



79 MOSLEY ST, MANCHESTER

RETAINED FAÇADE MONITORING

SPECIFICATION

FIRST ISSUE

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1 INTRODUCTION

It is proposed to redevelop the site of 79 Mosley Street, Manchester. The redevelopment works require the retention of the existing façade to Mosley Street, Princess Street and Back George St elevations, the demolition of remainder of the building and the construction of the new development within the confines of the existing façade.

During the demolition and construction phase of the works the existing façade will be restrained by a system of permanent and temporary steelwork framing. In order to measure the performance of the façade and restraints and to predict when intervention may be required a system of monitoring for both movement and vibration is proposed. This report details the monitoring requirements and the intervention / action limits associated with these.



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2 EXISTING SITE

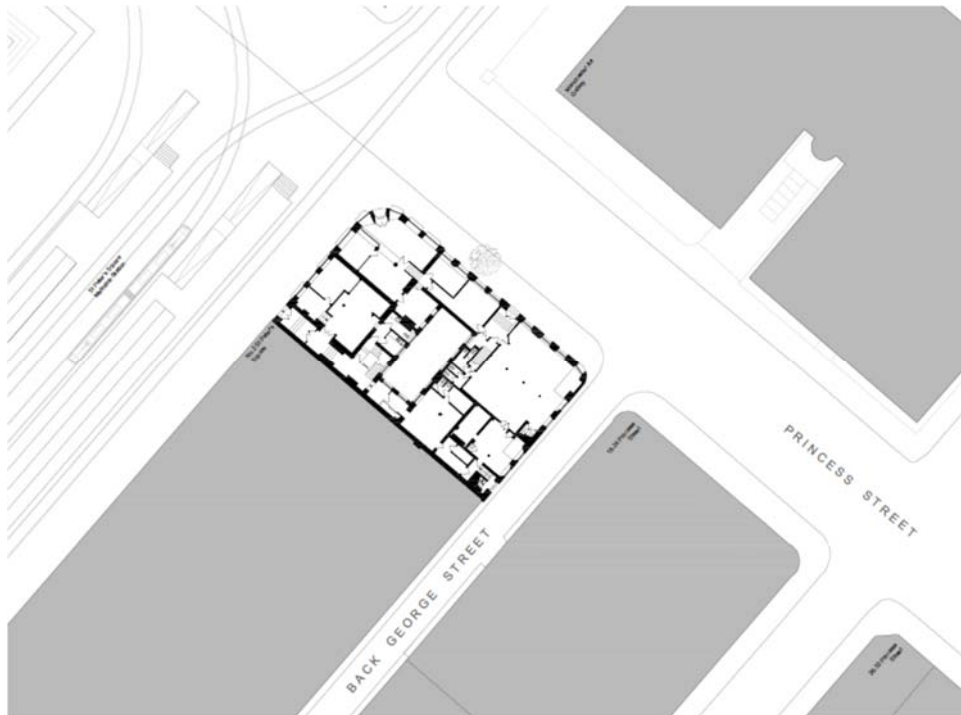


Figure 1 Site Location

2.1 Site Location

The site is located at the convergence of Mosley Street, Princess Street and Back George Street in the centre of Manchester.

The site occupies a peninsular location with exposed elevations facing onto the 3 highways noted above. The rear elevation shares a boundary with 2 St Peter's Square, a 12-storey office building. The longest elevation faces approximately North East fronting onto Princess Street.

2.2 Existing Structure

The existing structure extends over 5 storeys providing accommodation at basement, ground, 1st, 2nd and 3rd levels. The structure is formed by cast iron columns supporting a grillage of timber / steel primary beams in turn supporting timber joists and boards at each floor level. Around the perimeter of the floors the timber / steel beams extend onto the external wall providing lateral restraint to the external façade.



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A number of internal walls are loadbearing formed with solid masonry and extend for varying heights through the building.

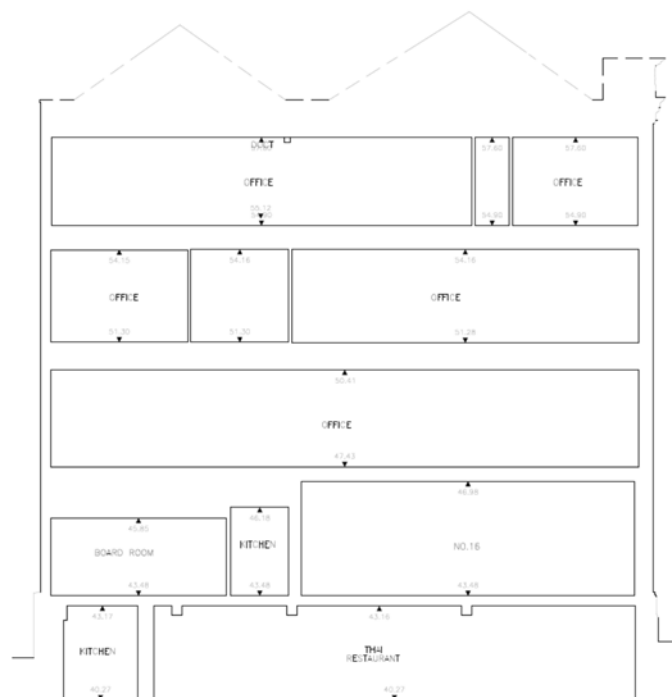
The pitched roof is formed by timber trusses supported on the internal columns and the external façade.

2.3 Existing Façade

The existing façade is 4 storeys high and is constructed from solid brickwork with natural stone features. The façade is punctuated with punched windows at every story, most with a stone surround and with 7 No windows at second floor benefitting from non-accessible projecting stone balconies. The façade at all levels extends below external ground level to form a retaining wall to the basement level.

Each retained elevation fronts onto a highway with the possibility of large commercial vehicle traffic. The Mosley Street elevation is parallel with and adjacent to the Metrolink track with the regular passing of trams near to the structure.

The exposed facades are restrained to the loadbearing internal frame at each floor and roof level.





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The external wall and the existing structure were found to be supported at shallow depth within the glacial till, the till was recorded as firm to stiff, becoming very stiff, high shear strength brown slightly sandy slightly gravelly laminated clay.

The adjacent building (2 St Peter's Square) has a 2-storey basement the perimeter walls of which are formed by a contiguous piled wall. The founding depth of this perimeter wall is much deeper than the founding depth of the current 79 Mosley Street structure and external wall.



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3 PROPOSED DEVELOPMENT

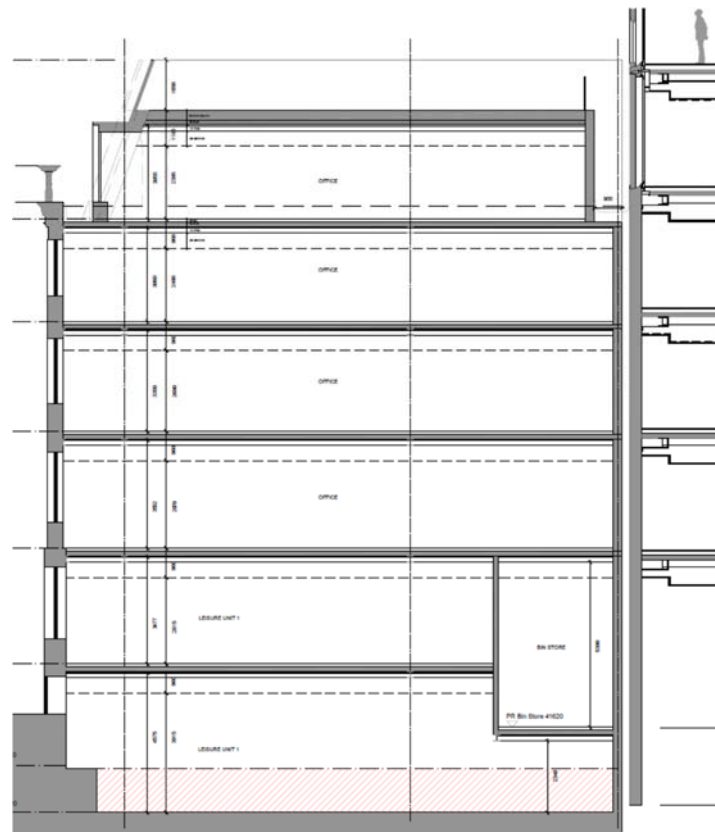


Figure 3 - Section Through Proposed Development

3.1 Proposed Scheme

The consented proposal requires the retention of the existing façades to Mosley Street, Princess Street and Back George Street and the subsequent demolition of the internal structure. It is proposed to reconstruct the internal structure with a new structural steelwork frame supporting composite concrete / steel decked slabs. The proposed structure comprises 5 suspended levels and a roof supporting plant and equipment.

3.2 Façade Retention

The retained façade is to be temporarily restrained during demolition of the existing and construction of the new structure. Façade restraint schemes are common in the building industry and normally take the form of an external temporary vertical cantilever structures tied to the façade by mechanical means or by clamping the façade through window openings or similar. The cantilever structure is usually prevented from



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overturning caused by lateral loads by utilising the dead load of the façade itself together with gravity kentledges or tension piles to counteract the resultant uplift forces.

In the case of 79 Mosley Street and external temporary façade restraint structure was not deemed feasible due to the following

- Partial obstruction of Back George Street preventing access to adjacent properties
- Manchester City Council Highway Department's restrictions on the narrowing of Princess Street
- Proximity of the Metro lines on Mosley Street/ St Peter's Square

Accordingly an internal restraint system has been developed utilising a combination of the proposed new structure and temporary steelwork members, the temporary members being removed upon the completion of the structure. The retained façade is to be tied to the new structure at each floor level. All the new vertical members are to be supported on piled foundations with a tension capacity where necessary to resist uplift forces in the temporary condition.



Figure 4 Plan Showing Typical Restraint Framing

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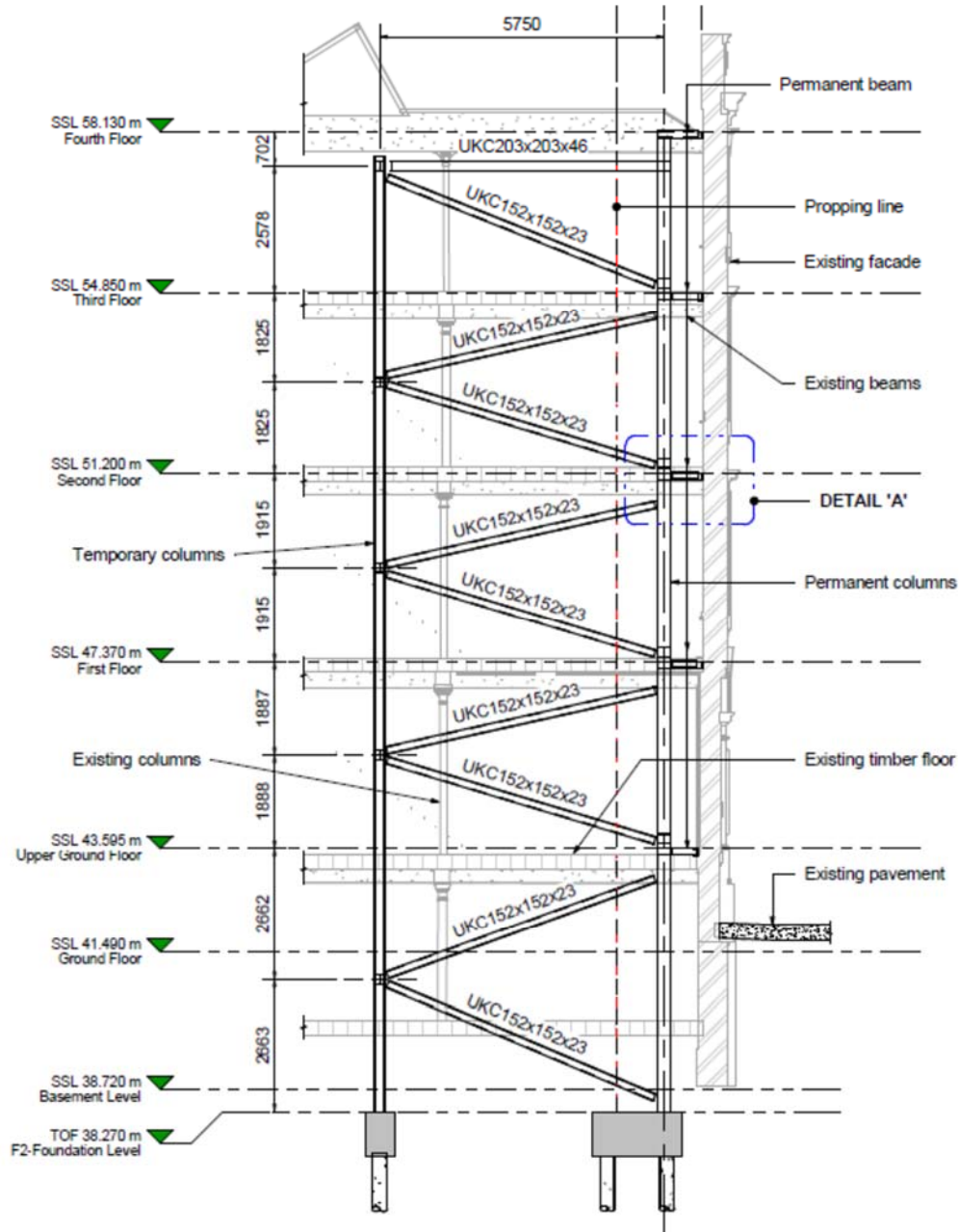


Figure 5 Section Showing Typical Restraint Framing



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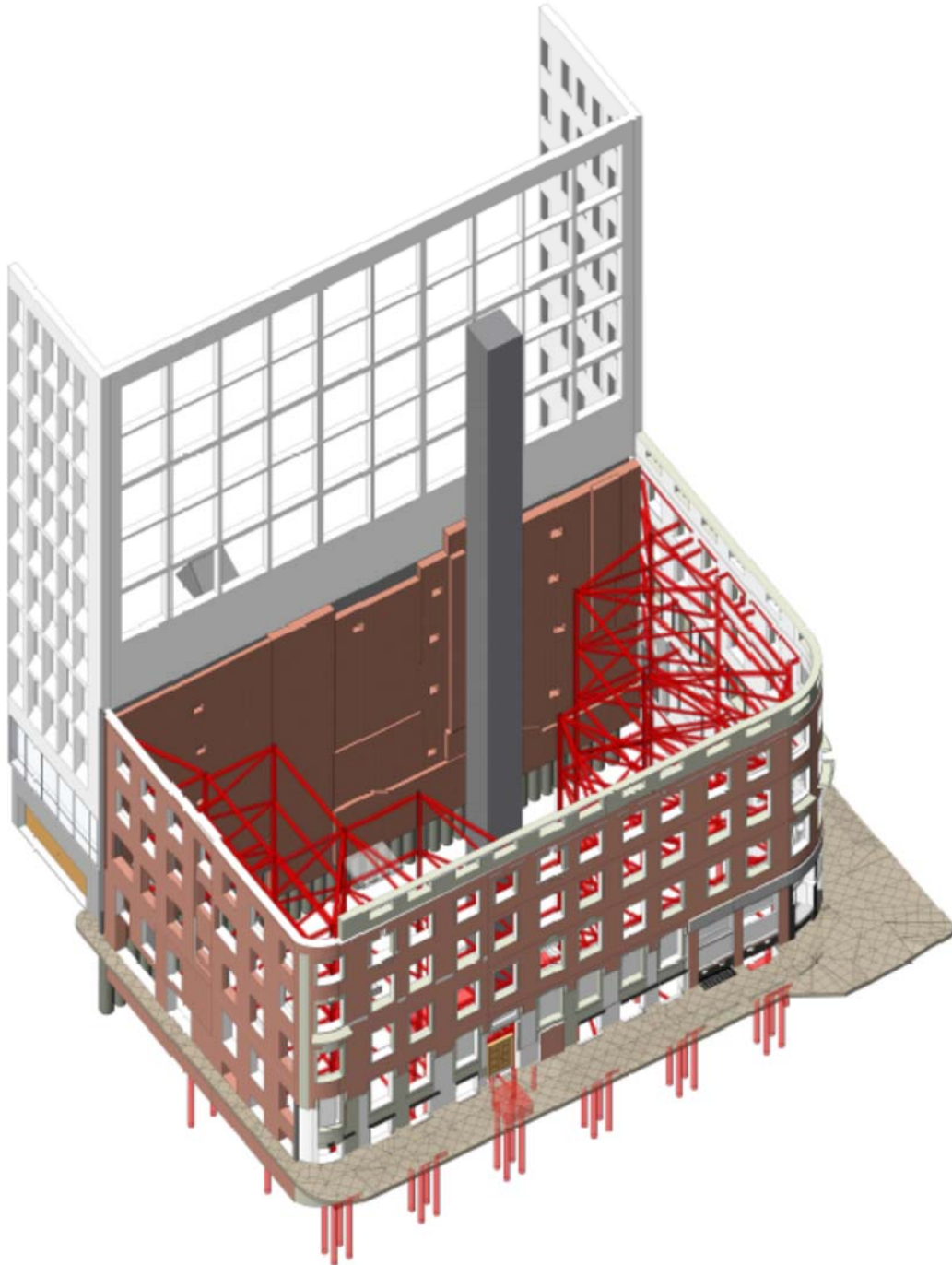


Figure 6 3D View of Restraint System



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4 MONITORING

4.1 Monitoring Principle

The monitoring of the movement of the façade prior to and during the works is important to provide reassurance that the movements are within the prescribed limits and to give warning of when movements are approaching these limits in order to identify the causes and modify the working methods accordingly

There are 2 elements of the monitoring process-

- Recording movements and vibrations
- Assessing the significance of recorded movements

As the works necessitate demolition of the existing structure and the installation of piled foundations to support the new structure it is also advisable to monitor the vibrations exerted upon the façade and to limit these to acceptable levels. This will assist in informing the selection of suitable plant and construction techniques for these operations.

4.2 Recording Movements

The datum points for monitoring should be installed and several sets of initial readings taken for a number of weeks prior to the commencement of the major demolition works. This applies to both the movement and vibration monitoring regimes.

The movement to be recorded are as follows

- Displacements x,y and z axes
- Verticality / tilt
- Width of existing cracks
- Vibration

It is proposed that prism reflector targets are fixed to the façade in locations shown in Appendices A, B and C to allow measurement in all 3 directions using an EDM. Particular attention to be given to ensuring that clear lines of sight are maintained throughout the monitoring period.

Verticality / tilt may be recorded by means of electrolevels or tiltmeters fixed to the façade or alternatively by comparison of the EDM readings detailed above.

Vibration monitors to be located on the façade in locations shown in Appendices A, B and C, it is suggested that these are remotely monitored with alarm limits as described in this report.

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The width of existing cracks to be monitored using simple overlapping calibrated crack width gauges fixed across selected cracks. Where possible the gauges to be located on both faces of the wall. The cracks to be monitored to be prescribed by the Engineer when close access is available.

The monitoring readings should be taken at the same time of day on each occasion to minimise the effects of temperature variations and ideally by the same individual using the same equipment.

4.3 Frequency of Monitoring

The frequency of monitoring the movement of the façade are as tabulated below.

Table 1 Proposed Movement Monitoring Frequency

Stage	Activity	Monitoring Frequency
1	From installation of monitoring to start of demolition	Weekly until readings have stabilised
2	Demolition of internal structure	Weekly
3	Construction of New Structure	Weekly until façade is fully tied to new structure, then monthly
4	During Defects Liability Period	Twice, at least 6 months apart

Table 2 Proposed Vibration Monitoring Frequency

Stage	Activity	Monitoring Frequency
1	From commencement of demolition to end of piling operations	Continuous during working hours

The above frequencies are to be increased if movements appear to be accelerating or if the trend of movements appears to be changing unexpectedly. Additional readings should also be taken after severe storms or any accidental impact on the restraint structure.



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4.4 Assessing Movements

All readings to be reviewed by the Engineer as soon as they are available to confirm that predicted movement patterns are being followed, or if not to give early warnings of this.

All readings to be submitted to the Engineer in tabular form for processing graphically.

The measured movements are to be assessed against the allowable movement limits dictated by the Engineer which in turn generates trigger and action levels for intervention.

Trigger levels correspond to 'Amber' caution light and if movement reaches this level it should trigger a review of working procedures and assumptions, to provide reassurance that the total movement will not be excessive, or to warrant modifying working methods.

Action levels correspond to the 'Red' stop light set to the specified limit on movement. Reaching this limit requires work to be stopped until the reason for reaching the limit has been identified and any remedial action has been agreed.

Table 3 Movement Trigger and Action Values

Movement Monitoring Position	Trigger Level	Action Level
M1 to M6 incl	7mm	11mm
M7 to M12	13mm	20mm

Vibration monitoring to be constant during working times with alarms relayed to a constantly monitored location.

The values tabulated below should be regarded as trigger levels with the same action requirements as for the movement levels. The tabulated vibration limits are as specified in BS7385-2:1993 and are intended to prevent cosmetic damage due to transient vibration.

Table 4 Vibration Action Values

Vibration Monitoring Position	Action level – Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
V1 to V3	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above





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APPENDIX

APPENDIX B – BACK GEORGE STREET ELEVATION MONITORING LOCATIONS





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APPENDIX C – MOSLEY STREET MONITORING LOCATIONS

