

Fite Fuaite

by Dónal McElwaine

Thesis submitted to the faculty of
Virginia Polytechnic Institute
& State University
in partial fulfillment of requirement for the degree of

Master of Architecture

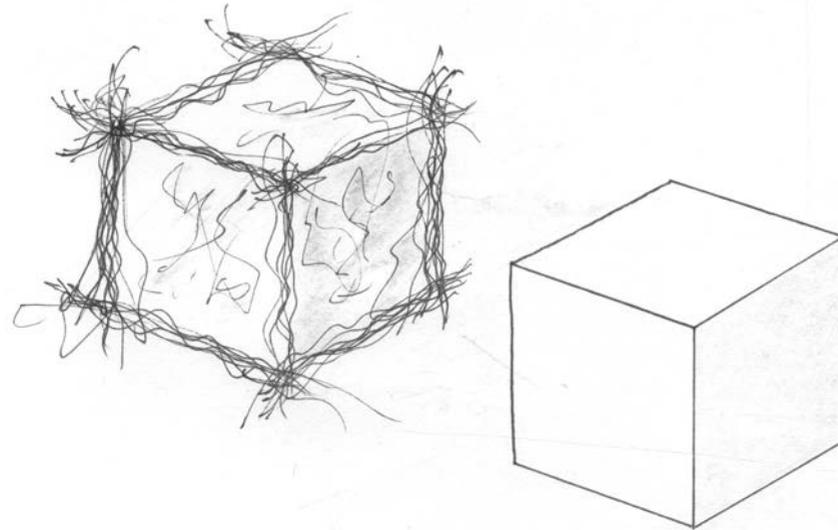
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A B S T R A C T

Exploration of the architectural re-purposing of a historic building ruin with the goal of maintaining and emphasizing its current character and state of decay. Simultaneously examining how new interventions can clearly achieve modern expectations of function and enclosure, while allowing the character of the existing structure to be minimally impacted. The intervention in the historic building fabric demonstrates how new materials and construction techniques allow for a distinct contrast between old and new, and how the two can work harmoniously together. Specifically integrates new glued-laminated timber frame structure in contrast to existing concrete walls, testing a general case for the potential power of interventions and adaptive reuse to be a means to a rebirth and retelling of the stories of existing buildings.





Sectional Perspective

Fite Fuaite;
An Irish (gaeilge) expression meaning *Intertwined / Interwoven*.

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My sincere gratitude

to Hunter, Heinrich and
James,
for your guidance, knowl-
edge, and critique...

to my friends,
who helped me enjoy, to
its fullest capacity, my time
studying at Virginia Tech...

agus do mo chlann,
don ghrá agus tacaíocht ar
fad l rith mo am ár choláiste,
sa bhaile agus thar sáile.



Interior view of new space

The thesis aims to explore the conditions of repurposing existing buildings while respecting their history. It examines the nature of allowing existing buildings to be appreciated in their aged conditions while also achieving the modern expectations of comfort. To explore the ideas of the thesis, a site with an existing derelict building was chosen. The site was chosen largely for the challenges presented by both, and the history of the existing structure and the natural beauty of its surrounding landscape.

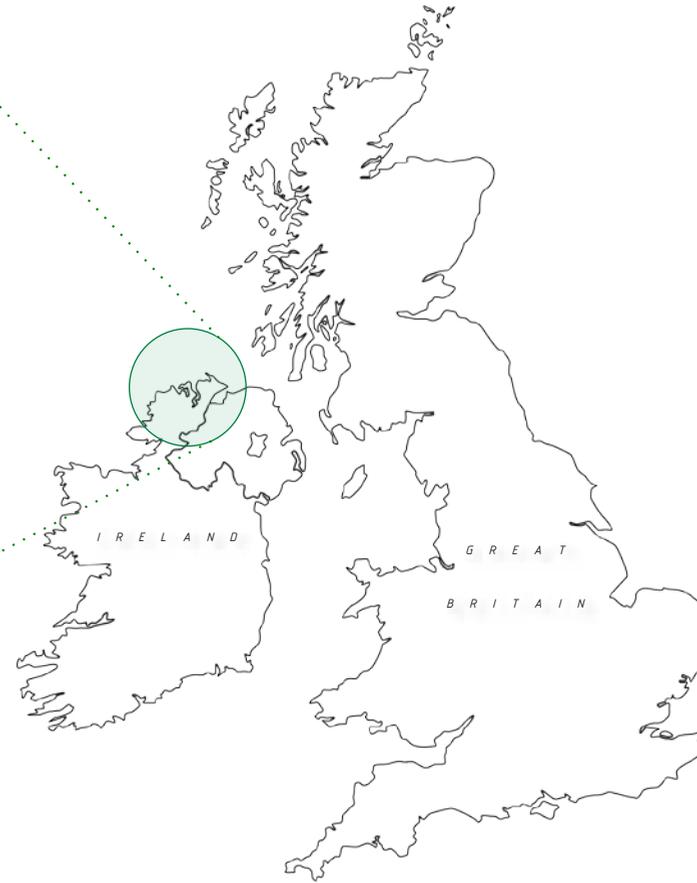
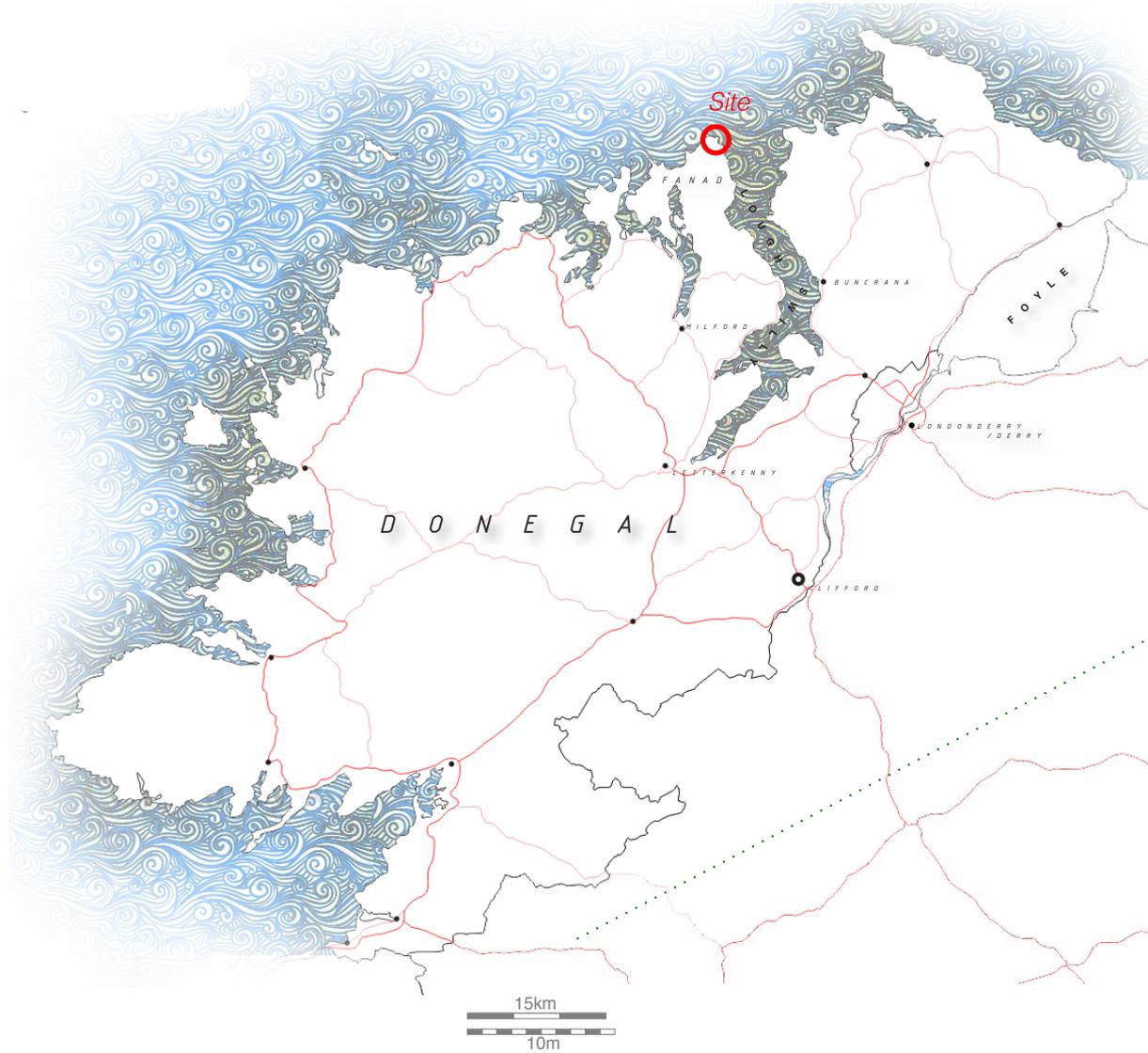
This structure presented the opportunity to explore contrasts between old and new, with consideration for materiality, manufacturing processes, construction methods, quality of light and of space, and embodied history and age. The project considered var-

ious materials to achieve the necessary structural requirements to ensure the existing building's continued presence on the site. The material palette of the new interventions was chosen based on how to best contrast and highlight the qualities of the existing concrete structure. All new insertions, including staircases, new flooring, envelope etc. are explored to achieve an independence from the existing building.

To accommodate the chosen program requirements a new building is proposed, juxtaposed with the existing. The sensitivities of the isolated site inform the scale and form of the new building.

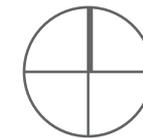
In the end the explorations of the thesis achieved a functional building which through its architecture tells the story of its past.

SITE
CONTEXT
& HISTORY



Fanad Head lighthouse on the north coast of Ireland was recently chosen as a signature point on the new 'Wild Atlantic Way' coastal driving route.

Standing next to the lighthouse is the ruin of a former coast guard station. It is one of many built in the early 20th century along the coast of Ireland by the British Naval services. Irish republicans attacked the building in 1920 and it was abandoned in 1922 following Ireland's independence from the British.



Site Context Map



Site Aerial photograph [Fig. 1.]



Site Photo [Fig. 2.]

EXISTING
STRUCTURE



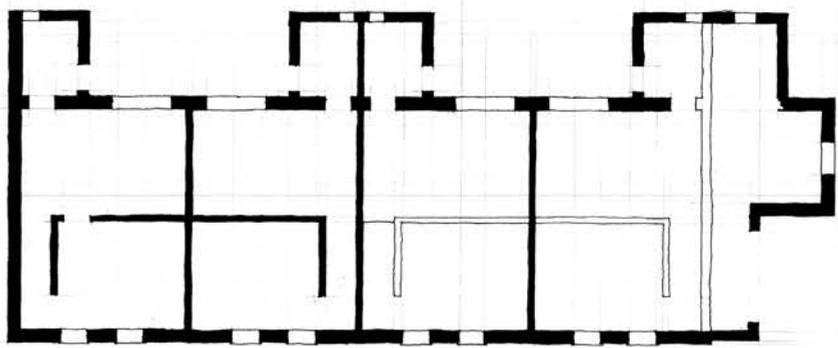
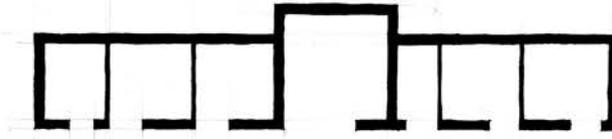
Existing Building

Romantic attachment to abandoned ruins is not unusual in the history of mankind. Here, the former coast guard station is in many ways an intricate part of the landscape and stands as a reminder of British occupation of the land and the wartime need to keep an eye on the seas.

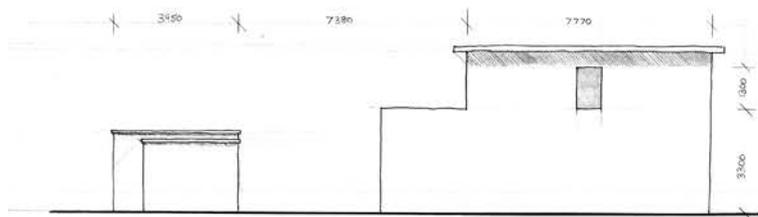
It has stood unchanged for decades, as a record against the might of the elements. Its walls have withstood the gales and winter storms, proudly marching into a new century of dereliction.

In this image we also see how the building seems to simply rise out of the rocky ground.

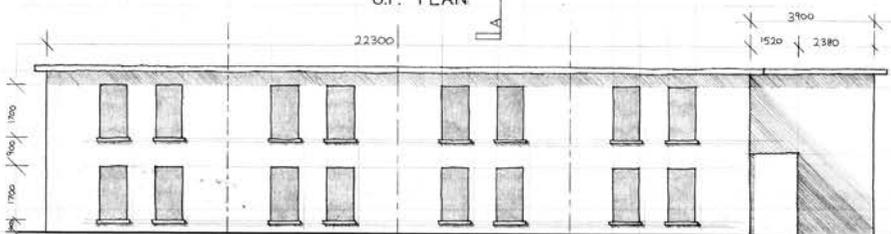
But can it be given a new purpose, now that the war is won, and the seas have calmed?



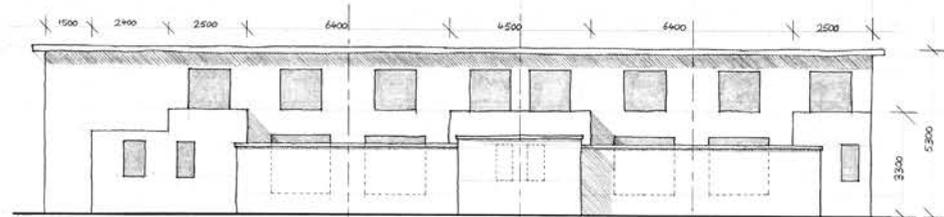
G.F. PLAN



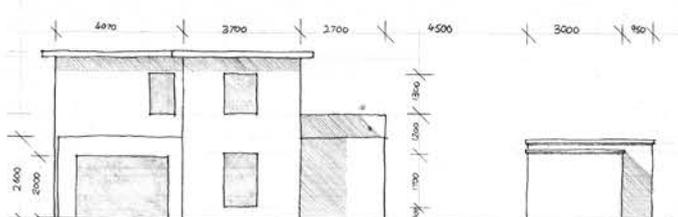
WEST ELEVATION



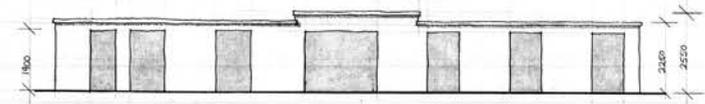
SOUTH ELEVATION



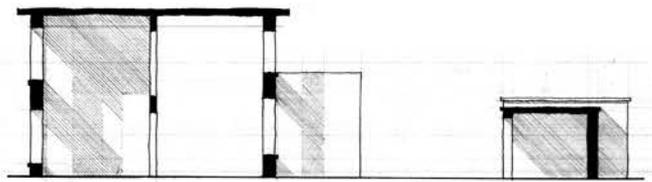
NORTH ELEVATION



EAST ELEVATION



SOUTH ELEVATION

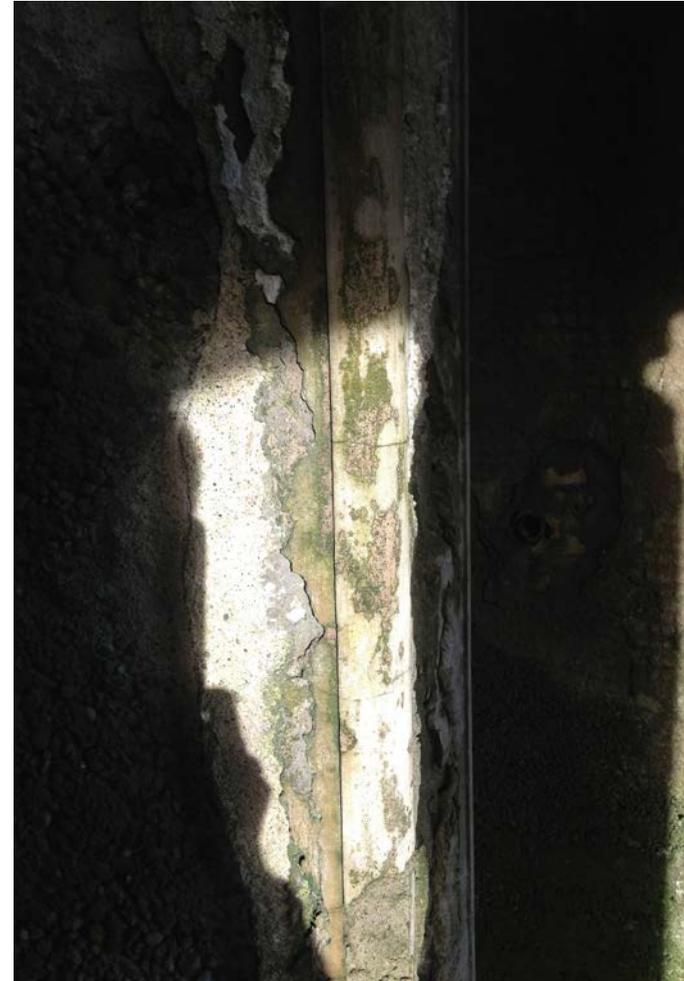


SECTION A-A

The original use of the building was as housing for the naval officers and their families. It was divided into 4 two-story apartments, with the entrances located to the back between the building and the outhouses. A small look-out post stands closer to the shoreline, and was manned 24 / 7 by the officers on rotating shifts to monitor activity in the seas. They had a flagpole, which they could use to signal nearby vessels. This echoed the 'signal towers' of the Napoleonic war, which were built along the coast within sight of each other and signaled each other with flags. The lighthouse replaced the signal tower at Fanad Head in 1817.



Window Detail



Internal wall decay

The external walls are 400mm thick solid cast in-situ concrete. In some 'damaged' areas of the concrete the rounded pebbles of the aggregate indicate that the material was collected from the surrounding coastline. The smooth, finer particle finish on the exterior suggests that a cementitious render was applied.

Simple rounded corners remove the sharp edges around window and doorframes, in the otherwise very rectilinear structure. Internally the walls have achieved a unique texture with render peeling away, faint remainders of paint, and a covering of lichen and other growth. As the building currently stands in a cattle grazed field, the floor of the building is buried under an accumulation of dirt.



View of lighthouse from Coastguard station

With the large number of internal walls resulting in small spaces, the interior can be quite dark on an overcast Irish day. This helps to frame the views of its unique surroundings through the small openings. By focusing the views in this way the eye is allowed to appreciate specific elements of the landscape in greater detail.

All non-concrete elements of the building have eroded with time and are no longer in place (doors, window frames). The space no longer has a floor at first floor level, but there are indications in the concrete of a previous timber joist floor.



North Elevation



1:100 Model of existing structure, northwest corner



1:100 Model of existing structure, southeast corner

P R E C E D E N T



Alte Pinakothek South Facade [Fig. 3.]

The Alte Pinakothek in Munich suffered significant damage during WWII. Its reconstruction, led by Hans Dollgast, restored the building while also maintaining the memory of its early life. The south facade bomb crater was in-filled with the original form and fenestration rhythm, using reclaimed bricks to stand in contrast with the existing. The stairwell was also relocated to the south facade, so that it could reflect the bomb crater. Respecting the nature of the material key-stoned arches are used above the window openings without the applied cornices, as on the existing. The engaged, ionic columns of the remaining portions of the facade are echoed by vertical tubular steel supports, which were originally only intended as temporary supports for the lean-to roof above. From a distance the building reads harmoniously as one, with the impact of the war still visible through material change (color). On closer inspection one can see how the new is built and treated in a much more modern way. [1]



Castelvecchio [Fig. 4.]

With the restoration of Castelvecchio in Verona in 1962, Carlo Scarpa dealt with the layers of history of the building with great honesty, revealing the various architectural typologies, which had been forced upon the building. He achieved this by peeling back layers of the structure to expose other elements, which could inform the visitor of its history and structure, and with the juxtaposition of new materials.

In this way the building itself becomes a museum of its own history.



Neues Museum Stairwell Original
[Fig. 5]



Neues Museum Stairwell Damaged
[Fig. 6.]



Neues Museum Stairwell Restored
[Fig. 7]

In the renovation of Neues Museum in Berlin, new elements inserted into the existing are clearly delineated with the contrast in material, in terms of color, texture, and how they are made. Chipperfield's new, smooth, white concrete emphasizes the rugged brickwork of the existing, and both old and new help to enhance and enrich the other.

The significant damage incurred by the building during war, meant that a number of approaches had to be taken with the project overall, with lost elements restored, *"the contemporary reflects the lost but without imitating it... it was clear that the ruin should not be interpreted as a backdrop for a completely new architecture but neither was an exact reconstruction of what had been irreversibly lost in the war seen as an option. [2]*



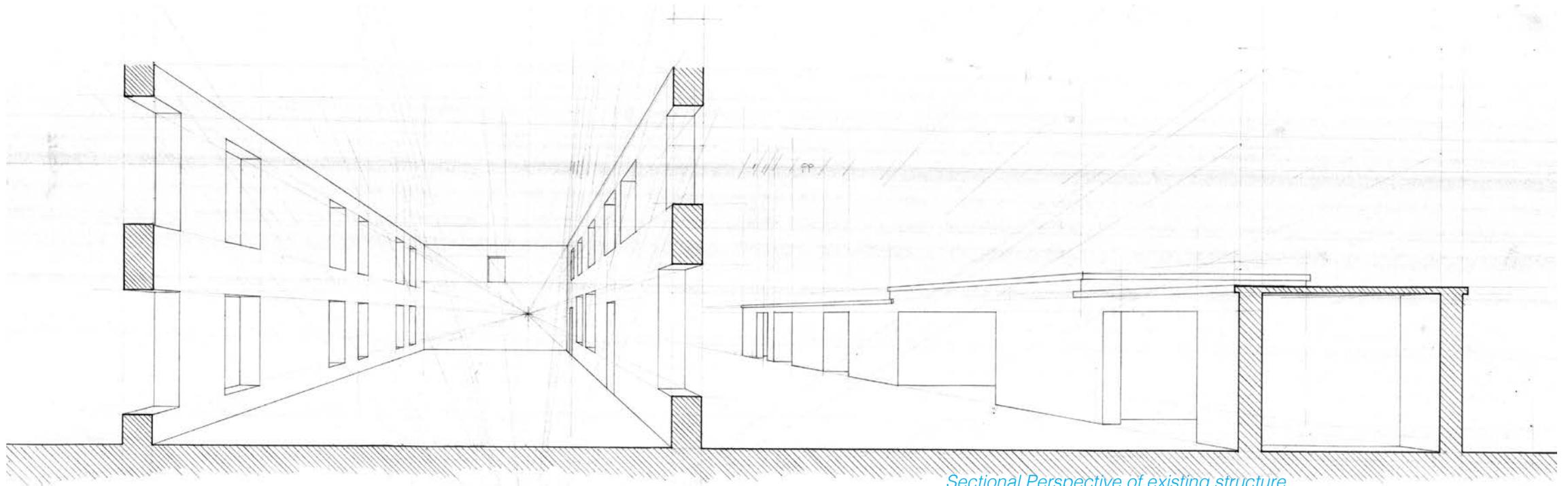
Tate Modern Turbine Hall [Fig. 8.]

In the case of Tate Modern in London, Herzog & DeMeuron took a different approach to the existing industrial building. While they left the exterior largely unchanged, on the interior they repurposed the building to its new use, which included a roof-light along the ceiling of the main space.

Here the line between old and new is less clear.

INITIAL
THOUGHTS

The important aspect of the existing building which must remain are the external walls; the face of the building. The internal walls and the roof are removed without having a significant impact on the external appearance of the building. The result is a vast volume bounded by the rhythmically punctured concrete, with a greater quality of light.

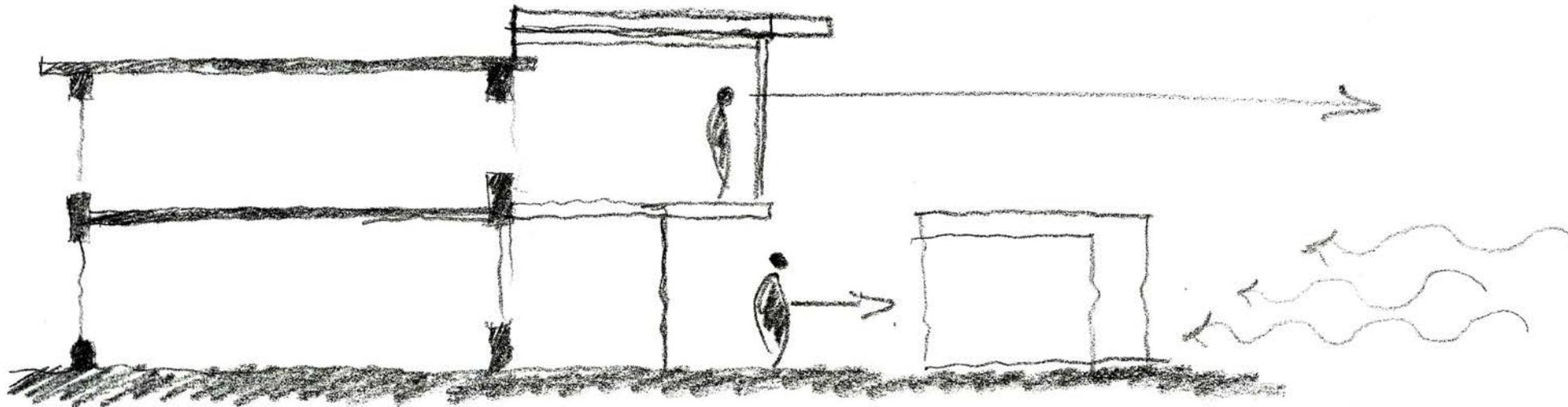


Sectional Perspective of existing structure

The single story storage building to the north likely acted both as a defense strategy and as a windbreak from the strong Atlantic gales.

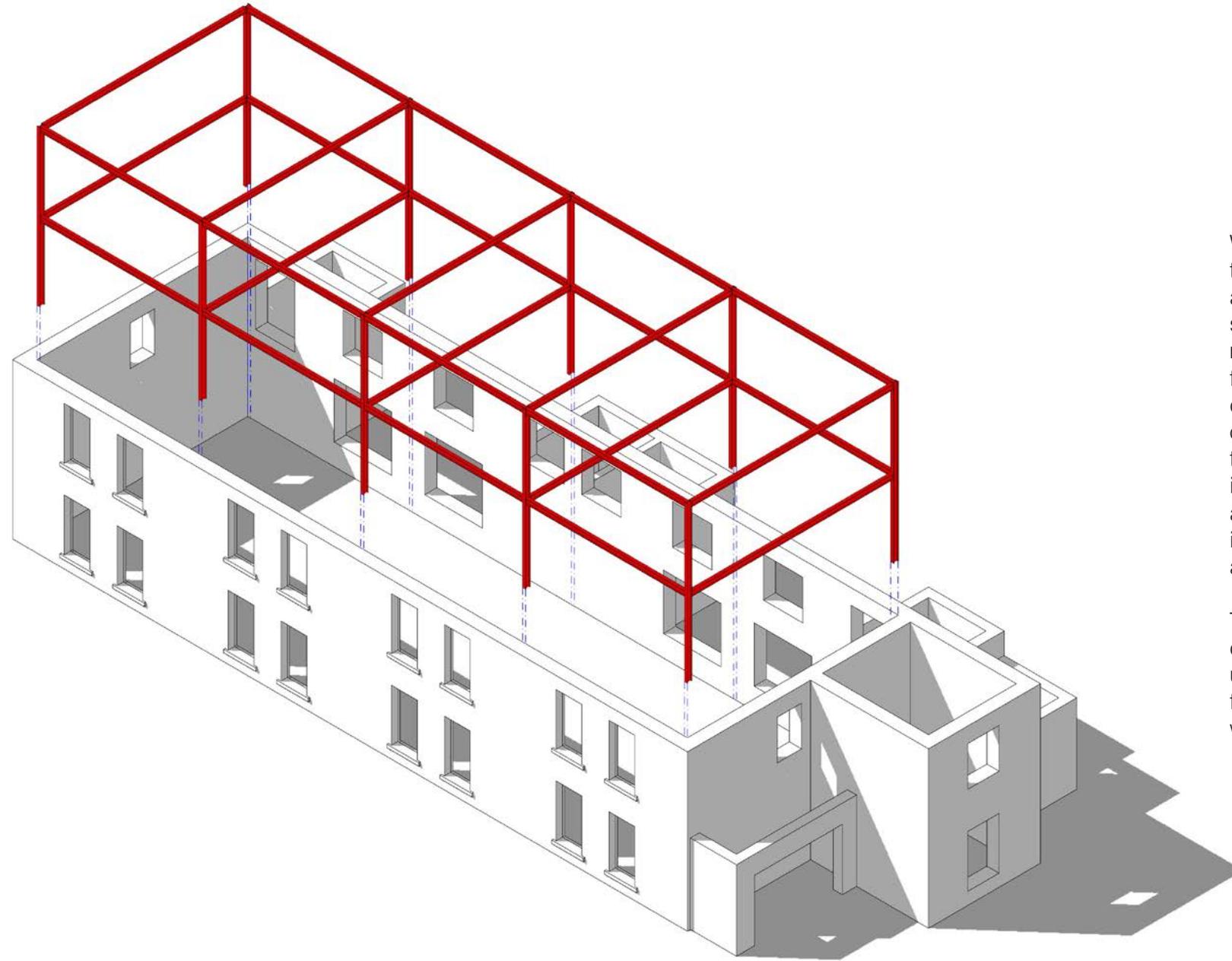
As the desirable views are also to the north, this poses a duality between seeking shelter from the elements, and opening up to the panorama.

The main space benefits from the removal of the storage building, and this move does not significantly detract from the buildings current presence in the landscape.



Cross Section through existing buildings

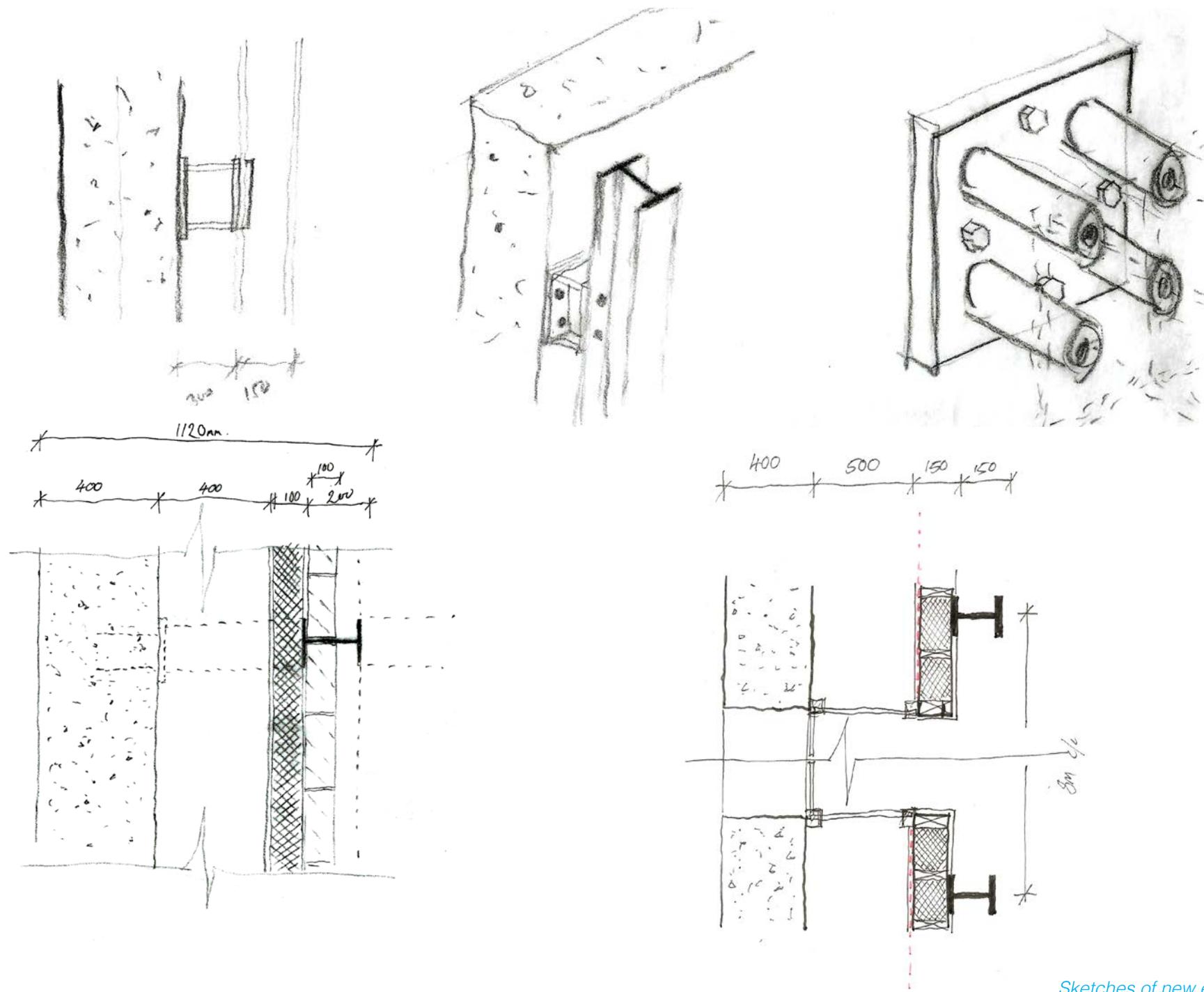
STEEL
FRAME



With the lateral support of the external walls removed, a steel frame takes over the support of the volume. The meeting of the new steel frame and the existing concrete wall raises the issues of a proper handshake between old and new. The detail itself also has the potential to architecturally identify what is supported and what is the actual structure.

To better respect the existing concrete wall, the steel columns were positioned away from the line of the concrete wall toward the inside.

Exploded Axo of new steel frame insertion



The steel frame reaches out to support the concrete walls. Anchor bolts secure the horizontal members to the wall, and they are bolted to the steel columns.

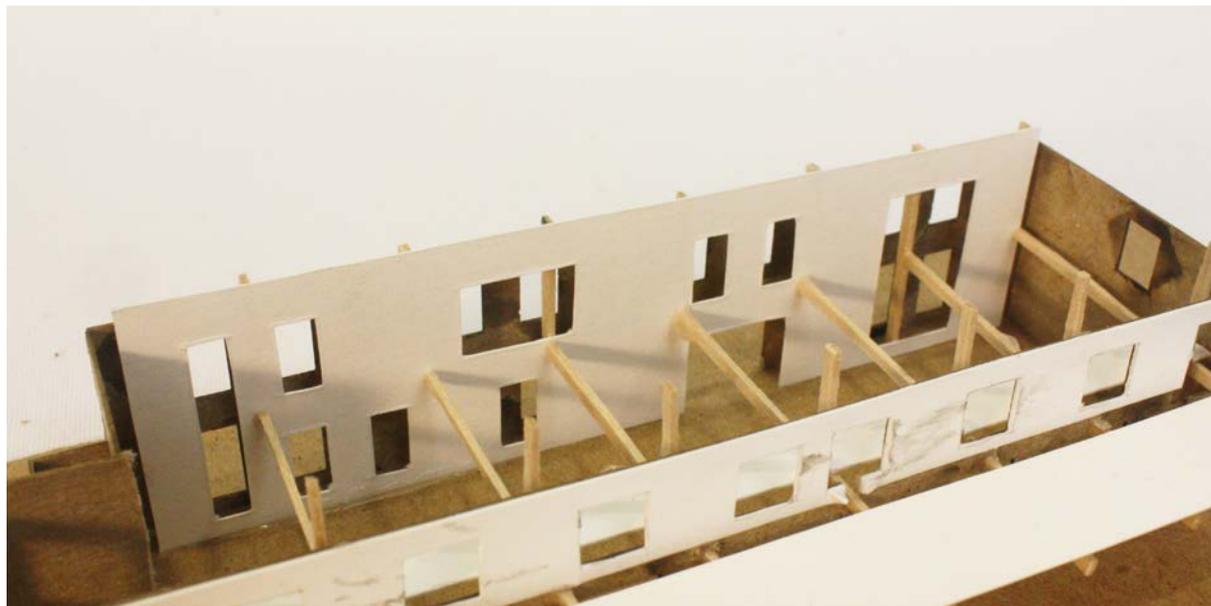
A new envelope is placed on the outer side of the steel columns. Here the rhythm of the frame is expressed internally.

Sketches of new envelope



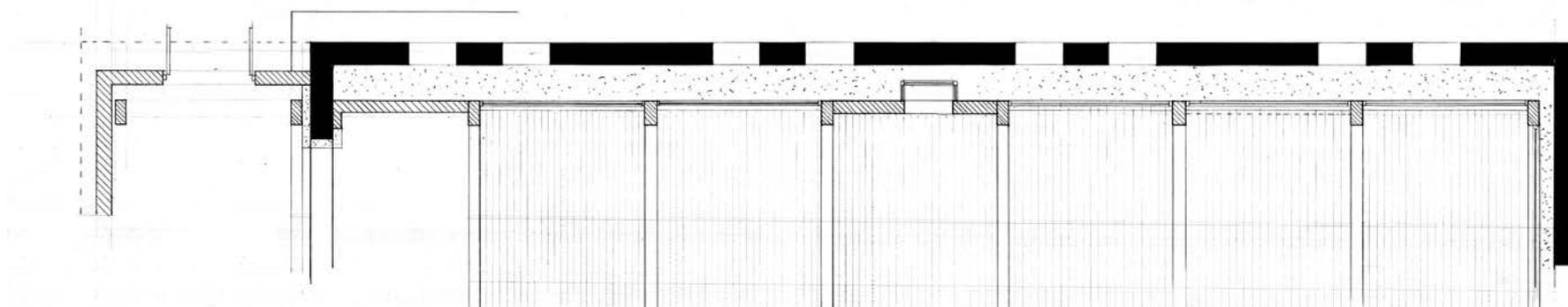
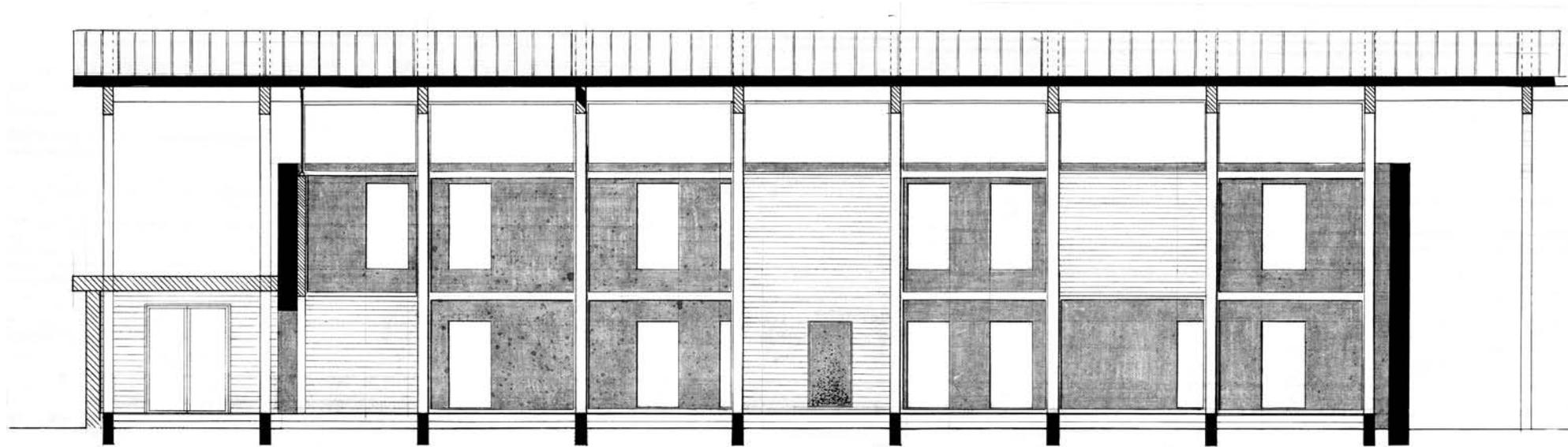
1:200 model south elevation

This model tests the spacing / rhythm of the steel frame as a system which demonstrates its independence from the rhythm of the openings in the concrete walls.



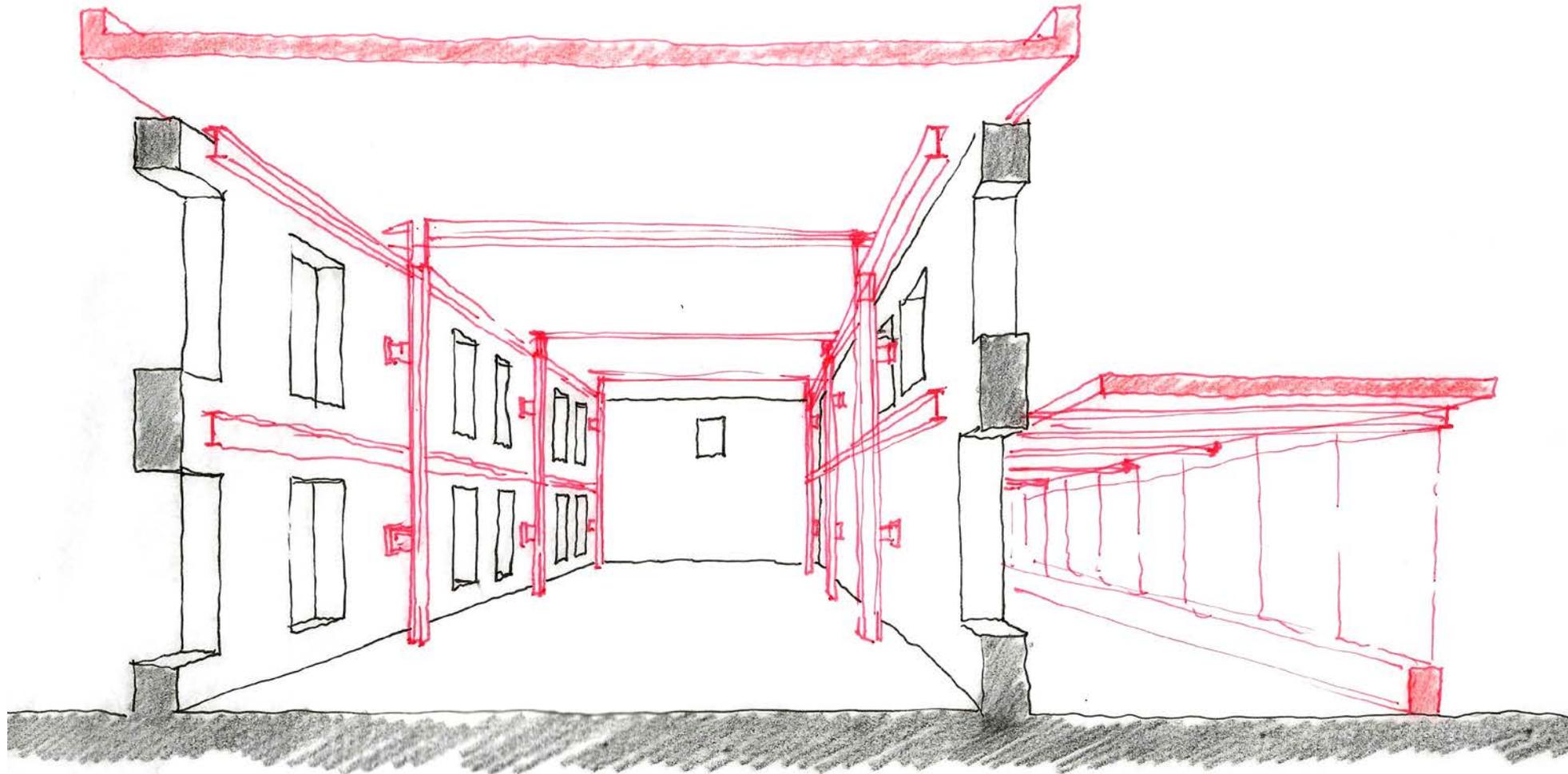
1:200 model envelope study

It also tests how a new envelope interacts with the existing walls. Here the openings increase the tension between old and new, with new apertures, which align with existing windows, and others that do not.



This drawing explores the envelope of the new insertion within the existing, whether it should be entirely glazed, or have some opaque sections to better control the views. The solid sections have openings, which look directly at the concrete, allowing the light to spill down from above, thus illuminating the rugged texture of the concrete.

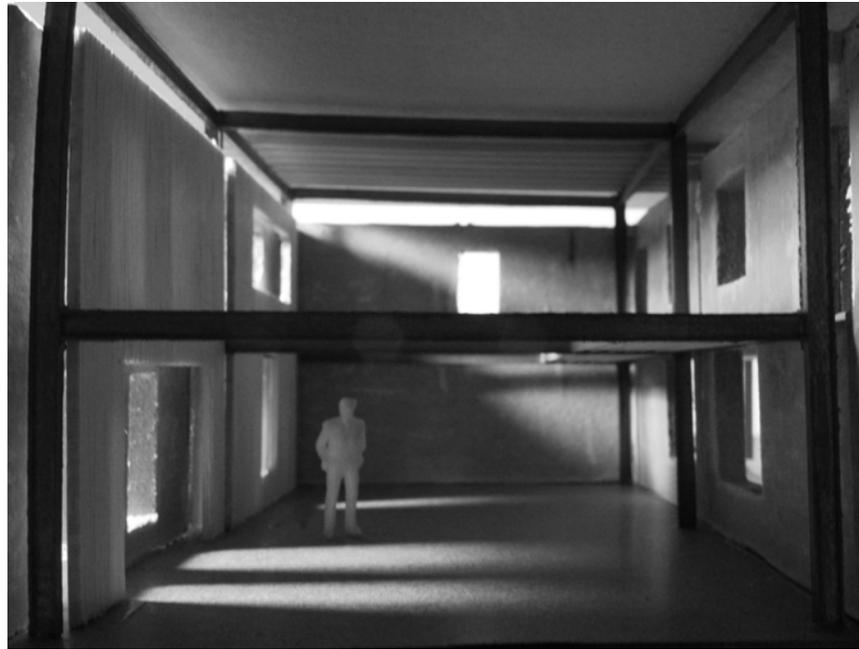
Part plan and internal elevation of new envelope within existing walls



With the steel frame as the primary structure, the roof has the potential to be separated from the existing, creating a clerestory window around the extent of the building.

To take advantage of the sea views, without puncturing the concrete walls any further a new single story space is added to the north. This light-filled, extensively glazed space immediately has a different atmosphere than that of the main space with its small and controlled openings. In this way the different layers of the building are clearly delineated as one moves between the spaces.

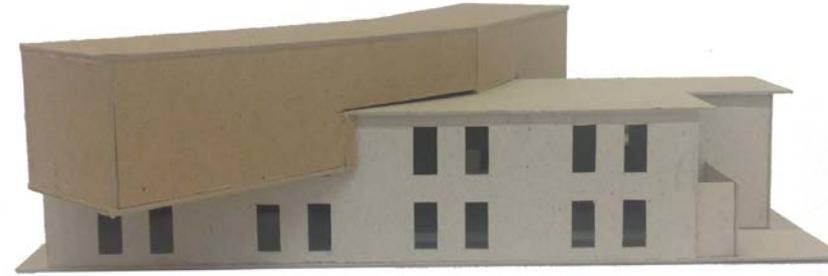
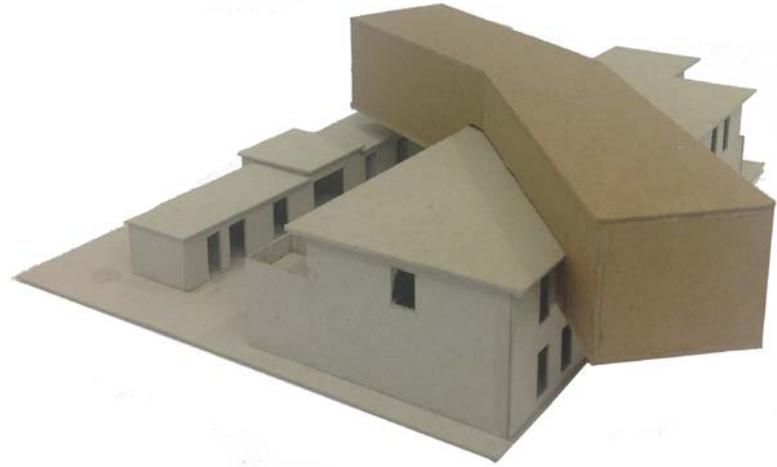
Sectional Perspective of steel frame in existing building



1:50 model light study (clerestory windows)



1:50 model of steel frame & envelope study



1:100 model of skewed design proposal

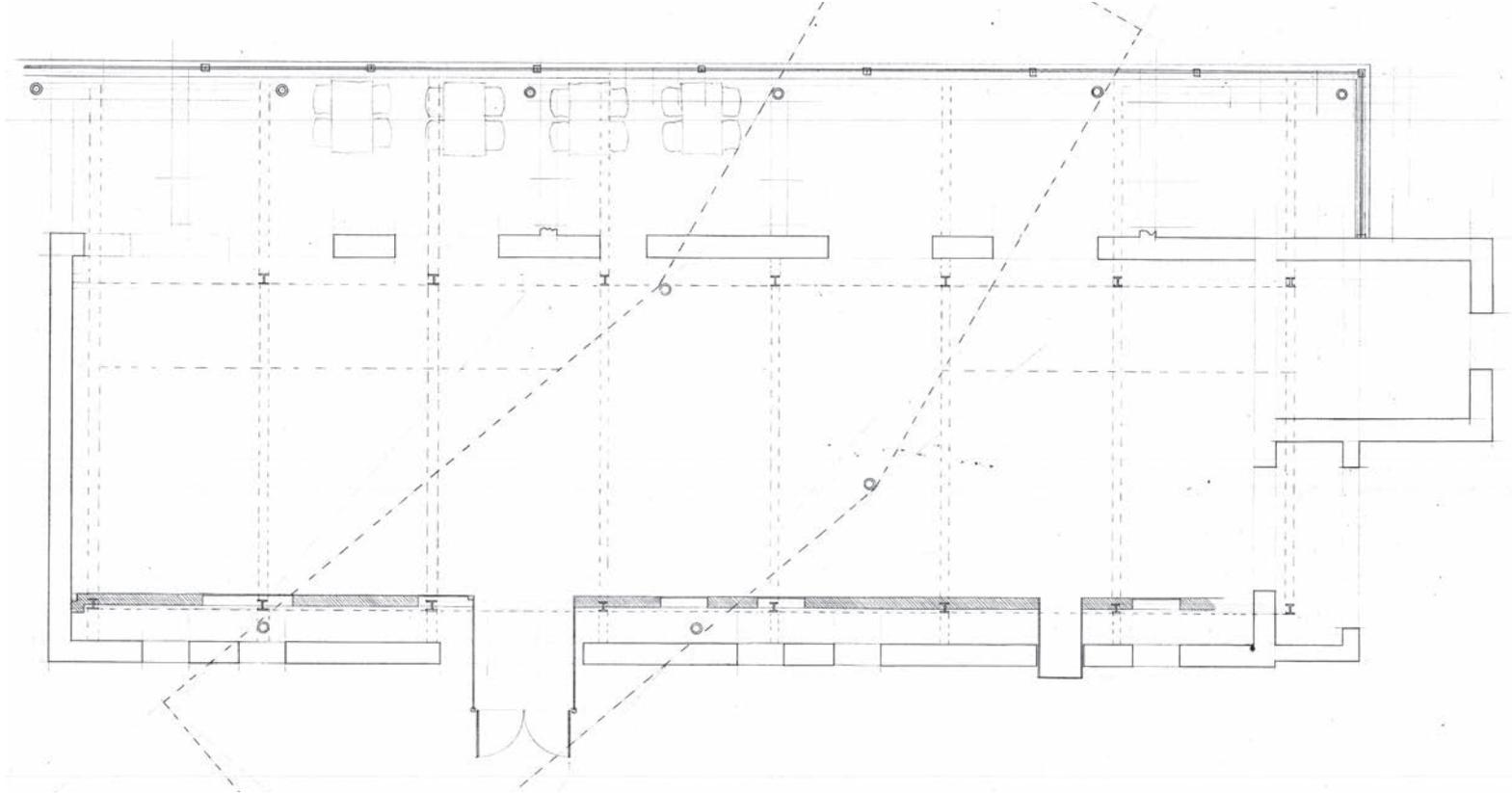
The site was once the location of a Napoleonic war signal tower, which signaled two neighboring towers of approaching enemy. The sightlines of these two towers inform the new intervention in terms of orientation.

The skewed box lands onto the existing building, with large openings towards Malin Head to the north east, and Melmore Head to the west. The large cantilevers present opportunities for an articulated entrance, and covered outdoor space.

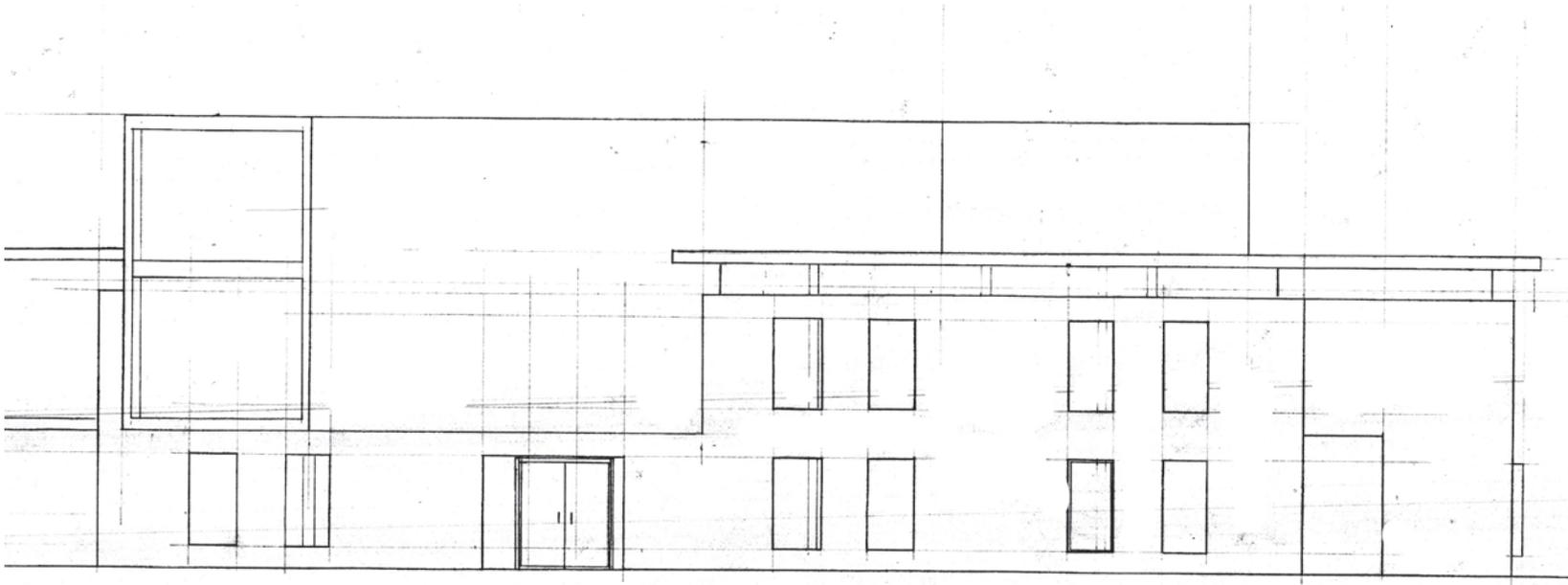
Such a proposal however does not clearly meet the intention of having a minimal impact on the external appearance of the existing building.



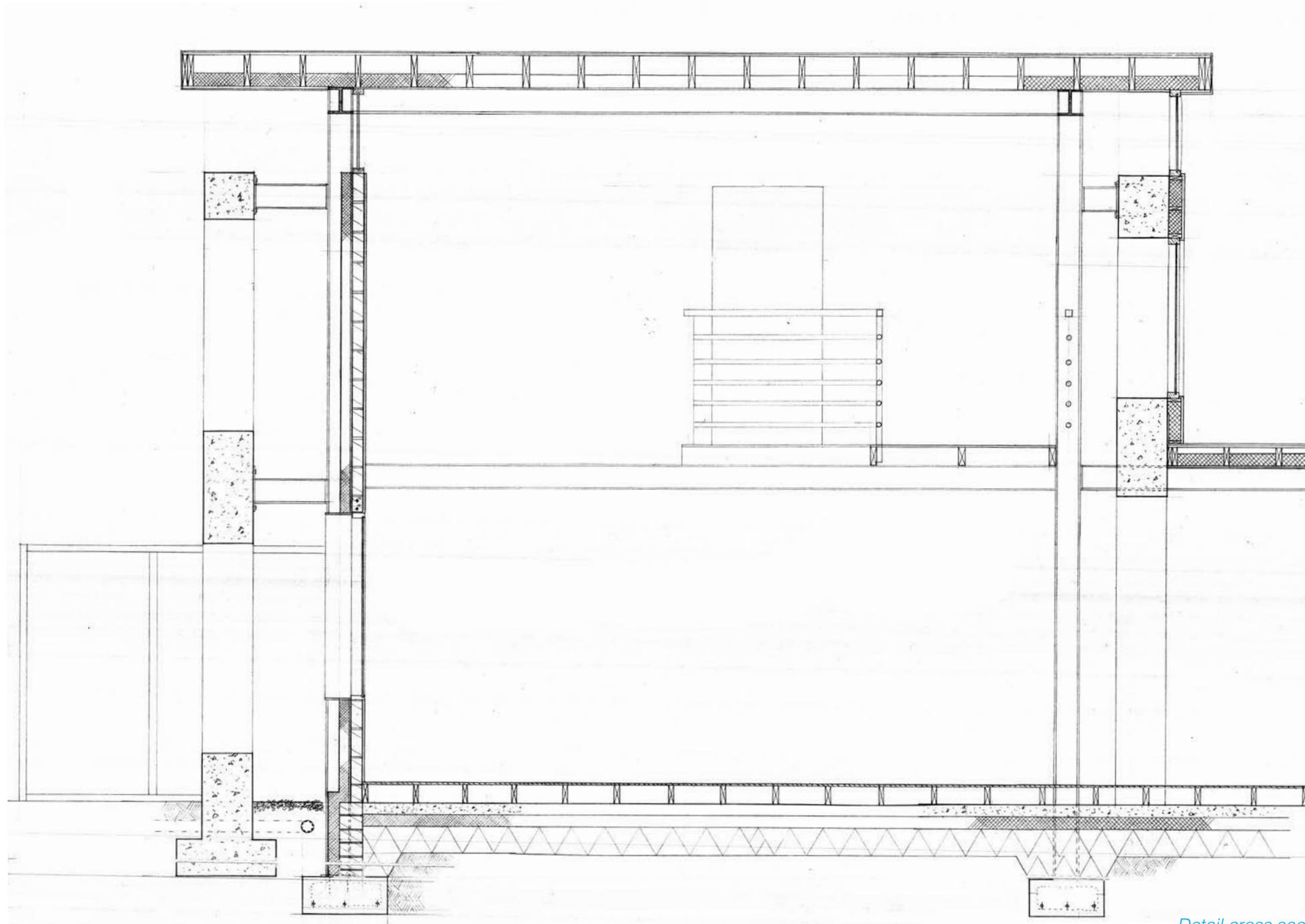
Site map showing sightlines.



Ground floor plan



South Elevation



The contrast between old and new could be heightened.

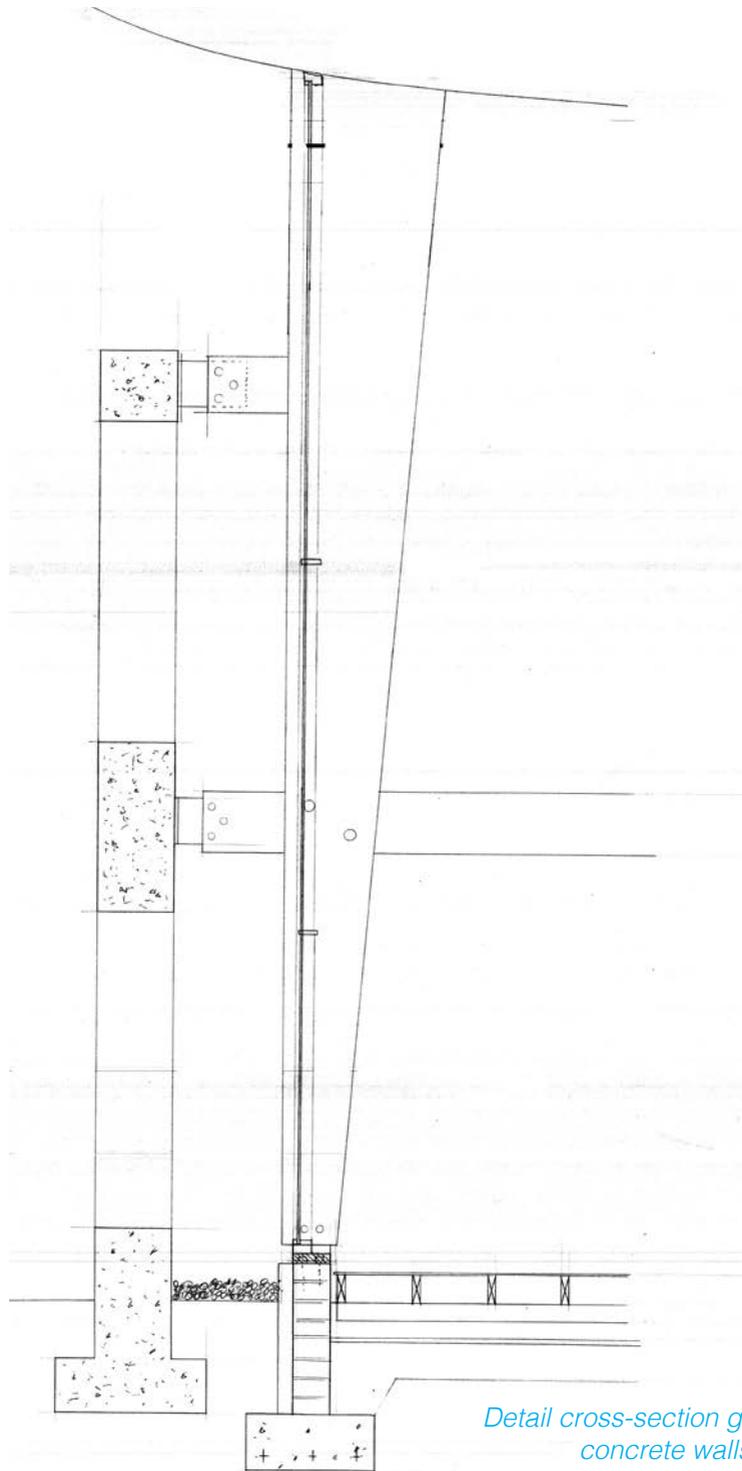
A strong aspect of the coast-guard station is its orthogonal relationships, and symmetrical south facade. The concrete as a material in itself suggests permanence and durability, as a monolithic entity.

Describing an Irish National Volunteers attack on the building in 1920, Lieut. - Col. James McMonagle recalls how he and the other volunteers had tried to destroy the building by fire, but were unsuccessful due to the non-combustible concrete.

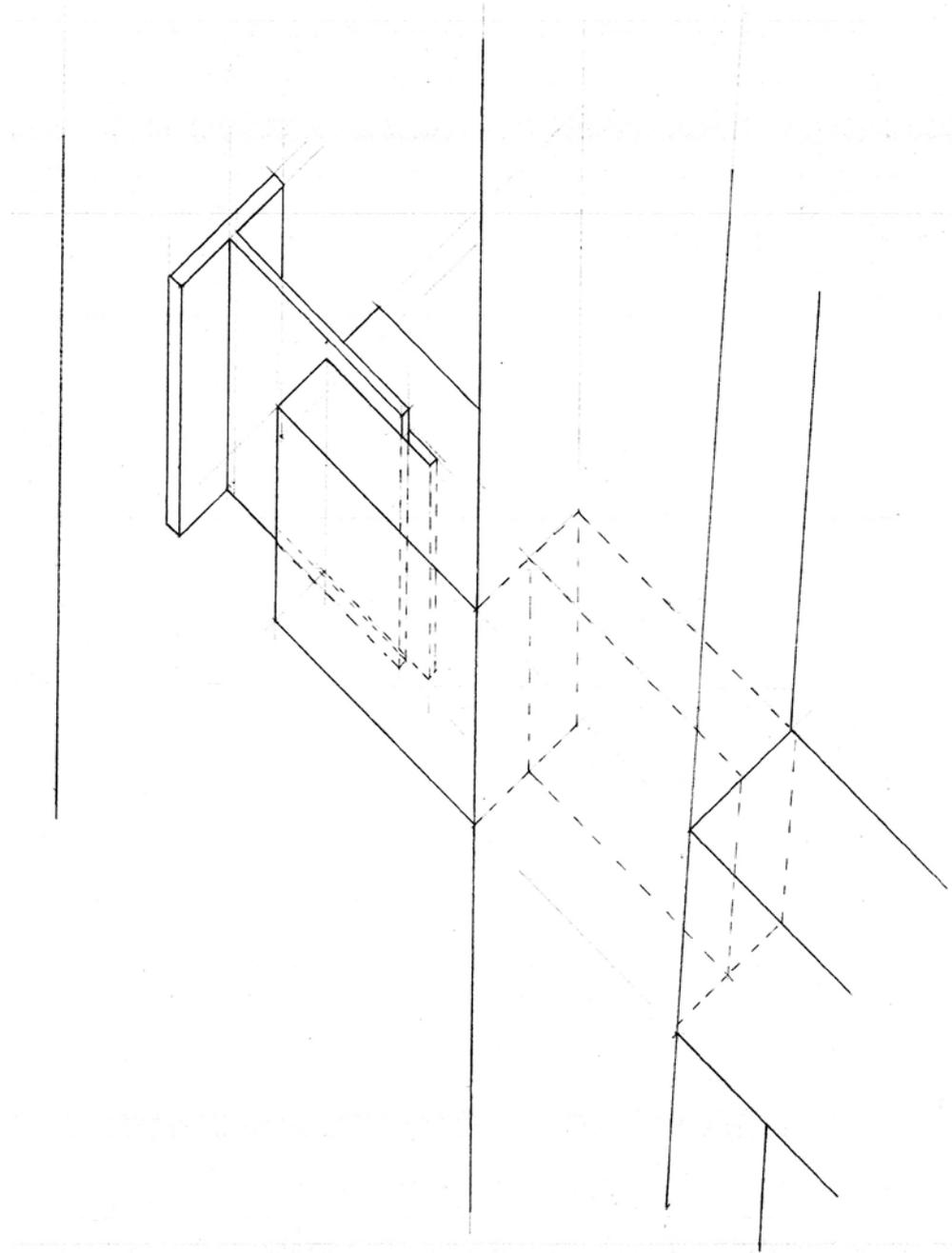
"On this instruction we moved into the building and disarmed the garrison. Due to the nature and construction of the building we were unable to burn it." [3]

Detail cross section

GLULAM
FRAME



*Detail cross-section glulam frame /
concrete walls relationship*

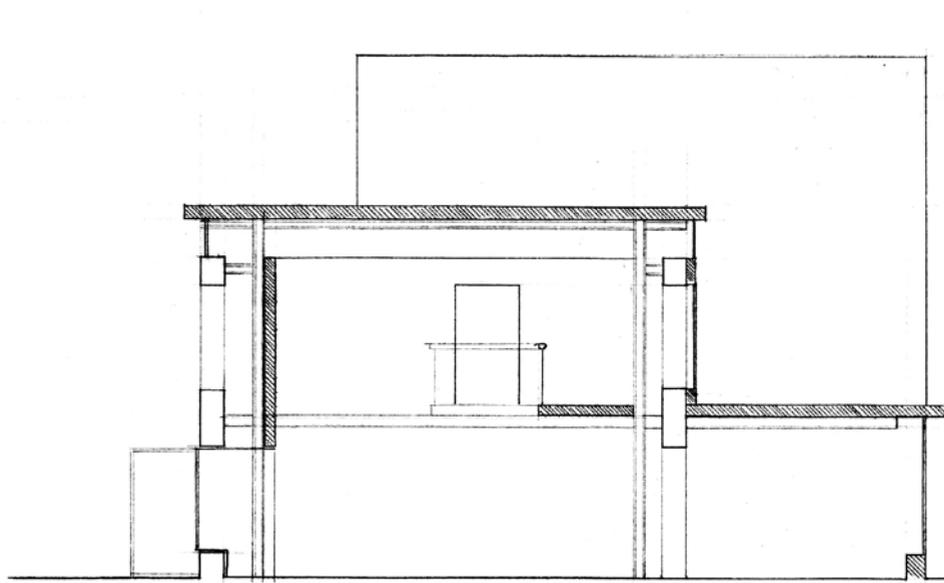


Isometric of glulam frame meeting existing concrete walls

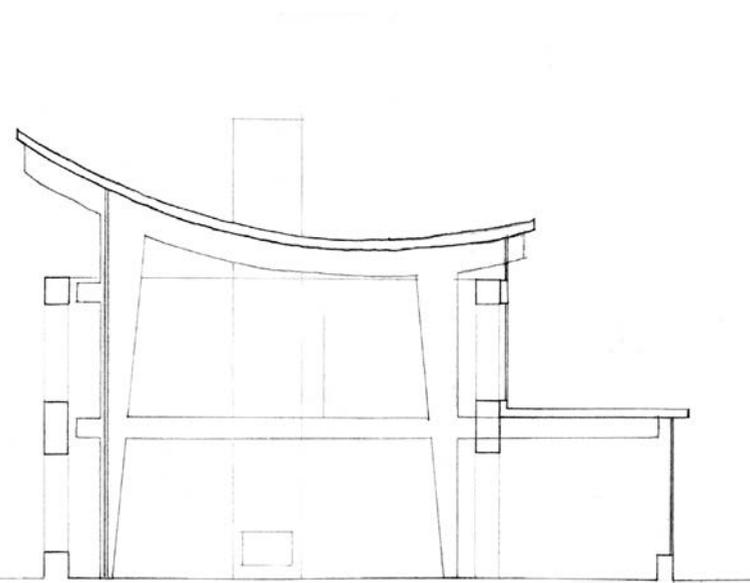
Reinstating wood into the building serves a contrast between materials and system, in addition to the possibility of conceptually differentiating between permanent and impermanent elements.

The lightness and vulnerability of the natural timber contrasts with the permanent, heavy, cold nature of the existing walls to a greater degree than steel does. Similarly, the use of timber in this tree-less landscape is a natural contrast with the on site concrete, as an import to the site.

Glued laminated timber expresses its manufactured process and comfortably achieves the necessary spans. Steel angles mediate the transition from old to new.



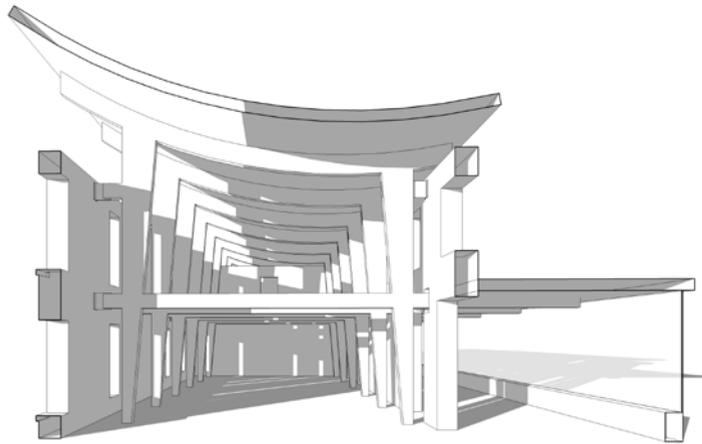
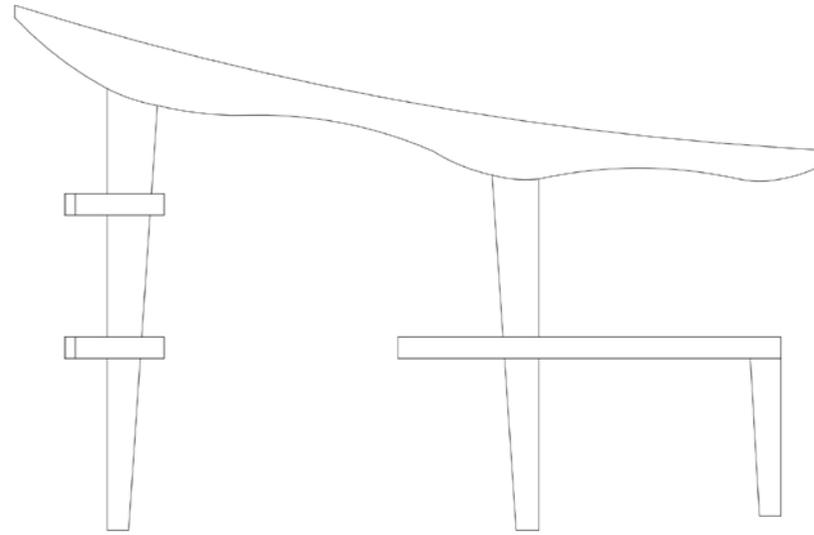
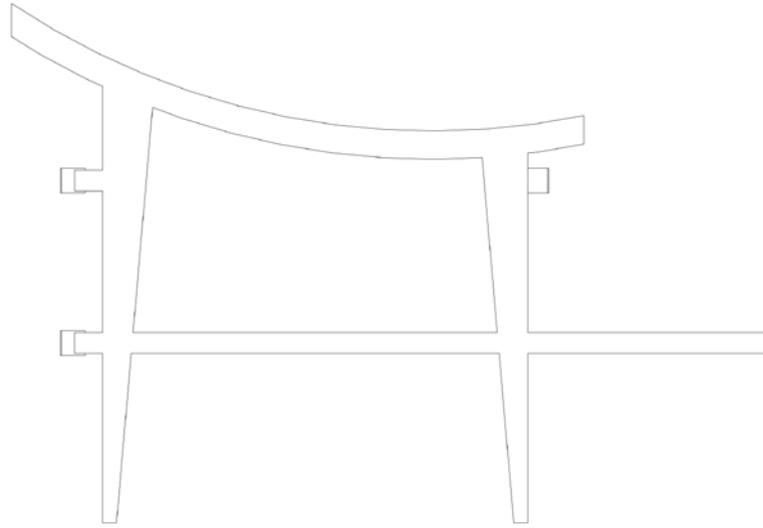
Cross-section with steel frame



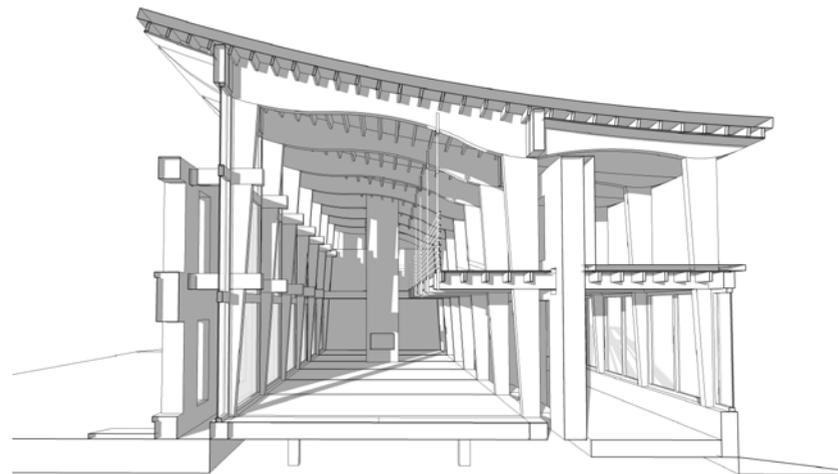
Cross-section with glulam frame

The move from steel to a glulam frame offers different possibilities in the architectural articulation, especially through the nature of its manufacturing process, in which a curvature is easily achieved through bending techniques.

By adding a slow curve to the roof, a 'mono-pitch' fall is achieved, while the curve also contrasts the recti-linearity of the existing walls. Similarly by tapering the columns outwards to increase the moment connection with the roof beams, it heightens further this contrast between old and new.



Section with curved glulam frame



Section, updated curved glulam frame

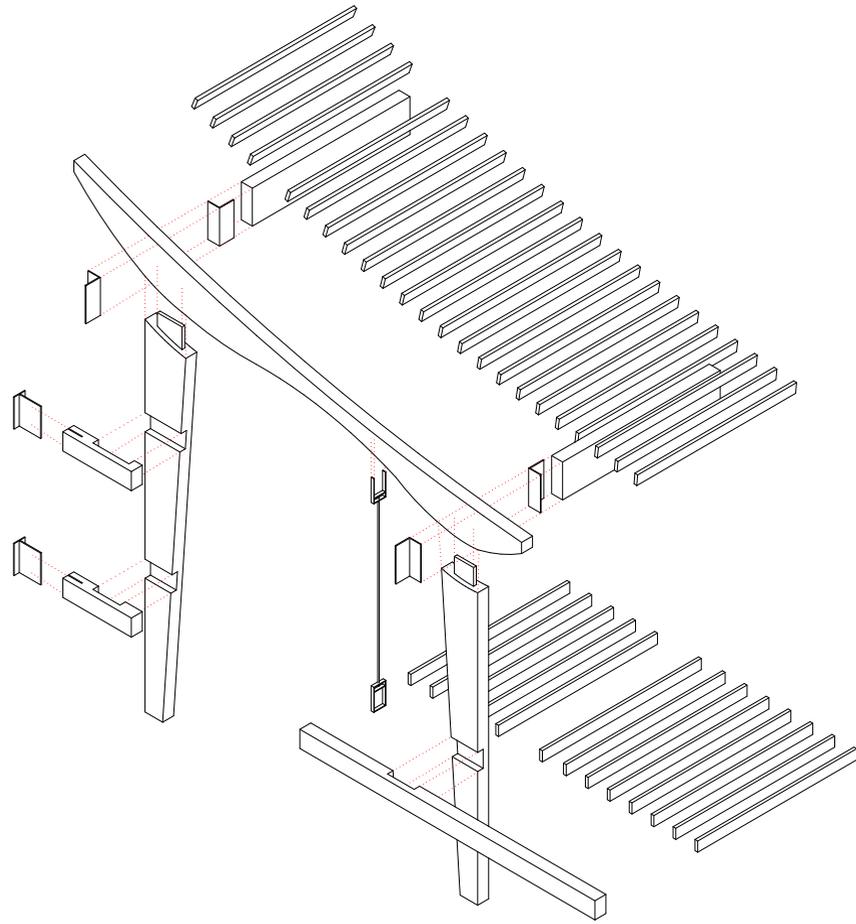
The beams developed to deepen in thickness where they meet the columns. This achieves a more robust connection between the two, and develops a wave-like form, as if sculpted by the tides or prevailing winds.



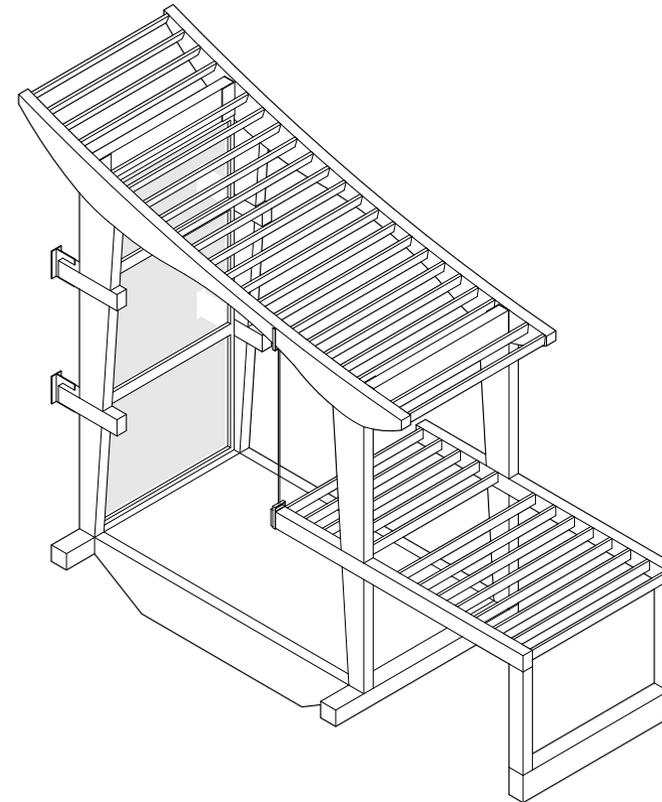
1:200 model with curved glulam frame



1:200 model updated glulam frame



Glulam frame exploded isometric

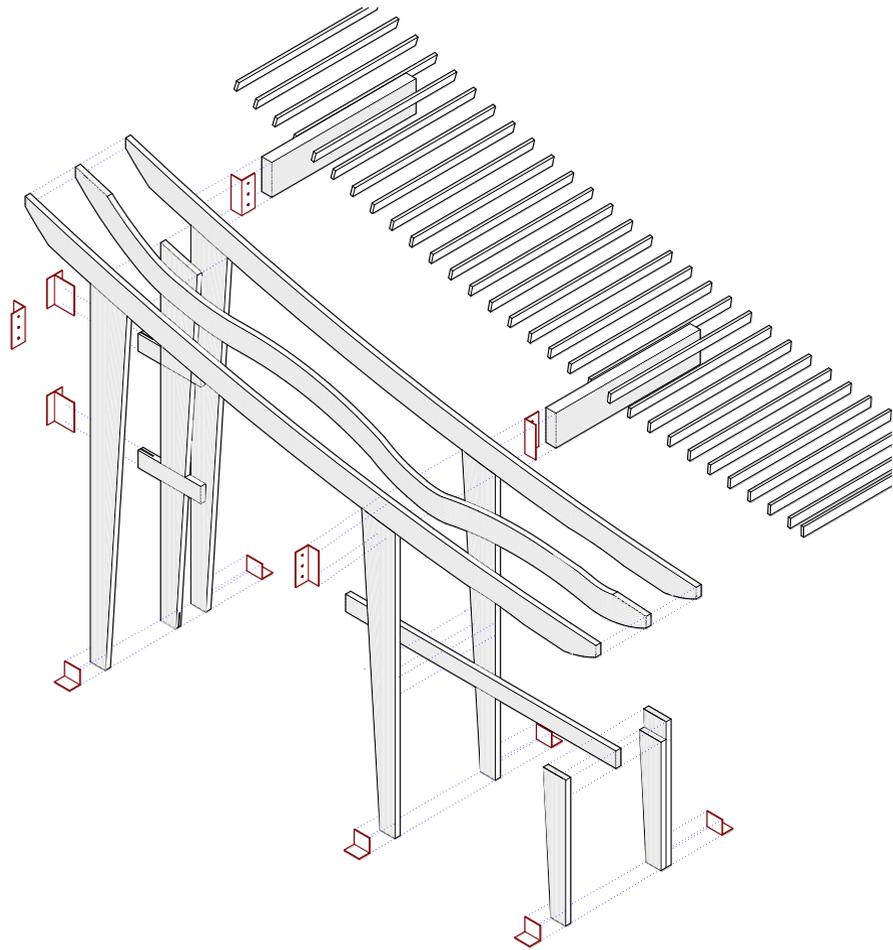


Glulam frame single bay isometric

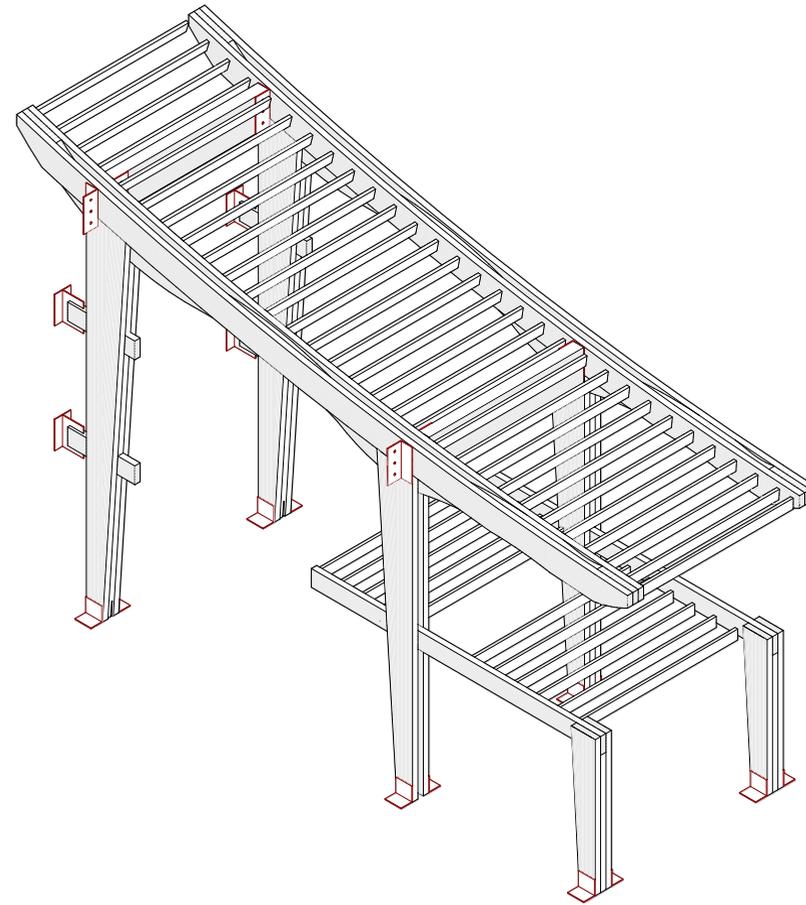
The first proposal for the glulam frame uses mortise and tenon, and housing joints between the elements so that they remain in the one plane, allowing for a simpler installation of an infill between the bays.

However, as the beams have a different curve on the top as on to the bottom, the glulam cannot be simply manufactured / bent to the shape, but needs to be cut to one of the curves after bending, thus exposing the end-grain.

In terms of the assembly of the frame, the hidden nature of the joints suggests a more permanent assembly and the visitor cannot easily understand how it is connected, or indeed how to disassemble it. The use of wooden pins / dowels similarly would suggest a more permanent connection, and therefore the assembly of this frame proposal does not contrast sufficiently with the existing concrete.



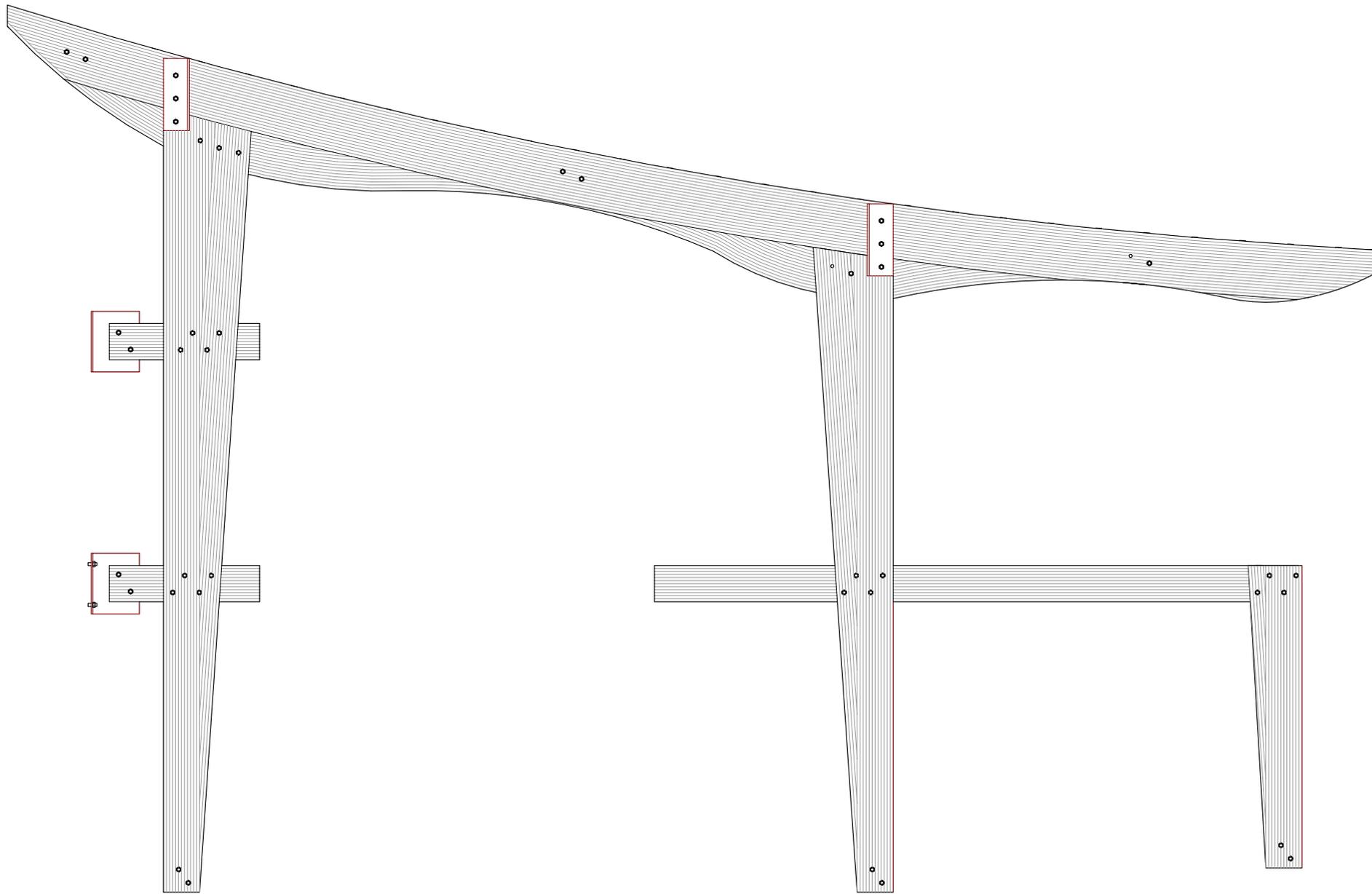
Updated glulam frame exploded isometric



Updated glulam frame single bay isometric

This glulam frame proposal splits the columns and beams each into 3 parts, allowing the curved roof beams to be individually formed to the desired curve, without the need to cut them after the fact.

It also achieves a simpler yet more robust connection between the columns and beams. In contrast with the existing concrete walls and their 'permanence', using nuts and bolts to assemble the frame allows the visitor to understand its assembly, and if desired to disassemble the frame and remove it from the ruin once again.



Elevation of glulam frame showing lamination pattern



Elevation of glulam frame showing lamination pattern

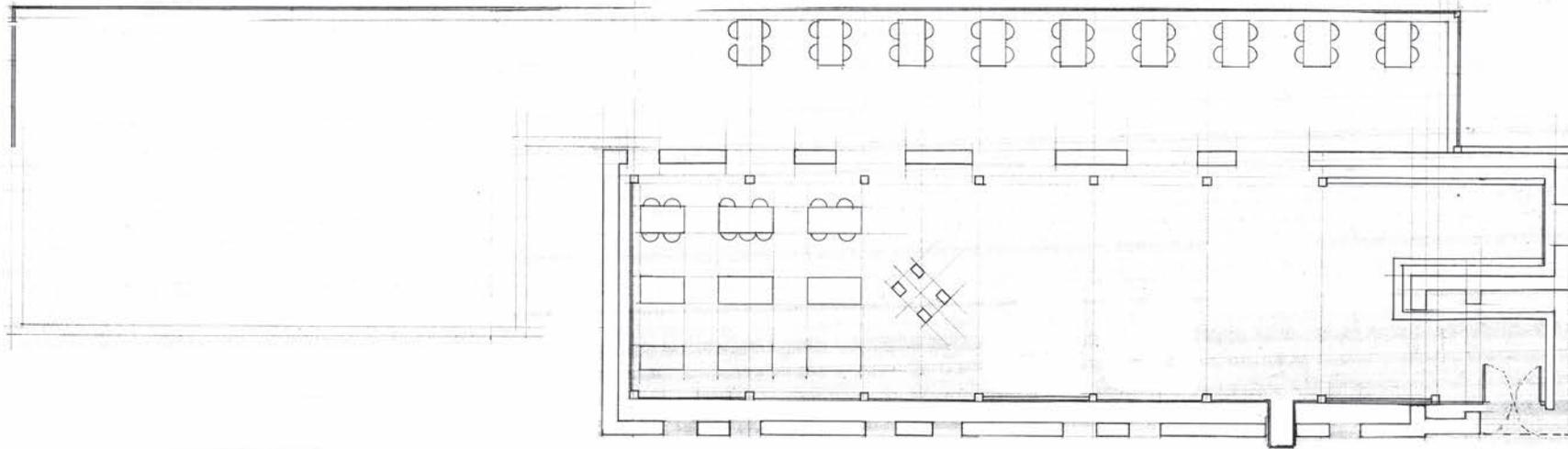
PROGRAM



The site plan shows the role of the building as a contributor to the visitor facilities and attractions on the site.

It stands in the middle of the existing visitors center and lighthouse. The lighthouse offers a tower tour, museum, and 3 bespoke self-catering apartments.

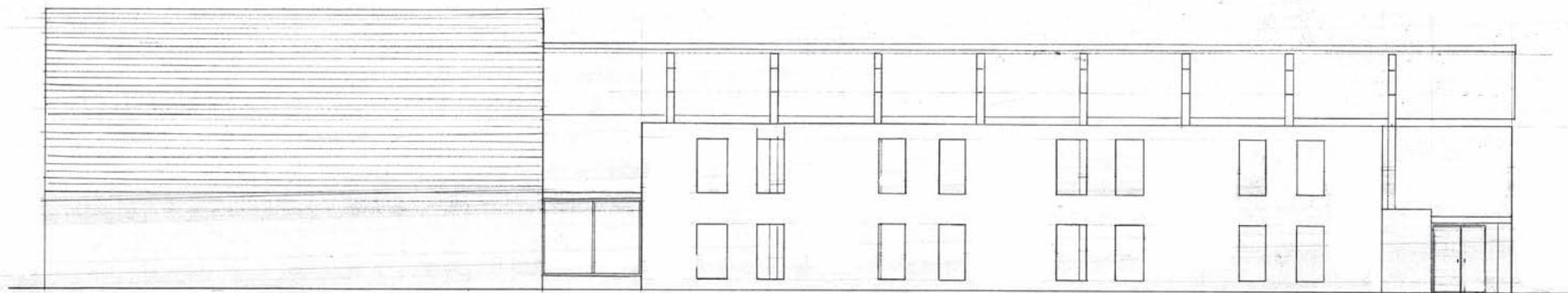
For the program of the thesis, it is pertinent to have a building that contributes to these visitor facilities. I proposed that the main volume of the existing building contains a restaurant. It still has the space for a small museum of the buildings history. Given the remote location and lack of accommodation options locally, I also proposed that it offers an alternative accommodation to the lighthouse apartments, and provides the provision for larger youth groups or school tours with a dormitory, and shower facilities for those wishing to camp or to participate in water sports.



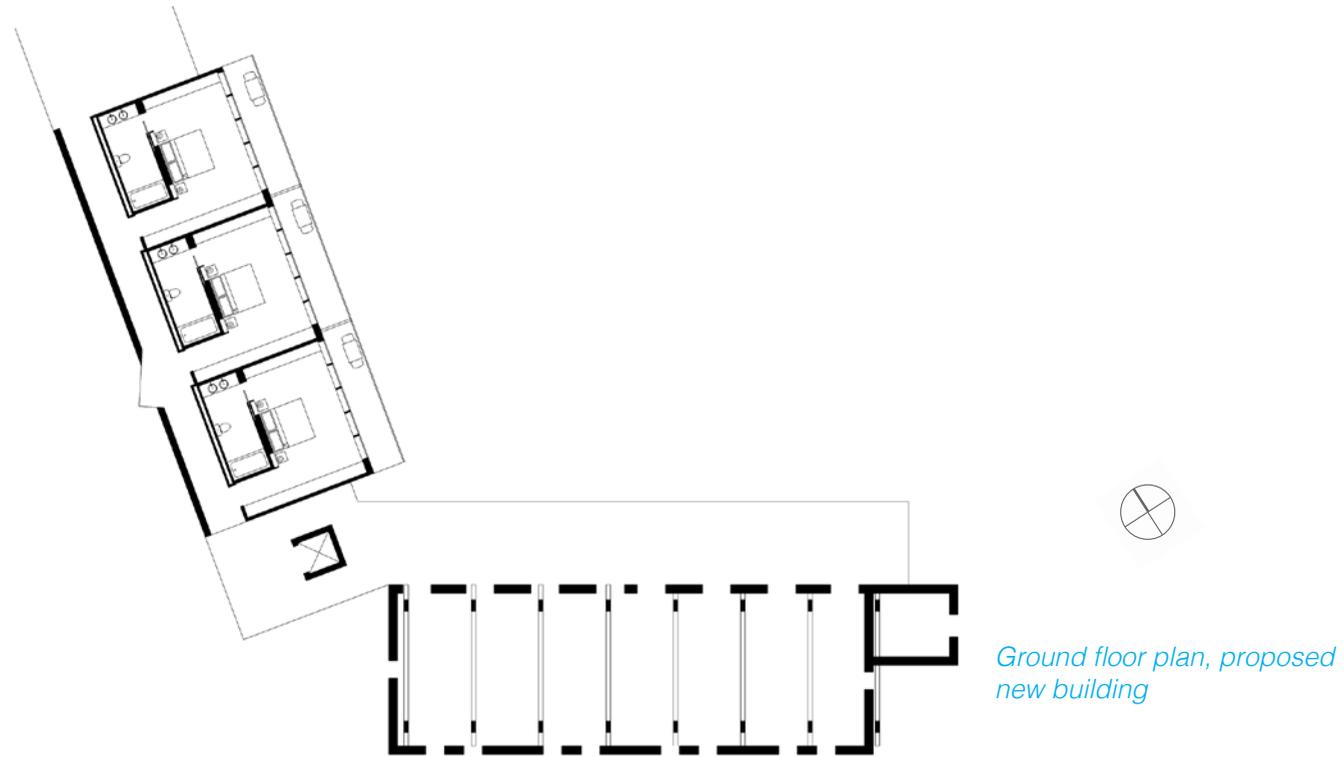
Ground floor plan

While the existing, with its addition to the north can easily accommodate the restaurant, museum and common spaces of the program, the accommodation and services require a new building.

This new build is located to the west of the existing as to not disturb the conversation between the coastguard station and the lighthouse to the east.



South elevation

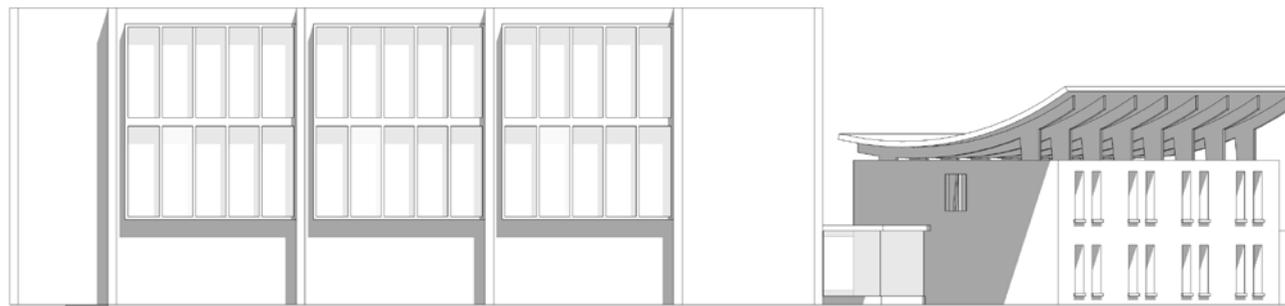


Ground floor plan, proposed new building

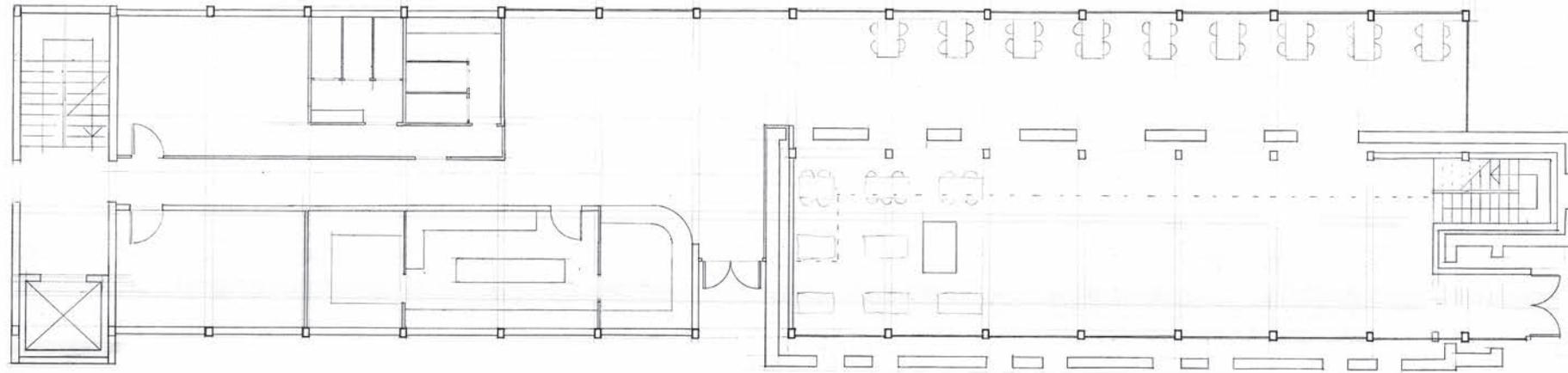
This proposal tested how the new building could contrast with the existing in its orientation. An east/ west orientation is better for day-lighting and to turn its back on the prevailing sea winds. The new building in this case however appears disjointed and alien to the existing.

Like Alte Pinakothek, the contrast between old and new can be achieved through the materials and nature of the construction.

It is clear that the glulam frame, which is inserted into the existing building, could continue to create the new build and be enclosed in such a way as to achieve a different kind of space.

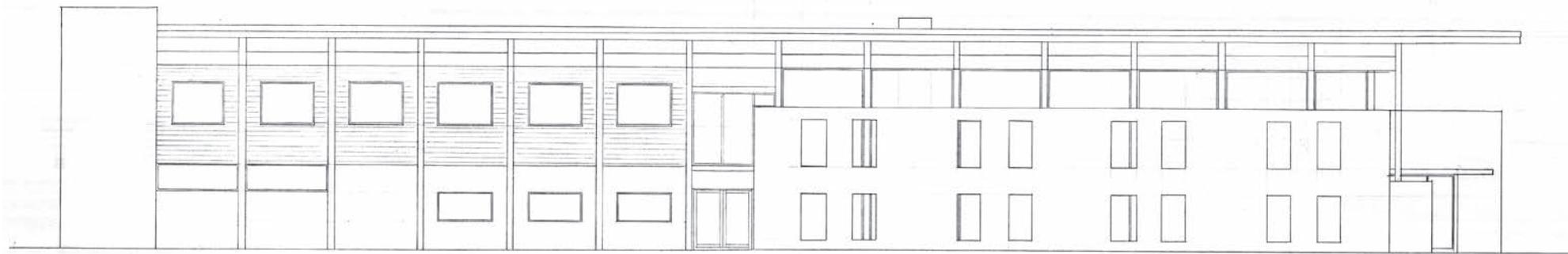


South west elevation, proposed new building

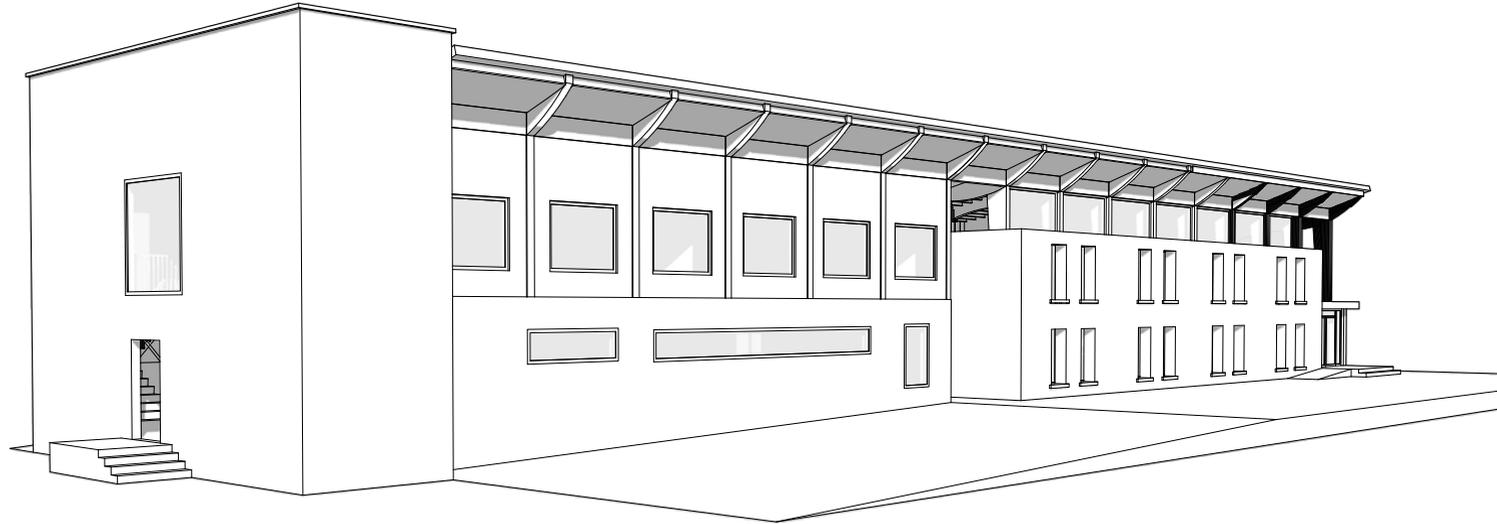


Ground floor plan

The glulam frame terminates with a concrete stair-core, which 'bookends' the building to the west, and provides lateral support to the frame. A second staircase, located at the opposite end of the building is required to meet fire code. The 'services' (kitchen, plant room, toilets etc.) are on the ground floor with the bedrooms on first floor, to take advantage of the expansive views.



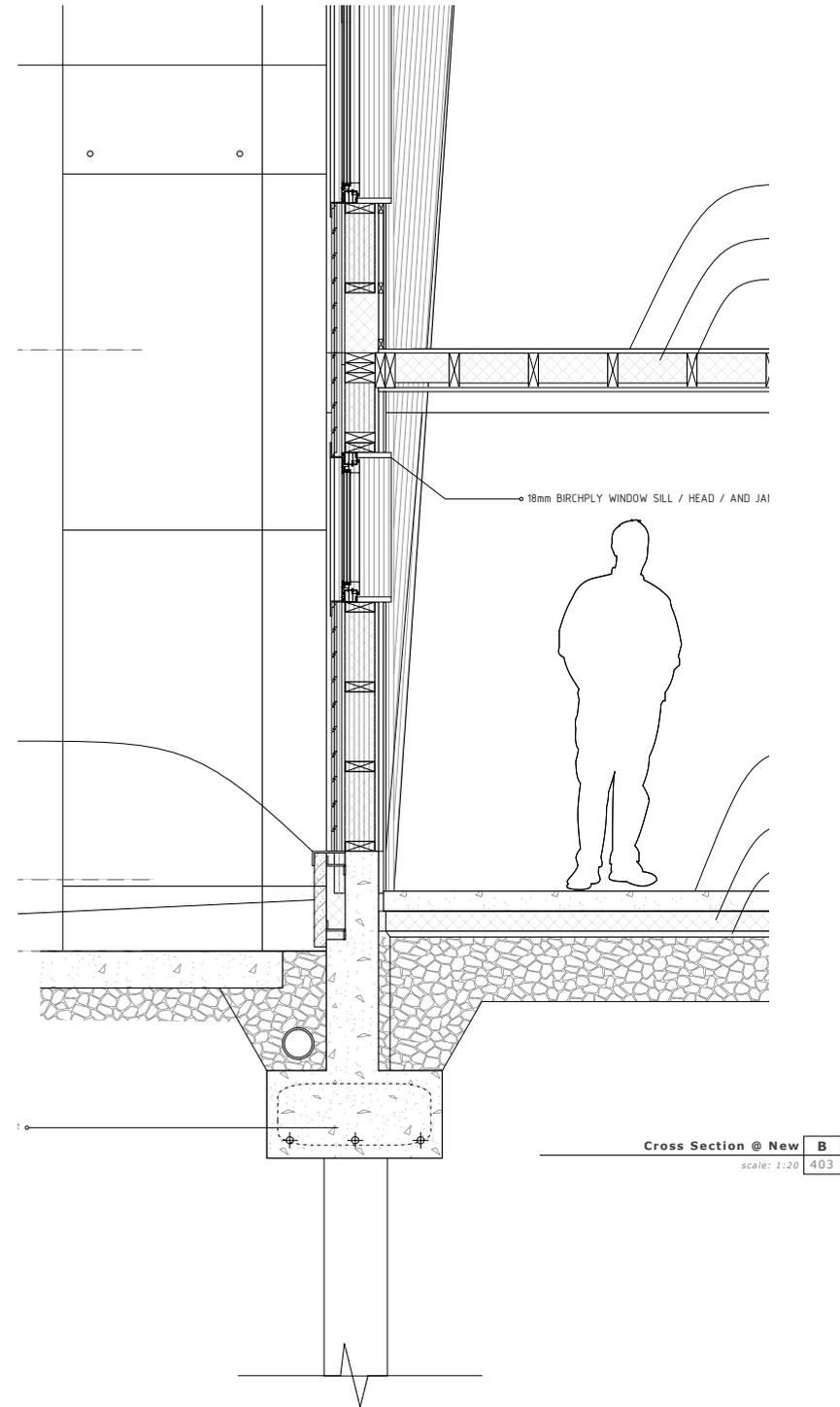
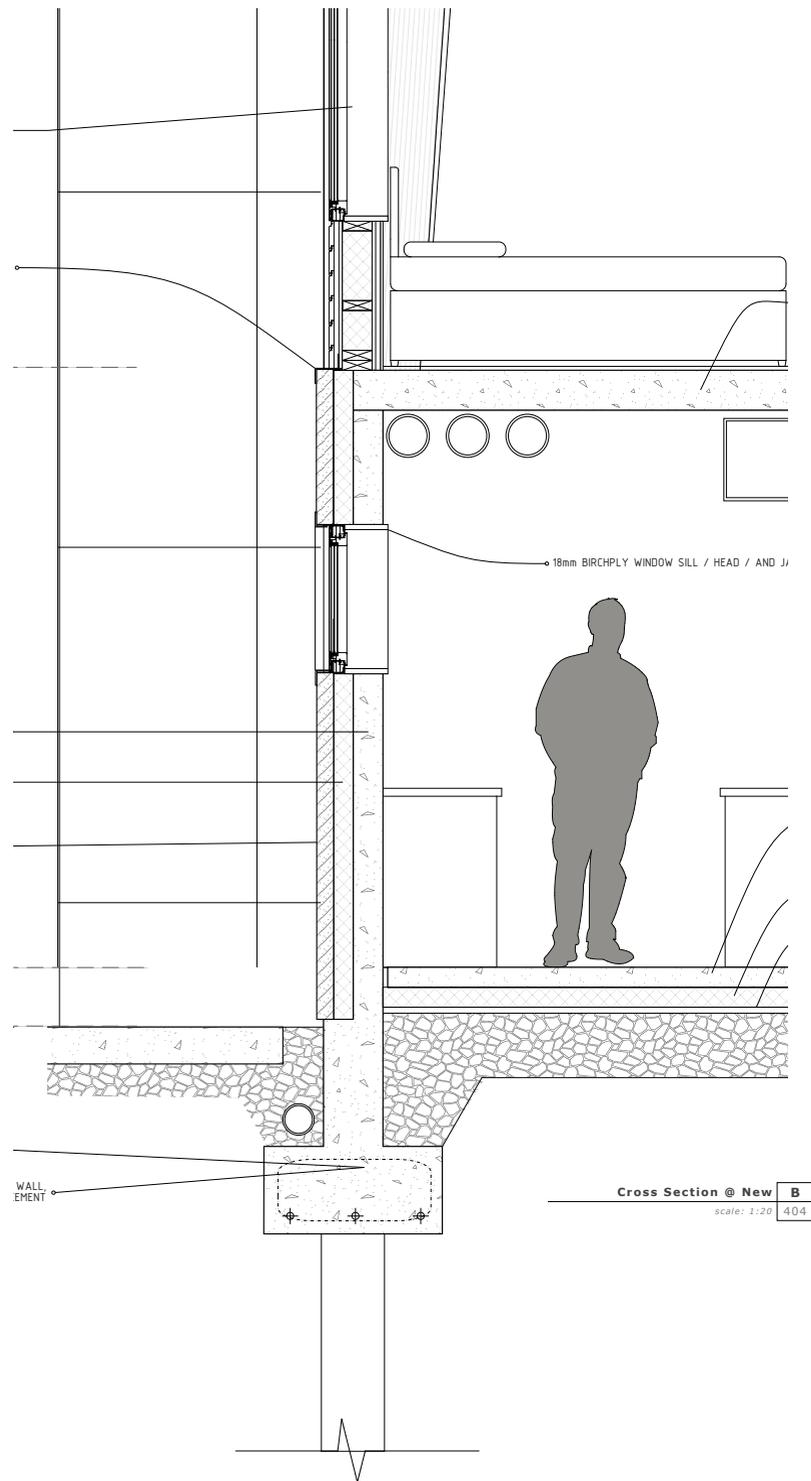
South elevation



External view from south west corner (concrete base in new building)

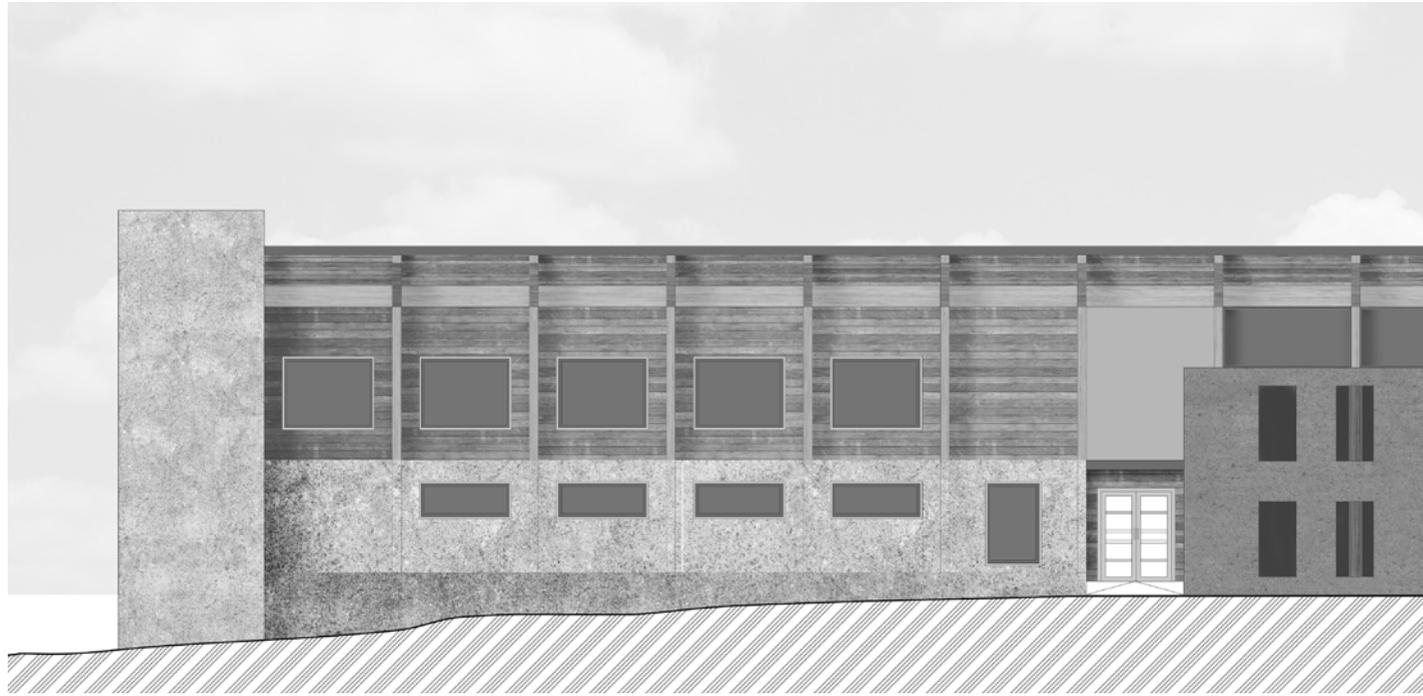


External view from south east corner (concrete base in new building)

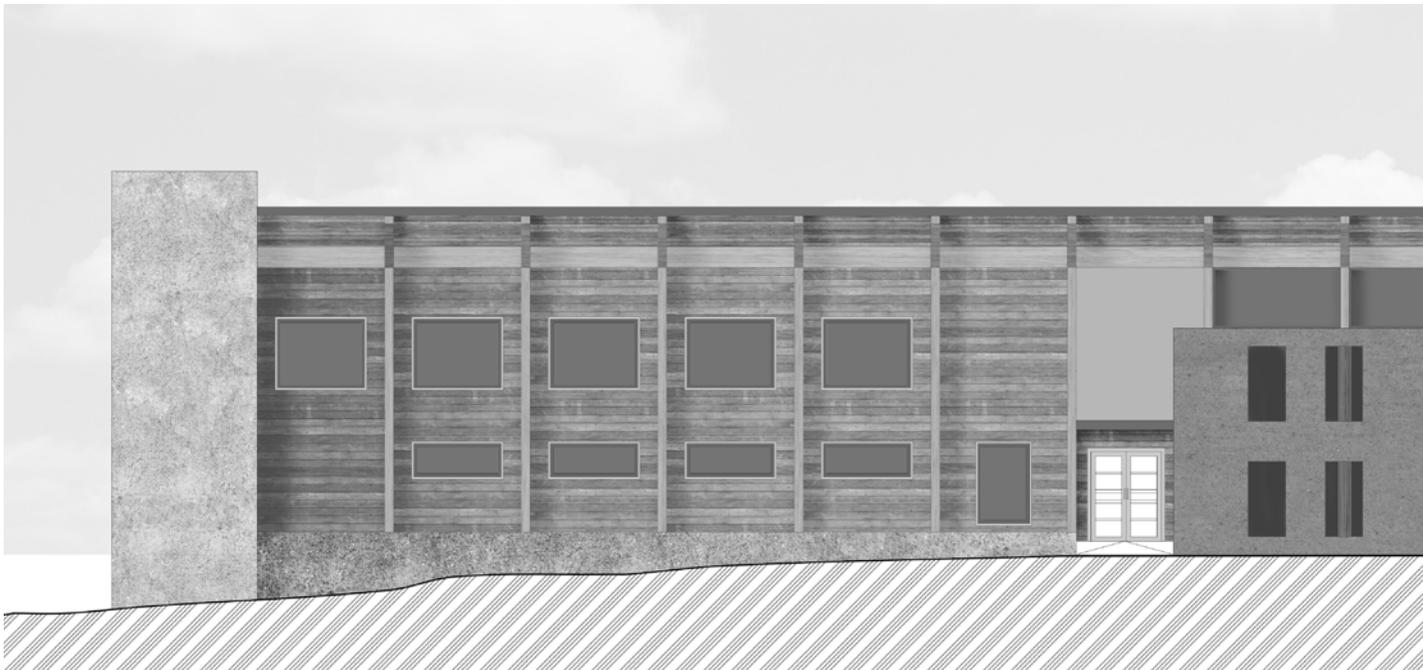


With the bedrooms and dormitory directly above the 'services' area, sound insulation is a significant factor. A concrete ground floor can act as a base for the wooden top, and also allows the use of precast concrete floor slabs, which achieve a greater, more solid division between the two levels.

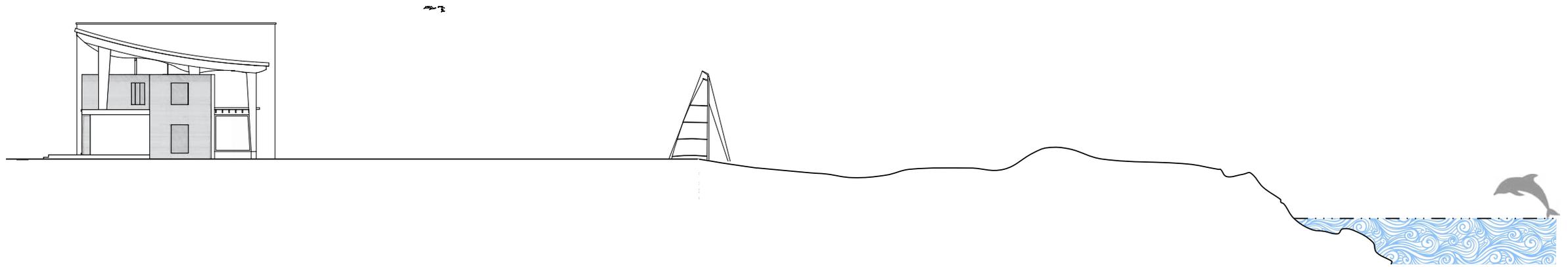
The concrete base does however involve cutting the glulam columns short at their bases, and thus the continuity of the frame system from old to new is clouded. Allowing the columns to come down to meet the ground in the new building, as they do within the existing walls, allows for a more harmonious relationship between both parts of the project. The use of timber frame partitions between the columns, clad with horizontal TG&V oak on the outside, also minimizes the material palette of the project.



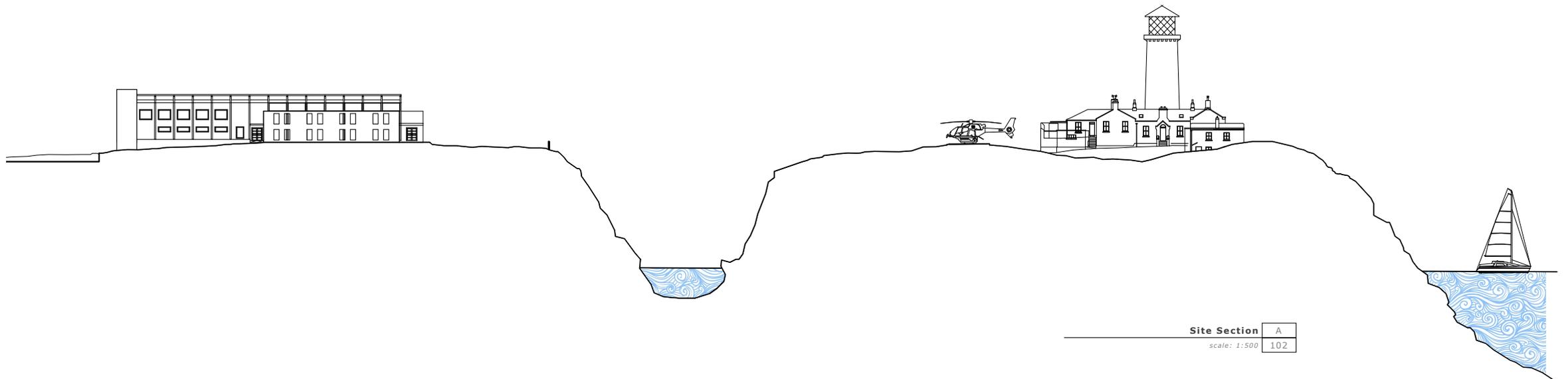
*Part south elevation
(concrete base)*



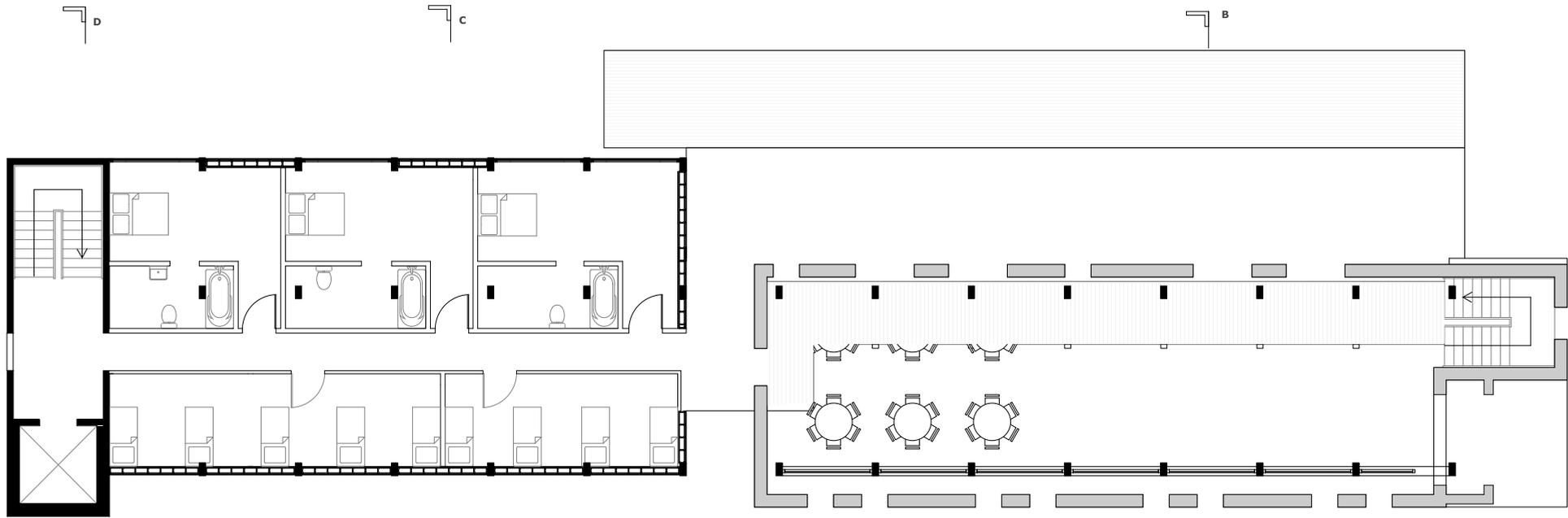
*Part south elevation
(timber cladding)*



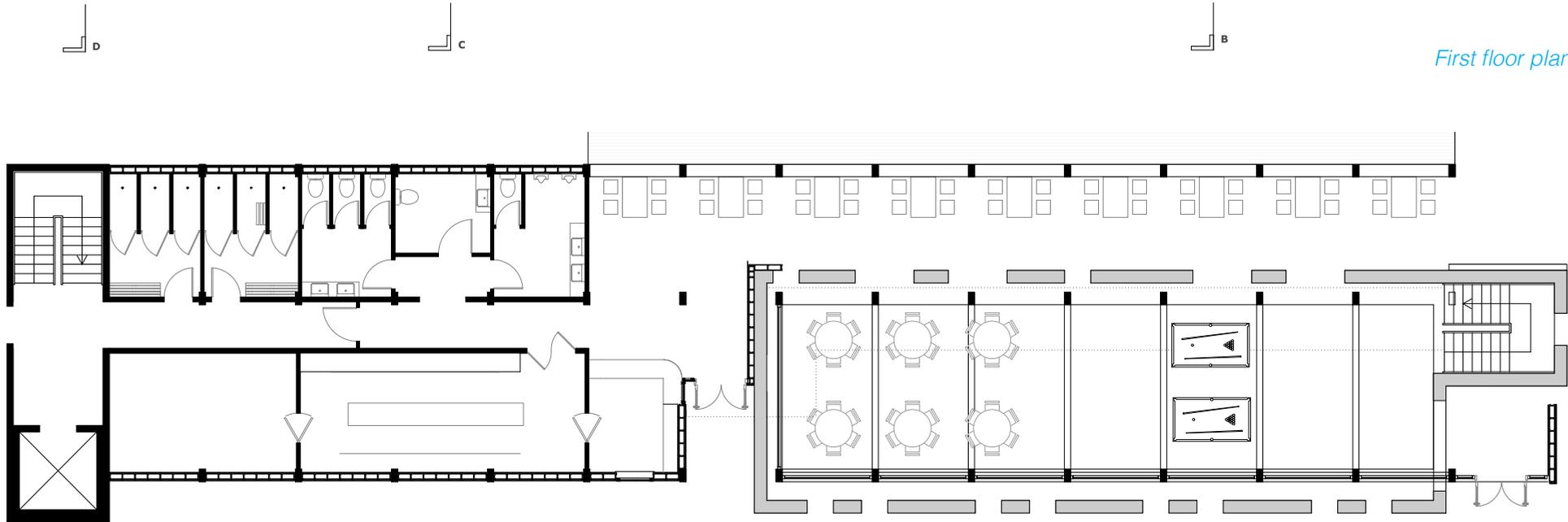
Cross Section @ Existing **B**
scale: 1:100 001



Site Section **A**
scale: 1:500 102



First floor plan

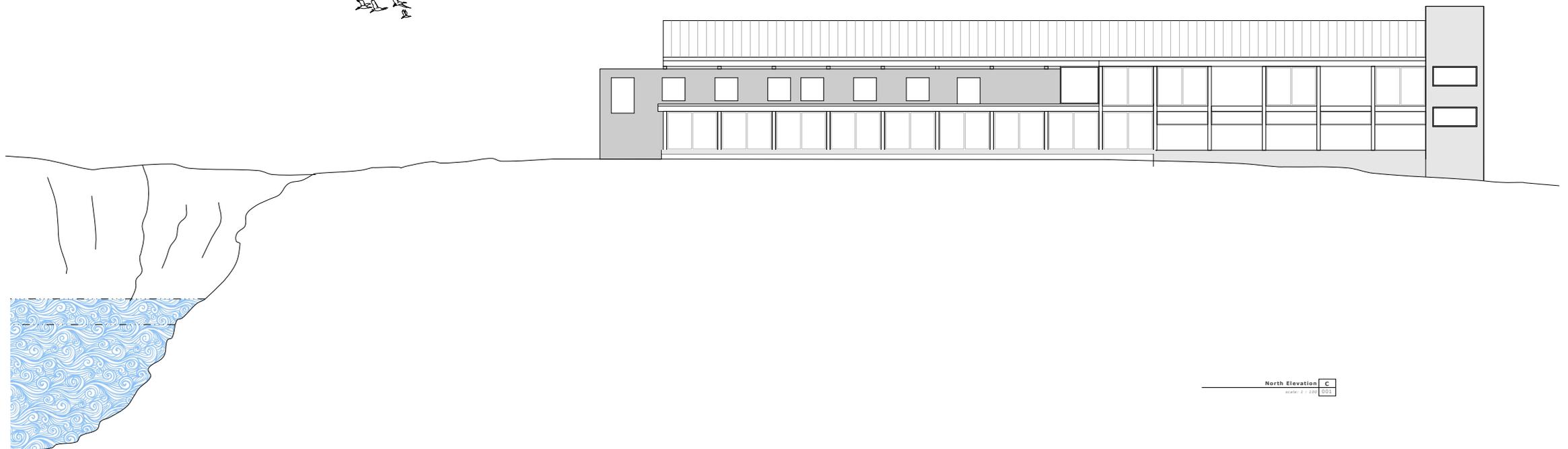


Ground floor plan

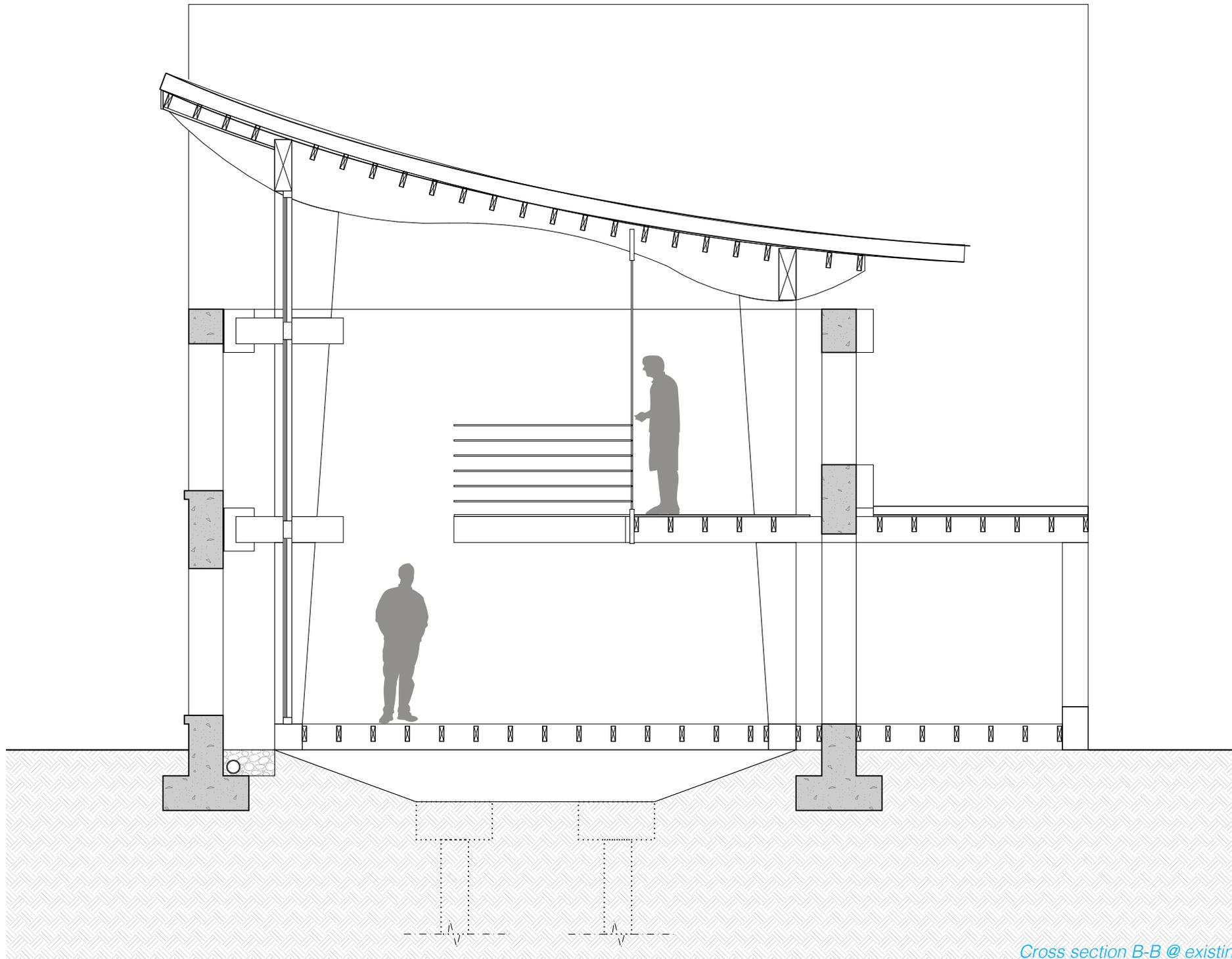


South Elevation C
scale: 1:200
001

2014.12.12



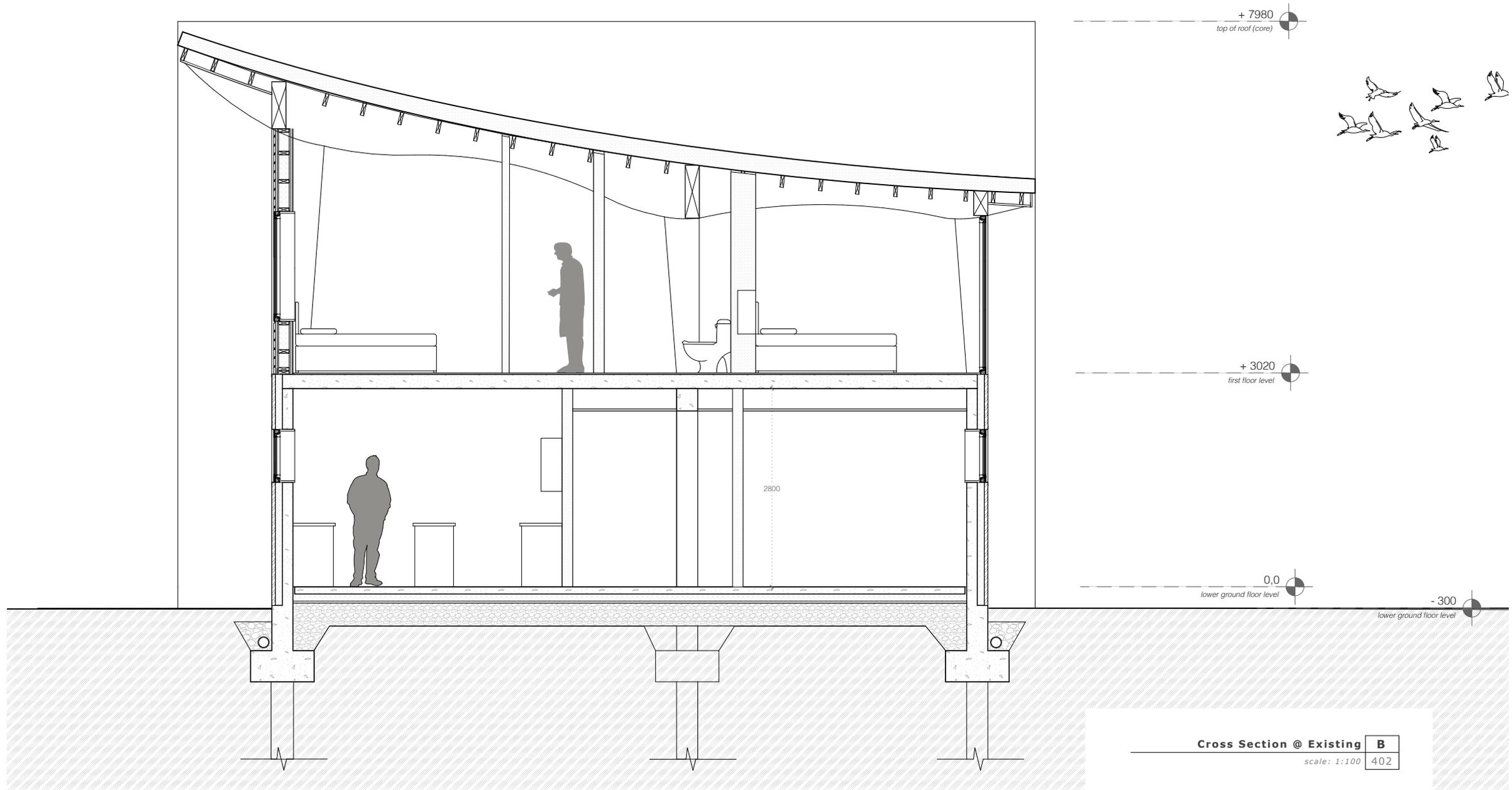
North Elevation C
scale: 1:200
001



Building the foundations to support the glulam frame, directly under the frame means that they are precariously close to the existing walls' foundations, potentially compromising them in the process.

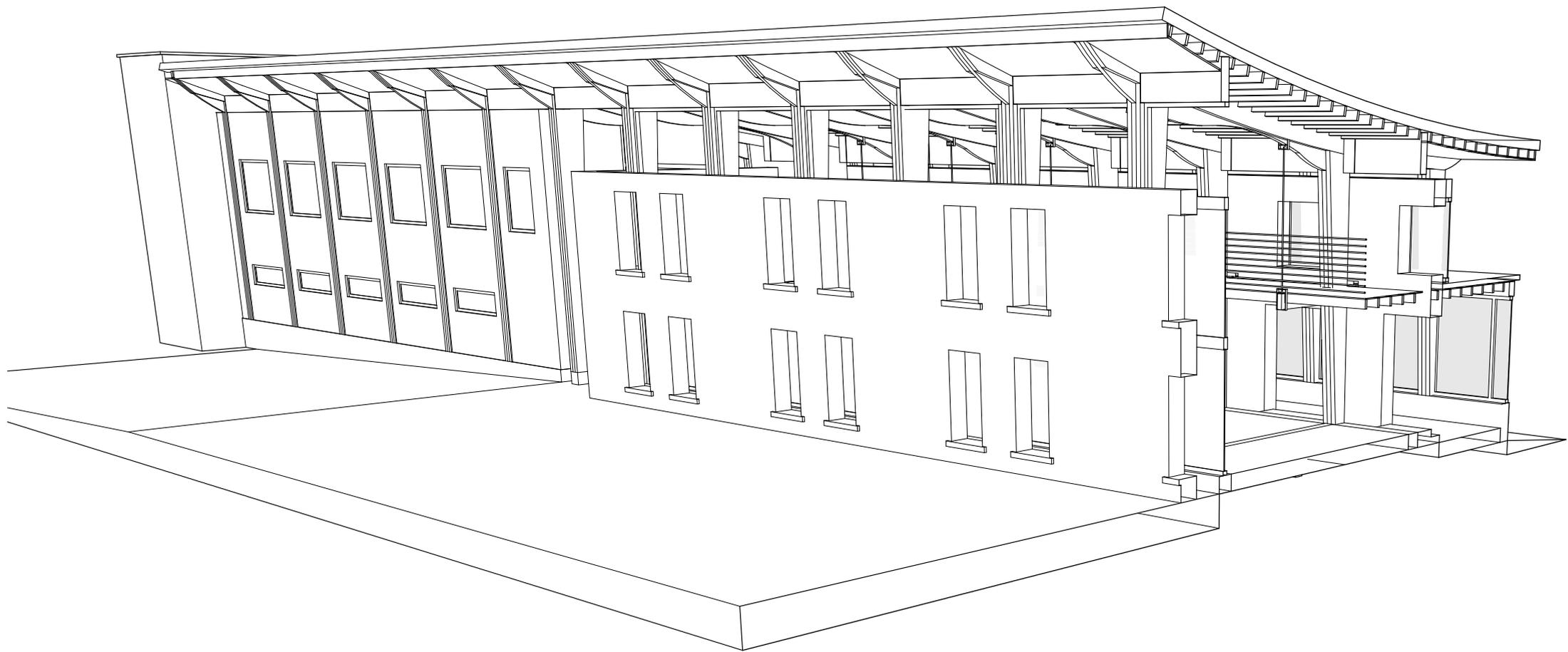
To avoid this potential problem, the new foundations step back considerably from the line of the existing walls to the inside, with cantilevering beams reaching out to support the frame. The tops of these beams are exposed on the finished floor level, echoing the frames spacing and rhythm on the floor.

Cross section B-B @ existing building





1:50 sectional model



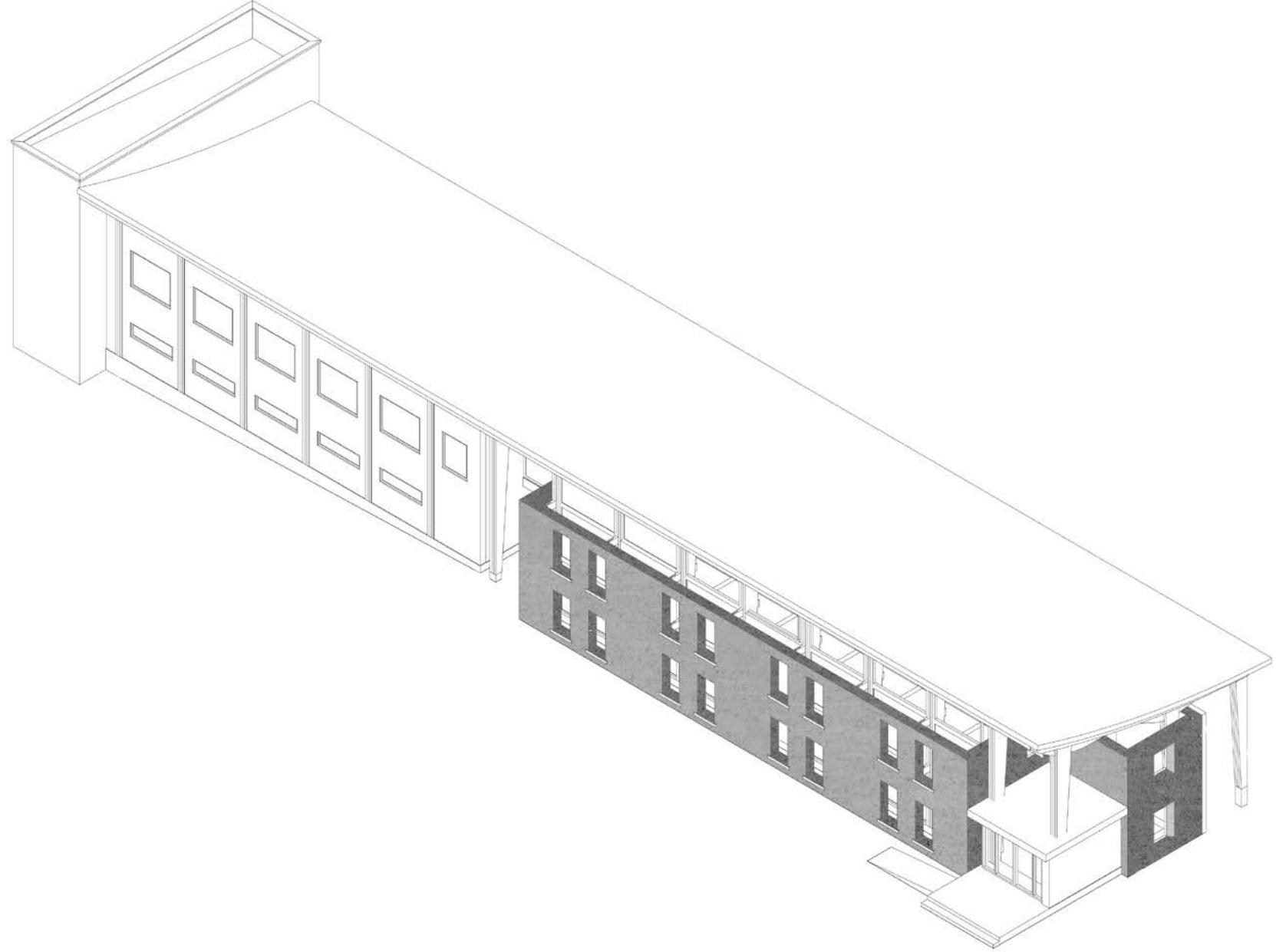
Sectional perspective from southeast corner



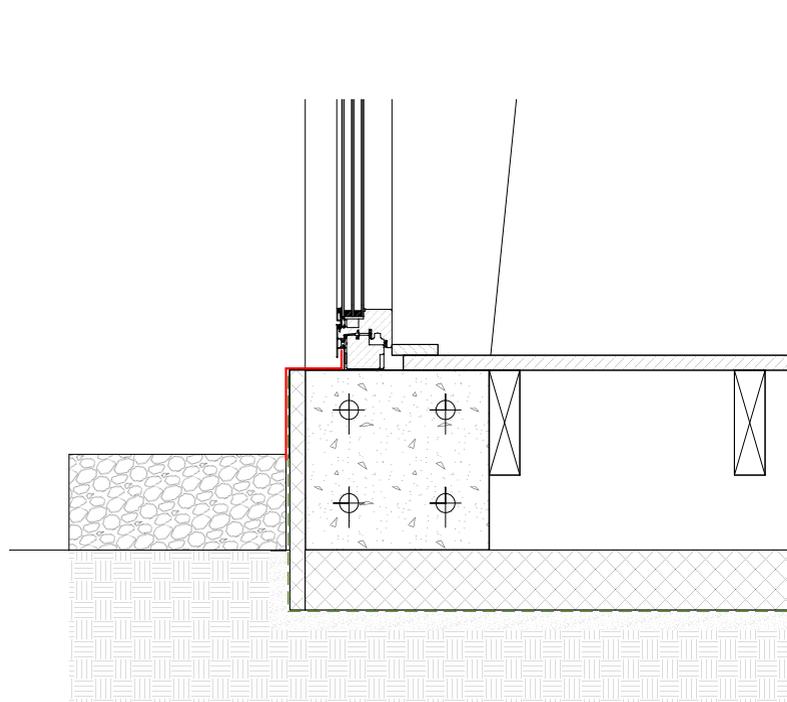
External view from southeast corner



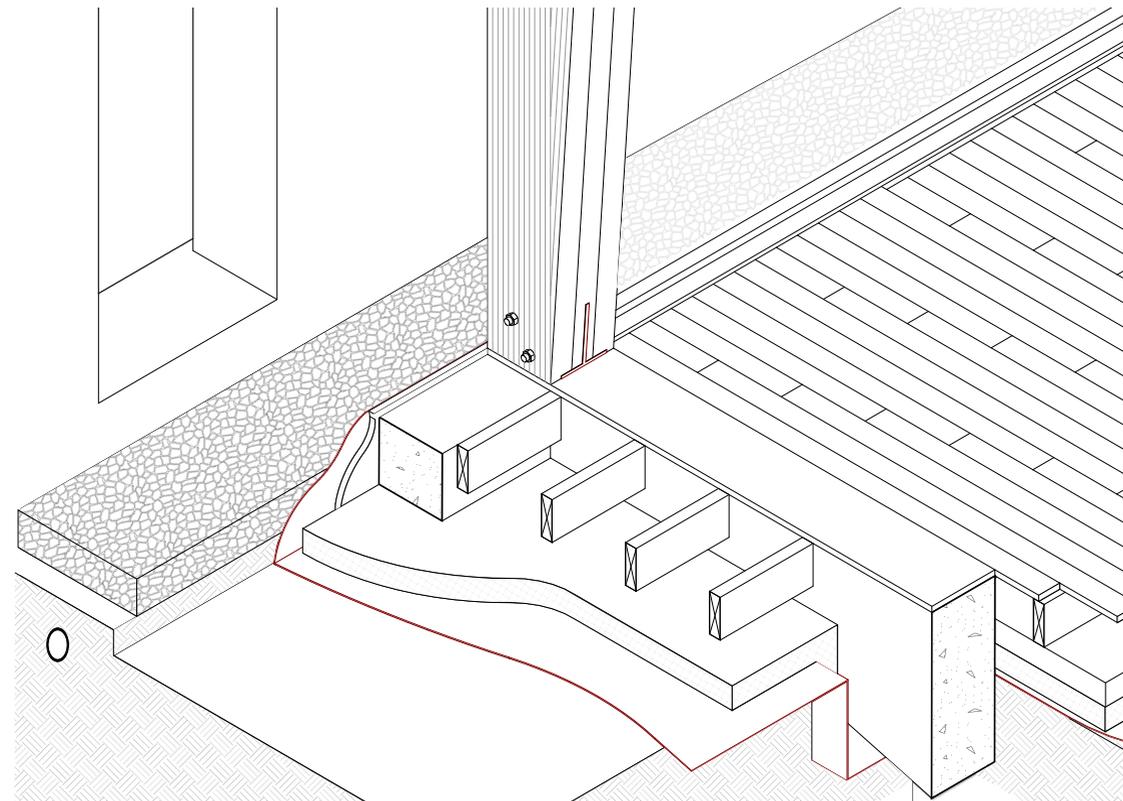
External view from northeast corner



DESIGN
DEVELOPMENT



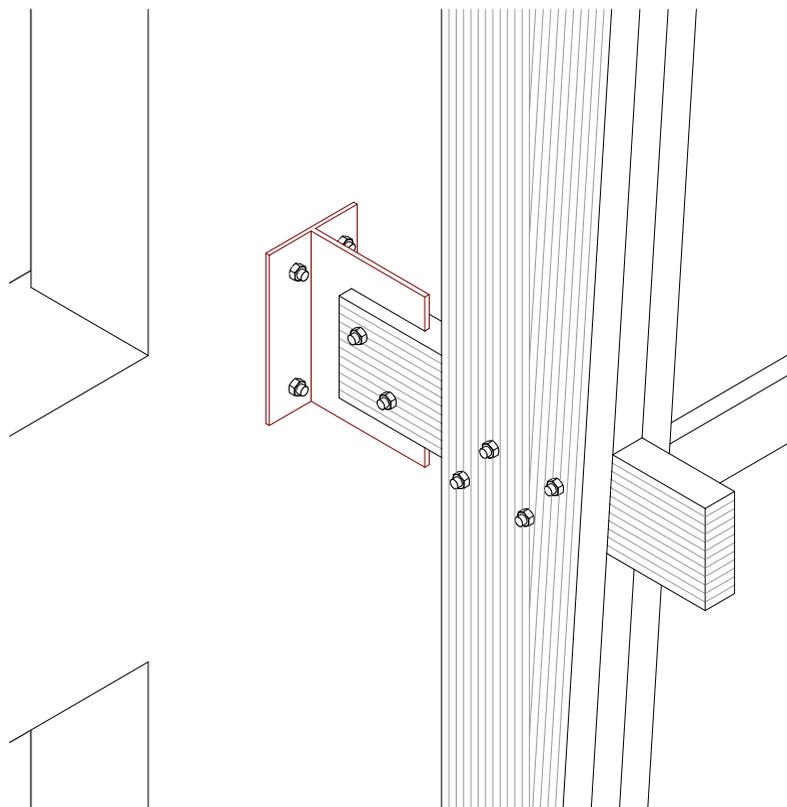
Detail section through new floor / frame foundation



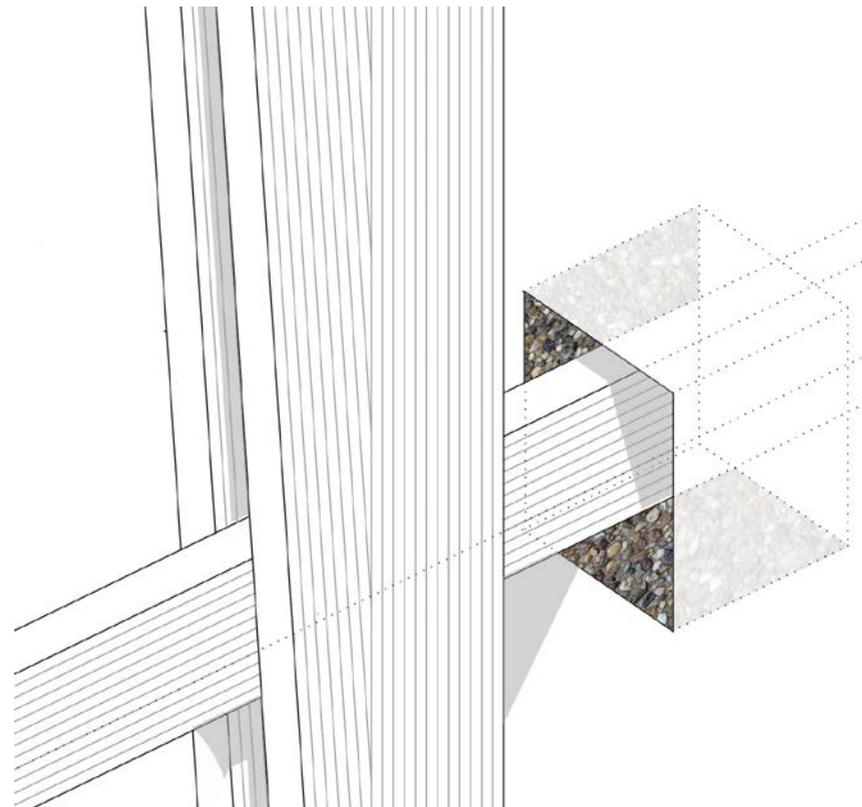
Isometric view of floor & foundation details

The steel plates which accept the columns to the concrete base are hidden, with only the through bolts exposed. In this way the steel connections (other than nuts and bolts) in the glulam frame only appear when the glulam makes a connection to the existing concrete (see image on page 65). The ends of the floorboards rest on top of the concrete beams, allowing for the expansion of the floorboards along their grain. The joists are hung as opposed to resting on the concrete screed, thus allowing the joists to be individually leveled independent of the poured screed levels.

To achieve the desired level of accuracy of flushness between the concrete foundations top surface and the timber floorboards, the concrete foundation beams are cast with a top surface lower than the finished floor level, and a screed is applied afterwards to match the timber levels.



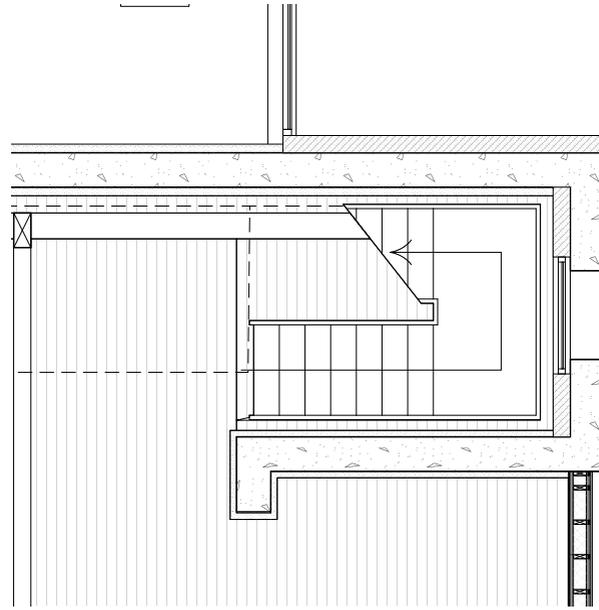
Isometric view of glulam frame meeting existing concrete walls



Isometric view of glulam frame beams penetrate through existing wall

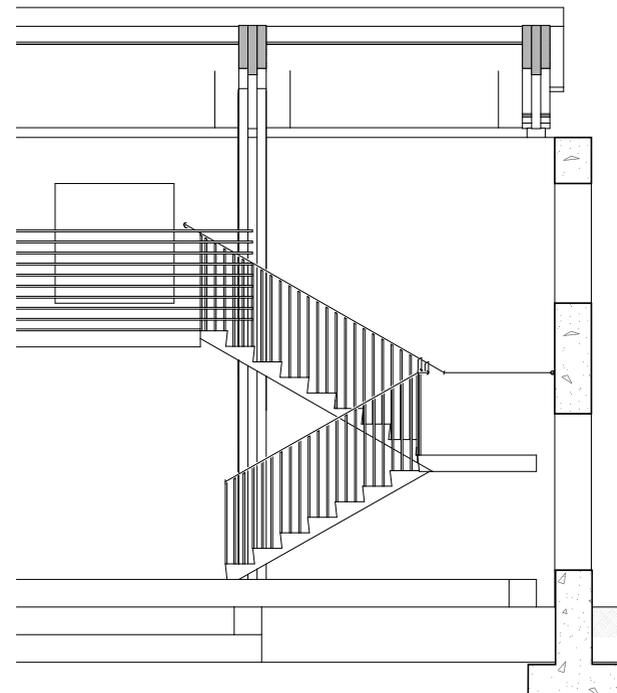
The image on the left shows the relationship of the glulam frame and the existing concrete walls. At these specific moments where the timber reaches out to support the concrete walls, a steel angle mediates the transition from old to new. It is at these moments alone that the steel connections are revealed, as if pulling back a sleeve to reveal a hand, allowing for an articulated handshake between the perishable wood, and the permanent concrete.

The image on the right shows the detail of how the first floor joists pass through the existing concrete walls on the north elevation of the building. The openings in the concrete are cut allowing a generous gap between the opening cut and the timber beams. The cut openings allow an examination of the concrete walls constituents, and expresses the tension between the two materials.



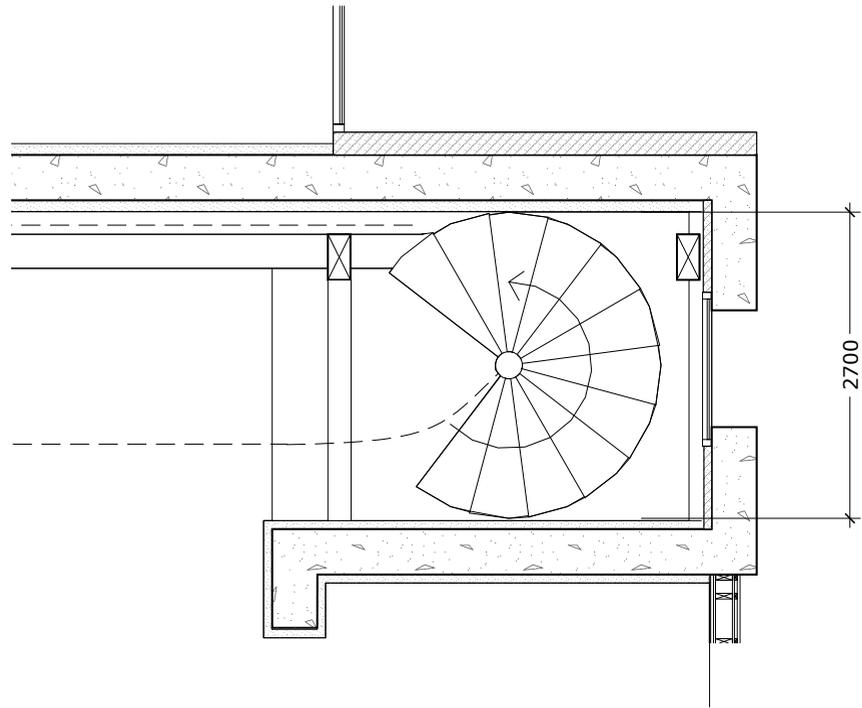
Part plan at east stairwell

The proposal to have a dogs-leg staircase fit snugly into the northeast corner of the building, despite being an appropriate location for the staircase, proves difficult to work as two glulam columns also occupy this space.

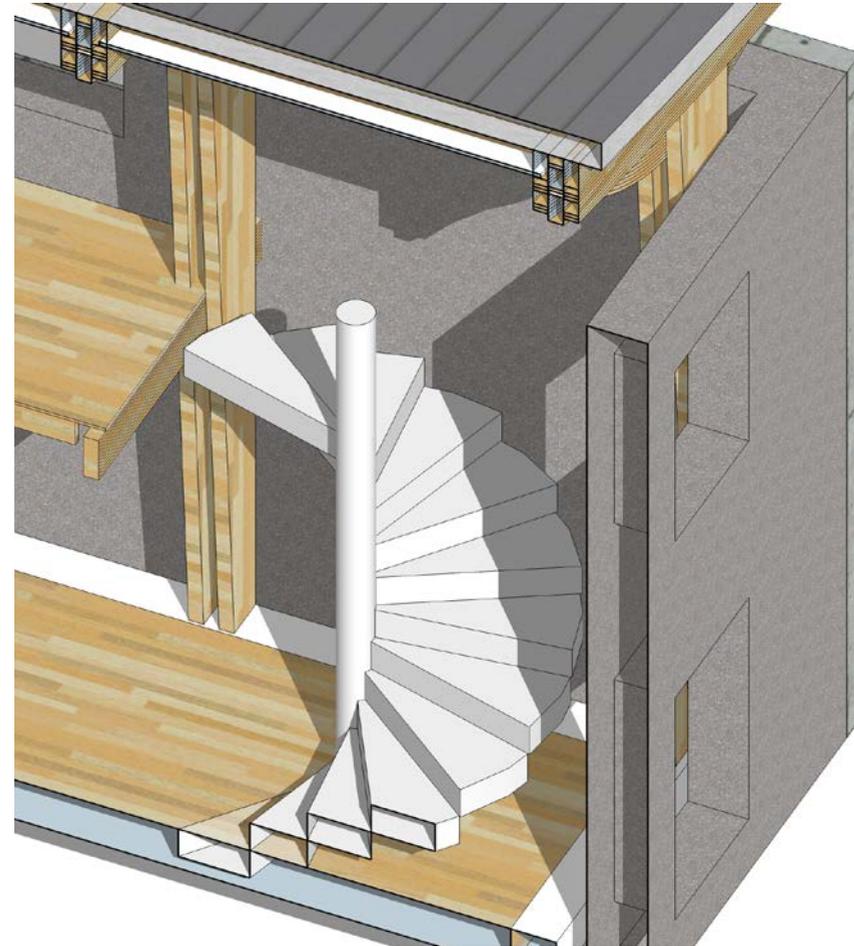


Section at east stairwell

A number of options for the stairs were explored, to find an arrangement, which fits this space along with the columns, while also articulating its independence from existing walls.

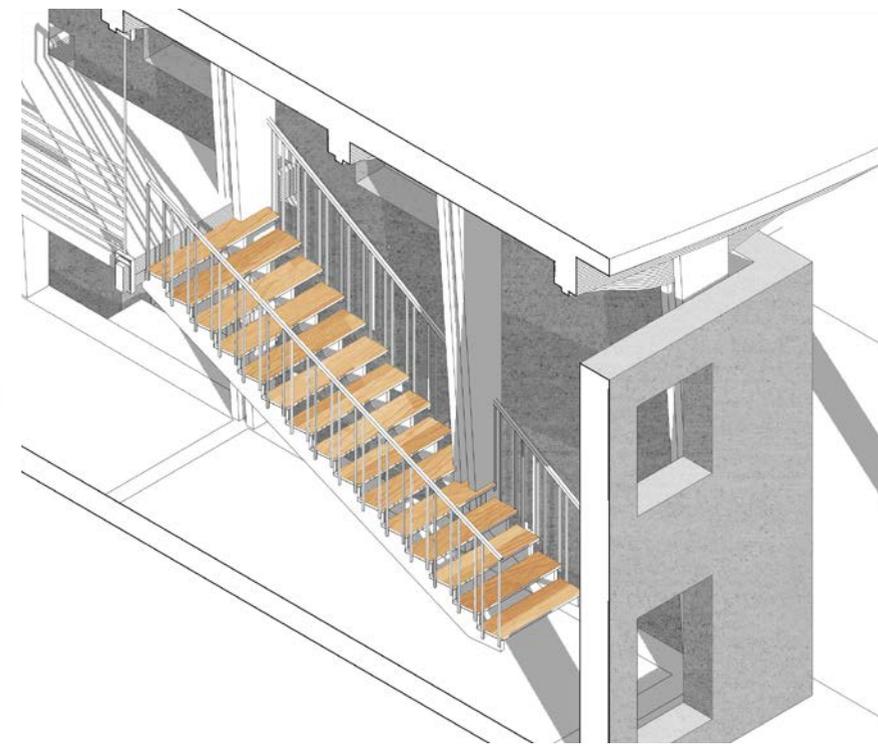
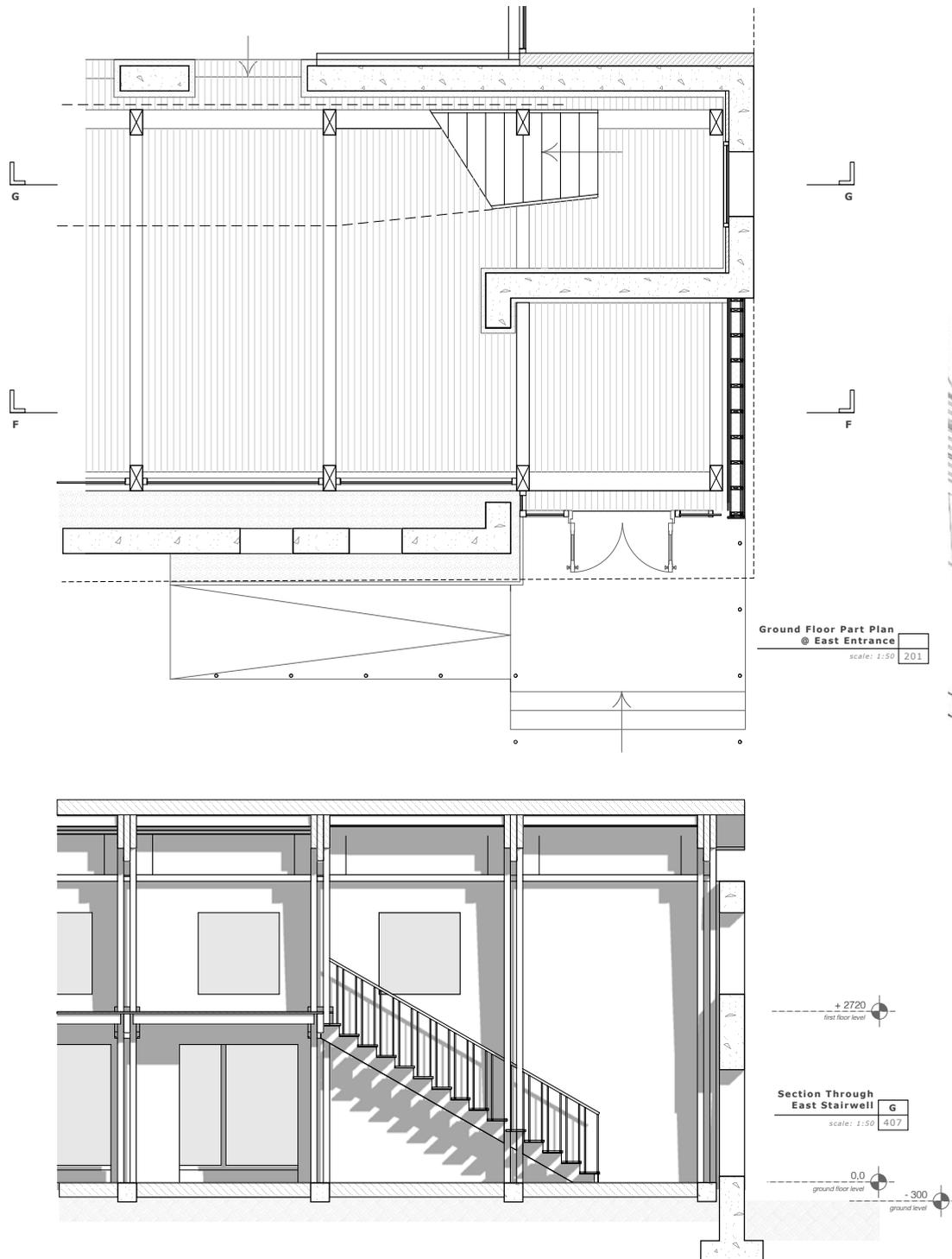


Part plan at east stairwell



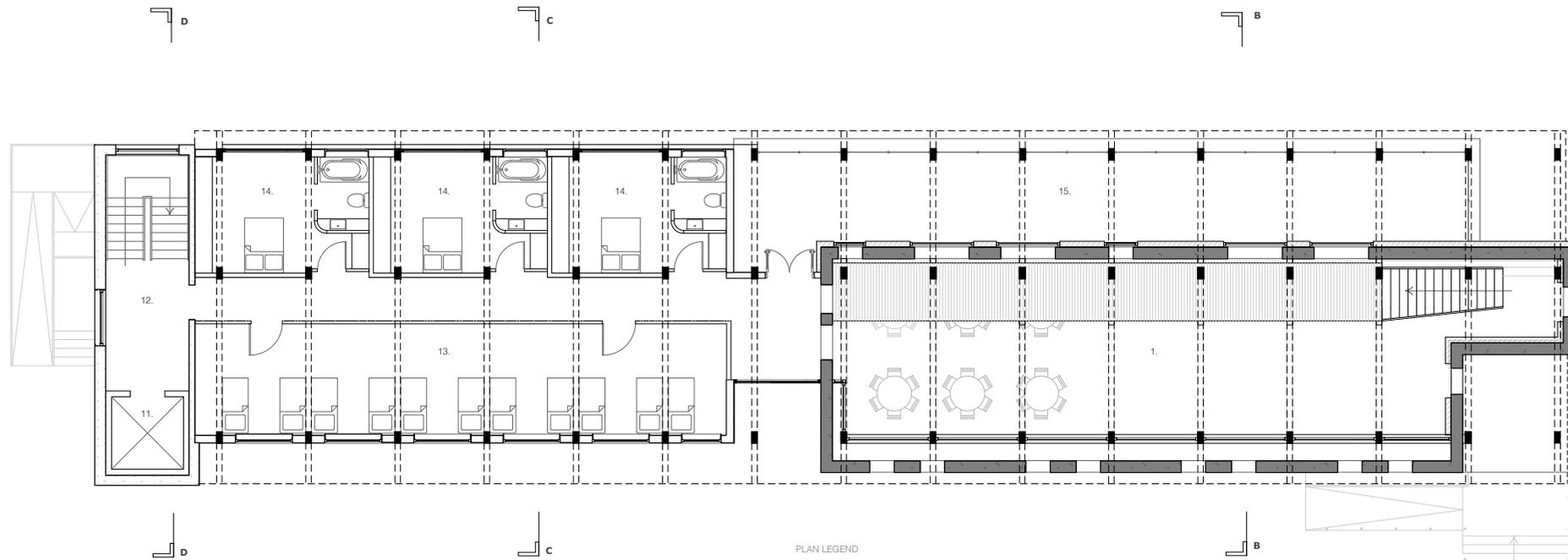
3D view of spiral staircase

A spiral staircase fits between the two column bays, and echoes the neighboring lighthouse. However they prove difficult to compose as the approach and departure from the stairs are 180 degrees from each other. Given the height difference, a spiral staircase cannot be achieved within the riser height limits.



A straight run stairs, which brushes past the columns, and maintains a distance from the existing walls, make it clear that they exist independently of the existing structure.

To allow at least the minimum widths for approaching the stairs at ground level, and to achieve the same width as the walkway at first floor level, the staircase tapers outwards as it moves up. This provides additional clear width as one passes the encroaching column, and again stands against the recti-linearity of the existing building. In this arrangement, one is faced directly with the tension between old and new, as approaching the stairs one is squeezed by the concrete walls, and then brush past the new glulam columns when ascending the stairs.

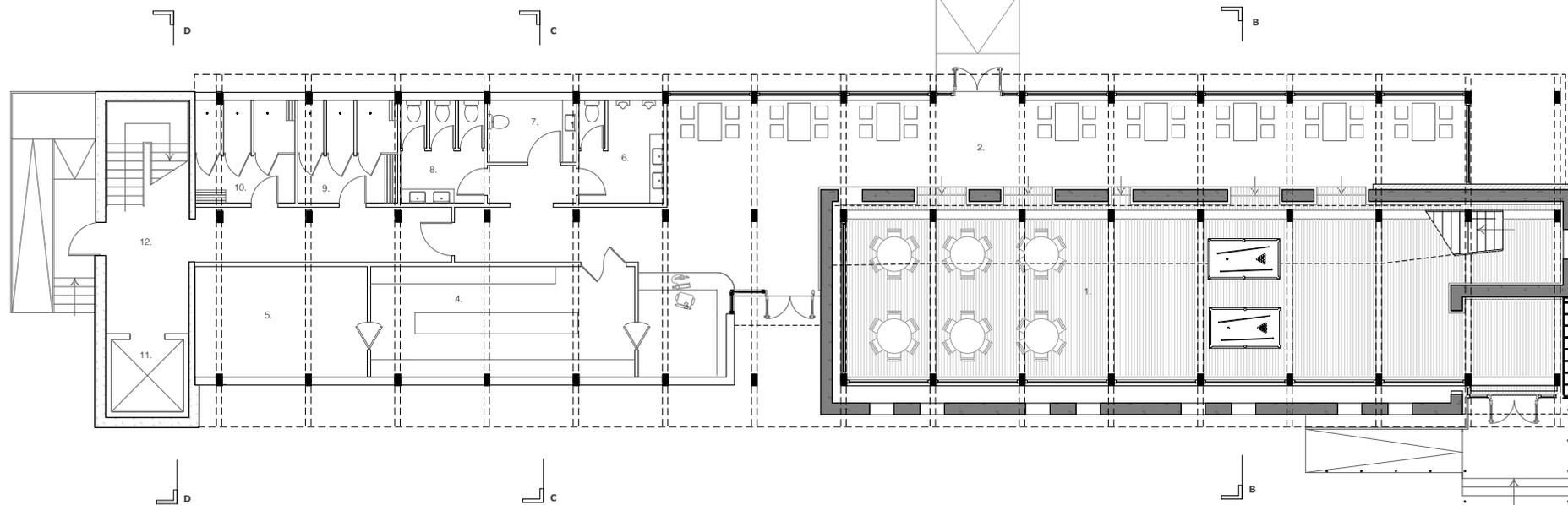


PLAN LEGEND

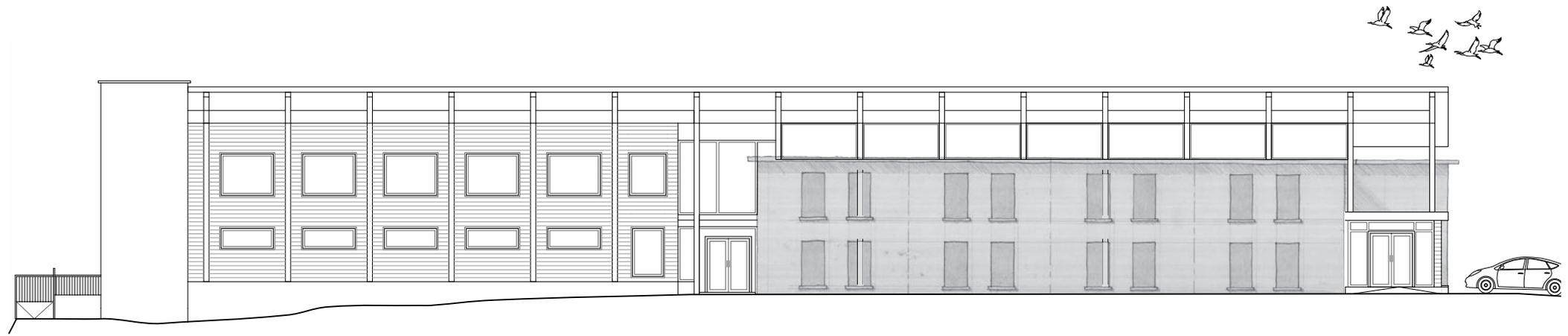
- | | |
|-------------------------------|-----------------------------|
| 1. Coastguard hall | 11. Elevator |
| 2. Restaurant | 12. Stair Core |
| 3. Reception / Entrance lobby | 13. Dormitory |
| 4. Kitchen | 14. Room (En-suite) |
| 5. Plant / Storage | 15. Roof Deck / Observatory |
| 6. W.C. M | |
| 7. W.C. DA | |
| 8. W.C. F | |
| 9. Shower Room M | |
| 10. Shower Room F | |



First Floor Plan
scale: 1: 100 202



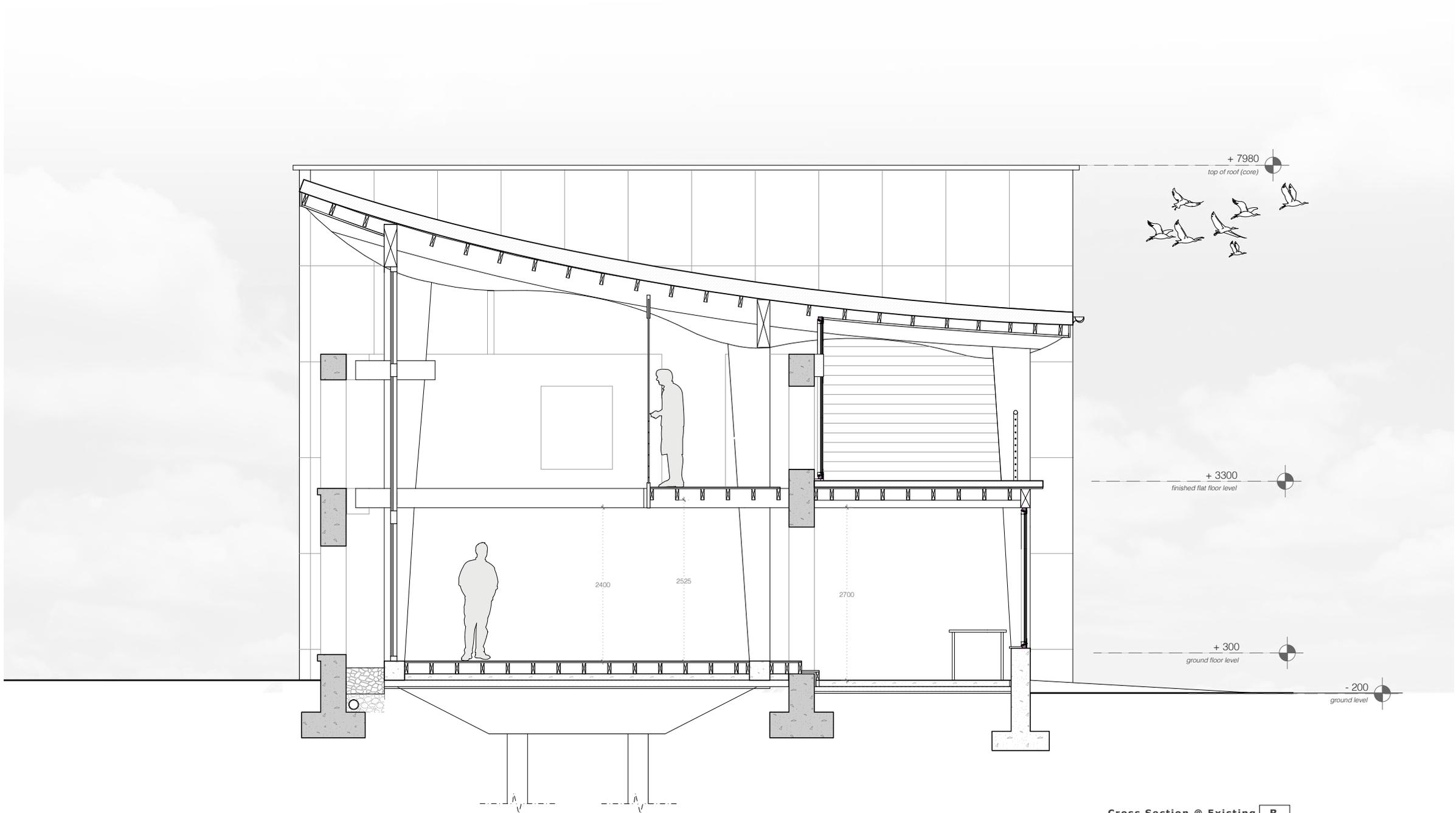
Ground Floor Plan
scale: 1: 100 201



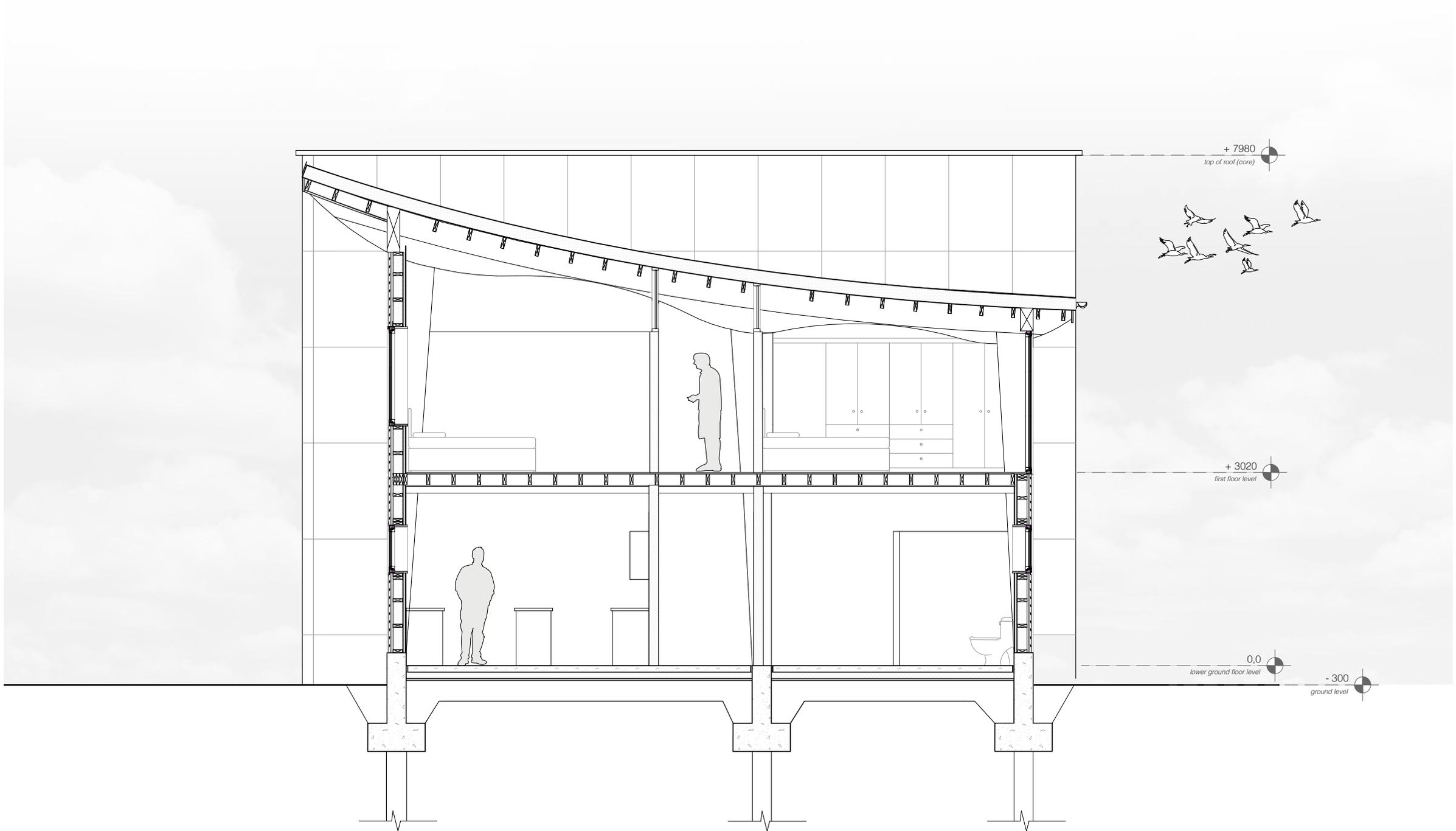
South Elevation
scale: 1 : 100 301



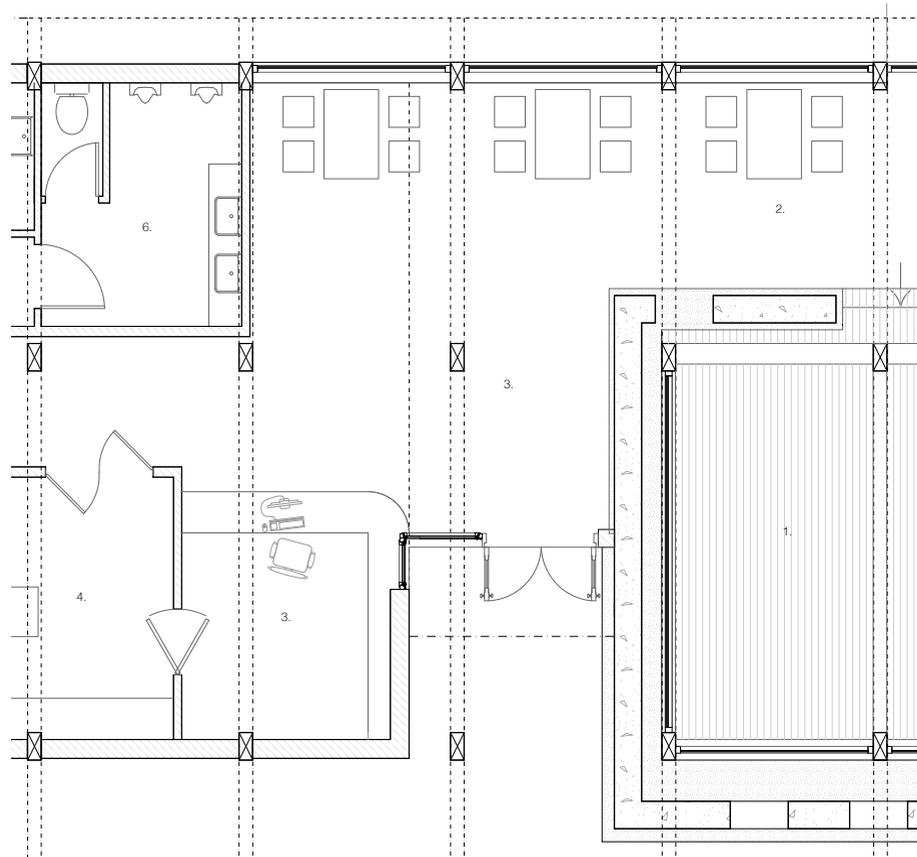
North Elevation
scale: 1 : 100 302



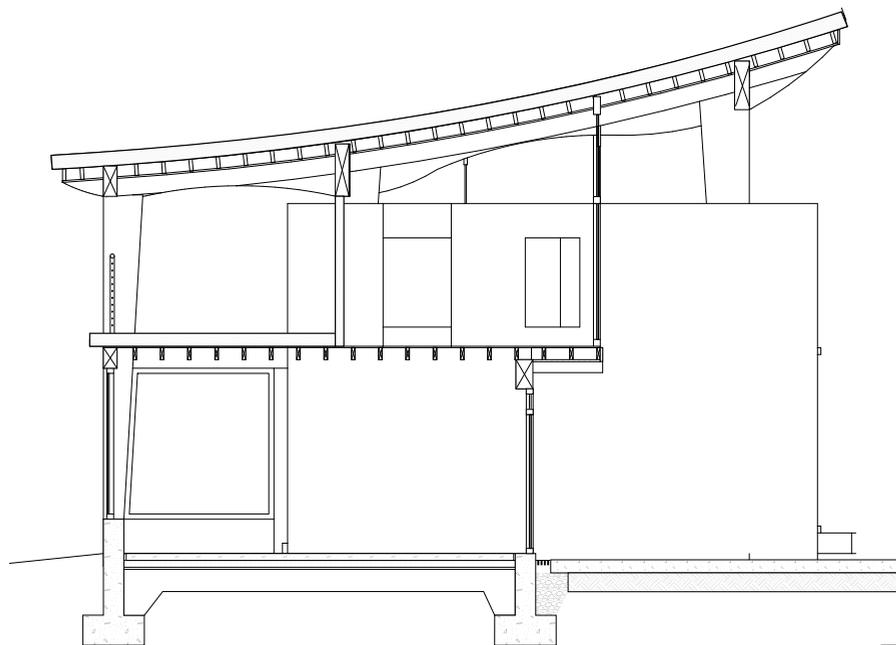
Cross Section @ Existing **B**
 scale: 1:50 402



Cross Section @ New **D**
scale: 1:50 404



Ground Floor Part Plan
@ Entrance
scale: 1:50 204



Section Through Entrance E
scale: 1:50 405

The main entrance to the building occurs in the space between the old and new buildings. The envelope of the new building is pulled back from one bay of the glulam frame, isolating a column at the entrance. This narrow space invites the visitor to walk between the juxtaposed old and new materials.

The set back of the entrance provides a covered outdoor space. The extensive use of glazing here allows the eye to see through the building to the sea beyond, enticing the visitor in and creating a visual separation between both portions of the building. While a contrast between old and new is achieved here, both work harmoniously together through the common denominator of the glulam frame system and curved roof.



Main entrance on south facade



Interior views of entrance space / reception



External view from southeast corner



Sectional Perspective



*Interior view of new space
to the north of the existing building*

REFERENCES

References

[1] Diamond, R., Wang, W., Eds. *9h No.9 On Continuity*; Princeton Architectural Press: New York, 1995, 61105

[2] http://www.davidchipperfield.co.uk/project/neues_museum August 24 2016

[3] <http://www.bureauofmilitaryhistory.ie/reels/bmh/BMH.WS1385.pdf> August 24 2016

Image References

Figure 1; Site Aerial Photograph provided by Keys & Monaghan Architects.

Figure 2; Google Street View <https://www.google.com/maps/place/Fanad+Head,+Arryheernabin,+Co.+Donegal,+Ireland/@55.2759106,-7.635107,3a,56.4y,63.68h,88.51t/data=!3m4!1e1!3m2!1sjp8OTi-NyfAUY-tu22QMjHQ!2e0!4m2!3m1!1s0x48f5585d75a040af:0x9114b24339564a18> August 24 2016

Figure 3; <http://www.muenchen.citysam.de/fotos-muenchen-p/alte-pinakothek-1.jpg> August 24 2016

Figure 4; Authenticity; Scarpa's Castelvechio <http://cubedesignresearch.com/2009/08/authenticity-scarpa-castelvechio/> August 24 2016

Figure 5, 6 & 7; http://www.davidchipperfield.co.uk/project/neues_museum August 24 2016

Figure 8; <http://www.e-architect.co.uk/london/tate-modern> August 24 2016

all other images (photographs, models, drawings and sketches) are the work of the author, and are not necessarily to the indicated scale.