



THOMAS STREET, MANCHESTER

**No. 7 KELVIN STREET
TEMPORARY WORKS
PERFORMANCE SPECIFICATION**

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1.0 INTRODUCTION

This report presents the performance specification for the temporary works modification scheme required for Number 7 Kelvin Street which forms part of the Thomas Street development site.

The specification and outline TW design and methodology presented are in response to the Clients Brief and have been developed in conjunction with the consultant team, construction partner and their supply chain. The proposals within this report will form the basis of the permanent works technical design (RIBA Stage 4).

The proposals should be reviewed by the Temporary Works Designer (TWD), Temporary Works Coordinator (TWC) and Principle Contractor (PC) to confirm;

- Feasibility of the Proposals
- Any required changes to the permanent works design arising from the detailed temporary works design

1.1 Project Description

The Thomas Street development consists of a new build 5-storey RC framed residential block, with the refurbishment of the Grade II listed 7 Kelvin Street warehouse forming part of the development.

The new RC framed development is to be founded on piled foundations given the ground conditions and magnitude of loadings.

The development site sits within the Smithfield Conservation Area.

1.2 Report Structure

The report is to be read in conjunction with the information contained within the appendices and the wider design team's information.

Section two of this report provides an overview of the existing site and associated constraints that have informed the structural proposals.

Section three presents information gathered on the existing construction of 7 Kelvin Street which is relevant for the temporary works designer. The information presented includes desk based study of historical information, plus measured building surveys, intrusive opening up works recordings and structural observations.

Section four focuses on the proposed permanent works structural design for 7 Kelvin Street.

Section five outlines the preferred temporary works scheme which is to be appraised by the TWD and developed into detailed design proposals.

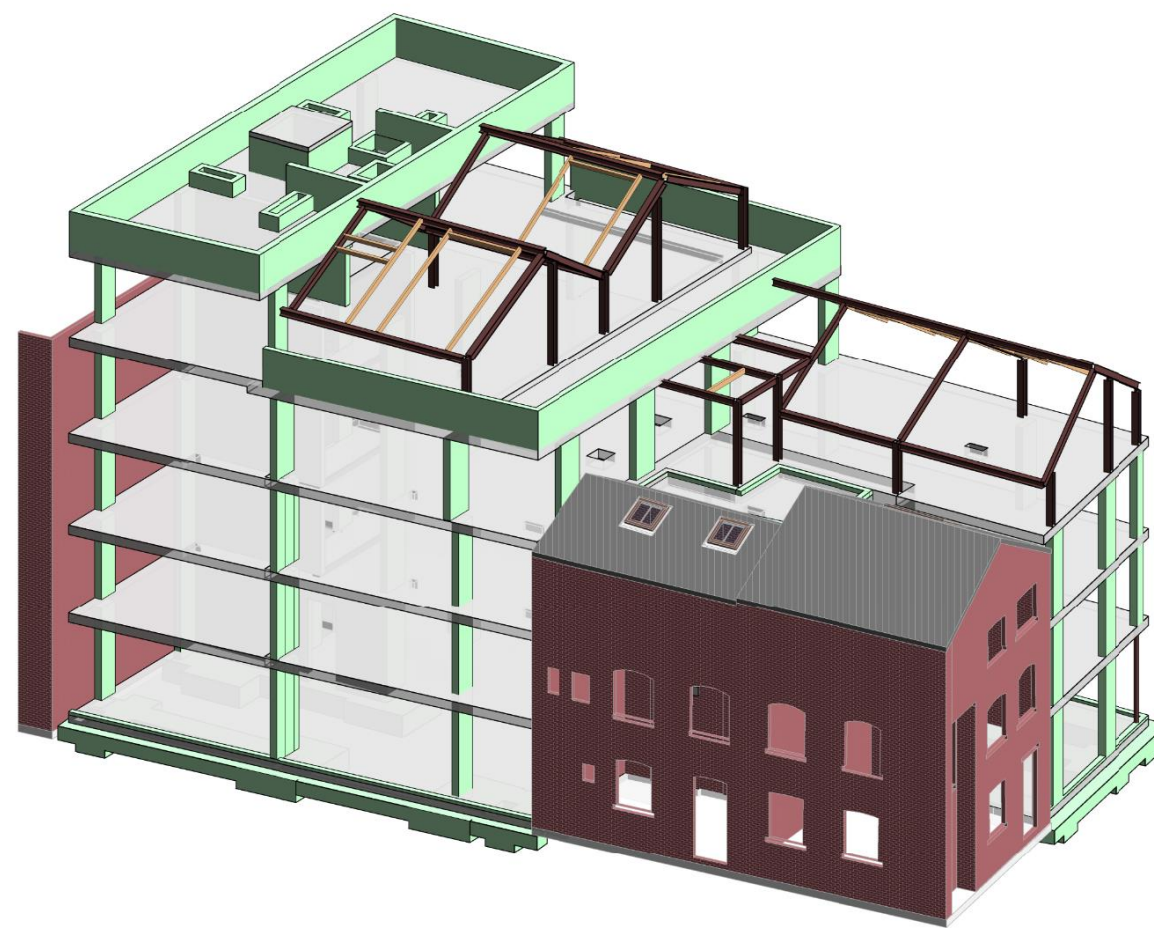


Figure 1.0 – Thomas Street Development 3D Model

2.0 SITE & CONSTRAINTS

In addition to the following section, please refer to the Site Constraints Plan provided by the Main Contractor.

2.1 Site Location

The property covered by this report is located in Manchester city centre, bounded by Kelvin Street, Back Turner Street and Thomas Street. The site is shown in Figure 2.1 below, with the building indicated in red.



Figure 2.1: Site Location (Image © Google)

The building has three storeys and is of traditional construction. The existing building has been scaffolded externally and internally since approximately 2016 following emergency demolition of the adjacent corner plot at 50 Thomas Street.

Number 7 Kelvin Street is a Grade 2 listed building on the National Heritage List for England, List number 1291627. It is included on the List as a “little-altered example of [an] early small-scale warehouse.” The building falls within the Smithfield Conservation Area, designated by Manchester City Council in 1987.

Part of the building can be seen in the photograph below in the right foreground, taken from Back Thomas Street looking northwest.



Figure 2.1 – Back Turner Street c.1918 (Image © Manchester Libraries)

Reference should be made to the Heritage Statement by Steven Levrant Heritage Architecture dated July 2016 as well as the associated Addendum to the Statement dated July 2017.

3.0 EXISTING BUILDING – 7KS

In addition to the following section, please refer to the existing building survey information:

- Measured building surveys by N.D.Oliver
- Site Investigation report by Brownfiled Solutions Ltd
- Timber and Damp Survey by Trace Remedial Building Services
- Structural Condition Survey by Renaissance

3.1 Surveys Undertaken

The following survey works have been undertaken to the existing building in order to inform the temporary and permanent works design.

- Structural Engineer Condition Report [Carried out 29/04/22]
- T&D Survey Report [Carried out 16/05/22]
- Verticality Survey [Carried out 30/05/22]

Note that further survey works may be required in order to inform the temporary works design. Such additional survey works should be specified by the Temporary Works Designer as required.

3.2 Existing Building Structural Overview

The existing building is a Grade II Listed warehouse building which dates from circa late 19th / early 20th century. The building occupies the corner plot at Back Turner Street and Kelvin Street and is of three storeys in height and of traditional load-bearing brickwork walls with timber joist and beam floors and elements of cast-iron / steelwork internally. The pitched roof is formed with timber trusses. A small portion of the plot contains a basement level which consists of a brick vaulted ceiling housing existing plant.

The roof is formed in two duo-pitched elements. The larger duo-pitch has its gable end fronting Kelvin Street & eaves along Back Turner Street & the previous interface with No. 50-48 Thomas Street. The smaller duo-pitch continues running back along Back Turner Street, but stops at the infill courtyard area between No.7 & No.48-50 Thomas St. The roof appears to have been reroofed with concrete tiles.

The existing building elevations comprise solid circa 360mm brickwork walls with header coursing every 7th brick course typically. Extensive repointing has taken place using a hard sand-cement mortar. The Back Turner Street elevation contains window openings serving ground and first floor levels and a bricked-up door opening at ground floor level. The walls are exhibiting significant out-of-plumbness. Historic Tie bars are evident in some locations on the external elevations.

No. 7 generally does not have a basement level, although evidence suggests a small space beneath the demise of No.7 is an accessible historic vaulted chamber, likely used for coal storage or similar.

3.3 Condition of Existing Building

The building is in a poor condition, primarily due to the large structural movement observed to the South-East corner of the Back Turner Street elevation, and the historic movement caused by No.48-50 Thomas Street. Additionally, water ingress has affected a significant part of the building.

The majority of the roof timbers have been affected by water ingress and are severely decayed in places. Refer to the specialist timber & damp surveys for the extent of decay, including at timber bearing points into the external walls and any other critical areas identified.

Floor timbers are also displaying signs of decay generally & there is a consistent & pronounced sloping of all the floors toward the South-East corner which is clearly perceivable & measures circa 50mm over a 6/7m distance.

The Back Turner Street elevation is out of plumb at the corner junction with Kelvin Street & displays a fairly consistent lean from ground level through the full height. Horizontal tying of this corner is absent, from both the return elevation along Kelvin Street due to the recessed loading bay opening, and to any of the floor/roof structures.

Emergency structural holding works have been present within the building since circa 2016. It is understood that these works initially consisted of an external buttressing scaffold which closed Back Turner Street. Several weeks later these works were then replaced with the internal 'birdcage' scaffolding system currently on site today, in order to reopen Back Turner Street. These works consist of clamping details to the building facades with internal scaffold standards on a circa 1.1m plan grid and extensive cross bracing. It has been noted that the vertical standard locations appear to vary from floor to floor and the vertical propping is not present to the floors in all locations. It appears that the current scaffolding works have no design calculations to support their installation and were undertaken by the scaffold contractor as an emergency temporary installation.

3.4 Vertical Load Path

The original vertical load path of the original building fabric is described as follows.

Vertical loads are carried at roof level by timber purlins and the ridge beam, which are supported on a large king-post timber truss which spans the full depth of No. 7. The roof beams, purlins, and trusses are built into the solid external walls with timber spreaders provided in the walls at the truss bearing points.

The floor structure generally is formed by timber joists spanning parallel to back turner Street notched onto primary timber beams which bear into the masonry walls. A timber strut is present at first floor level which props

the longer spanning floor beam above, broadly in the same structural line as the return wall between the courtyard infill area and No.7 further down Back turner Street.

At ground floor the exposed first floor structure at high level follows the same general arrangement as the second-floor structure above, with additional struts present to the main timber beam line which appears to date from different eras. The strut to the no.50 demise line is of ornate cast-iron construction. Two struts toward Back Turner Street are present and appear to be of more modern construction.

The original ground floor structure appears to be suspended timbers however these appear to have been removed during the installation of the emergency holding works. Steel/Cast-iron posts at ground floor level appear to be bearing onto shallow concrete/stone spreader footings onto ground.

The current emergency holding scaffolding works appear to vertically prop areas of the existing roof and floors, however this vertical propping does not appear to be consistent, with the locations of scaffold standards varying from floor to floor. The current vertical load path is therefore considered to be a mix of the original construction described in the earlier paragraphs supplemented with the emergency holding works. A site survey is recommended prior to commencement of temporary design works.

3.5 Lateral Load Path

The masonry load bearing facades appear to be only partially restrained by the existing floor structures, with no proper restraint provided in some local areas. As such, under wind loading the masonry wall panels are assumed to span vertically between floors to an extent, and laterally between return walls where the condition of the brick bonding between the walls permits.

The timber floor joists and beams are partially embedded into the walls and it is considered that the timber floors will provide an amount of diaphragm action to transfer lateral loads from the floors back into the wall system. The condition of this timber floor is variable and as such the diaphragm action of the floor is not recommended to be relied upon in its current condition.

The current emergency holding scaffolding works appear to provide some lateral support and tying of the building walls, via clamping of the external walls and tying back to a heavily cross braced internal scaffold system. As such the current horizontal load paths are likely to be a combination of the original building fabric described in the previous paragraphs supplemented to some degree with the emergency holding works. Due to the lack of continuity of the emergency holding works across floors, the current lateral load paths are complex and a site survey is recommended prior to commencement of temporary design works.

4.0 PERMANENT WORKS PROPOSALS – 7KS

This section should be read in conjunction with the latest structural and civils permanent works drawings available via the PC.

4.1 Structural Philosophy

As the building is Listed, any interventions should be appropriate for a structure with recognised and legally recognised heritage significance. Where possible, the proposed interventions will be positioned to minimise physical and visual intrusion into the internal spaces and external interventions will be kept to a minimum.

4.2 3.2 Superstructure

The proposed architectural scheme entails the retention of No. 7 Kelvin Street and the demolition of the other remaining structures on the site. Removal of the adjacent building will result in the end wall of No. 7 Kelvin Street becoming an external wall until such time that the proposed new buildings are constructed adjacent to it.

Number 7 Kelvin Street is proposed to become residential apartments following modification and removal of some internal walls; this may also necessitate the removal and replacement of some portions of floor currently supported by the removed elements. The existing staircase linking Ground and First floors is to be removed; second floor is currently only accessible via a ladder and access hatch. A new staircase is to be constructed linking all floors requiring portions of the existing floor to be removed.

In various places the existing walls exhibit cracking. In these locations a brick stitching detail will be employed to tie together the wall to either side of the crack(s). To further enhance the robustness of the building, particularly the area of the Back Turner Street elevation to Kelvin Street, the primary floor and roof elements will be tied to the external walls. Where demolition of 48-50 Thomas Street has taken place, the now-exposed wall will require local dismantling and rebuilding in various areas in the existing wall openings to be infilled, further enhancing the robustness of the building as a whole. On the Kelvin Street corner of this elevation a brick stitching detail will be employed over the full height.

4.3 3.3 Facades

The elevation to Kelvin Street is proposed to be left unchanged, with repointing of brickwork as necessary.

Tie rods (held by pattress plates on the Back Turner Street elevation and internally) are proposed to be introduced to help restrain the left side of the loading bay (i.e. the Kelvin Street / Back Turner Street corner). A tie rod and pattress plate are already present at the underside of first floor in this position. A portion of the existing brickwork near the top of the gable on Kelvin Street is proposed to be dismantled and rebuilt as it is considerably out-of-plumb.

On the Back Turner Street elevation, the new pattress plates mentioned above are proposed to be introduced with existing pattress

plates remaining in place. Repointing will be carried out as necessary. The architectural proposals entail the introduction of two new windows at Level 2 which would require new openings to be formed in this wall. The remaining external walls (following completion of the adjacent buildings) are those that currently form the two sides of the lightwell and the part-gable resulting from the change in ridge level along Back Turner Street. These areas are unchanged, to be repointed as necessary.

4.4 Summary of Permanent Remedial Works

- Allow for local rebuilding of Kelvin St. / Thomas Street facing corner with Helibar stitching detail full height.
- Allow for Cemite remedial fixing detail by Helifix or similar to connect external Back Turner Street wall to return of adjoining building.
- Existing timber joists to be replaced or strengthened, subject to Timber & Damp specialist guidance.
- Allow for strengthening of primary timber beams by through-bolted steel plates to both sides in areas of decay / damage (typical). Areas of decay to be identified by specialist.
- Existing tie rods and pattress plates to be replaced.
- Waling beams installed throughout to provide stability to walls.
- Existing timber beam tied to new waling beams to provide adequate tying.
- New timber beams positively fixed to purlins and ridge and provided with ancon Staifix timber frame ties to restrain the rebuilt portion of gable.
- Truss ends likely to require rectification.
- Areas of masonry throughout to be dismantled and rebuilt – as agreed with heritage consultant.

5.0 TEMPORARY WORKS – CONCEPT PROPOSALS

The proposed temporary works scheme concept is provided within Appendix A. This has been developed in response to the following key aspects of the brief;

1. Ensure the stability of 7 Kelvin Street prior to proposed site demolition works
2. Aim to re-use as much of the existing temporary works system in place to avoid having to install a new system in and around the existing dense temporary works arrangement
3. Facilitate the installation of the permanent tying and remedial structural works

This scheme is to be developed into a detailed design by the Temporary Works Designer, in full collaboration with the Permanent Works designer and relevant contractors via the Temporary Works Coordinator.

6.0 STRUCTURAL DESIGN CRITERIA

6.1 Design Codes

The Temporary Works Designer is to design the temporary works system to either the relevant British Standards or Eurocodes. The choice of design code must be consistent across the full design.

7.2 Loadings

The following section describes the loadings that must be accounted for by the Temporary Works Designer in the temporary works design.

7.2.1 Dead Loads (G_k)

Dead loads include the self-weight of the temporary structure itself including frames, walings, connections to the façade and any kentledge.

Dead loads could also include ancillary works such as additional scaffolding, access walkways, ramps, staircases, huts, hoists, storage platforms and sheeting and its supports. The Temporary Works Designer is to discuss and agree the requirements for ancillary works with the Principle Contractor as part of the temporary works design process to determine the loading applied to the retention system.

Note that only the permanent dead loads are permitted to be considered for resistance to overturning since storage, scaffold and other loads can be moved during the construction process.

The concept design has been based upon the following loading assumptions for the existing building fabric;

- Roof self-weight = 1.10 kN/m² on plan (excludes swt of trusses)
- Primary roof truss self-weight = 0.75kN/m run
- Timber Floors Self Weight (excludes swt of beams) = 0.40 kN/m²
- Primary timber floor beams self-weight = 0.40kN/m run
- Solid brick facades with brick unit density assumed at 16-19 kN/m³

7.2.2 Imposed Loads (Q_k)

Imposed vertical loads that are to be considered during construction could include any working platforms, stored materials, or snow.

Any working platforms are recommended to be designed for service class 2 loading as a minimum (1.5kN/m²). Where working platforms are to be used to store materials, for example to store brickwork or stonework during façade repair works, a higher loading allowance should be determined and designed for.

Material storage areas, loading bays or site cabins are to be considered separately as agreed with the Main Contractor.

7.2.3 Impact / Accidental Loads (A_k)

Accidental Impact loads can occur from a number of sources including falling debris, vehicles and suspended loads from a crane. These risks should be identified systematically in a specific risk assessment undertaken by the Temporary Works Designer in collaboration with the Principal Contractor where appropriate.

7.2.4 Wind Loading (W_k)

The structure is to be designed for wind loadings which are to be calculated using BS 6399-2 or BS EN 1992-1-1-4.

No reduction in loadings for shorter return periods is permitted for the temporary scheme.

It is recommended that the façade is taken as 100% impermeable (i.e. no reduction in wind loading taken due to removal of windows in the retained facade) unless unboarded windows and unsheeted scaffolds can be agreed with the Principal Contractor and observed at all stages of the project.

The temporary works design should be designed using a global wind loading of 0.70kN/m².

7.2.5 Notional Lateral Forces

The support system must be designed for the lateral loads generated by offsets or out-of-plumb in the façade. Further lateral loads will arise if additional out-of-plane movements take place during construction.

The Notional Lateral Forces should be taken as the greater of either of the following;

1. 1.5% of the total vertical load on the wall
2. The lateral load from the as-surveyed eccentricity of the façade load (including for out-of-plumbness plus offsets in façade thickness, projecting elements etc) Note that in this case the self-weight of the façade is not included.

A high level review of the verticality survey has been carried out and the proposed lateral loadings are provided on the temporary works concept design sketch. The temporary works designer can use this figure or calculate more detailed values using the verticality survey and the notes above as required.

The lateral load should be considered to act as a uniformly distributed load over the façade surface, and to be applied to the temporary works structure at the points of connection to the façade. It must be added to the calculated wind loads when designing the temporary works structure.

7.3 Deflection Criteria

7.3.1 Lateral Deflections (Out of Plane)

The following lateral deflection limit is to be adopted in the design of the structure:

Maximum Lateral Deflection = $H / 750$

Where H is the overall height of the façade above ground level.

Similarly, maximum relative deflection of parts of the facade in a vertical plane over a vertical height of 'h' should be limited to = $h / 750$

7.4 Connection to Façade Design

7.4.1 Connection Design

The design of connections between the façade and the temp works structure are to be designed for the lateral loads arising from items 7.2.4 and 7.2.5.

7.5 Movement Monitoring & Inspections

Reference should be made to the renaissance vibration and movement monitoring specification which proposes suitable movement monitoring including the appropriate trigger levels to allow the movements of the façade to be monitored and managed.

A baseline set of readings should be obtained prior to the demolition works commencing, and movements monitored throughout the demolition, erection of retention system, construction of permanent works and removal of retention system works.

Inspections should be carried out on a regular basis to check if ties, wedges and fixings are tight. Also, those checks should monitor the structure and its state of repair as well as any damages that could have happened due to impact during demolition and construction or after high winds for example.

APPENDIX A
TEMPORARY WORKS CONCEPT DESIGN

AT LEVEL 02 NO WINDOWS PRESENT
TO BTS THEREFORE ALLOW FOR
SCAFFOLD TO CORE THROUGH THE
MASONRY WALL AT PROPOSED
WINDOW OPENINGS AND CLAMP IT
BACK TO THE PLAN BRACING SYSTEM

 INDICATES EXISTING SCAFFOLD
 STANDARDS ON APPROXIMATE 1.1m
 PLAN GRID TO BE RETAINED. EXACT
 LOCATION OF STANDARDS TBC ON
 SITE VIA SURVEY BY SCAFFOLD
 DESIGNER PRIOR TO DETAILED
 DESIGN

 INDICATES EXG SCAFFOLD STANDARDS TO BE RE WITH ACROW PROP TO ROOF PURLINS AT TR FLOOR JOISTS TO LEV AND 02. SEQUENCE OF INSTALL VS. REMOVAL EXISTING SCAFFOLD T AGREED ON SITE WITH SCAFFOLD DESIGNER

PERIMETER WALLS TO BE CLAMPED
BY SCAFFOLD SYSTEM USING
SCAFFOLD BOARDS WEDGED TO
BOTH FACES TYPICALLY

NOTE: ON PLAN BRACING ELEMENTS THROUGHOUT TO BE MINIMUM 48MM DIAMETER **STEEL** SECTIONS.

INDICATES SCAFFOLD MEMBER
MECHANICALLY FIXED INTO EXISTING
MASONRY WALL USING 4No. RAWL
SAFETY PLUS II ANCHORS THROUGH
SCREW JACK BASE PLATE OR SIMILAR

LAST STANDARD TO BE MIN
300mm FROM FACE OF WALL
TO PERMIT FUTURE INSTALL OF
— PERMANENT WORKS TO
FACADE. ALLOW FOR
RELOCATION OF STANDARDS
TO SUIT LOCALLY

WIND LOAD PLUS FACADE OUT
OF PLUMB LATERAL LOADING
TO APPLY. REF TO DESIGN
CRITERIA IN PERFORMANCE
SPEC. DOCUMENT

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH WORKS OF THE NATURE,NOTE THE FOLLOWING ABNORMAL RISKS IDENTIFIED