically at 300mm, 400mm, or 600mm centres and can vary in depth dependant on spans and loading conditions. Boarding (to architect’s specification and required to act as a diaphragm) should be fitted to the top of the cassette using the more onerous of the board manufacturer’s specification or 4.8mm diameter screws at a maximum of 300mm centres to provide diaphragmatic action (depending on the board).

ROOFS

Typically, there are three types of roofing systems used with the system – composite concrete deck, steel joisted and timber truss - each of which are supported on internal and external walls and/or beams.

Once the top floor wall panels have been positioned, plumbed, propped and fixed the roof system can be installed and will restrain the top of the walls. Where design of roof trusses is provided by others, they must be made aware that roof must provide a structural diaphragm between buttressing walls.
LIFTS

The system can accommodate most lifts including hydraulic and traction systems. The MetStructures frame will provide the shaft and lifting beam / lifting slab (if applicable) and connection points for the guide rail mechanisms. Fire protective boarding can be factory applied locally behind the connection points for the guide rails.

Lifting eyes are to be supplied, installed and commissioned by others.

Lift shafts are formed using standard load-bearing wall panels spanning floor to floor. On the door side(s), an opening for the door is provided which may include a PFC at head to provide a fixing point for the lift door mechanism.

![Figure 20. Plan view of typical lift shaft](image1)

![Figure 21. Guide rail connection point](image2)

2.9.1 / LIFT DESIGN REQUIREMENTS

All designs for lift shafts rely on early receipt of the lift manufacturer’s requirements. For standard counter-balanced traction lifts, the key information required is:

- Setting out of and loading applied to guide rail attachment points
- Setting out of and loading applied to lifting connections
- Required clear opening dimensions of the shaft
- Setting out of the door openings and door connection points
- Any requirements for the door threshold (cutting back of screed etc)
- Confirmation of deflection limit (onerous deflection requirements may be accommodated)

For other types of lift, the requirements may vary and early dialogue between the lift designer and MetStructures design team is critical.

In order to set out the studs, confirmation of the boarding requirements to the inside of the shaft is also required from the architect.
MetStructures can supply and fit steel, precast or timber stair units, designed and supplied by specialists. The frame design will allow provision for stairs by means of clear openings and supporting beams where required.

Stairs may be in a variety of configurations including single flight, double-flights with half landings or more complex arrangements with quarter landings etc.

In all configurations, where stair voids are adjacent to external walls or other voids within the floor slab, a stiffening beam may be required to restrain the wall panels against lateral loads.

Figure 22. Typical stair arrangements
Where stairs are supplied by others, the stair designer must provide details of the loading which the stairs will apply back to the primary frame. Detailing to avoid the requirement to install the stair prior to pouring the slab may be preferable and should be discussed with the initial phasing requirements.

2.10.2 / SINGLE FLIGHT ARRANGEMENTS

For single flight stairs, the frame will provide a clear opening for the stair and an edge beam to bolt the stair.
For double-flight arrangements, the stair may either include the half landings or these can be provided as part of frame.

For more complex arrangements, the MetStructures frame will generally trim out the overall stair opening and provide supporting angles off the surrounding walls to support the stair. The stair must be designed to span between these without the need for cantilevering support beams etc. There may be multiple options for support positioning as shown in Figure 26 and therefore agreement with the stair manufacturer must be sought as early as possible in the design.
2.10.5 / STAIR ATTACHMENT

Design of the connection of the stair back to the primary frame is the responsibility of the stair designer and must be coordinated with the MetStructures frame design. Particular consideration to the sequence of stair attachment and concrete pour should be made where floors are concrete.

The following details are indicative only:

Fixing method for stair to trimmer beam to be confirmed by stair manufacturer

Floor build up as specified by architect

Joisted cassette by MetStructures

Plate welded to trimmer beam for end joist to fix into

Stair trimmer beam by MetStructures Designed on project specific basis

Fixing method for stair to trimmer beam to be confirmed with stair manufacturer

Composite structural decking cast after stair installation

Support plate welded to underside of trimmer beam

Stair trimmer beam by MetStructures Designed on project specific basis

Composite structural decking cast after stair installation

Support plate welded to underside of trimmer beam

Figure 27. Stair to joisted landing

Figure 28. Stair to concrete landing
If not within the MetStructures supply package, the contracted stair designer must provide details of the loading which the stairs will apply back to the primary frame.

2.10.6 / HAND RAILS & BALUSTRADES

Balustrading may be fixed back to walls adjacent to the stair. Where it is not possible to directly fix to the studs within the wall, the wall should be patressed to facilitate the connection.

Where cantilever balustrades are required, they must be identified to the MetStructures design team so that adequate support provisions can be included within the frame.
Where spans, loads or connections exceed the capacity of the cold rolled components the design can be supplemented with hot rolled steel elements which are easily integrated, all of which are supplied as part of MetStructures’ package.

Hot rolled sections may either be assembled into the panels within the factory or loose fit on site.

Beam connection perpendicular to wall

Beam connection parallel to wall

Partial depth beam connection
2.11 / INTEGRATION WITHIN THE PANEL

Generally, 100mm deep sections can be assembled within the panels – SHS or RHS columns being the most typical example. Connections from the column to the supported element is typically made by use of a fin plate.

Where columns are integrated into the panel, end plates are provided to allow floor to floor connections. The columns are also bolted into the head and base channels of the panel:

![Image of typical base detail for pre-panelised column](image30)

Figure 30. Typical base detail for pre-panelised column

2.11.2 / FREE STANDING COLUMNS

Columns which are not integrated into the panel must be tied in to the frame.

To avoid fouling the base plates with the adjacent wall panels, angles are typically welded to the columns in order to provide this connection:

![Diagram of site fitted column attachment to wall panels](image31)

Figure 31. Site fitted column attachment to wall panels

The column should also be tied in to the floor, normally by use of the connection to the supported beam.


**2.11.3 / BEAMS WITHIN FLOORS**

In both joisted cassette and composite concrete deck floor systems, hot rolled beams can normally be set with top of steel at structural slab level in order to minimise downstands into the service void.

![Diagram of beam with TOS = SSL](Figure 32)

Where no finishes are available to hide the exposed elements, beams may be lowered by 50mm in order to run the concrete over. Indicative beam depths can be provided as part of the design approval process in order to ensure adequate space for services. Where absolutely essential, service slots may be able to be designed into the beam webs to allow passing of services however this is a costly option and should be avoided if at all possible.

Where beams or columns are required outside of the lined zones, specific fire protection detailing may be required. This may be achieved by either boarding or intumescent painting the hot-rolled steel elements.

**2.11.4 / SURFACE COATINGS**

Guidance from BS EN ISO 12944-2 (BSI, 1998) and BS EN ISO 9223 (BSI, 2012) should be followed to classify the environmental exposure category and determine a suitable coating. Most sections are within the warm frame of the structure and therefore do not require substantial protection for the construction phase.

Where hot rolled elements are used externally, a more robust protection system must be employed and junctions between the warm frame and the external element must include suitable thermal isolation.

**2.12 / FINISHES**

Once the structural frame, boarding, roof finishes, windows and doors have been installed the envelope will be water-tight, so the services and internal and external finishes can begin.

This removes the external cladding from the critical path. A variety of external claddings can be applied to the system including masonry, render, terracotta rainscreen, cedar, insulated panels and brick slip among others. Masonry finishes are generally supported at podium or foundation level and the frame provides lateral restraint only however, in certain instances, masonry may be supported by project-specific agreement and design.

Further information on finishes can be found in section 1.3.4/ Cladding.
The system can accommodate service penetrations throughout. General guidance on the size of such penetrations is provided below however each project’s requirements are assessed at the design stage.

**Joisted floors/roofs**
Holes in the joist webs can be punched up to 60% of the joist depth. Vertical holes through floor panels can be trimmed out during the design process.

**Wall Panels**
Holes in the stud webs can be punched up to 60% of the web depth. Penetrations for vent pipes etc. through wall panels can be accommodated early on in the design stage so the studs can be positioned to miss the penetrations.

---

### GUIDANCE FOR RULES ON CUTTING:

**Dimensional Constraints**
SCI Publication 402 – Light Steel Framing in Residential Construction (Section 9) gives an approximate guide to the maximum sizes and spacing of service penetrations in light gauge steel sections.

The following rules should be followed when drilling, punching or cutting holes:

- **A** Depth of member
- **B** Distance from edge of hole to end of section \( B \geq 1.5 \times A \)
- **C** Clear distance between holes \( C \geq A \)
- **D** Diameter of circular hole edges \( D \leq 0.6 \times A \)
- **E** Width of elongated service \( E \leq 3 \times F \)
- **F** Depth of elongated service \( F \leq 0.4 \times A \)

**Service Hole Constraints**
These rules limit the size of hole that can be placed within a section, cutting into sections can reduce the structural capacity of the member. Always seek professional advice before cutting a structural member.

Gromits to be applied to all holes.

---

**Composite concrete decks**
Small holes (up to 300mm square) can generally be either core drilled or shuttered and cut away without additional reinforcement or support.

Larger holes may require additional reinforcement or supporting beams to be designed and provided. ‘Dura Grating’ glass reinforced plastic grating may be integrated into the system to provide a working platform within any voids. For detailed guidance, refer to the CMF MetFloor technical documentation.
In these instances, it is important that the loadings and locations are communicated to MetStructures, so the design can consider the specific loading requirements.

Sequencing is also important, timing should allow for pods to be positioned within the room before access is lost.

Pre-manufactured modular pods for elements such as bathrooms are commonly used within MetStructures framed buildings.
3. STANDARD COMPONENTS

3.1/ STANDARD COLD ROLLED SECTIONS

All MetStructures sections are manufactured using pre-hot dipped galvanised steel strip S450 to BS EN 10346:2015 (BSI, 2009) with a Z275 galvanised coating. Sections sizes vary and can be rolled to suit customers’ requirements.

3.1.1/ COLD ROLLED PARTS MC PROFILE

<table>
<thead>
<tr>
<th>Section Reference</th>
<th>Mass (kg/m)</th>
<th>Web (mm)</th>
<th>Flange (mm)</th>
<th>Lip (mm)</th>
<th>Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC-1007012</td>
<td>2.46</td>
<td>100</td>
<td>70</td>
<td>14</td>
<td>1.2</td>
</tr>
<tr>
<td>MC-1007016</td>
<td>3.19</td>
<td>100</td>
<td>70</td>
<td>14</td>
<td>1.6</td>
</tr>
<tr>
<td>MC-1007020</td>
<td>3.95</td>
<td>100</td>
<td>70</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>MC-1007024</td>
<td>4.87</td>
<td>100</td>
<td>70</td>
<td>14</td>
<td>2.4</td>
</tr>
<tr>
<td>MC-1007028</td>
<td>5.45</td>
<td>100</td>
<td>70</td>
<td>14</td>
<td>2.8</td>
</tr>
<tr>
<td>MC-1007032</td>
<td>6.18</td>
<td>100</td>
<td>70</td>
<td>14</td>
<td>3.2</td>
</tr>
<tr>
<td>MC-10010012</td>
<td>3.14</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>1.2</td>
</tr>
<tr>
<td>MC-10010016</td>
<td>4.09</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>1.6</td>
</tr>
<tr>
<td>MC-10010020</td>
<td>5.08</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>MC-10010024</td>
<td>6.22</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>2.4</td>
</tr>
<tr>
<td>MC-10010028</td>
<td>7.03</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>2.8</td>
</tr>
<tr>
<td>MC-10010032</td>
<td>7.99</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>3.2</td>
</tr>
</tbody>
</table>

3.1.2/ COLD ROLLED PARTS MU PROFILE

<table>
<thead>
<tr>
<th>Section Reference</th>
<th>Mass (kg/m)</th>
<th>Web (mm)</th>
<th>Flange (mm)</th>
<th>Gauge</th>
<th>Internal Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU-10412</td>
<td>2.27</td>
<td>104</td>
<td>77</td>
<td>1.2</td>
<td>1</td>
</tr>
<tr>
<td>MU-10420</td>
<td>3.71</td>
<td>104</td>
<td>77</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>MU-10512</td>
<td>2.04</td>
<td>105</td>
<td>60</td>
<td>1.2</td>
<td>1</td>
</tr>
</tbody>
</table>
4. DESIGN PRINCIPLES

4.1 DISPROPORTIONATE COLLAPSE

Disproportionate collapse is the phenomenon of a building undergoing a collapse which is disproportionate to the cause. For example, if a structure were to collapse entirely due to an accident which affected just one small area of the structure.

The requirements for provision of systems to avoid disproportionate collapse vary with the size and use of the building and are defined in The Building Regulations.

The MetStructures system is designed to include sufficient vertical and horizontal tying in order to meet the requirements for class 2B structures to BS EN 1991. To achieve this, the elements acting as ties and their end connections are checked by the designer to provide adequate tie forces. The UK National Annex to BS EN 1991-1-7 defines the tie forces which must be considered for cold rolled steel structures where tie forces are lower than hot rolled due to the frequent and distributed nature of the ties.

As the primary elements of the frame are bolted together at regular intervals, the frame is inherently well tied together. Additional detailing of reinforcing bars is usually required in order to tie the concrete floors in to the walls. Frequent screwed connections are required in order to vertically tie wall panels across breaks at floor levels.

4.2 BRACING & FRAME STABILITY

Lateral loads from wind are transferred from the external envelope of the structure into the floor plate which distributes them back to the braced walls via diaphragmatic action. Stability of the walls is generally achieved through regular distributed flat strap cross bracing to allow them to act as shear walls.

Sheathing boards and internal linings may also be considered to contribute to the racking resistance where adequate data exists to support this.

Loads are transferred down the bracing system and into the supporting foundation/podium via the base connection. Connections between wall panels at the floor junction are designed in order to transfer shear forces and any net overturning loads.

Notional and equivalent horizontal forces follow the same load path and are checked as part of the design of the bracing system.

4.3 LOAD PATHS & LOAD TRACING

Gravity loads are traced down the building as part of the design process. The system is comprised of panels of columns at 600mm centres therefore loads are considered to follow straight down the building rather than allowing for any spread as might be achieved in masonry design.

Where walls are interrupted by open areas, transfer beams and columns are included in order to take the loads. Beams are designed with adequate strength and stiffness to maintain the integrity of the frame.
4.4 / WINDOW/DOOR OPENING GUIDANCE

Window and door openings can be readily accommodated within the structural frame. Design is generally governed by the lateral loads (e.g. wind) applied back to the surrounding members, however the vertical loads from above openings are also considered, particularly where they do not align from floor to floor.

Small to medium size openings may be formed in cold rolled steel jambs, lintels and cills. Where larger openings are required they may require inclusion of hot rolled steelwork within the frame.

Curtain wall screens can also be accommodated and would generally be cleated back to beams at floor levels. The curtain wall designer should design the connections and advise of the loads applied back to the frame.

Where openings are set into a brick façade, a large flange jamb stud may be provided to accommodate the last brick tie channel and the cavity closer:

![Diagram of window/door opening guidance]

4.5 / ACCURACY & TOLERANCES

4.5.1 / SECTION ACCURACY

Sections are rolled in accordance with BS EN 10162:2003 for dimensional and cross-sectional tolerances.
4.5.2 / SITE TOLERANCE

An accurate starting point is required for the commencement of the frame. The acceptable tolerance for the foundation/podium (in the absence of further contractual agreement) shall be:

* Foundation level tolerance is +0mm / -6mm.

It is important that the foundation level, podium or ground beams are accurately measured before commencing installation of wall frames. This should be carried out by the client’s site engineer prior to handover and any deviation in tolerance above the shimming levels agreed must be remediated by the contractor by either ‘scabbling’ down the high points or grouting up the lows (to client’s engineer’s specification).

To accommodate the remaining site tolerances and avoid excessive site cutting, wall panels can be packed underneath the base track using galvanised steel shim packs for levelling purposes which may be subject to additional costs. The following guidance should be observed:

* Gaps up to 10mm, steel shim packs should be used under each loadbearing stud.
* For gaps between 10 - 20mm, steel shim packs installed under each stud as well as grouting with a high strength non-shrink grout under the entire length of the base channel.
* For gaps greater than 20mm, advice should be sought from the design engineer and remedial works to the base/ substructure will be required.

Where hot rolled columns are connected to the slab, a nominal 15mm under-height tolerance may be included to be fully shimmed and grouted by the contractor.

4.5.3 / FRAME INSTALLATION TOLERANCES

Installation tolerances are to be agreed with the main contractor prior to commencing on site. The National Structural Steel Specification (BCSA, 2007) can be used as a guidance but note this is written for hot rolled beam and column steel frames.

In the absence of alternative agreement, the following should be achieved:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of wall frame</td>
<td>+/- 10 mm in 10m</td>
</tr>
<tr>
<td>Verticality (plumb) of walls</td>
<td>+/- 5 mm per storey of 3m height (cumulative), OR L/600 for spans &gt;3m</td>
</tr>
<tr>
<td>Flatness of wall frame up to 10m length</td>
<td>+/- 5 mm</td>
</tr>
<tr>
<td>Horizontal position of wall frame</td>
<td>+/- 5 mm</td>
</tr>
<tr>
<td>Horizontal position of floor joists</td>
<td>+/- 5 mm</td>
</tr>
<tr>
<td>Flatness of floor joists</td>
<td>+/- 5 mm under a 2m straight edge with equal off-sets</td>
</tr>
<tr>
<td>Composite concrete floor slab thickness</td>
<td>+/- 20 mm</td>
</tr>
<tr>
<td>Composite concrete floor slab level</td>
<td>By agreement SR2 +/- 5 mm under a straight edge laid on the surface, OR SR3 +/- 10 mm under a straight edge laid on the surface</td>
</tr>
<tr>
<td>Composite concrete floor edge trim vertical</td>
<td>+/- 10 mm from steelwork</td>
</tr>
<tr>
<td>Composite concrete floor edge trim horizontal</td>
<td>+/- 5 mm from steelwork</td>
</tr>
</tbody>
</table>

4.5.4 / FOLLOW-ON TRADE TOLERANCES

The following requirements should be met by the nominated contractors:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verticality (plumb) of brickwork</td>
<td>+/- 10 mm total, AND</td>
</tr>
<tr>
<td>Deviation in surface of insulation</td>
<td>+/- 5 mm</td>
</tr>
</tbody>
</table>
5. STANDARD DETAILS

The following drawings give an abridged selection of the standard MetStructures construction details. A full and comprehensive pack of standard details can be obtained from MetStructures upon request.

### DETAIL CONTENTS

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET-012</td>
<td>External Wall Built off Concrete Slab</td>
</tr>
<tr>
<td>MET-013</td>
<td>External Wall Built off Podium Slab</td>
</tr>
<tr>
<td>MET-014</td>
<td>External Wall Built off Beam</td>
</tr>
<tr>
<td>MET-015</td>
<td>External Wall Lintel Detail</td>
</tr>
<tr>
<td>MET-016</td>
<td>External Wall Cill Detail</td>
</tr>
<tr>
<td>MET-017</td>
<td>External Wall to Concrete Floor Load Bearing Detail</td>
</tr>
<tr>
<td>MET-018</td>
<td>External Wall to Concrete Floor Non Load Bearing Detail</td>
</tr>
<tr>
<td>MET-019</td>
<td>External Wall to Joisted Cassette Floor Load Bearing Detail</td>
</tr>
<tr>
<td>MET-020</td>
<td>External Wall to Joisted Cassette Floor Non Load Bearing Detail</td>
</tr>
<tr>
<td>MET-021</td>
<td>Propped Balcony Detail</td>
</tr>
<tr>
<td>MET-022</td>
<td>Cantilever Balcony Detail</td>
</tr>
<tr>
<td>MET-023</td>
<td>External Wall Parapet</td>
</tr>
<tr>
<td>MET-024</td>
<td>External Wall to Concrete Roof</td>
</tr>
<tr>
<td>MET-025</td>
<td>External Wall to Timber Truss Roof</td>
</tr>
<tr>
<td>MET-026</td>
<td>External Wall to Timber Truss Gable</td>
</tr>
<tr>
<td>MET-027</td>
<td>External Wall to Joisted Cassette Roof</td>
</tr>
<tr>
<td>MET-029</td>
<td>Scaffold Tie Detail</td>
</tr>
<tr>
<td>MET-030</td>
<td>Brick Support Detail</td>
</tr>
<tr>
<td>MET-031</td>
<td>Internal Wall Built off Concrete Single &amp; Twin</td>
</tr>
<tr>
<td>MET-032</td>
<td>Single Internal Wall to Concrete Floor</td>
</tr>
<tr>
<td>MET-033</td>
<td>Twin Internal Wall to Concrete Floor</td>
</tr>
<tr>
<td>MET-034</td>
<td>Single Internal Wall to Joisted Cassette Floor</td>
</tr>
<tr>
<td>MET-035</td>
<td>Twin Internal Wall to Joisted Cassette Floor</td>
</tr>
<tr>
<td>MET-037</td>
<td>Internal Wall Door Head &amp; Jamb Details</td>
</tr>
<tr>
<td>MET-038</td>
<td>Internal Door Recessed Cill Detail</td>
</tr>
<tr>
<td>MET-039</td>
<td>Single Internal Wall to Timber Truss Roof</td>
</tr>
<tr>
<td>MET-040</td>
<td>Twin Partition Wall to Timber Truss Roof</td>
</tr>
<tr>
<td>MET-041</td>
<td>Single Internal Wall to Joisted Cassette Roof</td>
</tr>
<tr>
<td>MET-042</td>
<td>Internal Wall Built off Beam</td>
</tr>
<tr>
<td>MET-043</td>
<td>Threshold &amp; Barrier Details for Lift Shaft &amp; Other CDM Openings</td>
</tr>
<tr>
<td>MET-044</td>
<td>Lift Shaft Guide Rail Connection Detail</td>
</tr>
<tr>
<td>MET-045</td>
<td>Lift Wall Base to Pit</td>
</tr>
<tr>
<td>MET-046</td>
<td>Lifting Beam / Tie in Slab</td>
</tr>
<tr>
<td>MET-047</td>
<td>Typical Stair Plan Detail Half Landing</td>
</tr>
<tr>
<td>MET-048</td>
<td>Typical Stair Plan Detail Quarter Landing</td>
</tr>
<tr>
<td>MET-049</td>
<td>Typical Stair Trimmer Beam Detail Concrete Floor</td>
</tr>
<tr>
<td>MET-050</td>
<td>Typical Stair Trimmer Beam Detail Joisted Cassette Floor</td>
</tr>
<tr>
<td>MET-051</td>
<td>Half Landing Support Detail</td>
</tr>
<tr>
<td>MET-052</td>
<td>Single Internal Wall to External Wall</td>
</tr>
<tr>
<td>MET-053</td>
<td>Twin Internal Wall to External Wall</td>
</tr>
<tr>
<td>MET-054</td>
<td>External Corner Outward</td>
</tr>
<tr>
<td>MET-055</td>
<td>External Corner Inward</td>
</tr>
<tr>
<td>MET-056</td>
<td>External Corner non-90 Degree</td>
</tr>
<tr>
<td>MET-057</td>
<td>Internal Wall Junction Plan Details</td>
</tr>
<tr>
<td>MET-058</td>
<td>External Jamb Details</td>
</tr>
<tr>
<td>MET-059</td>
<td>Panel to Panel Junction Details</td>
</tr>
<tr>
<td>MET-060</td>
<td>Brick Movement Joint Detail</td>
</tr>
</tbody>
</table>
**MET-012 /**

- Bricktie channel by others
- Inter-stud insulation by others
- Cavity tray by others
- Weep hole by others
- Insulation to specification by others
- DPM by others
- Concrete foundation by others

**External Wall Built off Concrete Slab**

- Internal lining board to provide suitable fire protection to primary frame by others

**MET-013 /**

- Inter-stud insulation by others
- Bricktie channel by others
- Brickwork by others
- Cavity tray by others
- Insulation to specification by others
- Weep hole by others
- DPM by others
- Cavity barrier by others
- Cavity slab edge insulation by others
- Hot rolled beam & concrete slab with suitable insulation and fire protection by others
- Indicates line of finishes by others

**External Wall Built off Podium Slab**

- Internal lining board to provide suitable fire protection to primary frame by others

---

*www.metstructures.uk.com | 0121 389 1603*
External Wall Built off Beam

- Internal lining board to provide suitable fire protection to primary frame by others
- Bricktie channel by others
- Cavity tray by others
- Insulation to specification by others
- Weep hole by others
- Cavity insulation by others
- Cavity barrier by others
- Brickwork by others
- Hot rolled beam suitable insulation and fire protection by others
- Indicates line of finishes by others

External Wall Lintel Detail

- Internal lining board to provide suitable fire protection to primary frame by others
- Bricktie channel by others
- Brickwork by others
- Cavity tray by others
- Insulation to specification by others
- Weep hole by others
- Brickwork Support lintel by others
- Cavity Barrier by others
- Aperture by others
- M12 Countersunk bolt set with locking nut or equivalent rivet
- U Track
- C Stud
- External sheathing board
- Fixings in line with specification
- External sheathing board to return to inside face of frame (typically flush with brickwork opening) (Site fitted item)
External Wall Cill Detail

- Internal lining board to provide suitable fire protection to primary frame by others
- Bricktie channel by others
- Brickwork by others
- Cavity tray by others
- Insulation to specification by others
- Weep hole by others
- Brickwork Support lintel by others
- Cavity Barrier by others
- Aperture by others

External Wall to Concrete Floor Load Bearing Detail

- Bricktie channel by others
- Brickwork by others
- Cavity tray by others
- Weep hole by others
- Insulation to specification by others
- Cavity barrier by others
- Profiled fire stop by others
- Fire stop to supporting channel by others
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)

Fixings by design

Load bearing deck support

Composite structural decking

Fire Reinforcement & progressive collapse tie

Non fire rated ceiling by others

Internal lining board to provide suitable fire protection to primary frame by others

MET-016 / MET-017 /
**External Wall to Concrete Floor Non Load Bearing Detail**

- **Bricktie channel** by others
- **Brickwork** by others
- **Cavity tray** by others
- **Weep hole** by others
- **Insulation to specification** by others
- **Cavity barrier** by others
- **Profiled fire stop** by others
- **Fire stop to supporting channel** by others
- **Inter-stud insulation** by others (Min 600mm below ceiling line & 600 above SSL)
- **Internal lining board** to provide suitable fire protection to primary frame by others
- **External sheathing board**
- **Tapes by MetStructures (Site applied)**
- **Fixings by design**
- **M12 Countersunk bolt set with locking nut or equivalent rivet**
- **C Stud**
- **Composite structural decking with fibre reinforced concrete**
- **Progressive collapse tie (indicated by hatch) by design**
- **Fixings by design**
- **Non fire rated ceiling** by others
- **Floor finishes to Architects details**
- **5 tolerance**
- **Closure plate in 2mm flat steel strip to suit remainder of floor area to a maximum of 245mm**

**Note:** Teks cut off by others to allow fitting of boards

---

**External Wall to Joisted Cassette Floor Load Bearing Detail**

- **Bricktie channel** by others
- **Brickwork** by others
- **Cavity tray** by others
- **Weep hole** by others
- **Insulation to specification** by others
- **Cavity barrier** by others
- **Fire lining boards to underside of joists** by others
- **Inter-stud insulation** by others (Min 600mm below ceiling line & 600 above SSL)
- **Internal lining board** to provide suitable fire protection to primary frame by others
- **External sheathing board**
- **Tapes by MetStructures (Site applied)**
- **Fixings by design**
- **M12 Countersunk bolt set with locking nut or equivalent rivet**
- **C Stud**
- **U Track**
- **Factory fitted 22mm OSB3**
- **Fixings by design**
- **Non fire rated ceiling** by others
- **Floor finishes to Architects details**
**MET-020** / **External Wall to Joisted Cassette Floor Non Load Bearing Detail**

- Bricktie channel by others
- Brickwork by others
- Cavity tray by others
- Weep hole by others
- Insulation to specification by others
- Cavity barrier by others
- Fire lining boards to underside of joists by others
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
- Non fire rated ceiling by others

**MET-021** / **Propped Balcony Detail**

- Insulation to specification by others
- Bricktie channel by others
- Brickwork by others
- Cavity barrier by others
- Balcony steel by others
- Insulation made good around bracket on site
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
- Internal lining board to provide suitable fire protection to primary frame by others
- Galvanised stub by others or by MetStructures by agreement
- Thermal isolation pad by agreement
- Fixings by design
- Progressive collapse tie (Indicated by hatch) by design
- Fire Reinforcement & progressive collapse required (by design)
MET-022 / Cantilever Balcony Detail

- Insulation to specification by others
- Bricktie channel by others
- Brickwork by others
- Cavity barrier by others
- Balcony steel by others
- Insulation made good around bracket on site
- Internal lining board to provide suitable fire protection to primary frame by others
- Galvanised stub by others or Supplied by MetStructures by agreement
- Thermal isolation pad by others
- "U" Profile (Encapsulating hot rolled column)
- Tapes by MetStructures (Site applied)
- Non Load bearing deck support angle
- Composite structural decking with fibre reinforced concrete
- Fire Reinforcement & progressive collapse (Indicated by hatch) by design
- Progressive collapse tie (Indicated by hatch) by design
- Non fire rated ceiling by others
- External sheathing board
- Fixings by design
- Fixings by design

MET-023 / External Wall Parapet

- Parapet capping & ancillaries by others
- External sheathing board
- Bricktie channel by others
- Weep hole by others
- Insulation to specification by others
- Brickwork by others
- Cavity barrier by others
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
- Fire lining boards to underside of joists by others
- Internal lining board to provide suitable fire protection to primary frame by others
- Roof specification and products by others
- Factory fitted 22mm OSB3
- Fixings by design
- Site fitted External sheathing board
- Site fitted External sheathing board
- C Stud
- External sheathing board
- MetStructures Joint cassette
- Non fire rated ceiling by others
### MET-024 / External Wall to Concrete Roof

- Facade & ancillaries by others
- Cavity barrier by others, subject to fire strategy
- Profiled fire stop by others
- Fire stop to supporting channel by others
- Brickwork by others
- Bricktie channel by others
- Insulation to specification by others
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
- Internal lining board to provide suitable fire protection to primary frame by others
- Load bearing deck support
- Composite structural decking with fibre reinforced concrete
- Progressive collapse tie by design
- Fire Reinforcement & progressive collapse required (by design)
- Note: Teks cut off by others to allow fitting of boards
- External sheathing board
- Non fire rated ceiling by others

### MET-025 / External Wall to Timber Truss Roof

- Roof joists and finishes to specification by others
- Fire barrier by others
- Bricktie channel by others
- Brickwork by others
- Insulation to specification by others
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
- Cavity tray by others
- Internal lining board to provide suitable fire protection to primary frame by others
- Weep hole by others
- Fixing by design
- Timber sole plate (by others or by MetStructures by negotiation)
- Tapes by MetStructures (Site applied)
- External sheathing board
- MetStructures wall
- External sheathing board
MET-026 / External Wall to Timber Truss Gable

- Roof joists and finishes to specification by others
- Gable tie plate Fixing by design by others
- Cavity tray by others
- Fixing by design by others
- Weep hole by others
- Cavity barrier by others
- Fire lining boards to underside of joists by others
- Brickwork by others
- Bricktie channel by others
- Insulation to specification by others
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
- Cavity tray by others
- Weep hole by others
- Window by others
- Timber sole plate (by others or by MetStructures by negotiation)
- Tapes by MetStructures
- External sheathing board
- C Stud
- External sheathing board

MET-027 / External Wall to Joisted Cassette Roof

- Facade & ancillaries by others
- Cavity barrier by others subject to fire strategy
- Fire lining boards to underside of joists by others
- Insulation to specification by others
- Bricktie channel by others
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
- Internal lining board to provide suitable fire protection to primary frame by others
- Brickwork by others
- Fixings by design
- Factory fitted OSB3
- External sheathing board
- MetStructures wall system
**Scaffold Tie Detail**

**EXTERNAL WALL SCAFFOLD TIE - INTO DECK**

- Insulation made good around bracket on site
- Scaffold tie and bar by others
- Sacrificial connector left in place by others
- Site set out by others
- Fire lining boards to underside of joists by others

**EXTERNAL WALL SCAFFOLD TIE - INTO JOIST**

- Insulation made good around bracket on site
- Scaffold tie and bar by others
- Sacrificial connector left in place by others
- Site set out by others

Floor finishes to Architects details

- External sheathing board
- Fixings by design
- U Track
- M12 Countersunk bolt set with locking nut
- Factory fitted 22mm OSB3
- Tapes by MetStructures (Site applied)

- Load Bearing Deck Support
- C Stud

Tapes by MetStructures

**Scaffold Tie Detail**

- Fire lining boards to underside of joists by others

External sheathing board

Fixings by design

U Track

M12 Countersunk bolt set with locking nut

Factory fitted 22mm OSB3

Tapes by MetStructures (Site applied)

Load Bearing Deck Support

C Stud
Brick Support Detail

Internal lining board to provide suitable fire protection to primary frame by others.

Insulation made good around bracket on site.

Cavity barrier by others.

Fire stop to supporting channel by others.

Tapes by MetStructures (Site applied).

Floor finishes to Architects details.

Non fire rated ceiling by others.

External sheathing board.

Composite structural decking with fibre reinforced concrete.

Progressive collapse tie (indicated by hatch) by design.

Fire Reinforcement & progressive collapse required (by design).

Non Load bearing deck support angle.

150 (min).

Bracket by MetStructures by negotiation.

Horizontal soft joint to engineers specification.

Brickwork by others.

Bricktie channel by others.

Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL).

Cavity tray by others.

Weep hole by others.

Brick support design by others.

C Stud.

Tapes by MetStructures (Site applied).

Weep hole by others.

Brick tie channel by others.

Cavity barrier by others.

Fire stop to supporting channel by others.

Brick support design by others.

Internal lining board to provide suitable fire protection to primary frame by others.

Tapes by MetStructures (Site applied).

Floor finishes to Architects details.

Non fire rated ceiling by others.

External sheathing board.
MET-031/

**Internal Wall Built off Concrete Single & Twin**

- Insulation to specification by others
- Internal lining board to provide suitable fire protection to primary frame by others
- Floor finishes to Architects details if applicable

**GROUND FLOOR SLAB IN LINE WITH STRUCTURAL ENGINEERS SPECIFICATION**

- Insulation to specification by others
- Internal lining board to provide suitable fire protection to primary frame by others
- Floor finishes to Architects details if applicable

**WITH RESILIENT BAR**

- M12 Countersunk bolt set with locking nut or equivalent rivet
- Resilient bar to be added by other subject to specification requirements

**MET-032/**

**Single Internal Wall to Concrete Floor**

- Profiled fire stop by others
- Fire stop to supporting channel by others
- Inter-stud insulation by others (above and below ceiling line)
- Internal lining board to provide suitable fire protection by others

**LOAD BEARING SIDE**

- Floor finishes to Architects details

**Non Load bearing deck support**

**Progressive collapse tie by design**

**Fire Reinforcement & progressive collapse required (by design)**

**Ceiling by others**

**C Stud**
Non Load bearing deck support

C Stud

Profiled fire stop required by others

Fire stop to supporting channel by others

Internal lining board to provide suitable fire protection by others

Inter-stud insulation by others (above and below ceiling line)

Fire Reinforcement & progressive collapse required (by design)

Progressive collapse tie by design

Ceiling by others

Partition wall tie

LOAD BEARING SIDE

NON LOAD BEARING SIDE

M12 Countersunk bolt set with locking nut or equivalent rivet

Factory fitted 22mm OSB3

Fixings by design

Fire lining boards to underside of joists by others

Internal lining board to provide suitable fire protection to primary frame by others

Ceiling by others

Insulation by others (Specification subject to performance requirements by others)

Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
**MET-035 /**

**Twin Internal Wall to Joisted Cassette Floor**

- **Cavity barrier by others**
- **Floor finishes to Architects details**
- **Ceiling by others**
- **Insulation by others** (Specification subject to performance requirements by others)
- **Inter-stud insulation by others** (Min 600mm below ceiling line & 600 above SSL)
- **Fire lining boards to underside of joists by others**
- **Internal lining board to provide suitable fire protection to primary frame by others**

**LOAD BEARING SIDE**

**NON LOAD BEARING SIDE**

- **M12 Countersunk bolt set with locking nut**
- **Factory fitted 22mm OSB3**
- **Fixings by design**
- **Partition wall tie**

**MET-037 /**

**Internal Wall Door Head & Jamb Details**

- **Internal lining board to provide suitable fire protection to primary frame by others**
- **Door frame build up by others**
- **Door to specification by others**
- **Internal lining board to provide suitable fire protection to primary frame. (Specification subject to performance requirements by others)**

**Internal Door Head**

- **C Stud**
- **M12 Countersunk bolt set with locking nut or equivalent rivet**

**Internal Jamb**

- **C Stud**
- **U Track**
Section A-A

- M12 Countersunk bolt set with locking nut or equivalent rivet
- Fixings by design
- U Track
- Deck Support
- Inter-stud insulation by others (min 600mm below ceiling line & 600mm above SSL)
- Ceiling by others
- Internal lining board to provide suitable fire protection to primary frame

Section B-B

- M12 Countersunk bolt set with locking nut or equivalent rivet
- U Track
- Deck Support
- Inter-stud insulation by others (min 600mm below ceiling line & 600mm above SSL)
- Ceiling by others
- Internal lining board to provide suitable fire protection to primary frame
**MET-039 / Single Internal Wall to Timber Truss Roof**

- Timber roof construction to specialist design
- Shim packer as required
- Internal lining board to provide suitable fire protection to primary frame by others
- MetStructures wall construction

**MET-040 / Twin Partition Wall to Timber Truss Roof**

- Timber partition wall by others
- Internal lining board to provide suitable fire protection to primary frame by others
- MetStructures wall construction
**MET-041**

**Single Internal Wall to Joisted Cassette Roof**

- **Load Bearing Side**
  - Internal lining board to provide suitable fire protection to primary frame by others
  - Fixings by design
  - MetStructures wall construction

- **Non Load Bearing Side**
  - M12 Countersunk bolt set with locking nut or equivalent rivet
  - Fixings by design

**MET-042**

**Internal Wall Built off Beam**

- **Inter-stud insulation**
  - by others (Min 600mm below ceiling line & 600 above SSL)

- **Internal lining board**
  - to provide suitable fire protection to primary frame by others

- **Tab plate**
  - welded to beam by design

- **Fire protection**
  - by others

- **U track**
  - Factory fitted 22mm OSB3

- **Beam**
  - by MetStructures

- **M12 Countersunk bolt**
  - bolt set with locking nut or equivalent rivet

- **Fixings by design**
Threshold & Barrier Details for Lift Shaft & Other CDM Openings

Flat strap bracing, angle or C profile stud to act as temporary barrier to design

Note: Toe board by others as required

SSL

Lift Shaft Guide Rail Connection Detail

2 Layers of 12mm external sheathing board factory fitted to lift shaft wall panel

Fire Mastic

Steel spacer

P1001-B3 Unistrut or similar approved

MetStructures wall construction

Internal lining board to provide suitable fire protection to primary frame by others
**MET-045 / Lift Wall Base to Pit**

- Lifting beam by MetStructures
- Lifting eye to be installed and tested by lift installer
- Vertical spacings for guide rails to suit lift manufacturer designs
- Internal lining board to provide suitable fire protection to primary frame by others
- Concrete lift pit to engineers details
- Channel assembly cast into concrete (by others)
- MetStructures wall construction
- Vertical spacings for guide rails to suit lift manufacturer designs
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
- MetStructures wall construction
- Min edge distance to be observed

**MET-046 / Lifting Beam / Tie in Slab**

- Lifting beam by MetStructures
- Lifting eye installed and tested by lift installer
- Additional studs to support lifting beam
- Lift shaft studs as per design
- Height to U/S of lifting eye as per lift manufacturer details
- MetStructures wall construction
- Concrete lift pit to engineers details
- Inter-stud insulation by others (Min 600mm below ceiling line & 600 above SSL)
**MET-047** / **Typical Stair Plan Detail Half Landing**

- RSA or similar by MetStructures to support landing slab
- Half landing slab
- 10mm Gap between stringer and plaster boards

**MET-048** / **Typical Stair Plan Detail Quarter Landing**

- RSA or similar by MetStructures to support stair half landings
- Landing by Stair Supplier
- 10mm Gap between stringer and plaster boards
**MET-049**

**Typical Stair Trimmer Beam Detail Concrete Floor**

- Composite structural decking cast after stair installation
- Support plate welded to underside of trimmer beam
- Stair trimmer beam by MetStructures Designed on project specific basis
- Fixing method for stair to trimmer beam to be confirmed with stair manufacturer

**MET-050**

**Typical Stair Trimmer Beam Detail Joisted Cassette Floor**

- Joisted cassette by MetStructures
- Floor build up as specified by architect
- Plate welded to trimmer beam for end joist to fix into
- Stair trimmer beam by MetStructures Designed on project specific basis
- Fixing method for stair to trimmer beam to be confirmed by stair manufacturer
Half Landing Support Detail

Internal lining board to provide suitable fire protection to primary frame by others
Inter-stud insulation by others
Profiled fire stop required
Fire stop to supporting channel

150 (min)

Composite structural decking with fibre reinforced concrete
Progressive collapse tie by design
Fire Reinforcement & progressive collapse required (by design)
Support by MetStructures bolted to flange of studs
Note: Tek's cut off by others to allow fitting of boards

MET-052 / Single Internal Wall to External Wall

Internal lining board to provide suitable fire protection to primary frame by others
Inter-stud insulation by others
External insulation
Bricktie channel
Brickwork by others

C Stud
External sheathing board
**Internal lining board** to provide suitable fire protection to primary frame by others.

**Inter-stud insulation** by others (Min 600mm beyond wall when required for flanking, to be confirmed by acoustician).

**Insulation to specification** by others.

**Bricktie channel** by others.

**Brickwork** by others.

**Secondary angle or studwork** to support dry-lining by others.

**C Stud**

**Internal lining board** to provide suitable fire protection to primary frame by others.

**Inter-stud insulation** by others (Min 600mm beyond wall when required for flanking, to be confirmed by acoustician).

**Insulation to specification** by others.

**Bricktie channel** by others.

**Brickwork** by others.

**Cavity barrier** by others.

**MET-053**

**External Corner Outward**

**MET-054**

**MET-053** and **MET-054** represent standard details for the Twin Internal Wall to External Wall and the External Corner Outward configurations, respectively. Each diagram illustrates the necessary components and their placement within the structural components, ensuring compliance with fire protection and acoustic requirements.
**MET-055 / External Corner Inward**

- Internal lining board to provide suitable fire protection to primary frame by others
- Inter-stud insulation by others
- Bricktie channel by others
- Brickwork by others
- Cavity barrier by others
- Additional stud to fix boarding min 70mm access required
- Board support angle by others
- M12 Grade 8.8 bolt complete with locking nut and washers (Top & bottom)
- External sheathing board
- Additional stud to carry cavity barrier by agreement only

**MET-056 / External Corner non-90 Degree**

- Internal lining board to provide suitable fire protection to primary frame by others
- Insulation to specification by others
- Inter-stud insulation by others
- Brickwork by others
- Bricktie channel by others
- External sheathing board
- Site applied External sheathing board to panel edge
- Low profile Ø5.5 Tek screw fixing support plate to wall panels. Fixing by design
- Angled plate by design
- C Stud
INTERNAL SEPARATING WALL

Internal lining board to provide suitable fire protection to primary frame by others

Insulation to specification by others

C Stud

M12 Grade 8.8 bolt complete with locking nut and washers (Top & bottom)

INTERNAL NON-SEPARATING WALL

Internal lining board to provide suitable fire protection to primary frame by others

Secondary lining board support by others

C Stud

M12 Grade 8.8 bolt complete with locking nut and washers (Top & bottom)
**External Jamb Details**

- Internal lining board to provide suitable fire protection to primary frame by others.
- Brickwork by others.
- Bricktie channel by others.
- Insulation to specification by others.
- Cavity barrier by others.
- Window system by others.
- Brick tie channel by others.

100mm Flange Option - No additional brick-tie required.

Brick-tie channel by others accessibility subject to cavity closure width by others.
Panel to Panel Junction Details

EXTERNAL PANEL TO PANEL JUNCTION

- Internal lining board to provide suitable fire protection to primary frame by others
- C Stud
- M12 Grade 8.8 bolt complete with locking nut and washers (Top & bottom)
- External Sheathing Board
- Insulation by others
- Brick tie channel by others
- Brickwork by others

INTERNAL PANEL TO PANEL JUNCTION

- C Stud
- M12 Grade 8.8 bolt complete with locking nut and washers (Top & bottom)
- Internal lining board to provide suitable fire protection to primary frame by others

Brick Movement Joint Detail

- Insulation to specification by others
- Bricktie channel by others
- Brickwork by others
- Sleeved tie channel by others
- External sheathing board

200 max