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STRUCTURAL ASSESSMENT

of

2 Harter Street,
Manchester
M1 6HP

for

Brookmoor Developments Ltd.
1st Floor, Manchester House,
341 Great Western Street,
Manchester
M14 4HB

prepared by

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THOMASONS

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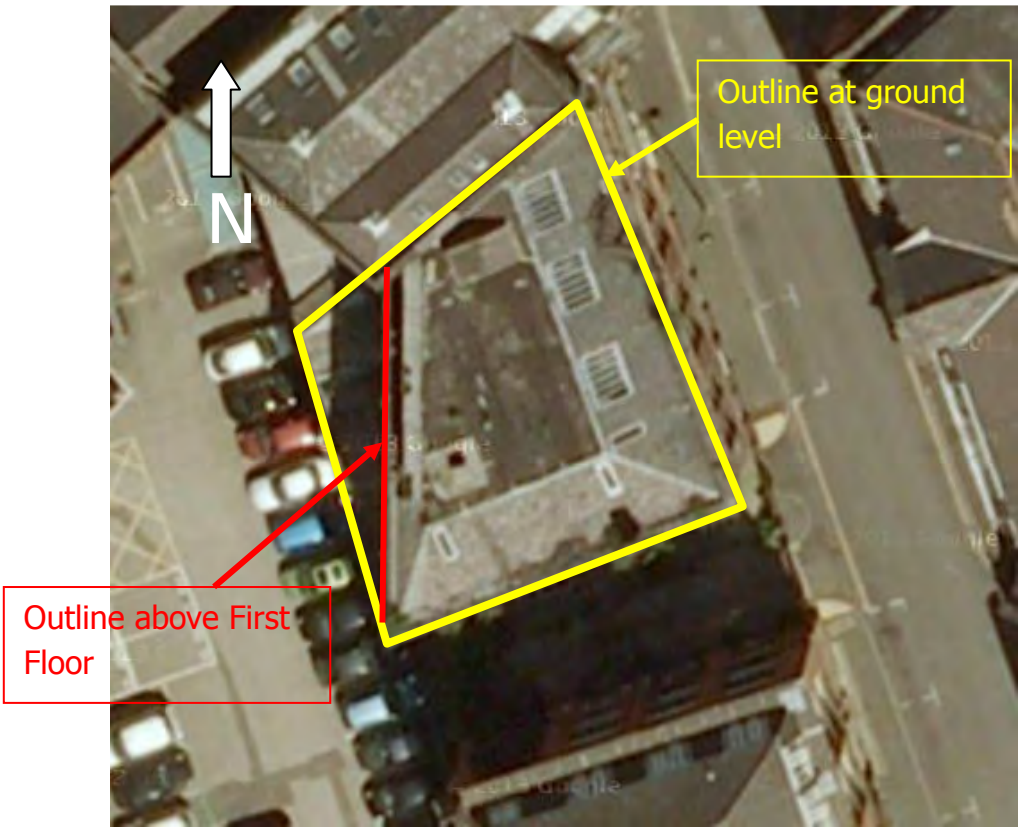
1.0 Introduction

1.1 Thomasons were commissioned by Brookmoor Developments Ltd. to undertake a visual investigation at 2 Harter Street, Manchester M1 6HP and report on the structural condition of the building. The property is 5 storeys from Harter Street with a basement, which exits at a lower ground level at the rear, and an additional floor within the attic space.

1.2 The property is a Grade II Listed Building that was built around the late 19th Century. It was originally a paper warehouse which will have undergone numerous adaptations over the years.

1.3



Aerial Plan of 2 Harter Street

1.4 A representative from Thomasons visited the building on Friday 29th November 2013 when the weather was damp and overcast.

2.0 Observations

2.1 External

2.2 The Harter street (east) elevation consisted of red brickwork with numerous decorative features and sandstone dressings. The sandstone plinth course showed signs of deterioration at ground level but is in reasonable condition for its age. There were no significant cracks visible from ground level.

At high level there is one location where plant growth was visible just below the coping level, which would suggest loose brickwork.

2.3



Harter Street elevation (East)



East elevation at parapet level

2.4 The south elevation was perpendicular to Harter Street and consisted of the same red brick construction. This elevation had significant plant growth at mid and high level and the brickwork appeared damp. There was greater water staining and brickwork efflorescence than on the east elevation.

The plant growth was most prominent at high level on the corner with Harter Street where uneven coping stones were visible.

2.5



South elevation with significant plant growth



Damaged mortar joints and uneven coping stones

2.6 At first floor level, towards the rear of the building, a dilapidated steel lean-to is supported on columns and spans onto the south elevation. It comprised of circular section columns and a series of steel roof trusses fixed to the wall. Only remnants of a roof covering existed. There was also a davit crane fixed to the wall.

2.7



Lean-to canopy structure

2.8 The red brick rear (west) elevation had exits from the basement onto a narrow passageway that was below the general ground level (private car park) by approximately 700mm. This passageway had a service pipe fixed to the low retaining wall and had significant amounts of debris – general rubbish, leaves etc.

This elevation was in two parts with the lower two storeys and basement being parallel to Harter Street whilst the upper 3 storeys splayed back from the south west corner, forming a triangular flat roof at second floor level – refer to 1.3.

2.9



West elevation from private car park



Passageway providing rear access to basement

2.10 The lower red brick elevation was of a lower quality brick that had minor areas of spalling and poor pointing although there were no significant cracks. At eaves level plastic sheeting (blue) was visible which suggested a temporary covering over the flat roof. Again, there was some plant growth, particularly from the eaves gutters. There were several items of embedded steelwork and corroded metal fixings screwed to the wall.

2.11 The higher level brickwork was white in colour, (possible a ceramic finish?) which appeared to be in a reasonable condition. There were small areas of plant growth and some of the coping stones were missing or uneven. There were no significant cracks visible from the car park level.

2.12 <u>Internal</u>

2.13 Vertical access through the building was via two staircases. The main stair was concrete construction which winds around a cage lift and was located against the north party wall. The secondary stair was in the south west corner and was constructed in timber.

2.14 The main stair was not original construction and the stair void was probably modified when the lift was introduced. Two masonry walls flank the staircase and provide support for the floor structure.

2.15



Brickwork flank walls supporting floor beams



Stair void lintel – concrete cased steel beam

2.16 The main stair has been strengthened in the past and appears to be in a good condition.

2.17



Steel strengthening to concrete stair flight



Circular cast-iron column built into flank wall

2.18 The secondary timber staircase at the rear of the building appears to have been extensively refurbished (or recently replaced) and appears to be in a good condition.

2.19



Timber staircase construction



Top of stair at attic level (limited headroom)

2.20 The fifth floor of the building was within the hipped roof space and was essentially an attic room. There was evidence that a significant amount of refurbishment work had been

undertaken as there were areas of relatively new timbers but the work had clearly not been completed. There was significant water ingress throughout the roof space and evidence that temporary sheeting had failed. A temporary stud wall had been constructed along the south elevation, immediately behind the steeply sloping *mansard* roof construction, but this was not able to prevent water ingress.

2.21



Lower purlin with additional props



Temporary covering on mansard and flat roof area

2.22 The attic level had a series of circular cast-iron columns supporting steel beams which formed a flat roof area constructed of steel joists with concrete slab infill (filler joist construction). The bottom flanges of the infill steel joists were visible due to corrosion and spalling of the concrete.

The steel beams supported a high-level timber purlin which supported the rafters forming the hipped roof. Significant numbers of rafters had been recently replaced but the purlins appeared to be original (or at least significantly older). Large areas of the roof and floor were wet.

2.23



Corroded steel flanges of infill concrete flat roof



Junction of hip and upper purlin

2.24 A lower level purlin was supported by a mono-pitch truss which ran down to eaves level. The trusses generally appeared to be sound although close inspection at eaves level was not possible. There were some areas of 70mm thick floor boarding missing; some of which appeared to have been recently replaced.

2.25



Lower purlin spanning between mono-pitch trusses



Missing 70mm deep flooring timber

2.26 Below the attic level the construction of the 2nd, 3rd, 4th and 5th floors were similar and all suffered from significant water ingress with large areas of the floor being wet; with some patches of standing water. Some areas had 70mm boards replaced and others areas were open but made safe with a protective ply board over.

The construction consisted of a grid of circular cast-iron columns on a 4.0–4.5m grid supporting a steel beam, spanning east-west, which picked up secondary beams at 1.8m centres. The majority of these secondary beams were finished in a timber cladding (approximately 25mm thick) but the core member could not be determined visually. Some of the secondary beams in the end bay, spanning onto the south wall, had a steel flange visible in the soffit of the 'timber' beam and bolts along the length of the beam. This suggests that it is a flitch beam construction with (possibly) a 'T' section steel member within timber beams and these members sat onto stone padstones on the external brickwork wall.

Structural member details can be found on the drawings in Appendix A.

2.27



Typical floor construction configuration



Flitch beam spanning onto external wall

2.28 The floor boarding was 70mm thick and spanned (1.8m) onto the secondary beams. The end bay is supported on a timber beam which spanned between steel cleats bolted to the Harter Street wall, at the piers in between windows. This timber section was relatively small and, in some locations, deflection appeared excessive.

2.29



Timber edge beam supported on steel cleats



Excessive deflection of edge beam

2.30 The masonry walls consisted of exposed brickwork and regular header courses suggest it is a solid construction. All walls, other than the party wall, were damp/wet and the south elevation was particularly affected. The walls had clearly been wet for a considerable period of time and the mortar had perished extensively.

In some isolated locations bricks were missing and loose and there was some spalling brickwork.

2.31



Damaged brickwork south elevation 3rd floor level



Missing bricks to pier at 4th floor

2.32 At first floor level the building area increased to the profile indicated on the Aerial Plan in 1.3 above. The wall over was supported on a series of steel 'I' beams plated together to form a compound section 220mm deep which spanned between circular columns on the line of the wall over.

The second floor construction was as described above except for an area of floor that had trimming beams forming a square section of floor that was probably once an opening that was floored over.

2.33



Compound steel beam supporting wall over



Trimming timber beams

2.34 The roof over the extended area of floor consisted of a shallow pitch roof area made up of of timber joists supported on a timber purlin which spanned from the party wall to the plated steel beam. The roof timbers were damp and water ingress was evident.

The inside face of the wall on the south elevation has a series of corroded steel plates and fixings associated with the external canopy.

2.35



Corroded steel fixings from external canopy



Underside of roof (at 2nd floor level)

2.36 The ground floor level had a greater floor to ceiling height than the upper floors. This level had limited daylight as the majority of the windows were boarded up however we established that the floor construction had a similar configuration to the first floor, including the trimmed opening.

Again, the south elevation appeared to have been affected most by water ingress as the walls and floor were wet.

2.37



Flitch beam supported on lintel over windows



Damp floor and walls

2.38 The Harter Street (front) elevation had two bulkheads at floor level that were constructed in brick and concrete and which provided (beer drop?) access to the basement area from Harter Street.

2.39



Sloping bulk head at ground floor level



Stepped bulkhead in masonry and concrete

2.40 We did not have a survey plan of the basement area and there was no daylight and limited task lighting (being used by asbestos clearance company). The basement was very damp throughout. Visible steel beams were corroded there was mould present on the floor timbers. The configuration appeared similar to the other floor but this requires confirmation.

The main entrance to the ground floor was formed in concrete and this construction was in a reasonable condition when viewed from basement level.

2.41



Ground floor viewed from basement



Area of concrete ground floor

2.42 The basement extended beyond the building line, beneath the parking area, adjacent the south elevation. We understand that this area was originally toilets and a boiler room.

From our inspection it would appear that the roof construction is precast concrete planks supported on steel beams. Again, the area was very damp but the precast concrete soffit appeared to be in a reasonable condition. The steelwork was corroded but it did not seem excessive although the paint finish had broken down and afforded no protection.

2.43



Original toilet block



Roof below parking area adjacent south elevation

3.0 Conclusions and Recommendations

3.1 The building has suffered from neglect for several years and consequently water ingress has penetrated the full extent of the building. It is apparent that some recent refurbishment has been undertaken, but not completed, and attempts to provide temporary protection from the elements have failed. Consequently specialist advice is essential to fully understand the current condition of the timber members throughout the building, which we understand you have obtained separately. There are areas of floor boarding which have standing water that will require replacement. The following recommendations are based on the assumption that remaining timber members have been certified as satisfactory and will have strength properties equivalent to C24 (or an appropriate figure, as advised by the specialist).

The chronic water ingress has also caused deterioration of the mortar and local spalling of brickwork. There is evidence some brickwork repairs have been undertaken but, again, not completed. Loose and missing bricks need to be replaced and re-laid and where mortar is addled deep rake out and repointing will be necessary to maintain the integrity of the walls. The most vulnerable areas are on the south elevation and south east corner.

We have assumed that the usual refurbishment works will be undertaken to ensure the finished building is watertight and durable, including:

- Watertight roof covering;
- Removal of plant growth;
- New flashings and gutters; and
- Repointing of external elevations.

3.2 Staircases

The main concrete staircase is in a satisfactory condition and would appear to be adequate for use in a residential development. The concrete encased lintels at the opening to the stairwell will require remedial measures. Break off any loose concrete, wire brush steelwork and undertake specialist cementitious repair.

3.3 Attic roof space

Some of the roof timber rafters have been (recently) replaced but the supporting purlins appear to be original. The lower purlin appears too shallow for the load/span and this is demonstrated by obvious deflection between supports and introduction of *ad hoc* support posts in the past. The cantilever configuration at the hip location will result in sagging of the roof if additional support is not introduced.

The high-level concrete roof has particularly suffered from water ingress and the severity of the corrosion to the bottom flange requires that this roof is replaced. We do not recommend repair or strengthening as the reduction in weight afforded by a new, lightweight roof over this area will benefit the structure for the proposed refurbishment. It is also likely to be more economical.

The supporting steel work is corroding but it is generally satisfactory and we recommend it is wire brushed and suitably painted to provide protection.

The existing purlin section sizes are unlikely to comply with current standards, particularly with regard to deflection limits. Strengthening would not necessarily be a requirement of Building regulations but an evaluation of potential deflection would be advisable.

3.4 Floor Structure (1st floor and above)

In general the primary steel beams and supporting columns are in a satisfactory condition but would benefit from local wire brushing and painting. Calculations may be necessary for Building Regulations (change of use) but, due to the previous usage as a paper warehouse, the steel/cast-iron elements of structure are likely to be satisfactory for a residential development. However, depending on the requirements of the Building Control Authority, there may still be a requirement for a formal submission of calculations so

intrusive investigation work may be necessary to establish the section properties, in particular, the wall thickness of cast iron columns to justify capacity and compliance with relevant regulations.

The secondary beams that span onto the primary beams should also be satisfactory from a loading perspective (for the same reasons as above) but with timber members it is often difficult to prove compliance with deflection requirements. This may not necessarily be a Building Regulations issue but can be a problem between occupiers in a residential situation because of vibrations due to washing machines etc. Further intrusive investigation would be necessary to accurately establish the beam construction in order to undertake the necessary calculations, if this is deemed appropriate.

The timber beam running alongside the Harter Street wall would appear to be undersized in some locations and requires strengthening.

The steel structure supporting the back wall, at second floor level, is satisfactory as there are no signs of distress and there are no significant structural cracks in the wall being supported.

3.5 Ground Floor

The timber ground floor construction is particularly wet and the steelwork is corroding more that the floors above but the depth of corrosion is not significant and a suitable painting specification will be satisfactory.

The south wall is also particularly wet and requires further inspection when lighting and access is available.

3.6 Basement

The chronic water ingress requires closer inspection of the steelwork (when full access and lighting is available). Again, we feel the corrosion is not significant but it is worse in the basement than any other level.

The proposed residential scheme appears not to include the toilet/plant area outside the building line but the roof slab would need to be inspected closely and strengthened, if

required, prior to closing up.

3.7 Floor Boards

From experience, the 70mm deep floor boards are likely to be satisfactory for residential loading once they have proven to be in a satisfactory condition.

3.8 As part of the *change of use* of the building there will be a Building Regulation requirement for the property to comply with Regulation A3 – Disproportionate Collapse. This requires the structure to be tied horizontally and vertically at the intersection of structural elements to ensure robustness of the building in the event of accidental damage. This traditional 19th Century *warehouse* type construction requires a significant amount of tying details to comply with this requirement and this may include collars at column head positions, steel straps at timber/masonry junctions and additional cleats at steel beam/timber beam connections. Final details can be developed once the additional intrusive investigations work, described above, has been undertaken.



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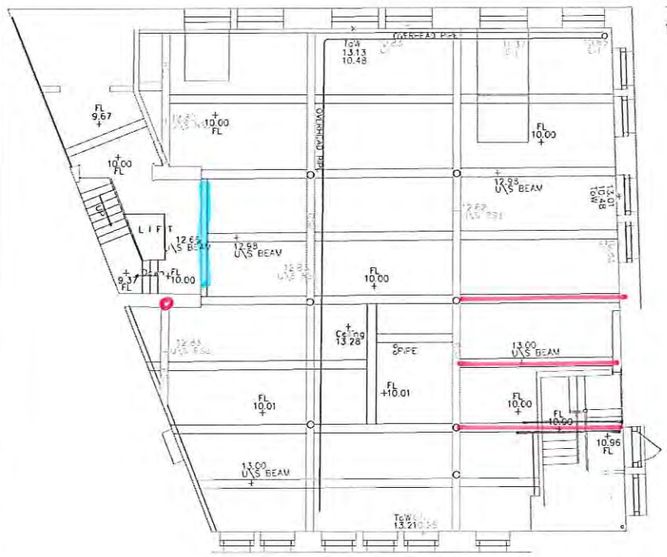
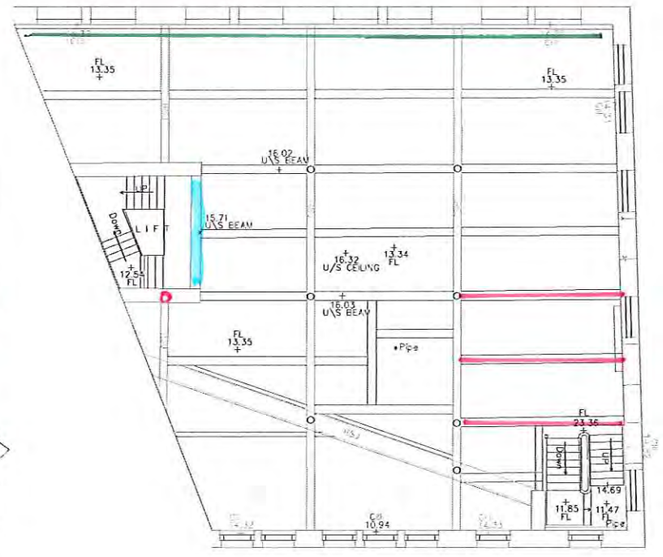
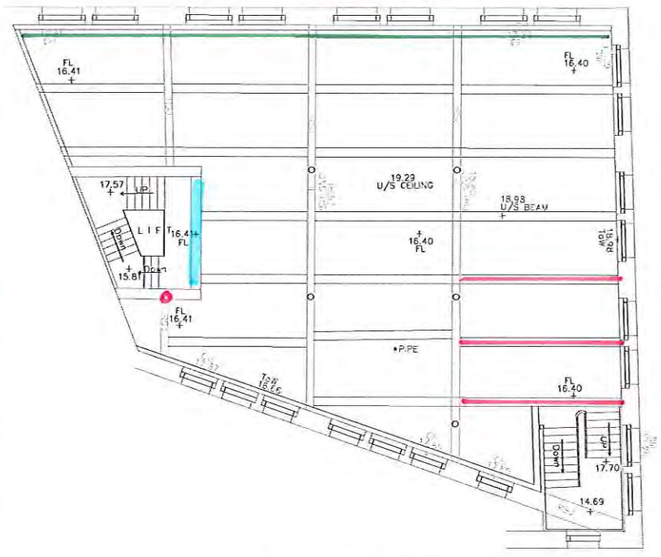
Appendix A Marked-up plans



GROUND FLOOR

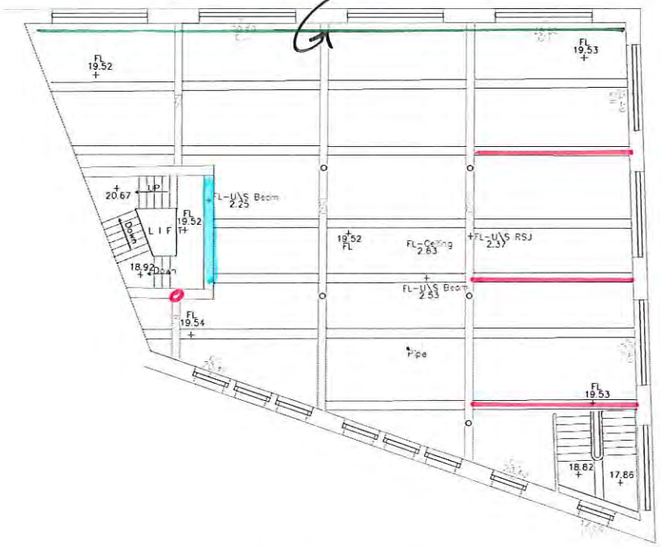


1st FLOOR

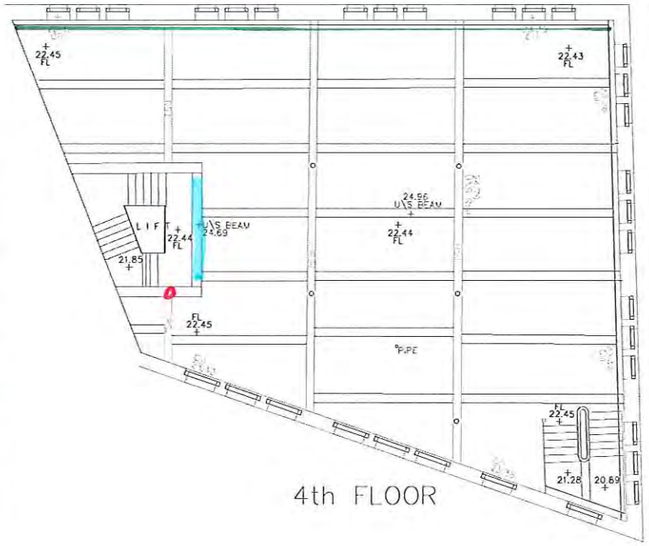


2nd FLOOR

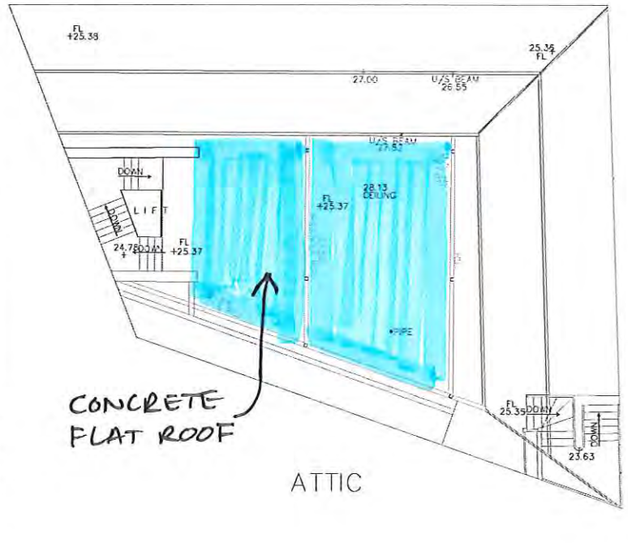
UNDERSIZED TIMBER EDGE BEAM



3rd FLOOR



4th FLOOR



CONCRETE FLAT ROOF

ATTIC

KEY

FLITCHED BEAMS

TIMBER EDGE BEAM

CONCRETE ENCASED STEEL BEAM

NOTES

ALL LEVELS ARE IN METRES RELATED TO ORDNANCE SURVEY LEVEL

ALL CO-ORDINATES ARE IN METRES RELATED TO NATIONAL GRID CO-ORDINATES FIXED BY G P S

ALL SERVICES & MANHOLES SHOWN VISIBLE AT TIME OF SURVEY

Topographical Survey Legend

Bol	Bollard	MP	Mile post
Bin	Litter bin	Pt	Post
BL	Bed level	PM	Parking meter
BS	Bus stop	PP	Power point
BT	British Telecom	RE	Rodding eye
Com	Security Camera	Ridge	Roof ridge level
CATV	Cable television cover	RS	Road sign
CL	Cover level	Rwp	Rain water pipe
DR	Drain	SL	Soffit level
Elec	Electrical lic	Slab	Slab level
EC	Electric Cable	Stay	Cable stay
EL	Eaves level	Step	Step level
EP	Elec. pole	SV	Stop valve
ER	Earth rod	Svp	Soil pipe
FP	Flagpole	TL	Traffic light
FT	Floodlight	ToB	Top of Building
GY	Gully	ToW	Top of wall level
GP	Gate post	TP	Telegraph pole
GV	Gas valve	TS	Traffic Signal
FH	Hydrant	TT	Tac Tile
FL	Floor level	VP	Vent pipe
IC	Inspection cover	WL	Water level
IL	Invert level	WM	Water meter
LP	Lamp post	UTL	Unable to lit
MH	Manhole	ZCB	Zebra Crossing Beacon
Mkr	Utility marker		

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CLIENT

BROOKMOOR

JOB TITLE

FLOOR PLANS
HARTER STREET,MANCHESTER

SCALE	DATE	JOB REF
1:100	OCT 2013	BROOKMOOR(HARTER ST)
REVISIONS		