

Civil and Structural Engineering Principles
for
The Next Chapter,
John Rylands Library

JRL-WML-ZZ-XX-TR-S-1003

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1.0 INTRODUCTION

This document outlines the Civil and Structural Engineering design principles for the proposed Next Chapter project at the John Ryland Library, Deansgate, Manchester.

The works primarily involve internal refurbishment, however some structural interventions are planned to facilitate the changes to the use of certain rooms.

This document is provided for inclusion with the Architect's RIBA Stage 3 report, and the development of the project is in line with this stage.

Existing Building Structure

The building is grade I listed and was constructed in four phases (dates taken from Price & Myers Report). Some record information for the building is available, dating from the 2005 extension project which also involved some works within the older structures.

Main original library – 1894:

Load bearing brick and red sandstone structure with floors formed by brick vaults or concrete filler joist slabs

Library extension – 1920:

Load bearing brick and stone walls with floors typically formed by concrete filler joist slabs

Extension – 1950:

Load bearing brick walls with floors formed by concrete slabs supported by downstand beams

Entrance and archive extension – 2005:

Steel frame with in-situ concrete basement and composite steel and precast upper floor slabs

Design Philosophy

Interventions will be kept to a minimum in keeping with the grade I listing. Where necessary structural design will be undertaken in accordance good design practice, with reference to current British/European Standards, British Standards/Eurocode Codes of Practice, Health and Safety legislation and Building Regulations.

The structure shall be designed to satisfy all the requirements of the Design Brief during the intended life of the building and shall safely support all defined and regulatory loadings without damage or distress to the building components, finishes or fittings. Consideration shall not only be given to the strength, but to durability, stability, robustness, water tightness, thermal and sound insulation, and fire resistance, along with the influence of weather, ageing, use, ill-use, accident and other causes of deterioration.

Eurocodes to be used in the design shall include the following as appropriate:

- BS EN 1990 & National Annex – Basis of Structural Design
- BS EN 1991 & National Annex – Actions on Structures
- BS EN 1992 & National Annex – Design of Concrete Structures
- BS EN 1993 & National Annex – Design of Steel Structures
- BS EN 1994 & National Annex – Design of Composite Steel and Concrete Structures
- BS EN 1995 & National Annex – Design of Timber Structures
- BS EN 1996 & National Annex – Design of Masonry Structures
- BS EN 1997 & National Annex – Geotechnical Design
- BS EN 752-4:1998 Drainage and Sewer Systems outside Buildings.

2.0 STRUCTURAL ENGINEERING WORKS

Proposed works are illustrated on the architect's drawings, room references in this document refer to the architect's drawings. WML drawings indicating areas of structural works have been produced.

Level B001

Access to basement

The principle structural intervention is to provide step free access to the basement level.

The preferred solution is to form a ramp from the existing fire escape corridor through two walls to access the end room (Areas 1 & 3).

The difference in slab levels between the modern entrance ground floor slab and the original building cellar slab is approximately 780mm, and in order to create a 1200 wide x 2100 high opening through it is necessary to remove approximately 300mm depth of the existing wall above the intersection point of wall with the existing basement barrel vault arch.

Intrusive Investigations have revealed that the existing walls are formed using solid brickwork. The vault was found to be 9" brickwork to the perimeter with a compacted rubble fill over. It was not possible to establish the thickness of the slab over the vault fill as disruption to the ground floor was not permitted by the Conservation Officer.

Study of the existing structural arrangement indicates that the thrust from the vaults is likely currently resisted by the weight of the 900mm thick wall only; adjacent floors are at a different level and buttressing walls are not of substantial thickness. As such it is considered that a local structural intervention to form the new opening will be adequate with only nominal horizontal thrust being a consideration.

The primary consideration for the new opening is the construction sequencing, and a proposed method has been developed to allow a reinforced concrete frame structure to be formed to support the vault and wall above. This is illustrated on WML drawings.

A simple door opening is to be formed through the original perimeter wall of the building just below an existing window opening. This opening can be formed in a relatively traditional manner with temporary supports to allow steel lintels to be installed.

It is assumed that the new ramp will be of lightweight construction can be supported from the existing basement slab without any requirement for new formal foundations.

An existing service trench within the basement floor beneath this area is formed with brick walls supporting stone flags. The ramp will be designed to bridge over the trench, hatches will be provided in the ramp floor to allow maintenance access.

Level B001

New door opening

A new opening is proposed between Area 6 & Area 7 to provide a fire escape the staircase. This wall is formed using solid brickwork behind the dressed stone face on the staircase side.

The wall supports above to the full building height, however there is a doorway opening directly over the proposed opening which means that load on the new lintels will only be from the ground floor arrangement.

As such this opening can be formed in a relatively traditional manner with temporary supports to allow steel lintels to be installed. This is illustrated on a WML drawing.

It is assumed that it may be necessary to respect the dressed stone finish to the wall on the staircase side (Area 7).

These works have been considered to Stage 3 design, but are not to be progressed to Stage 4 unless the project scope is extended.

New Accessible toilet

It is proposed to install a new toilet in Area 6a. This is adjacent to existing toilet provision, and existing drawings show underground drainage below this room.

It is assumed that it will be possible to break out the existing slab to form a new connection into the existing underground drainage system. This is illustrated on the WML drawing.

These works have been considered to Stage 3 design, but are not to be progressed to Stage 4 unless the project scope is extended.

Damp proofing to Areas 8 & 9

It is assumed that a perimeter drained cavity solution will be adopted and this will require a floor trench and sump connected into existing underground drainage.

It is assumed that it will be possible to break out the existing slab to form a new connection into the existing underground drainage system. This is illustrated on the WML drawing.

These works have been considered to Stage 3 design, but are not to be progressed to Stage 4 unless the project scope is extended.

Level B002

There are no proposed alterations which require Structural works at this level.

Level F000

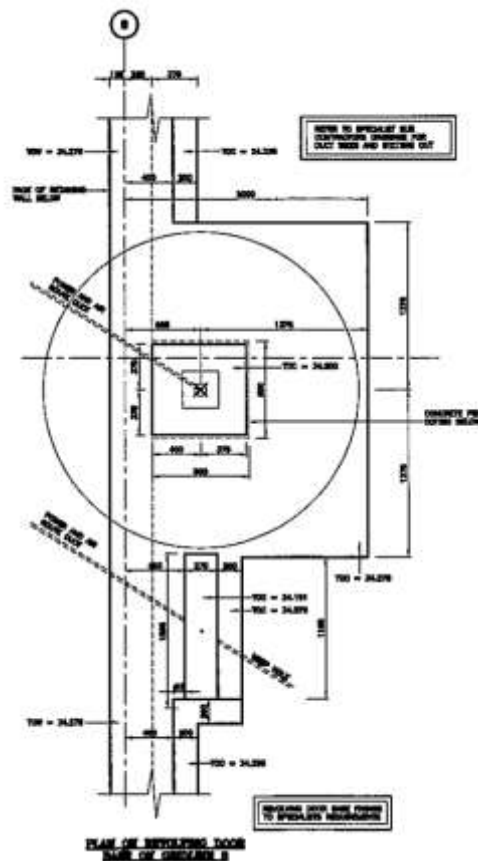
Access to basement

Structural works related to the formation of the new level B001 access have been discussed above.

Entrance Lobby

A new entrance lobby is proposed.

Record drawings indicate a concrete slab below the existing revolving door, as the record drawing extract below.



Extract from drawing 23881/112 G: Level 2 Detailed Sections

The new lobby is to be formed using a steel frame which will be supported from the existing floor slab / perimeter foundation structure.

At this stage the structural support requirements for the external element of the new entrance feature cladding are not known and as such cantilevered steelwork is shown to provide support for the steel profiled cladding. This may be omitted once details of the cladding are developed at the next stage.

Alterations to the existing glazing adjacent to and over the revolving door are required. It is currently proposed that panels will be replaced. A specialist will need to be consulted to advise on requirements to support the existing glazing and any new glazing or cladding finishes around the new lobby.

Level F000

Events Space

The existing ground floor space is to be divided to create an events space with introduction of a new glazed partition.

It is assumed that the screen will require head restraint fixings into the structure above, however no details of requirements are available at this stage.

It is also proposed to install shading screens to the perimeter of the space, a number of which will have the ability to rotate. It is assumed that these will be proprietary elements, but will require head and base support.

Connections to the primary first floor beams with brackets is expected to be achievable to support these screening elements.

New Plant Deck in service yard

A new plant deck is required to support chiller equipment for the basement Air Handling Unit. It is proposed that this will be located above the existing bin store and will make use of the existing screening.

A drawing for the steelwork has been produced.

These works have been considered to Stage 3 design, but are not to be progressed to Stage 4 unless the project scope is extended.

Level F001

Imaging Suite

A ramped access is to be provided in the Area 1 and 2 room, along with a new access door into the adjacent stair/lift lobby.

The ramp height is to be less than 100mm and this will be formed in timber in order to avoid overloading the existing floor slab.

The new door is to be located within the width of the existing window opening. The window is framed by insitu concrete elements which also form the lintel supporting masonry above. It will be necessary to cut the existing concrete window framing at cill level, and to alter the mullions in order to create the new opening.

A steel 'goal-post' support is to be set with the concrete frame to ensure that support to the concrete window frame / lintel is maintained.

New Builderswork openings for ventilation to the imaging suite are to be formed through masonry wall which adjoins the atrium.

The masonry is load bearing and lintels will be required to support the masonry over the new openings. This is illustrated on the WML drawing.

Level F002

There are no proposed alterations which require Structural works at this level.

There are no proposed alterations which require Structural works at this level.

Level F004

There are no proposed alterations which require Structural works at this level.

It is proposed to extend the existing roof top plant platform to support new equipment. The existing plant platform is supported on steel beams spanning onto the masonry walls of the 1950 extension.



The existing plant deck is to be enlarged by spanning new galvanised steel beams onto the perimeter walls with the addition of a new plant screen. The existing louvre structure is to be removed to provide more open access.

The load capacity of the decking has been limited to 5.0kN/m² to ensure that the existing structure is not overloaded. This is suitable for the plant which is proposed at this stage.

General Items

Support to suspended services

New suspended services will require fixings into the existing structural slabs / brick vaults. Appropriate fixings will be specified, along with pull testing to verify capacity. It is assumed that fixings will need to be resin anchors rather than standard expanding anchors.

Structural Defects / Repairs

A Structural Condition report for the building as a whole has been produced by Price & Myres.

The recommendations have been reviewed and categorised as follows:

- Defects which are within areas affected by the Next Chapter project and which should be addressed to maintain structural safety
- Defects which are within areas affected by the Next Chapter project and have the potential to be progressive, creating a defect which may worsen over time. It is recommended that these be included in the project.
- Defects which are within areas affected by the Next Chapter project but which are unlikely to be progressive and could be repaired if desirable for aesthetic reasons.
- Defects which are not within areas affected by the Next Chapter project, or which are considered to be beyond the scope of the project because they require fundamental assessment of the primary building structure.

Guidance as to which defects are to be addressed by the Next Chapter project is required from the client. Once this has been provided repair proposals will be developed during stage 4.

There are numerous recommendations for investigations and repairs to the building which will not be addressed by this project. The University will need to implement a programme of investigation and repair to address the wider recommendations of the report.

Fire Protection

As required to suit the Architect's specification.

Stability

Global stability to the existing building will be unaffected by the proposals.

Consideration will be given to local stability of walls if the proposed ramp or lift require removal of an intermediate floor which provides restraint to an existing wall.

3.0 CIVIL ENGINEERING WORKS

It is proposed to carry out some enhancement works to the public realm outside the main entrance.

It is reported that surface water overland flows result in the building flooding during heavy rainfall events. A report into the cause of the flooding was prepared by Thomasons in 2018.

The Thomasons Report concluded that the existing arrangement of slot drains and channels and the downstream pipework appear to be of adequate size in principle, however the slot drains and channels were blocked with debris and grout / silt to circa 60% of their area.

The report recommends that the channels should be cleared, and that to do so it would be necessary to remove the existing paving finishes.

It is not clear whether this work was ever carried out, however the new entrance proposals involve replacing the existing channels with new as noted below.

The paving to the main entrance will require alteration to suit the new entrance lobby and the opportunity will be taken to carry out some minor releveling to create a rise to the building entrance. This will necessitate new drainage around this area.

It is proposed to use the enhancements to the public realm as a method of attenuating and diverting surface water flows in order to reduce the risk of flooding at the building entrance. This involves the introduction of soft landscaping and permeable surfaces along with a new covered channel.

A drawing illustrating the proposals has been developed.

4.0 DEROGATIONS FROM UNIVERSITY STANDARDS

4.1 The University EPM documents do not address Structural matters relevant to this project.