Carnegie Free Library
Swords
Co. Dublin

Report on the Existing Structural Fabric & General Civil and Structural Engineering

Issue No. 3

Date: February 2021

2043

CORA Consulting Engineers
Behan House
10 Lower Mount St
Dublin D02 HT71
Tel: 01-661-1100
Fax: 01-661-1119
E: info@cora.ie

CORA
CONSULTING ENGINEERS

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Document Issue Record:

DATE:	REVISION:	ISSUE DESCRIPTION:	ISSUED BY:	REVIEWED BY:
12.02.2011	Rev 1	First Draft	KOM	JFC
14.04.2021	Rev 2	Minor revisions	KOM	JFC
16.06.2021	Rev 3	Minor revisions to Drainage Section	KOM	JFC

1 Introduction

CORA Consulting Engineers have been appointed to act as Consulting Structural Engineers for the proposed refurbishment of the Carnegie Free Library Building in Swords, Co Dublin.

The proposed development is to refurbish the existing protected structure using the principles of good conservation practice.

This report shall outline how the original structural fabric shall be retained and strengthened where necessary and provide an overview of the proposed methodologies for any new structural interventions. A new two storey contemporary structure shall be constructed to the North of the building

This report has been carried out following a review of the existing drawings for the building and from a number of site inspections. A site inspection of 5th February 2021 followed opening up works where we obtained detailed information on the form of the existing structural fabric.

2 Existing Structural Fabric to Carnegie Free Library

2.1 General

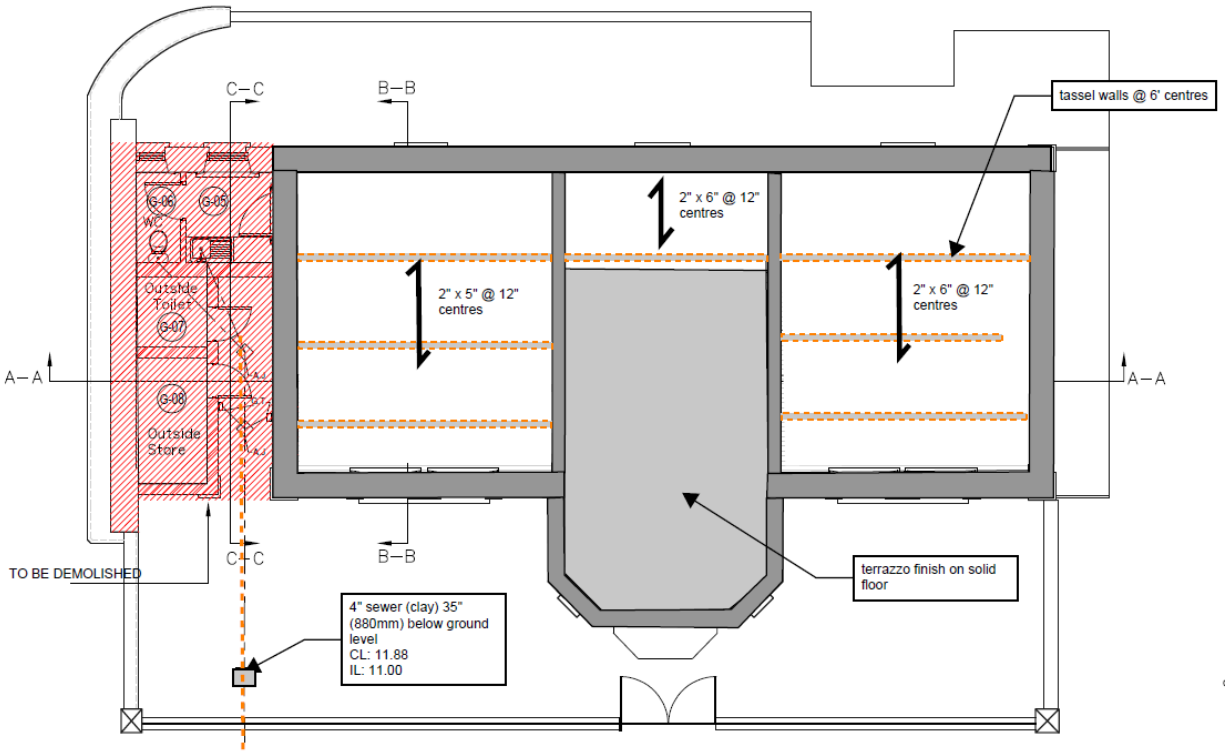
The existing building at Carnegie Free Library is formed with traditional materials with load bearing masonry walls, timber floors and a timber roof. The entrance area at ground floor level appears to be formed with a solid floor whereas the rooms to each side have suspended timber floors. The stairs is formed with timber as are the existing balustrades.

In general the structural fabric is considered in sound condition and the overall building is robust. Structural defects noted are discussed below.

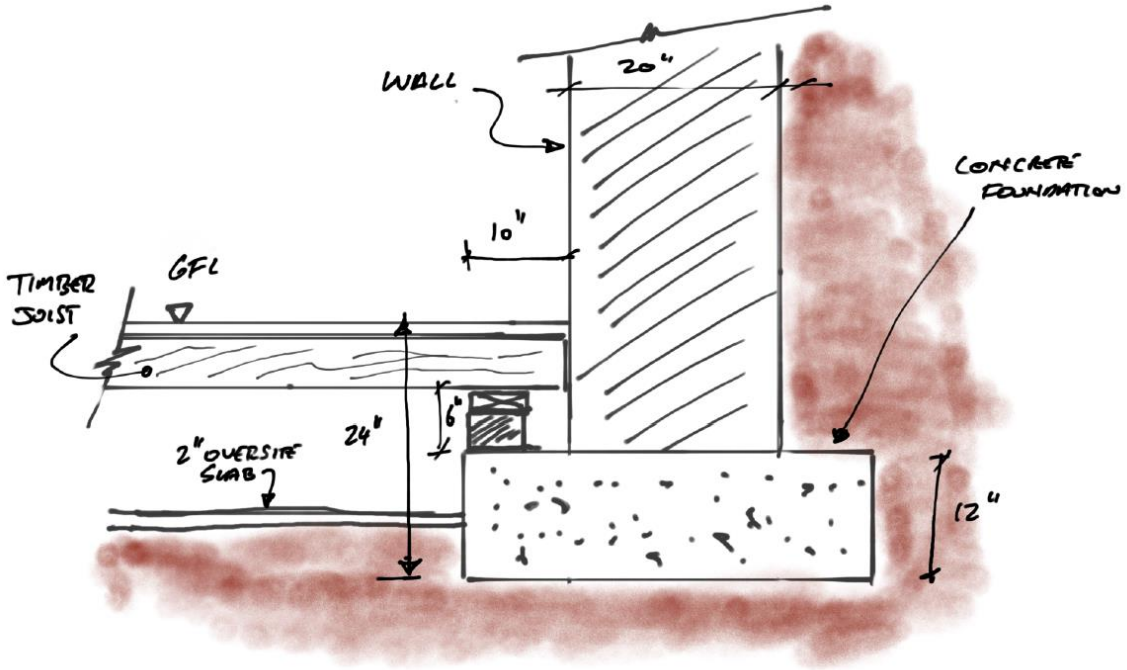
2.2 Ground Floor

The solid entrance lobby to the building is finished with terrazzo and noted to be sound underfoot. There was no evidence of structural distress.

The suspended timber floors to the rooms to each side and to the rear corridor are formed with 2” x 5” timber joists at 12” centres to the room to the North and 2” x 6” joists in the room to the South. Joists are supported on tassel walls at circa 6’ centres.



A typical detail of the relationship between the timber floor joists and rear load bearing masonry wall is shown below.



The form of construction and size of the joists is robust and the joists are suitably sized to support a crowd load. However it was noted that due to significant water ingress, particularly near the rear wall the timber sections are significantly decayed and the loss of cross section is such that the joists would need to be replaced with a suitable alternative structural floor system.

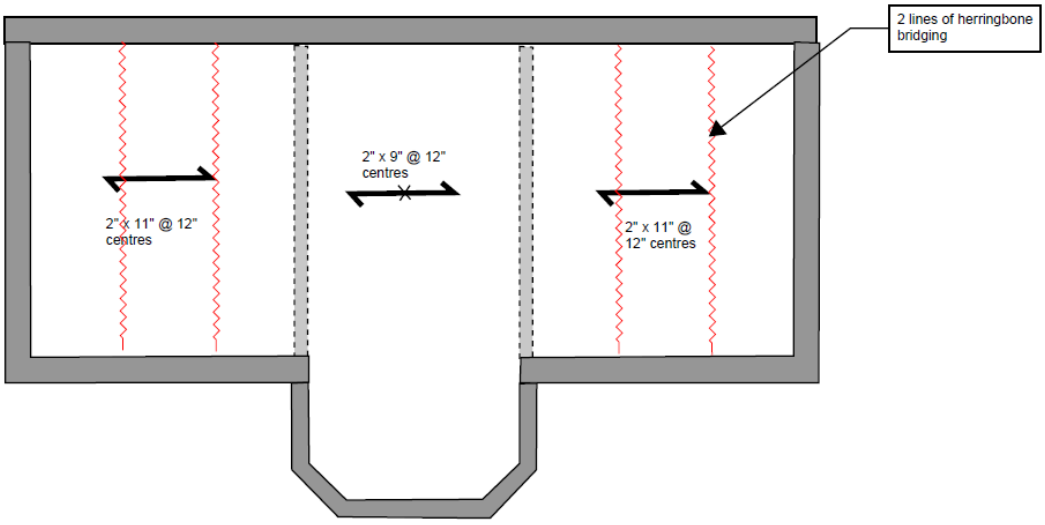
The extent of the decay at ground floor level has been accelerated from water ingress through the rear wall, where a planter has been built against the masonry wall and that the timber sections at ground floor have been subject to an environment allowing decay to progress.

A report carried out by Gordon Knaggs (timber Specialist) describes the extent of the decay in greater detail.

2.3 First Floor

The first floor timber systems are formed with 2” x 11” timber joists at 12” centres spanning from the gable ends onto load bearing cross internal cross walls each side of the entrance area. The floor above the entrance area has a shorter span and 2” x 9” joists at 12” centres have been used here. Two lines of herringbone noggins were noted at third points along the length of the joists for the deeper joists spanning the longer distance in each side room.

No evidence of structural distress or decay was noted, however as the gable walls were noted to have a higher moisture content it is possible that there could be some decay in the end bearings of the joists and that local repairs may be required.



2.4 Roof

The roof is formed with timber trusses and 2” x 6” timber rafters at 12” centres. A small section of the ceiling finishes was removed, exposing a small section of the rafters and no decay was noted. The underside of the timber trusses is visible form the first floor and appears to be in sound condition.

2.5 Masonry Walls

Externally no significant defects were noted in the visible masonry fabric. External Walls generally appear to be circa 18” to 20” thick and formed with brickwork.

Internally the masonry fabric is generally concealed with timber finishes, however where exposed the internal walls were noted to be sound and are noted to be in the order of 9” to 10” thick.

The gable to the south of the building is formed with random rubble and the bed joists were noted to be soft.

Along the rear elevation where the planter has been formed externally the masonry is in reasonable condition with minor repairs only required and some treatment to prevent further water ingress.

3 Proposed Structural Works to Protected Fabric.

3.1 Ground Floor

Given the extent of decay in the timber floors, it is likely that the suspended timber joists and wallplates are beyond repair and should be replaced.

Given that there is little sub-floor ventilation the recommended option for the new ground floor is to install a ground bearing reinforced concrete slab. Insulation and finishing screed can also be installed on top of the RC slab to provide the optimum solution for a ground floor system.

The detailing of this floor shall be further developed with the design team with particular attention given to the treatment of the rear wall to prevent further water ingress.

3.2 First Floor

The existing floor system is considered robust and has an imposed load capacity of 4kN/m^2 which is in line with a C4 category of use in accordance with the Irish national Annex of EN 1991-1-1.

(Actions on Structures). The description of category C4 is below and it is noted that this is well within the proposed use of the refurbished building.

> C4: Areas with possible physical activities, e.g. dance halls, gymnastic rooms, stages.

It will be necessary to modify this floor to meet fire and acoustic performance and as part of these works it is considered adding a 12mm stressed skin plywood layer to the joists. By adding the stressed skin the load capacity of the floor shall increase to well above 5.0kN/m^2 and therefore meets the crowd loading criteria as well as adding additional dead load for an underfloor heating system.

Localised repairs may be necessary to the bearing ends, particularly at the gable wall to the south where water ingress has been noted.

3.3 Masonry

The masonry walls are generally in a sound state of repair. Treatments to prevent further water ingress to the rear wall and to the gable at the southern end shall be further developed with the design team and localised repairs are likely to eb necessary.

3.4 Stairs

The timber stairs is considered solid under foot, however the balustrade is lower than modern standards allow. Therefore the balustrade will need to be enhanced (in height), typically using a glass screen being the least invasive method in order to meet the requirements.

3.5 Roof

Other than local repairs to the rafters at the bearing ends, significant structural works to the roof is not envisaged as being necessary.

4 New Contemporary Side Extension

The proposed new extension not the north side of the building shall be formed with load bearing masonry walls and suspended timber first floor and roof. Foundations shall be formed with traditional strip footings matching the levels of the existing foundations (of the original structure). It is envisaged that the side walls at the Northern site boundary shall be demolished and the new gable wall shall form the new site boundary.

5 Drainage

5.1 Foul Drainage

There is an existing foul connection to the public sewer on North St. All new foul appliances shall connect by gravity to the existing 100mm diameter sewer within the site boundary and discharge via the existing connection. There is no increase in the wastewater loading and therefore no Pre-connection Enquiry to Irish Water is required.

5.2 Surface Water Drainage

At the present time the gutter system for the protected structure is connected to a single external downpipe that discharges directly to the existing combined below ground drainage system.

The entrance yard and rear soft landscaping areas shall be developed with a combination of soft landscaping and permeable paving over a layer of crushed limestone (approx. 300mm). Run-off from the roofs to the new extension (and original roofs) can be directed to this system which shall provide a combined treatment stage and attenuation feature before any surplus run-off from extreme storm events can overflow to the a new connection to the public surface water sewer on North St.

Therefore a treatment stage and an attenuation system are provided to his development in line with modern standards along with a completely separate storm water system. This system also complements the protected status of the building.

The surface water treatment and separate systems meet the requirements of the GDSDS.

Details are shown on CORA drawing SK03C.

6 Conclusions

The existing building is in sound structural condition given its age, save for the ground floor as noted above.

The proposed development shall utilise the majority of the existing structural fabric, in line with the principles of good conservation practices and the structural works are considered to be a light touch approach to restoring the building for the proposed future use.