engineers

Mary Ward Centre

The Brief

Mary Ward Settlement Group is a multi-service charity focusing on adult education, access to welfare, and social justice.

They were operating from a Grade II listed building in Bloomsbury but required more space to serve their 5,500 students, and consolidate their growing services into a single future-fit hub.

AWW were tasked with designing a hub that mirrored the principles championed by Mary Ward herself. The new space had to provide a welcoming and supportive environment, promote individual growth, collective empowerment, and social cohesion.

Guided by these core social values, the principles of a circular economy became central to the project brief.

Queensway House was identified as a potential new home - a disused, 1970s, concrete-framed office building in Stratford. But the building was approximately 60% too small to cater for Mary Ward's needs.

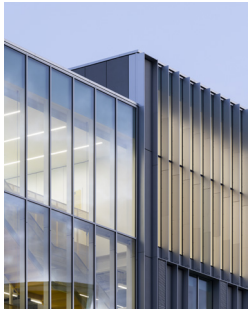
The Mary Ward Group promote positive human experiences for all who visit them and use their services. To fit within this ethos, their new HQ needed to put the local economy, community, and environment at the heart of the transformation.

5,500

Five thousand five hundred students are served at Mary Ward Centre every year

60%

Queensway House was approximately sixty percent too small to cater for Mary Ward's needs



Queensway House

Mary Ward secured a loan from the ‘Skills for Londoners Capital Fund’ to renovate and extend Queensway House.

Environmental considerations were crucial to the funding application, and approval was dependent upon the reuse of the existing concrete frame.

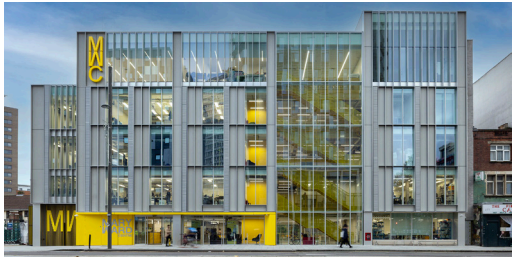
There were also potential cost and programme benefits for the client, depending on the extent of the structure that could be reused.

A preliminary engineering study deemed a heavy retrofit was not viable and advised a demolition and new build approach would be the most appropriate solution. Given the funding structure and cost estimate for a new build, this put the future viability of the project at significant risk.

SD Engineers were consulted for an independent review and to better understand if retention could be achieved commercially.

We proposed a robust and systematic approach to verify the capacity and suitability of the existing frame, which could then be reviewed against the design proposals.

The design team subsequently restructured and SD Engineers were appointed as structural and civil engineers.



The Architecture

It is rare that a charity has the opportunity to develop a purpose-built space which can be accessible and inclusive for all its users, and so Mary Ward and AWW adopted a community-centric approach to ensure they delivered a sustainable and equitable urban development.

A series of workshops explored the building programme in collaboration with stakeholders from within a 3 mile radius. These workshops continued throughout the project to help develop a co-design approach and ensure opportunities were fully realised.

Ultimately, Queensway House was fully refurbished and extended by two storeys on top and 1.5m to the front.

The building layout is arranged according to the needs of four distinct and interconnected groups: Mary Ward Centre staff; Legal Centre clients; Students; the wider community.

The floorplates were reconfigured to maximise space efficiencies and to enhance connections between the floors.

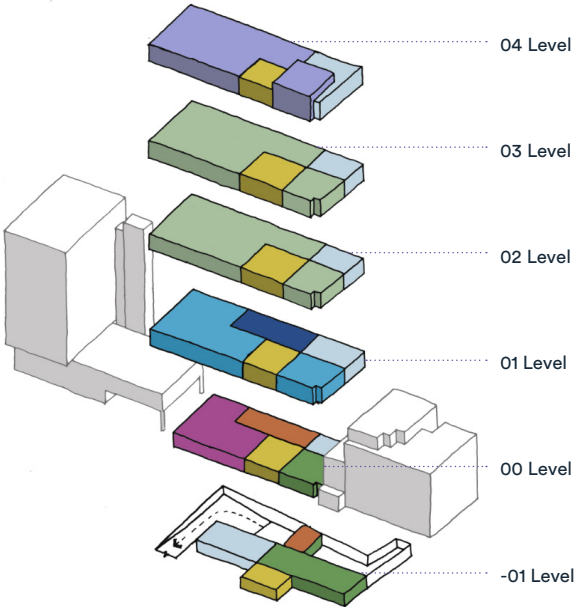
This strengthens the sense of community when moving through the building, and provides a safe place to learn.

Generous circulation areas and a sequence of spaces takes the user from the entrance to their destination, while providing opportunities for pause and connection on the way.

A bold yellow punctuates the monochromatic colour scheme, both complimenting and highlighting the existing concrete structure and the new steel frame.

The yellow acts as a way finder, both inside and outside of the building, and creates a distinct identity for this vital community resource.

Justifying Re-use



The original three-storey building, Queensway House, needed to provide a public café, staff offices, meeting rooms, consultation spaces, teaching rooms, and a dance studio/arts hub

Not all existing buildings are suitable for retention and reuse. It is important for clients to know that a further detailed study might confirm an efficient new build structure would be the better solution overall.

Our experience on similarly complex retention projects has taught us the best way to approach challenges like this is to use a systematic approach and split the investigation work into stages, addressing the highest risk areas first. If initial investigations are promising, this can give the client confidence to invest further in more exploratory works, tackling the next highest project residual risks and so on.

The previous engineering assessment had identified some key risk areas as to why a refurbishment of Queensway House was unlikely to be feasible. The level of risk to the project cost and programme was too high for the client to commit to a planning application based on reuse.

However, SD Engineers classed these as ‘medium’ risk items with potential to become ‘low’ risk. Following discussion with the client, we agreed that investment in further investigation works was worthwhile, particularly given their commitment to retention.

We began by thoroughly reviewing all archive information, and undertook a site inspection to enable us to plan the intrusive survey investigations required.

The Analysis

A series of material testing procedures and opening up works further validated the existing building fabric capabilities and allowed us to address the key risk areas directly.

Concrete samples and localised break outs were carried out on elements at each level. Further concrete samples were taken for compressive strength along with carbonation testing.

The existing reinforced concrete elements were scanned with a Ferroscan survey as a cost efficient and non-destructive method to gain further information on the diameter, cover and spacing of the reinforcement bars.

Samples and survey results were utilised to inform our analysis and confirm the existing capacity of the structure. Only 38% of the columns required strengthening - offering significant savings in cost and programme.

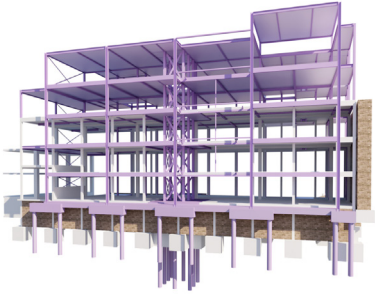
Typically, any load increase on shallow foundations beyond 10% requires detailed justification, or all too commonly, the automatic specification of underpinning/ strengthening as a conservative and easier solution for the engineer.

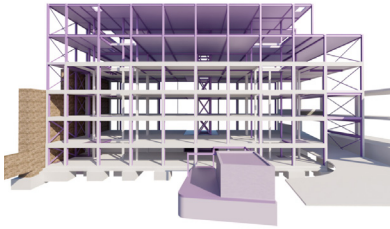
Even with the additional two upper floors constructed using lightweight construction, the total load increase calculated on some of the foundations was found to be over 35%.

Boreholes and trial pits were used to better understand the foundation geometry and bearing strata. Traditional approaches to existing foundations would suggest foundations required underpinning or widening which would have resulted in significant cost, programme, and embodied carbon issues.

Keen to avoid this, we worked closely with the geotechnical engineering consultant to explore if strengthening could be avoided.

They undertook extensive analysis of time-loading information, soil mass types, ultimate bearing capacity, pore water pressure, and settlement measurements of the site. As a result, only two of the existing shallow foundations at the rear of the building needed to be strengthened.





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Strengthening works required to only two pad foundations

38%

Only thirty-eight percent of the columns required strengthening

Structural Design

The additional two storeys use steelwork and a metal deck slab. Given that the structure would remain exposed, meetings were held with the client and design team to discuss the aesthetic of the structural works. It was agreed that steelwork would be used to strengthen slabs and columns.

The exposed aesthetic clearly showcases the interface between the new and existing sections and modifications while suiting the budget of the client and the ambition to achieve a low-carbon design.

The existing roof slab proved to not be strong enough to support the additional loads from the two extra storeys. Rather than demolish the ‘weak’ slab, we introduced a steel grillage below it. This grillage split the existing slab span allowing the slab to be able to support the increased floor loadings, and act as a transfer structure to support the new columns above.

Retaining the slab reduced the need for temporary works and for a new floor to be installed.

Existing columns were strengthened with PFC sections bolted either side and packed tight to the floor and soffit to take the additional loading.

A new braced lift core and steel cross bracing at either end of the building enhanced stability to account for the increased wind load from the taller structure with the addition of the two storeys.

The end bay cross bracing is a hybrid of new steelwork and existing concrete columns and beams. Investigative work confirmed the existing elements had capacity for the additional shear and axial loads and could withstand the design forces without further strengthening being required.

The new central lift core required the installation of new piles due to the restricted footprint and overturning forces to be resisted. An iterative sensitivity analysis was conducted between the stiffness of the new end elevation cross bracing, and the stiffness of the new braced core. This was to achieve acceptable building wind drift, while not exceeding pile capacity tension limits in the proposed core or uplift from occurring in the existing pad foundations below the new braced bays.

The increase in height and change of use of the space meant the building was re-classified to a Class 2B structure. This meant the building needed to be tied vertically and horizontally to satisfy Disproportionate Collapse requirements.

The columns are tied by the beam and pot floor and detailed calculations confirmed the designed detailing satisfied the tie force specified in the code. This approach omitted the need to introduce new tie members which would have added cost, carbon, and service disruption complexity.

To address vibration concerns from the dance studio at fourth level, an acoustic floating floor was selected as the most economical and low carbon approach.

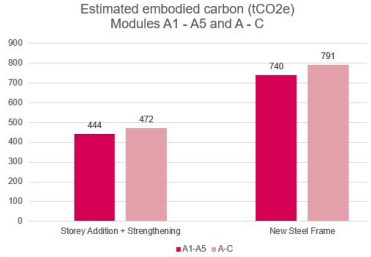
Carbon

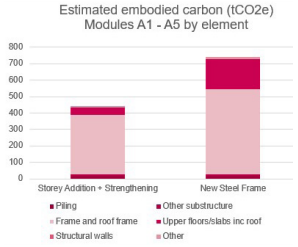
Environmental considerations were key on this project.

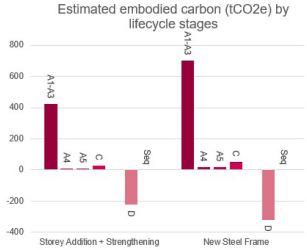
To calculate the saving in CO_2 by opting for the refurbishment approach, a new steel-framed building was developed for comparison.

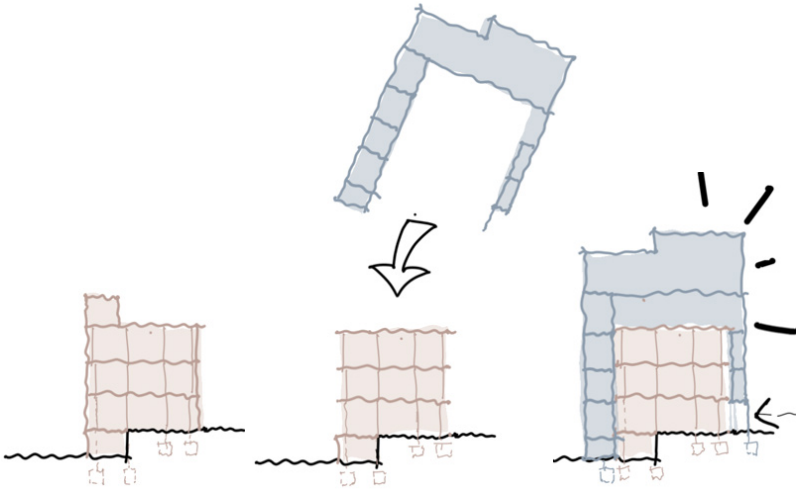
As the existing frame, as well as the new, were fully modelled in Revit, our Technicians used the plug-in for Revit (using EOC ECO2) to calculate the embodied carbon of the two options. We then used the IStructE's Structural carbon tool to calculate how much CO_2 would be produced by the single elements.

The carbon assessment for the structural refurbishment calculated there was over 40% reduction in embodied carbon when compared to the construction of a new building (not including the demolition of the existing frame), with the scheme meeting RIBA and LETI's targets.









AWW sketch showing a light-weight, low carbon sleeve being pulled over the existing retained structure

300 tCO_2e

Retaining the existing structure translated into an estimated reduction of over 300 tCO_2e (Modules A1-A5) compared to a new construction approach

Impact

Mary Ward Centre has significantly impacted the local community by addressing educational and socio-economic challenges and fostering a sense of local identity and collaboration. This project exemplifies a commitment to social responsibility, demonstrating how a thoughtfully designed educational space can become a community hub and a catalyst for positive change.

By engaging local stakeholders, the project reflects a deep understanding of the local context. Outreach efforts within a three-mile radius ensured that diverse voices were heard and incorporated into the design and planning process, tailoring the project to meet the particular needs of the Stratford community and further afield.

The project acted as a catalyst for Mary Ward to grow and develop local, sustainable partnerships - approximately 40 partnerships created so far.

40%

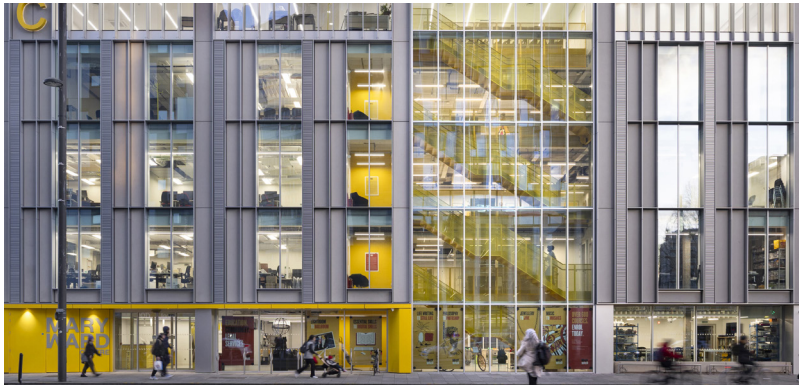
Forty percent of learners are from local areas

76%

Seventy-six percent of students are women

56%

Fifty-six percent of students attending exercise classes are aged 60+



“The engineers played a fundamental role in giving the client and stakeholders the confidence to strengthen and reuse the existing building rather than demolish. Their diligent and determined approach demonstrated a viable future for the existing structure. The project is a substantial retrofit and vertical extension which doubled the building size, achieving a complete transformation with significant carbon savings. The before and after transformation is remarkable.”

Structural Award Judge’s citation

“As the only Institute for Adult Learning in East London, the building demonstrates a firm commitment to learning, support, and access to justice - attracting local partners, encouraging connections, and cross-sector working. This is beginning to build a strong web of referrals and connected support for our local communities, with more plans on the horizon to provide additional community services at our Stratford Centre.”

Therese Reinheimer-Jones, CEO of the Mary Ward Settlement

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