

Re:Works Islington

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1. Site Introduction and Registration

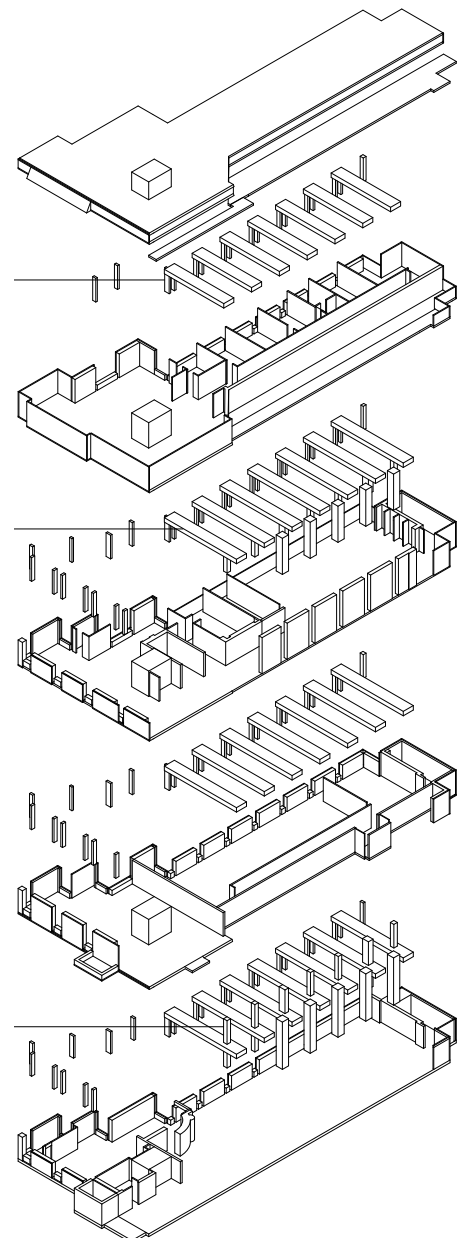
Tucked away on Holloway Road in Islington lies the Islington Central Library, the site for this adaptive reuse project that will transform it into a progressive laboratory for university design students. The original wing was constructed in 1906, with a red brick extension being introduced in 1972. There are disparities between the facade language of the 1970s extension and the heritage building, prompting more discussion of aesthetics and the impact it has on the continuity of the building.

Existing uses of the building include several reading rooms, a children centre and office spaces. As a central hub in the local community, efforts to keep some uses of the original building will be taken, such as the children centre and an archive to store the current collection of books at the library. The program of this project proposal will include the following spaces:

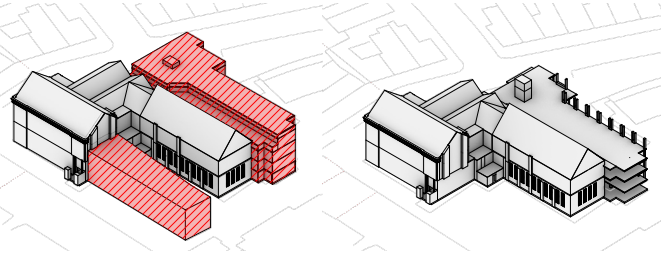
- Design studios for students
- Workshops/Labs
- Material Library
- Exhibition gallery
- Bookshop/Library archive
- Events Space
- Children centre
- Cafe



The 1970s extension also exhibits an entirely different structural system, which is a concrete frame consisting of beams and columns. Surrounding the structural system are non-load bearing partitions and red brick cladding. Archive photos aid in understanding the configuration of the elements, alluding to load paths and section properties.



Immediate impressions of the sight show that the 1970s extension has poor aesthetic impacts on the original building and the contrast in architectural language is displeasing to the eye. As it doesn't serve a heritage purpose to the building and has poor environmental performance, this extension will be demolished and stripped back to its concrete frame as part of the overall proposal.



At this stage, the following mission statement was created to establish the key drivers of this project and be used as a design criteria when developing architectural, environmental and structural design strategies:

This project re-imagines the existing library as a more human-scaled, responsive learning environment, breaking down its monolithic form into a series of rhythmic, adaptable spaces that support the evolving needs of students. Through a network of flexible, user-centred studios organised around a central atrium, it establishes a progressive laboratory that supports collaboration, engagement, and integrated design education.

Human-Scaled

Responsive

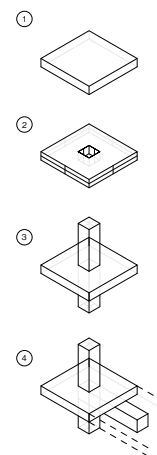
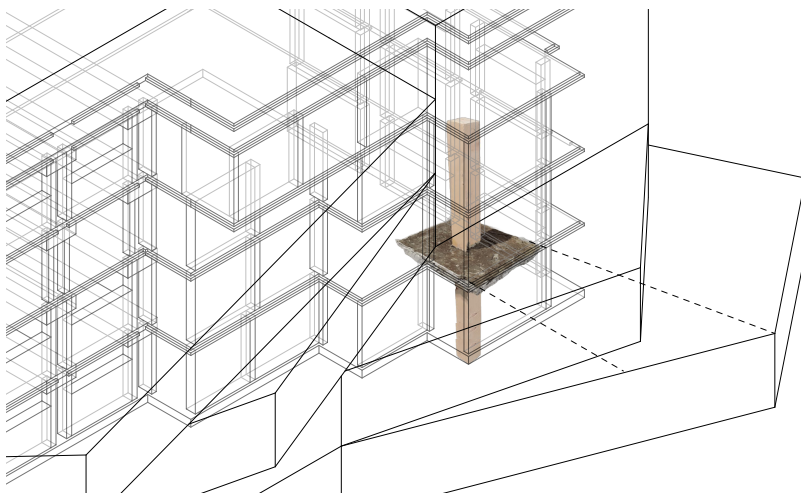
Adaptable

2. Strategy Development

Accommodating to the spatial function and increase in occupants prompted discussions on expanding the structural grid and slabs to increase floor area for the design studios of the students. Whilst the existing concrete frame stood bare, it was important to introduce strategies that encouraged sustainable design, inviting texture and materiality, and a raw feel of the space to enhance the students spatial experience. This led to the introduction of timber to the existing concrete, resulting in a timber concrete hybrid structure.

This approach is advantageous in several ways and maximises the potential of both timber and concrete. Timber excels in modular, repetitive framing systems and introduces warm, tactile and human scale qualities to the space. The hybrid nature allows for heaviness (in workshops) and lightness (in studios and galleries) to act as a point of inspiration to the users and a visible demonstration of hybrid systems. Retaining and adapting the existing structure as opposed to demolition for a new build strengthens the projects trajectory towards its environmental targets of lower embodied carbon and more material reuse.

The conceptual schematics show a potential method of introducing a timber structural system extension to commence past the existing concrete frame, as a way to repurpose it whilst minimising embodied carbon and improving the quality of the internal spaces with warm, tactile material compositions.



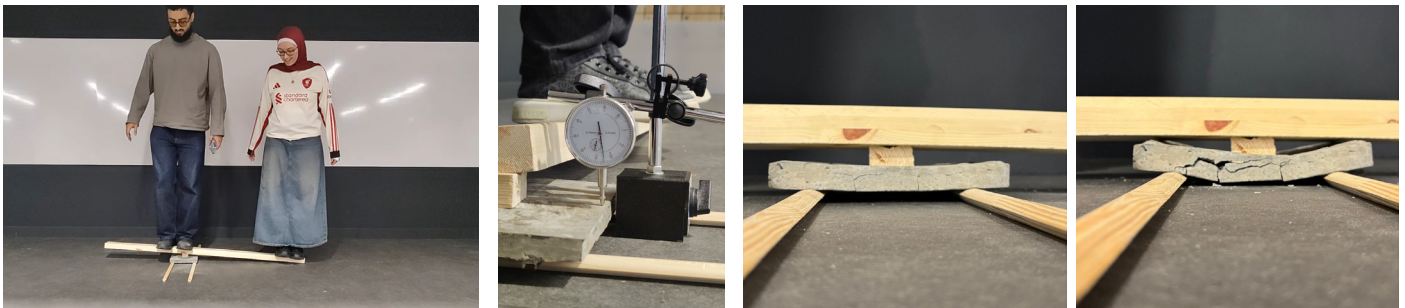
Differential behaviour between concrete and timber in this context was yet to be determined and required further exploration and testing to understand how these materials can come together to excel in a hybrid structure for the extension of the design studios.

3. Physical Testing

Concrete casting was undertaken to further understand the differential behaviours of reinforced concrete slabs and timber-concrete composite slabs, where the timber acts as reinforcement for the concrete. The casting process is outlined below, which was refined after several attempts of trying to achieve the correct concrete mix and pouring method. A key lesson was learned in mixing the correct ratio of concrete to water, as that affected how the sample held together. Once the ratio 4:1 was determined, the first successful sample was made.

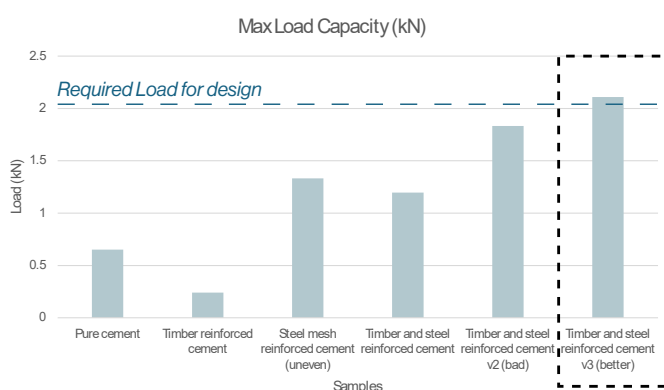
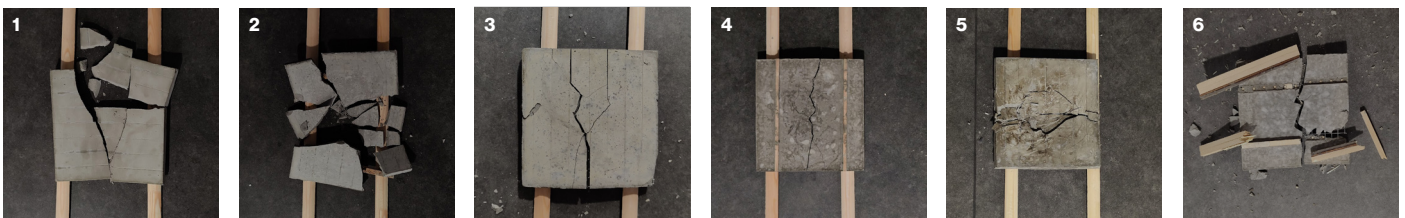


To then test the load bearing capabilities of these slab samples, an experimental procedure was developed of using human weights to incrementally apply loading to the centre of the slab. As one volunteer fixed an end of a wooden plank, the other volunteer would walk up the plank at equidistant points to gradually apply their weight to the sample, whilst the applied load and displacement were being recorded.

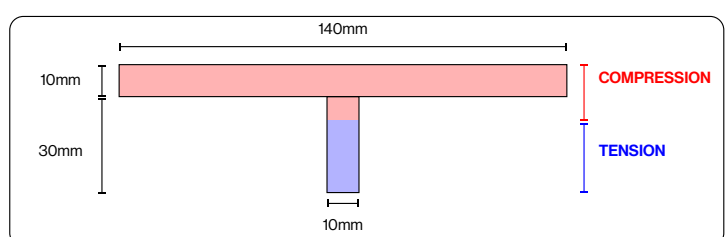


Immediate visible failure mechanisms revealed weaknesses in the sample, and if the behaviour was homogeneous as desired. An iterative process of testing the sample and modifying the concrete mix, shear links configuration, and timber beam depths allowed for the refinement of the samples until they behaved as expected and their properties could be recorded to help determine the predicted behaviour of this timber-concrete hybrid slab design. Calculations of the neutral axis of the section were undertaken to identify a ratio of concrete to timber depth so that the concrete remains entirely in compression, and the timber beams take tension. This ratio was applied to the final sample.

The summary of results from all tested samples showed the last sample containing the calculated materials ratio was the most successful compared against load capacity, material volume and embodied carbon per kN load capacity.

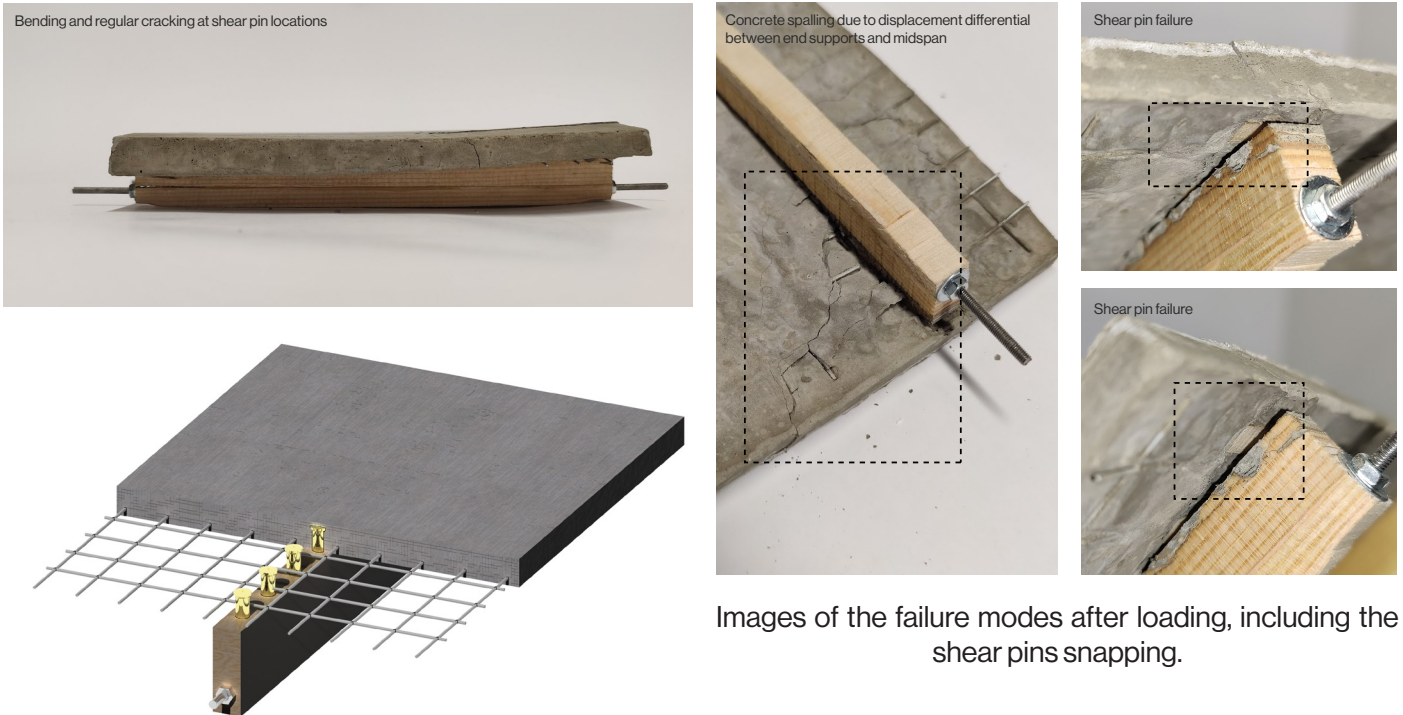


Confirmed Model Section Behaviour



4. Global Structural Design

The final sample still exceeded established deflection limits, therefore to minimise the deflection, post tensioning of the timber beams was introduced and subsequently tested. This method was successful in limiting deflection, allowing the governing failure mode to be identified as the timber shear pins between the concrete and timber. Brass shear pins were instead used in the design to address the observed shear failure.

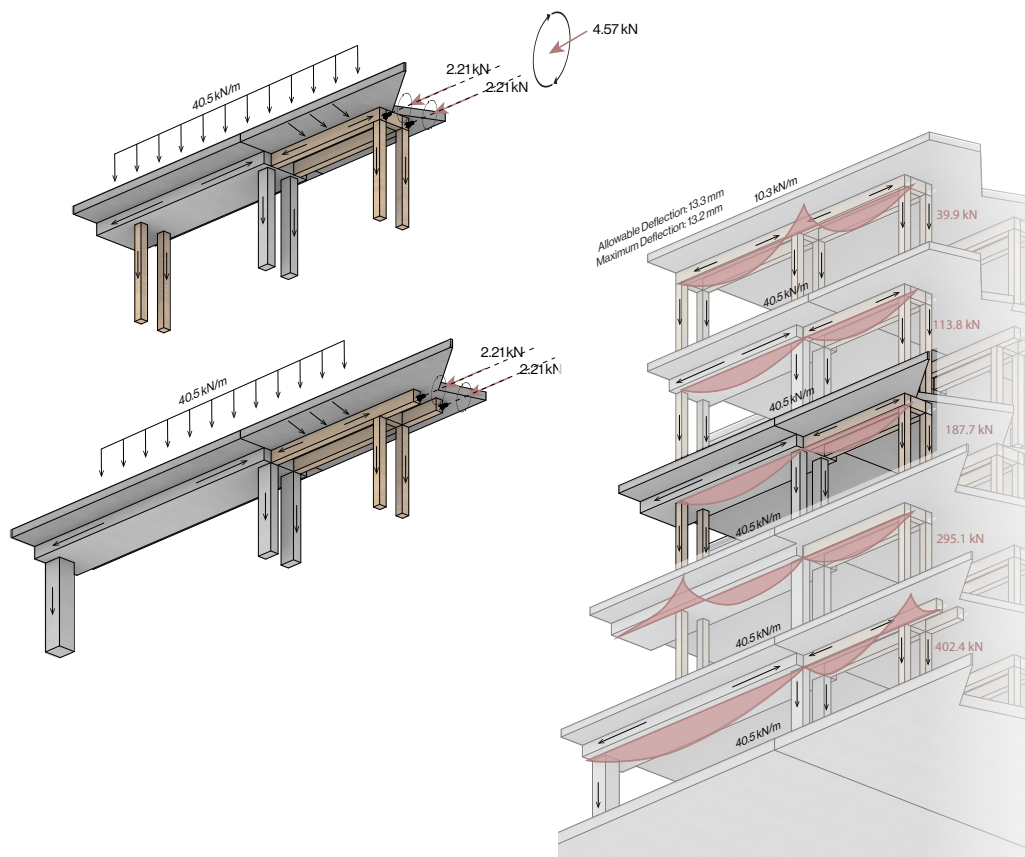


Images of the failure modes after loading, including the shear pins snapping.

Concluding from the physical testing and results, the final global structure is outlined here, with exact pre-axial forces required to sufficiently post tension the timber beams so that deflection is minimized. Beams and columns of the new construction are sized according to live, dead and superimposed loads, including solar panels and active system components on the roof. The decision of double columns as part of the concrete timber hybrid extension was taken to match the existing concrete column arrangement, ensuring harmony between new and old additions.

The impact of this hybrid structural design solution introduces sustainable strategies to adaptive reuse projects in Islington that consider architectural, structural and environmental implications.

However a critical reflection of this strategy is that it may not be an applicable design to other areas on this site or other projects in general. The concept and testing of this hybrid design had quite specific requirements and objectives, meaning it would be difficult to use in other projects with criteria that doesn't align. A more generic framework for concrete timber hybrid systems would make this research more meaningful for industrial studies on these materials and systems.



5. Final Design Intent

The hybrid slab system was then integrated into the retrofit project, enhancing the studio quality for students to undertake their work and establishing the materiality and spatial configuration of the design studios.



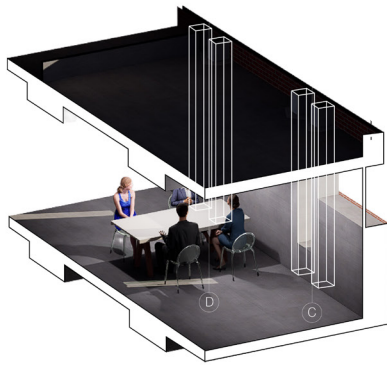
Main Street View of Whole Project Proposal



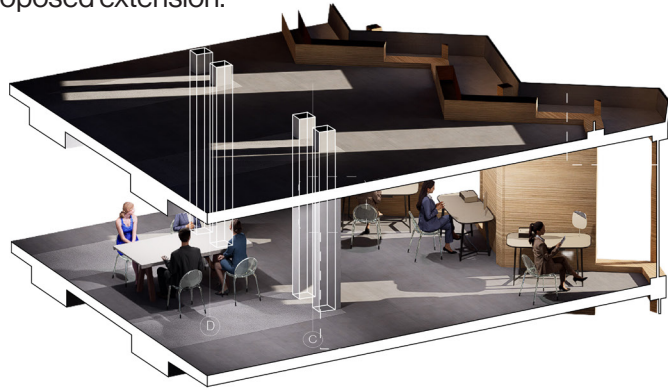
Internal Views of Studios with Hybrid Structural System

An alternative view shows a direct comparison of the existing and proposed extension to the original 1906 stone building, where the floor slabs have been extended to accommodate the students in their design studios.

Existing extension:



Proposed extension:



This project and contribution to the local community and university students successfully reaches the design criteria established in the project statement through the following aspects:

- Human Scaled - rhythmic, pleated CLT panel facade, breaking down the existing monolithic form.
- Responsive - individual student bays that respond to existing students desires for studio spaces.
- Adaptable - hybrid structural design that adapts existing structure to reach required load capacity.



Key areas of success include the physical iterative testing of the timber concrete hybrid slab system, which allowed for refinement of the design to suit the purpose and optimise the structural behaviour in terms of load capacity, deflection and embodied carbon of materials. The consideration of all these factors not only makes this design a holistic and integrated strategy for the grid expansion, but also encourages the students using the space to think and design in a similar way. This makes the project a teaching tool and point of inspiration for the users, as they sit amongst the architecture and learn from its composition to inform their own work.

Whilst there may be room for improved aesthetic integration with the surrounding architecture of Islington, the project's intervention remains subtle at street level, yet inviting to passers by, encouraging more engagement with the community and inspiration for students to design, create, explore, test and dream big.