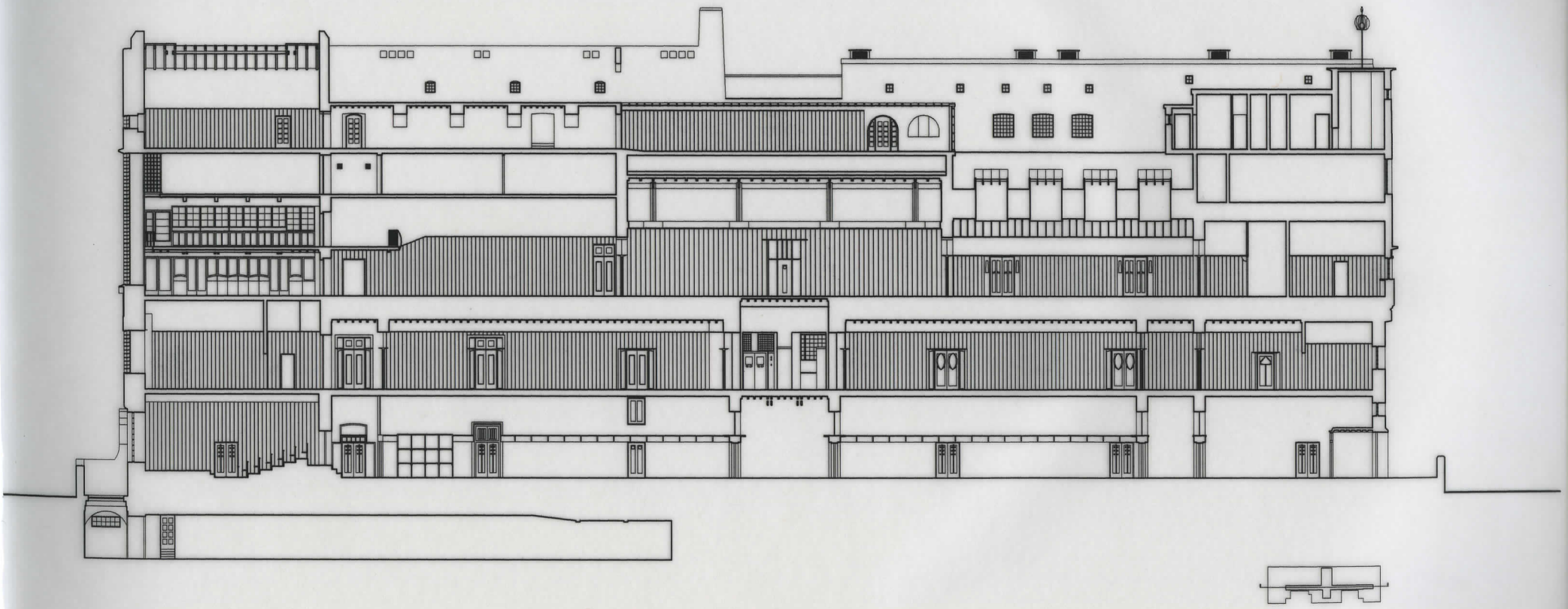
The Glasgow School of Art

The Appreciation of the Section

Robert Moore



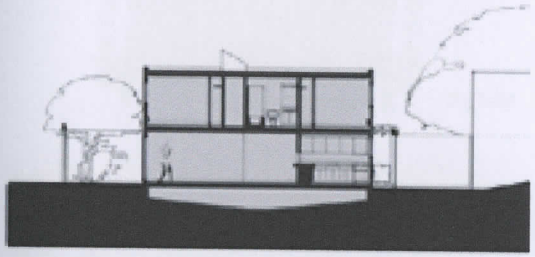
A Cross or Longitudinal section through any object or structure provides a visual orthographic projection better than any other form of drawing. The section emphasises the internal configuration of space in an elevation form and describes better than a plan the transition between solid and void.

The plan does consider how you approach the building and cross the threshold. It also defines the clear boundary of the building envelop. However the section goes further in being able to provide you with a clear representation of how the ground falls or rises around, under or over the building form. The section considers not only what happens at ground level but also what happens at the top of the building. This unique relationship is only achieved through the use of a section.

A greater level of detail can be expressed through a section. From a simplistic section showing floor levels to complex construction details, the section incorporates both and provides necessary information that is not available in other drawings.

By including a scale person in an architectural section drawing you are immediately able to identify the scale and character of a space within a building. It is only then that you will have some appreciation of what that space is used for and what it is trying to convey.

The building type is also easier to identify through a section rather than plan. The plan is often limited to its context yet the section is able to transform and deliver unique spaces within individual building types.



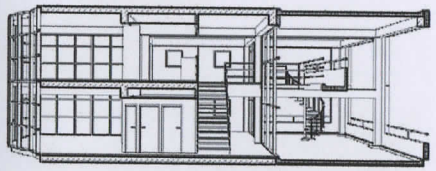


Fig 1.01

For example a two storey house may have a similar plan to that of a duplex apartment. In section, however the apartment may be 6 – 8 storey's from ground level while the house will have a direct connection with the ground. The section therefore offers clarity and precise acknowledgement of its type of residential accommodation [shown in fig 1.01].

Communities and relationships with neighbours are identifiable in a high rise housing block. Shown in section, it replicates the standard requirements such as structure and servicing. The main pattern of change and individuality is shown through an elevation. The elevation will always remain repetitive unless designed otherwise; the section will highlight people's own interpretation of space and comfort. Smaller rooms may be appreciated for some, while others may want one large open space.

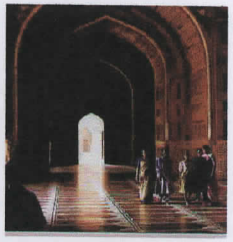


Fig 1.02

Some buildings such as the Taj Mahal achieve two unique experiences internally and externally. The building is manipulated internally to give a completely different form and composition from the grand exterior. The section highlights this change showing both the silhouette of the exterior form and the internal profile of the ceiling [shown in fig 1.02].

One building that does differ greatly internally from its exterior form is St Paul's Cathedral dome designed by Sir Christopher Wren. The external dome is an ovoid shape and not semicircular whilst

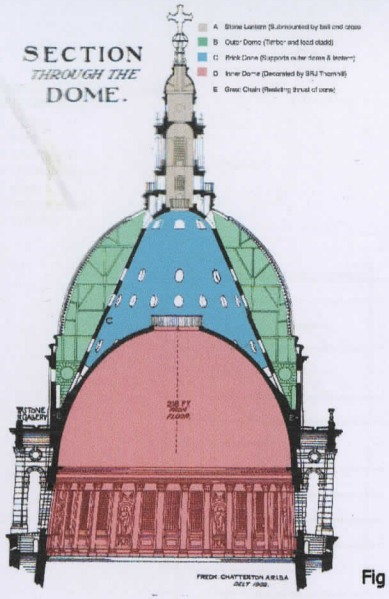


Fig 1.03

internally the inner dome has a semicircular shape with an opening in the top. It was intentional by Wren to transform the interior space by the inclusion of the internal dome. Not only did he hide the structure but he readdressed the scale of what would have been a very tall and unsatisfactory funnel over the central space of the church.

The vital parts of the structure are hidden from sight between the two domes. A third structural dome between the interior and exterior domes is the most important of the three and yet it is not visible from inside or outside the building. Only through the use of a section does it become apparent that it exists. Its purpose is to support the stone lantern and cross at the top of the timber and lead clad outer dome, which it structurally supports. Made from a cone of brickwork, the third dome is supported by chains set into the stonework and fixed to the main piers. Fig 1.03 highlights the space within the section (red) identifying the inner dome, green the outer dome and roof and third structural dome colored turquoise.

The cross section of one particular high rise apartment block that suggested an integration of both affordable accommodation in a densely organised vertical system, with community based facilities was that of the Unite' d' Habitation in Marseilles, France. Designed by Le Corbusier between 1946 and 1952, the section replicates a well organised system. The apartments can be stacked vertically, provide adequate access, incorporate various sizes and types and incorporate functional facilities for the residents.

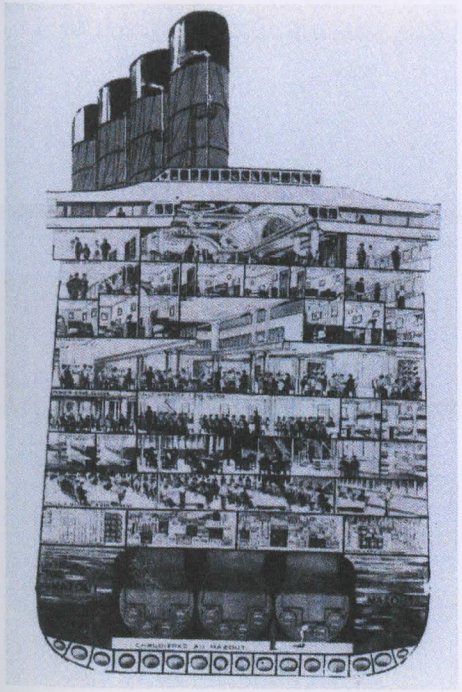


Fig 1.04

Le Corbusier suggested that the building would become self contained, integrated and efficient, often describing a house or apartment as a machine for living in. Whilst on this grand and more densely populated scale, the building would become a city that would incorporate all the necessary facilities and would maintain and preserve the ground level for other activities.

This form of accommodation already existed in another machine: the Ocean Liner. Le Corbusier was fascinated by the ship's ability to accommodate thousands of people within a densely enclosed space. The organisation of these spaces and how they dealt with providing comfortable living accommodation at a scale that still functioned adequately interested him [shown in fig 1.04].

The ocean liner provided all amenities required and this is how Le Corbusier perceived the way in which a building and community should function. It became the conceptual form for the Unite'd' Habitation and many of the ship's ideas were incorporated into the design of not only the public communal areas but also each compact apartment. The layout of each cabin was also meticulously planned to avoid unusable space. This level of detail impressed Le Corbusier. He strived to accomplish a similar, minimal yet functional allocation for the layout for each apartment type, whether it was for a bachelor or a family of six or eight.

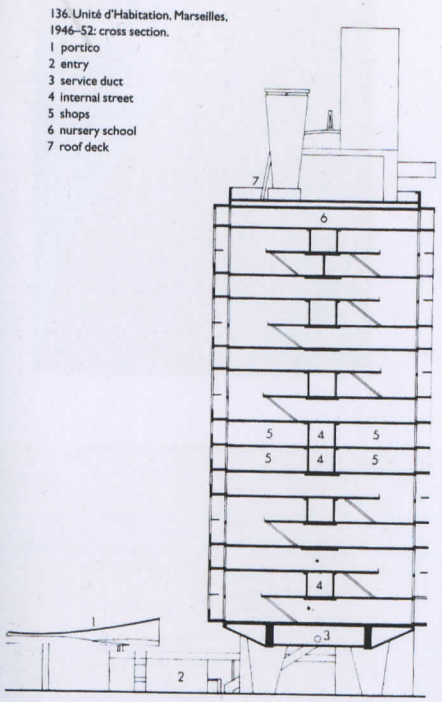


Fig 1.05

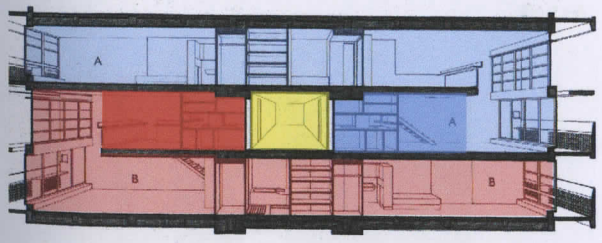


Fig 1.06

The Cross section of the ocean liner entitled "Cross section of a floating apartment house" was included in Le Corbusier's book, is noticeably similar to some of the major design components of the Unite' d' Habitation, especially identifiable in section.

For example, the building cross section clearly identifies the allocation of a different type of space at mid level compared to the rest of the section, currently providing community amenities. The balconies on either side of the building with attached Brise soleil replace the covered promenades along the ship. The internal corridor (street) provides access to the individual apartments similar to the form of organisation used on the ocean liner. The roof form deliberately expresses Le Corbusier's interpretation of the ocean liner with the scale and shape of the roof forms mimicking the funnels of the ship. The use of the roof for recreational activities and social interaction conforms to the use of the top deck of an ocean liner [shown in fig 1.05].

What makes the section of the Unite' unique is the staggered arrangement of the duplex apartments connected centrally around the access corridor/street. You enter either apartment at the same level but internally the circulation arrangement is turned upside down [shown in fig 1.06].

In apartment A you proceed through kitchen/dining and living area at street level with the bedrooms positioned above, adjacent to the double height living area. The master bedroom and children's bedrooms extend through to the other side of the apartment block. This works extremely well and benefits from having the larger floor area and double height space dedicated to the living quarters. In apartment B you also arrive into the kitchen/dining mezzanine but you have to descend down to the children's bedrooms. You then turn back on yourself to reach the master bedroom and living area. This apartment creates a poor relationship between kitchen and living area as they are on separate floors and there is no physical connection.

In section you understand the complexity that a duplex apartment creates when it involves the interaction of another apartment of the same type and access. This type of apartment could be manipulated to suit a single person by transforming the lower floor to suit living and private quarters.

The building is elevated off the ground and supported on exposed concrete pilotis. The section signifies the grand scale of the concrete columns. They have been manipulated to achieve a monumental and significant gesture of providing support for the building above.
Nothing happens directly below the building at ground level and I wonder if the building design had ever considered having apartments at ground level. Le Corbusier may have deliberately avoided the difficult constraint of having to design housing at this level. It would have lost its identity as a machine for living in and become a more mundane office block.
I have noticed that the building does become increasingly more like the form of a section through an ocean liner the more I compare the components of each. When the building is observed in its context it seems to float amidst the level of the tree canopy and replicate the concept of an ocean liner in the sea.

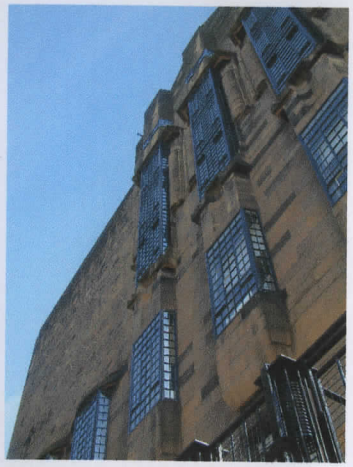


Fig 2.04

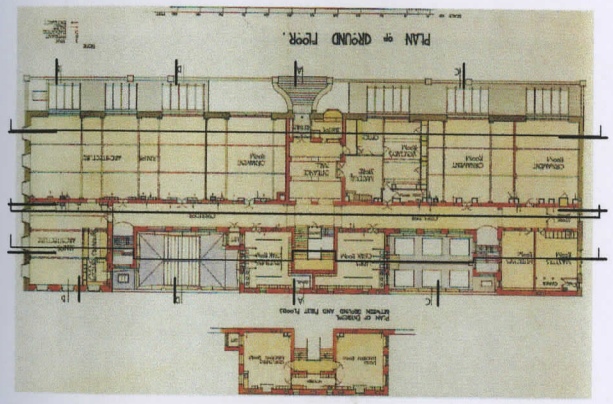


Fig 2.05

Fig 2.06

The Mackintosh school of art is undoubtedly one of Charles Rennie Mackintosh's most documented, visited, explored, discussed, photographed and greatly admired buildings of his architectural career. The building dominates the top of Renfrew Street in all its glory and elegant manner and is still functioning as an art school from the first day it opened. Fig 2.04 view of west elevation.

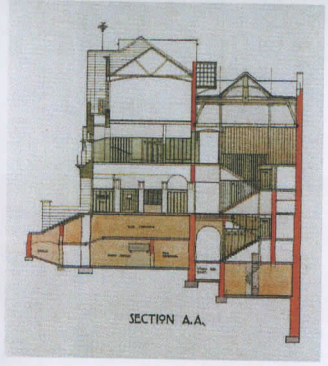
Many have written and discussed his ideas and aspirations of the building including Sorrel Challands, a former student of the Mackintosh School of Architecture who started the task by completing the first part; three longitudinal sections looking south [shown in appendix under fig 3.01-3.03].

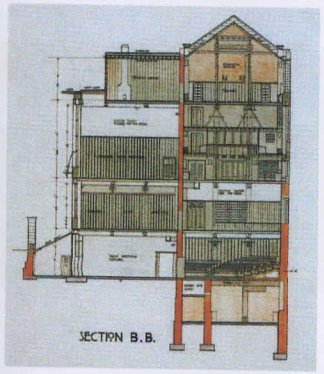
I was incredibility interested and intrigued from learning that no complete building longitudinal sections were ever accounted for before last year. Mackintosh himself did a number of cross sections in great detail but never included any longitudinal section drawings, which were requested for the submission of the competition.

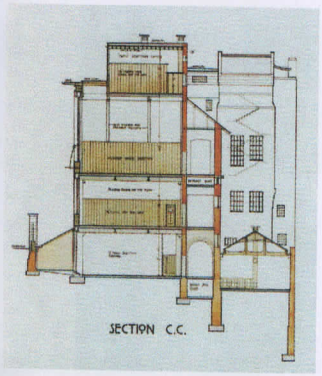
I decided to take on the task of completing the set by studying, surveying and drawing the remaining longitudinal sections looking north. It has been a great opportunity for me to be able to explore the many rooms and spaces within the building and complement the building and its designer by producing the drawings that in themselves explain further Mackintosh's legacy.

The first decision I had to make was the location of each section line through the building from east to west in three distinctive locations. The first I positioned close to the north façade this enabled me to capture not only the asymmetrical arrangement of the building but also the flexibility of the internal studio spaces. Mackintosh was a pioneer in formulating the use of partitions that were not structural but simply a means for dividing studios spaces. Each wall therefore, was only restrained by the positioning of the large north facing windows. Mackintosh exploits every available square inch of façade with glass and also parts of the roof that many have described as more industrial than arts and crafts. Fig 2.05 shows the ground floor plan facing north with the three longitudinal section lines and four cross section lines.

The second was taken along the length of the corridor that provides access to the primary spaces of the studios and enclosed spaces of the library on the west side and board room on the east. The half level balcony and lantern roof lights transform it into something special and less of an archetype. I considered it important to establish a link with the cross sections that all show some part of the corridor and felt it was important that it is viewed in longitudinal section, which would never be achievable in other formats. Fig 2.06 is a photograph looking from east to west along the corridor allowing an undisturbed view of the linear space that is now obstructed by inclusion of fire doors.
The third section line explores and defines the two opposites that exist within the building. The bright and symmetrical Board room designed during the first phase with the dark double height timber library designed much later during the second phase before completion. It also highlights the south façade and clear definition of the E shape plan.







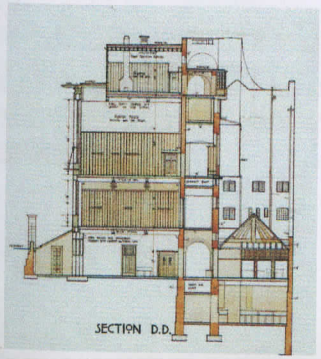


Fig 2.07

The four cross sections included and revised several times by Mackintosh play a compensative part in understanding the building and his interpretation in dealing with a steeply sloping site. Fig 2.07 shows the completed cross sections through the building.

Section A is cut through the main entrance lobby, director's office and museum and identifies the transition between the gradual movement from street, up into the centre of the building into a space dominated by columns similar to that of a Portico. From there you transcend through into a clearing at the base of the stairs, replicating movement through a palazzo into a cortile or in this case the atrium of the museum. By achieving this you are unaware that you are at midlevel within the section and plan. This ingenious idea by Mackintosh created enough space below to provide a further two levels and benefit from the topography of the site. Mackintosh was also great at improvising: instead of refiguring any of the first phase, he instead provided the connection between the upper floors by means of a cantilevered corridor known as the hen run.

The other sections B, C & D provide you with a detailed inspection of the internal, less public spaces and educational rooms. On the north of each section you perceive the generous space allocated to each studio and transparency of the north façade. The professor's offices occupy the top level adjacent to the loggia. The corridor dissects the centre of the building plan and section. Where the plan narrows between the three fingers of the building, natural light from the south filters into the corridor from above in the east corridor. This creates an altogether sharp contrast with the studios, which only receive north light on the lower floors. The corridor is transformed into a place to chat and socialise whilst the studio spaces are colder and perceived as a place where work materialises.

At the top of the section cut through the corridor, the atmosphere and scale is transformed, almost mimicking what should be located at the base of the building. Instead, the intimate spaces created between the dominant, over-elaborated arches allow for students to sit and study. This is surely jeopardised by the amazing panoramic views south over the city, by the use of the bay window that is one of the few significant elements that exists on both north and south elevations.

On the south side of the sections, two naturally top lit studios are provided at basement level both used for life modeling and anatomy. Internally they create warmer environments than the other studios and yet are hidden and considered inappropriate for the public domain of the street. The library and lecture theatre conclude the cross sections shown in section B. The library is clothed in dark timber and surrounded by tapering internal columns replicating the form of a forest. The columns, like other structurally elaborate false elements in the building, do not function as they seem intended. The floor above is in fact supported in places by supports from the structural beams above. The double height space with mezzanine level makes the library seem as grand as and more important than the museum. It is this west side of the building in which Mackintosh's style and maturity as an architect is revealed.

Fig 2.08

Fig 2.09

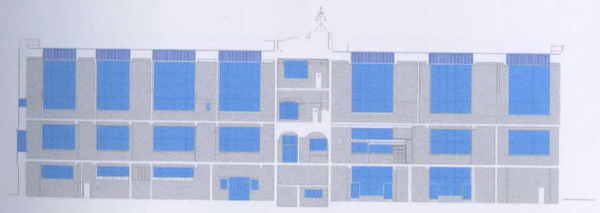


Fig 2.10

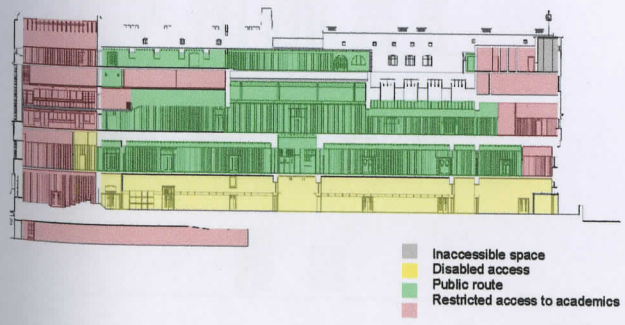


Fig 2.11

It is relevant to compare the three sections drawn south by Sorrel and the three I have completed looking north.

Section A: A

The north section is the only way by which to experience the internal arrangement of the façade. It highlights the fact that the internal walls are incorporated as a partition and the studios could easily have been one or two large volumes within the shell of each floor level. This is demonstrated on fig 2.08 coloured red is the studio volume, blue the director's studio and brown the boiler rooms.

It is difficult to view, either through sketches or photographs, the complete internal studio environment of the whole building at once. The section realistically portrays this and only an elevation would achieve a similar experience. It too is difficult to photograph all at once as the building is dominant on the narrow street and results in several photographs merged together. Fig 2.09 is an oblique montage image by Adrian Brannan showing the difficultly of perceiving the façade.

A small window in the life room on the first floor was only discovered from the exterior when I was walking past one evening. It is an unusual addition to a symmetrical façade and a point of interest in relation to its function. Internally, it has been concealed and after focusing on the plan it turned out to be a light source for a changing booth used by models that has long since been removed. Mackintosh was clearly providing function rather than aesthetics.

A direct contrast between both sections is the director's room and studio above. To the south it could easily be classed as a normal room. While looking north it benefits from the use of an alcove where the director would have sat and looked out through the small paned window. Sorrel includes the second floor studio and professor's studios that extend the building higher. I focused on implementing the way in which Mackintosh's emphasis was on providing well lit north facing studios. Fig 2.10 shows the contrast between solid in grey and transparent in blue with the roof lights colored purple.

Section B: B

This set of sections is the only example of when the two section lines are situated at the same location on the plan, only facing opposite directions. Sorrel's looking south highlights the fenestration along the corridors and window seats that provided an additional use for the corridor.

My section looks back towards the entrance and emphasises the overbearing low level hallway between the entrance doors and corridor. It also shows clearly the placement of the loggia and hen run passageways that reunite the building at this new level. The profile of the south elevation starts to become apparent and the ventilation ducts that run through the corridor walls are visible only on the section looking north. Shown on fig 2.11 is the hierarchy of circulation space and scale at which it differs on the various floor levels.

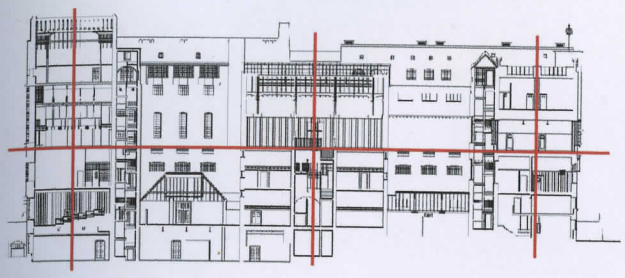


Fig 2.12

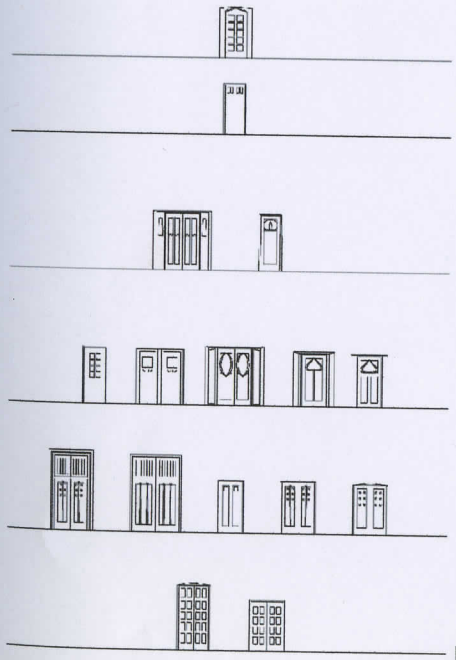


Fig 2.13

Section C: C

The building is broken up into the three distinctive fingers in section. This section is the only medium of drawing that allows and exploits the three characteristic rooms, which have less to do with art but more with composition and connection. They include the former board room on the east, the museum in the central block and the library on the west side of the building. Fig 2.12 shows the powerful way in which Mackintosh repeats the symmetry of the plan and elevation in also the section. The horizontal line emphasises that the three rooms are all on the same floor level and accessed at mid level in the building. The intersection of each represents the strong emphasises these three rooms have on the building as a whole.

From the inclusion of a longitudinal section, you are able to study the change in Mackintosh's architectural language and style. The north and south elevations tell us nothing of this, whilst the east and west elevations tell us a great deal. It is difficult however to appreciate a connection between both. The cross sections only provide glimpses of the change, while the longitudinal section considers both ends and the materialisation of the space between. The former board room, with its symmetrical arrangement and bright white finish is a sharp contrast to the dark timber finish of the library. The two rooms are poles apart, not only through the ten year difference in completion, but also mackintosh's development as a practicing architect.

Sorrels section distinctly emphasises the void left between each block and the isolation of each. My section includes the majority of the south façade in relief.

Fig 2.13 shows the homogeneous nature of each of the doors within the building all with differing levels of decoration and variation in size. The doors to the studios and main offices have stain glass insets that represent Mackintosh's love for nature. Rosebuds, birds, trees, seeds and butterflies are depicted in glass. All of the doors to the studios are shown in section B and C.

This now complete set of longitudinal sections will provide not only a greater appreciation for section drawings but will encourage new discussion and debate, as to whether Mackintosh considered the design less, or more, longitudinally than the cross section.

Bibliography

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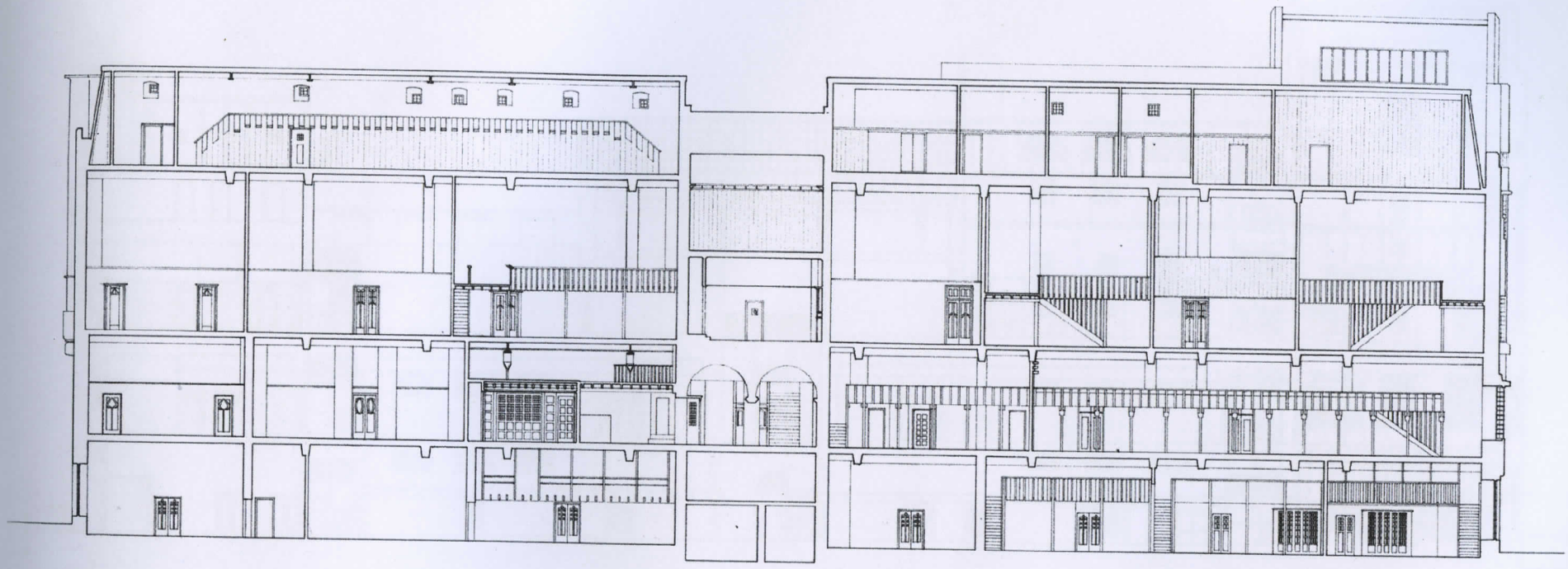


Fig 3.01
Sorrel Challands longitudinal section A looking south

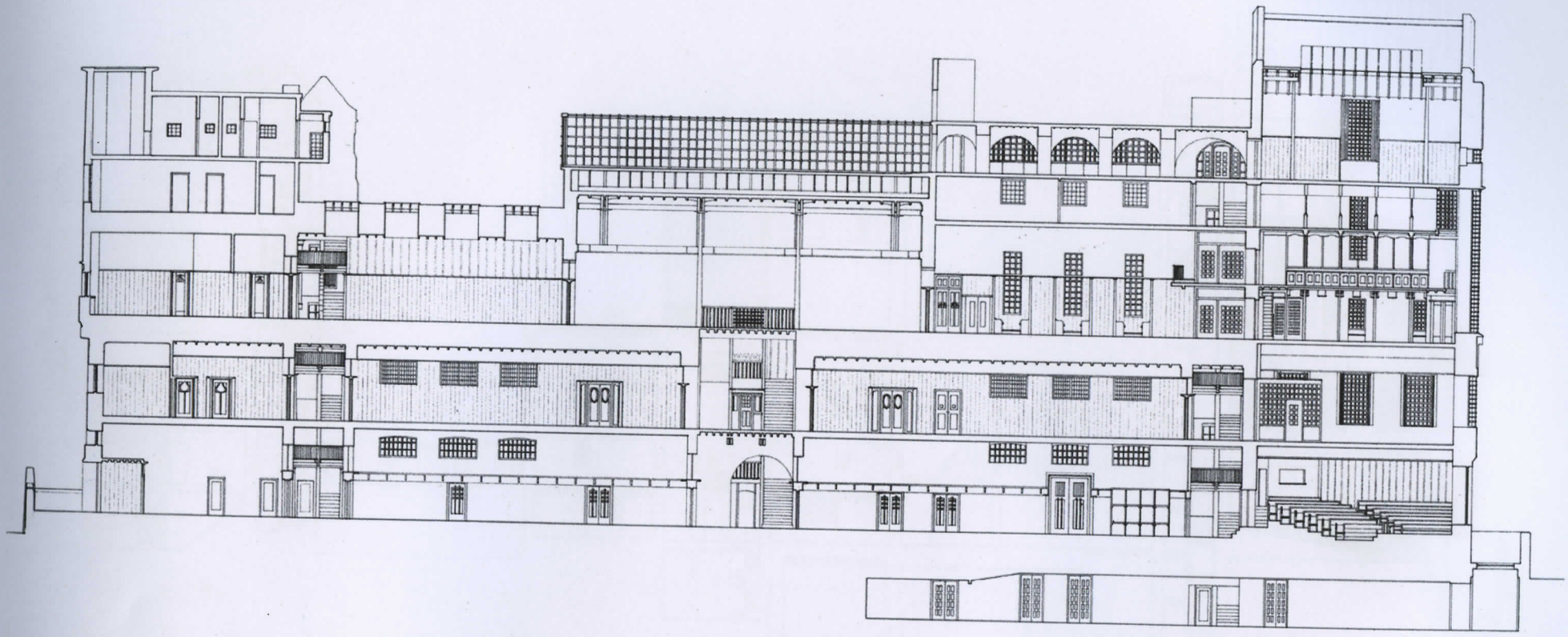


Fig 3.02
Sorrel Challands longitudinal section B looking south

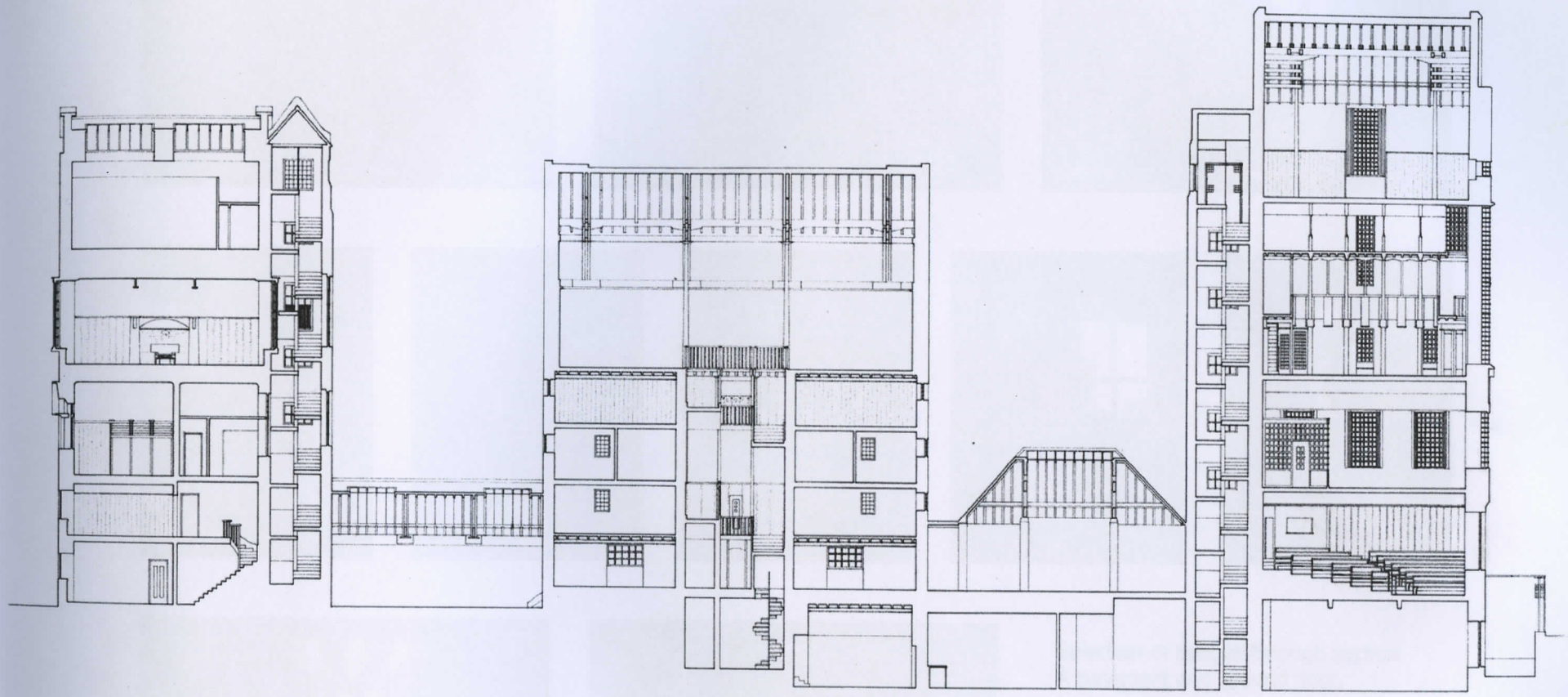
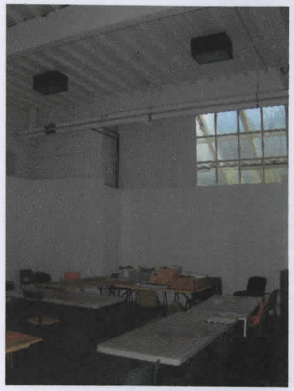
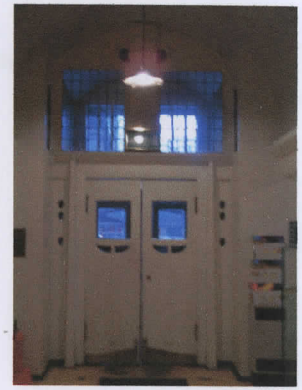


Fig 3.03
Sorrel Challands longitudinal section C looking south



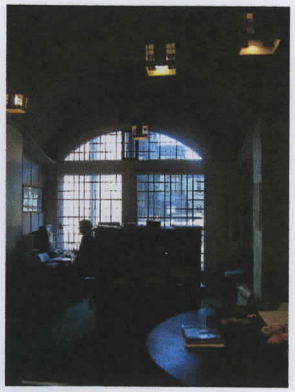
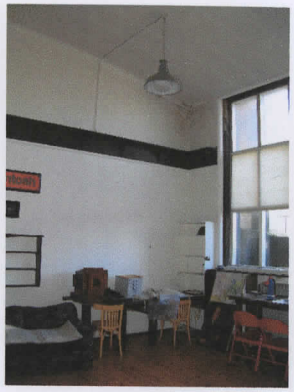




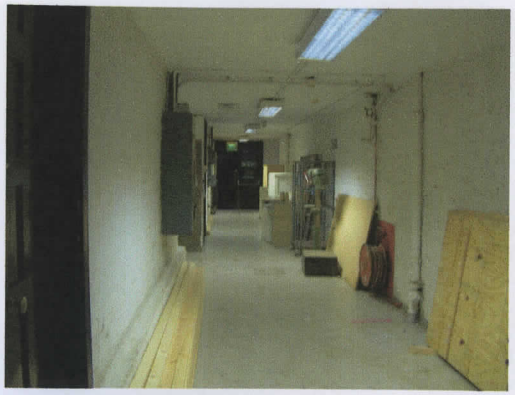
Selection of images through section
A basement and ground floor.

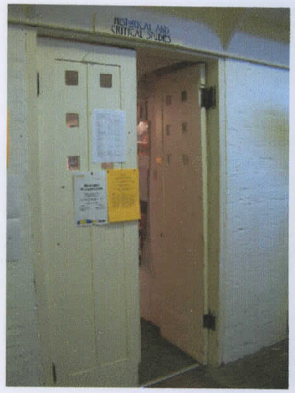




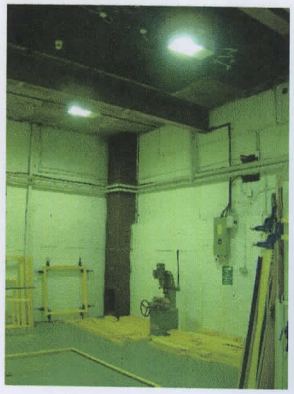
Selection of images through section
A first floor.

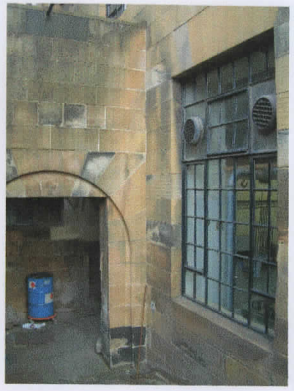





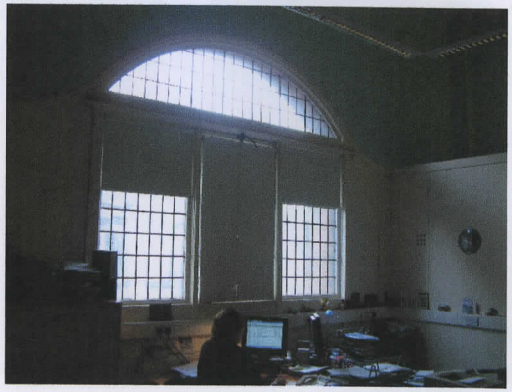

Selection of images through section B all floors.



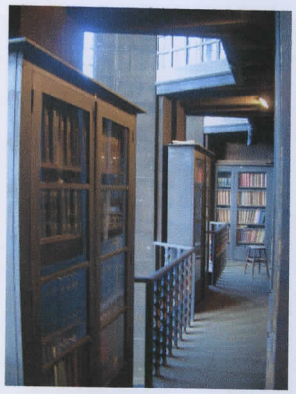
Selection of images through section C all floors.



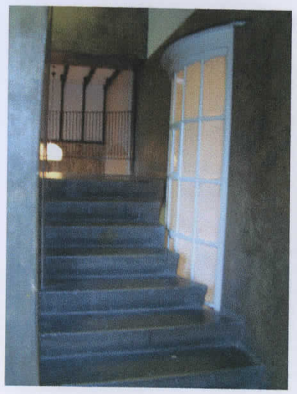







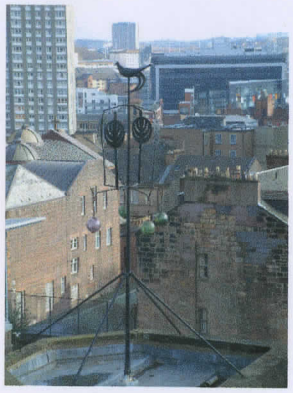



Selection of images taken in library and former board room.

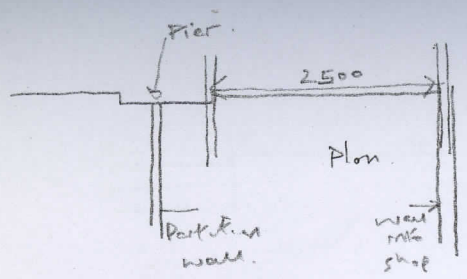


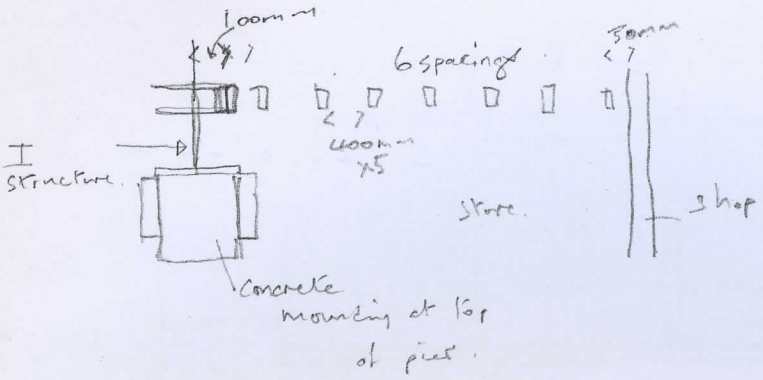


Selection of images taken from the roof.

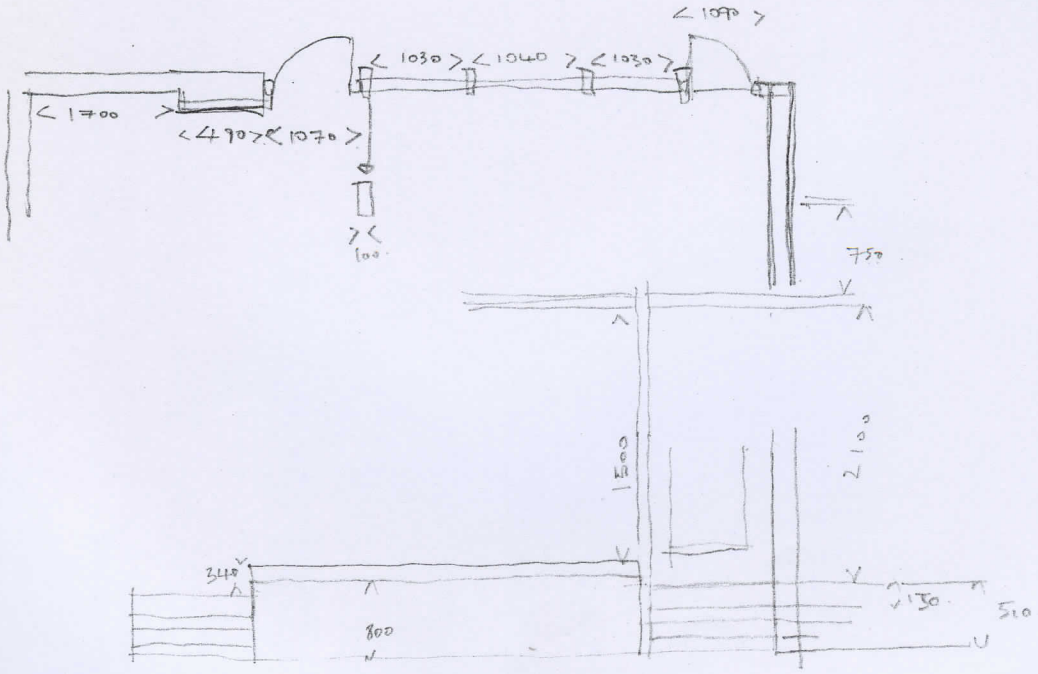
STORE next door to shop



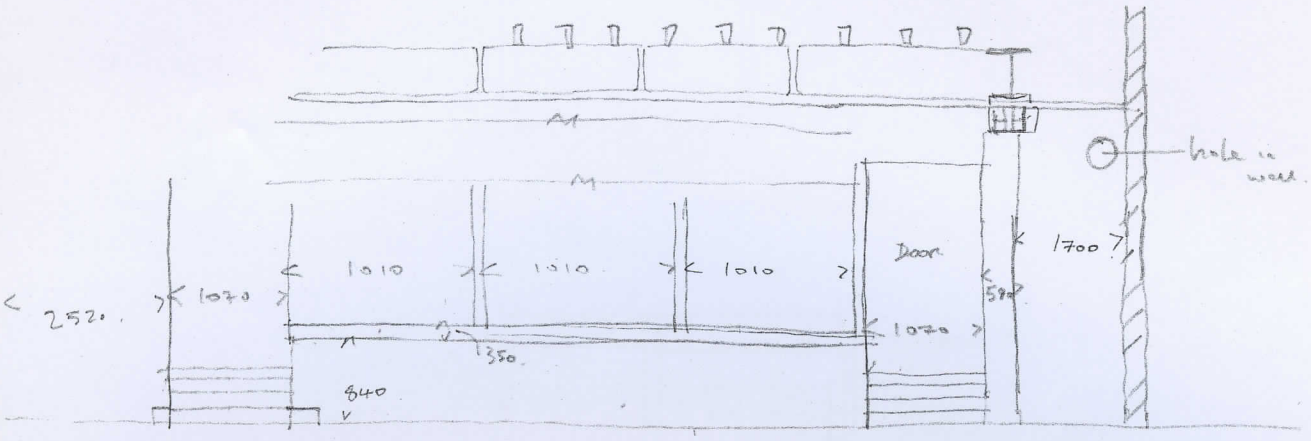


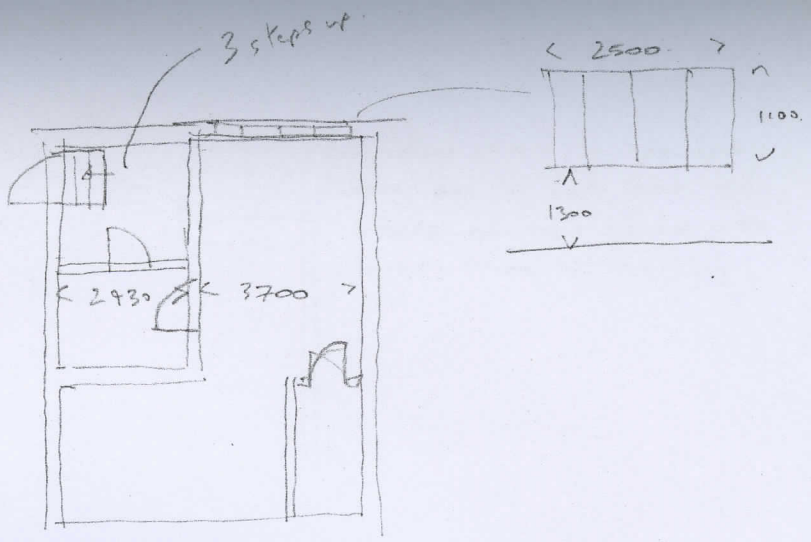
A-103

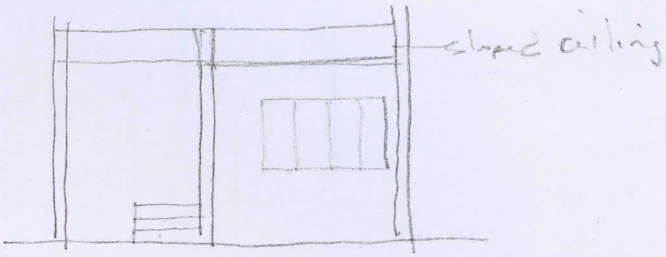
Research centre (c

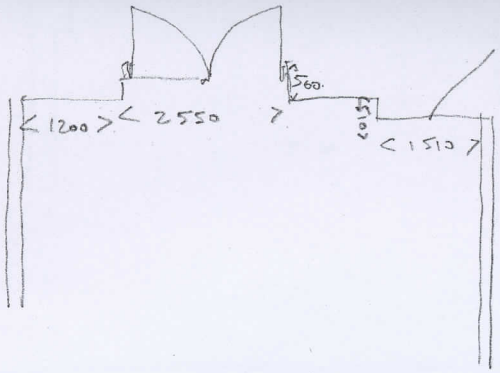



4
3
2
1
Pier.

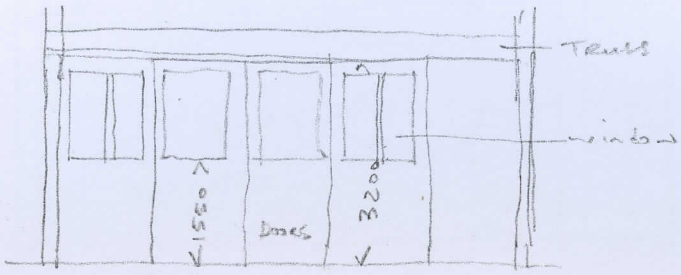

hole in wall.
Door.
1700
1010
1010
1010
2520.
1070
580
1070
350.
840

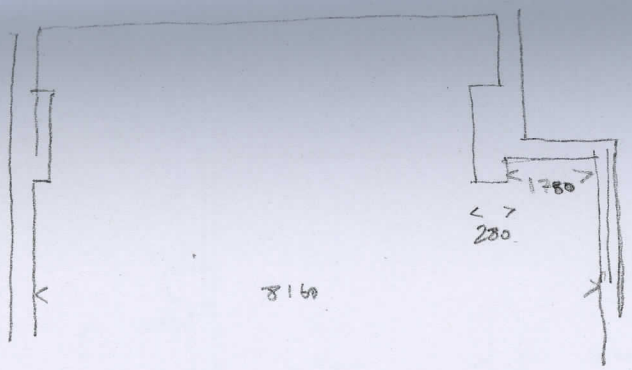

3 steps up
2500
1100
1300
2430
3700

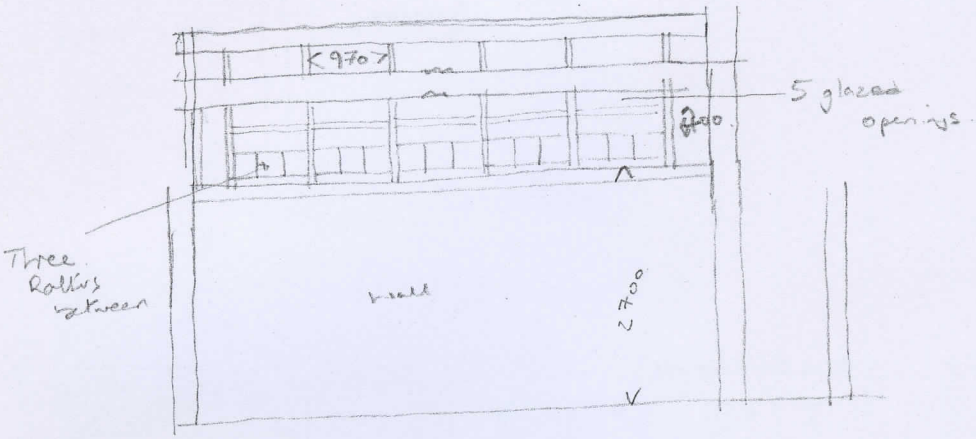

sloped ceiling

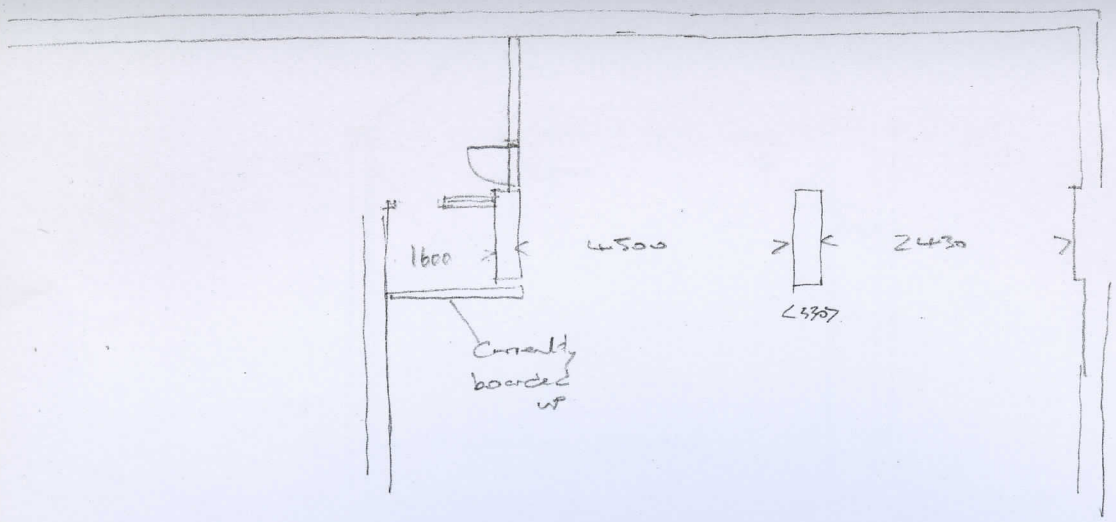


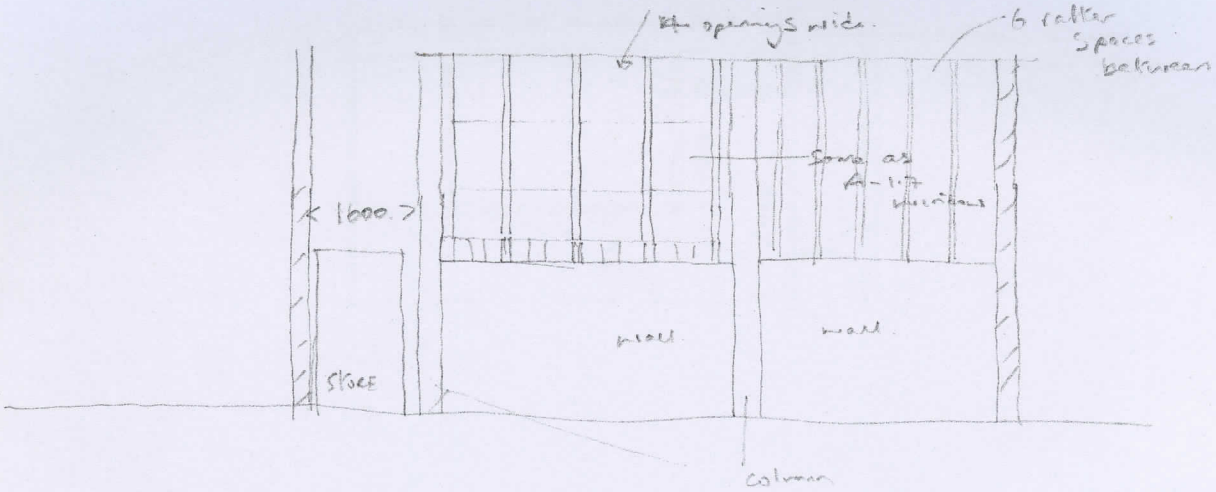
Dimensions should be considerably more due to fact that the walls are now clad with MDF Floor To ceiling

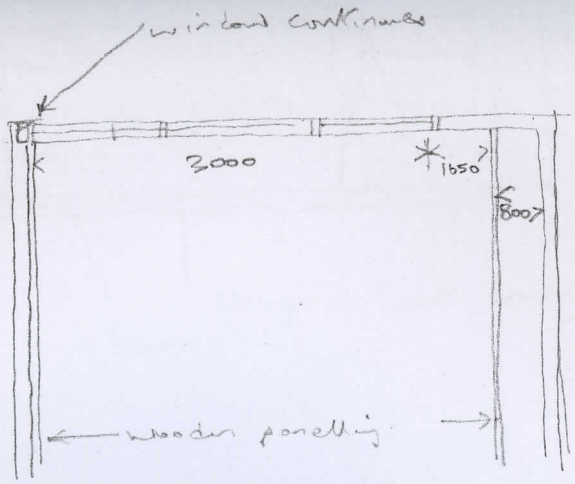


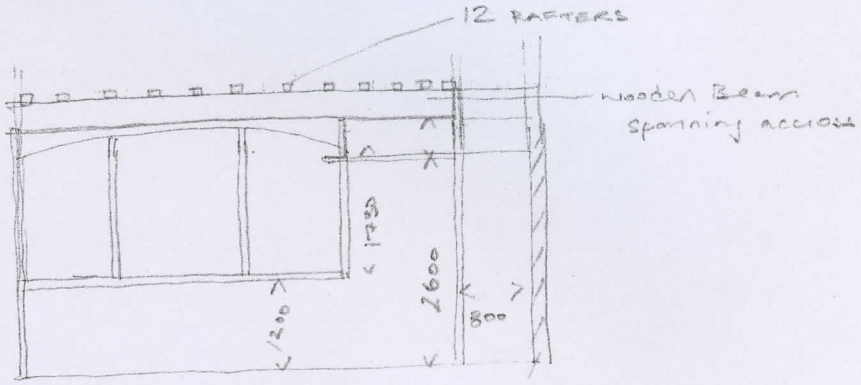

1780
280
8160


970
5 glazed openings
Three Rollers between
wall
2700

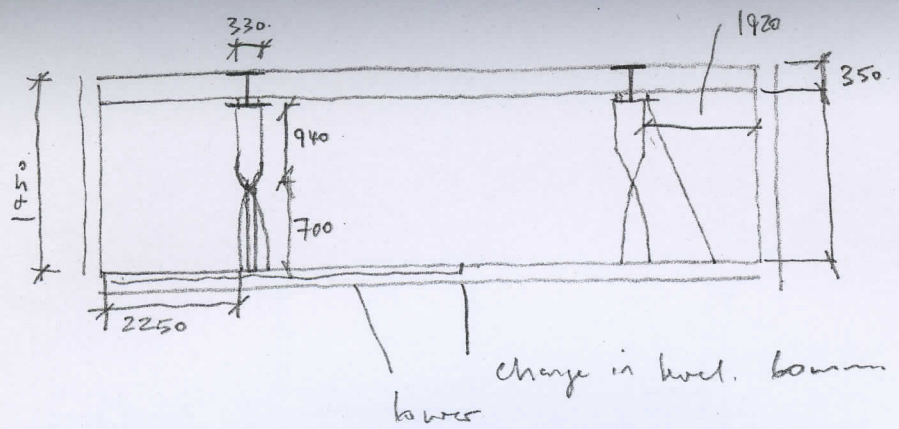

1600
4500
2430
<330>
Currently boarded up

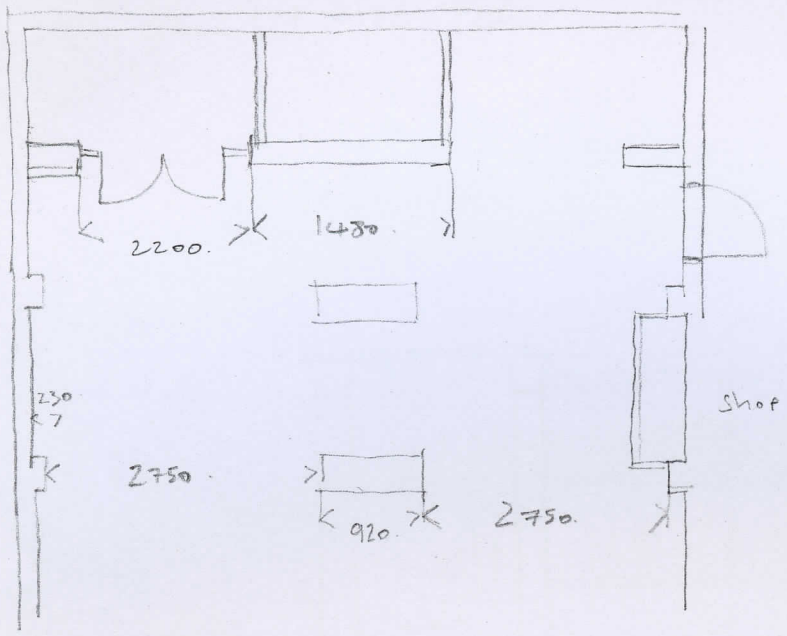

4 openings wide
6 rafter spaces between
Same as A-1.7 elevations
<1600>
wall
wall
stage
column

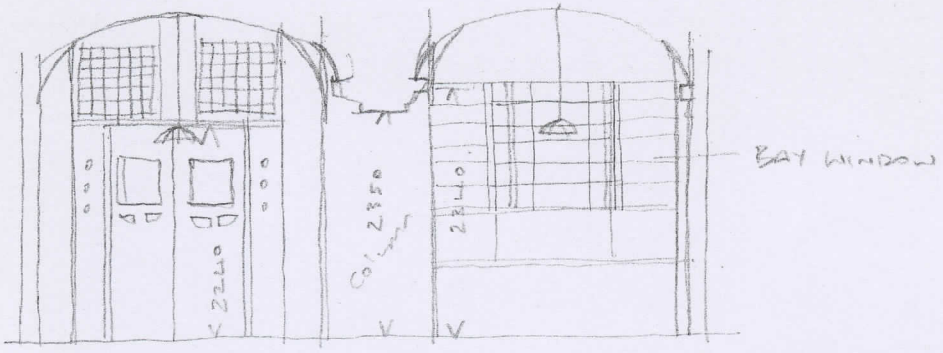

window continues
3000
1650
800
wooden panelling

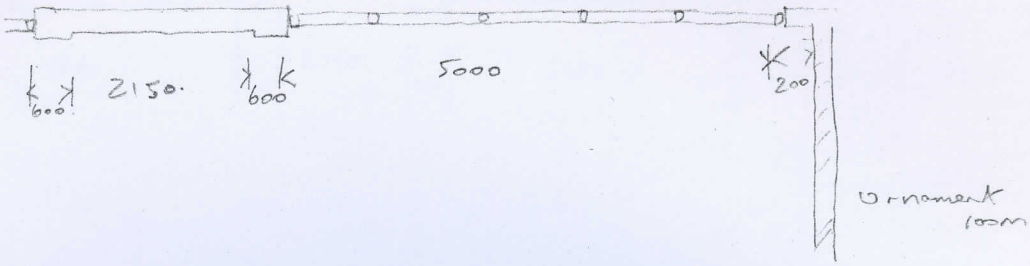

12 RAFTERS
wooden Beam
spanning across
1750
2600
800
1200

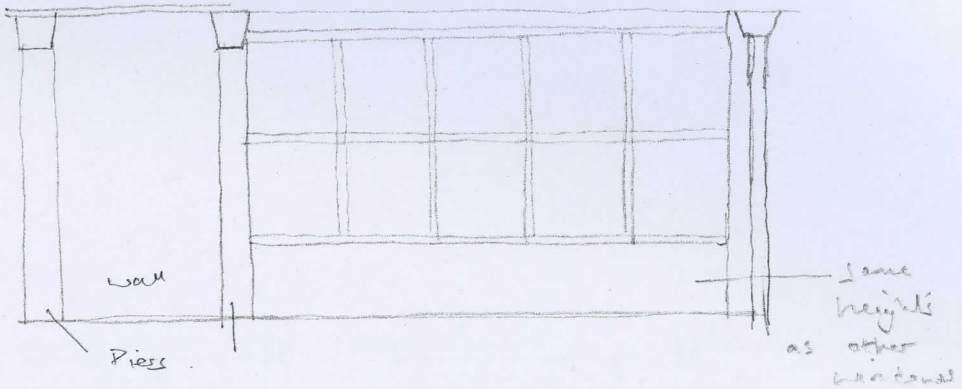
ARCHIVE ABOVE SHOP

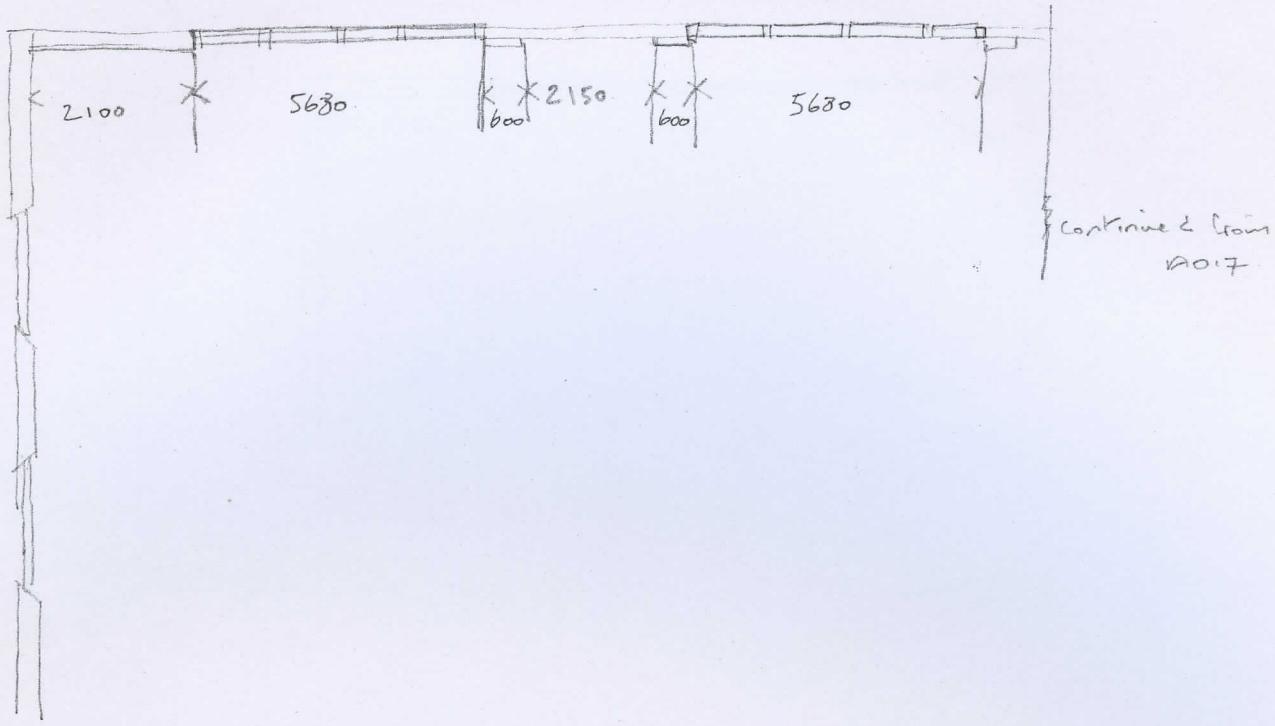


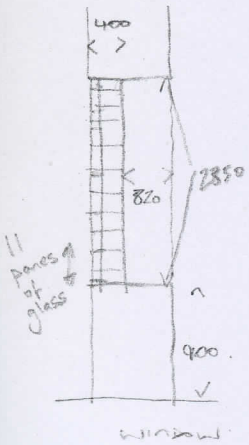

2200.
1480.
230
2750.
920.
2750.
Shop

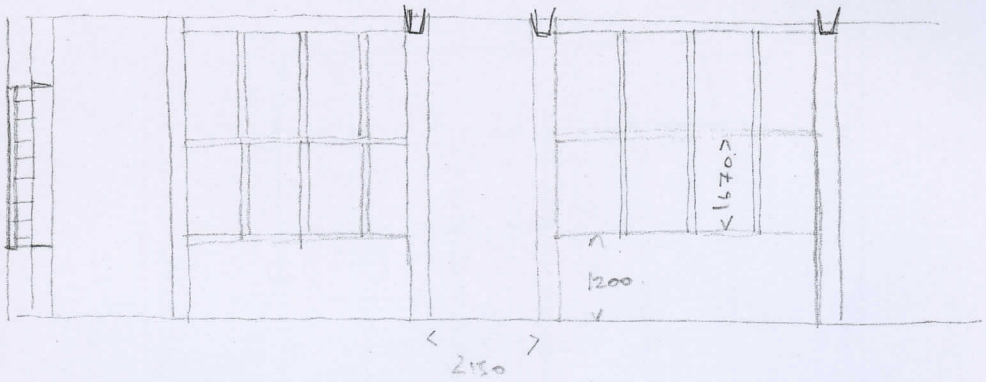

BAY WINDOW
2440
Col 2350
2440

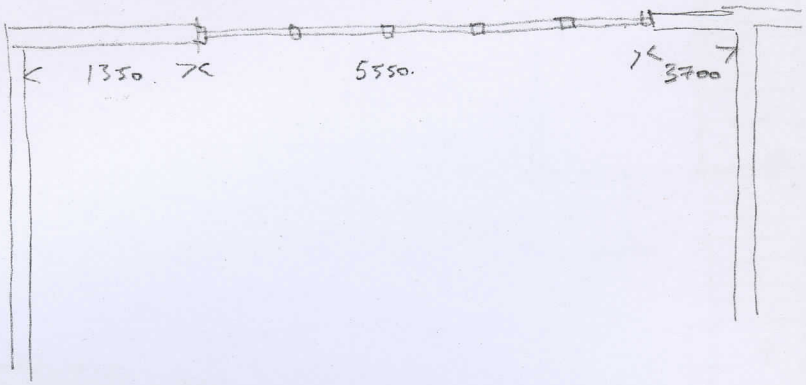

600
2150.
600
5000
200
Ornament room

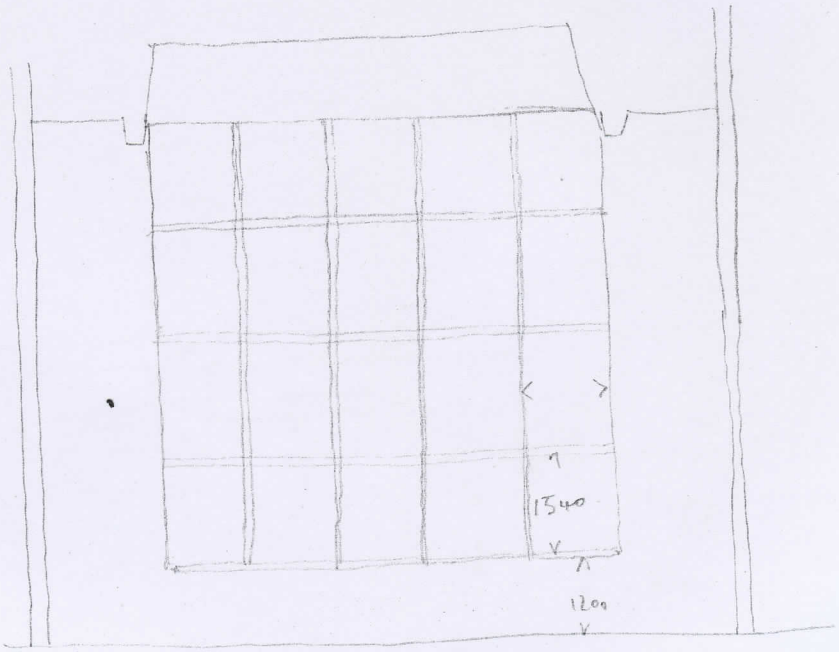

wall
Piers
same height as other walls

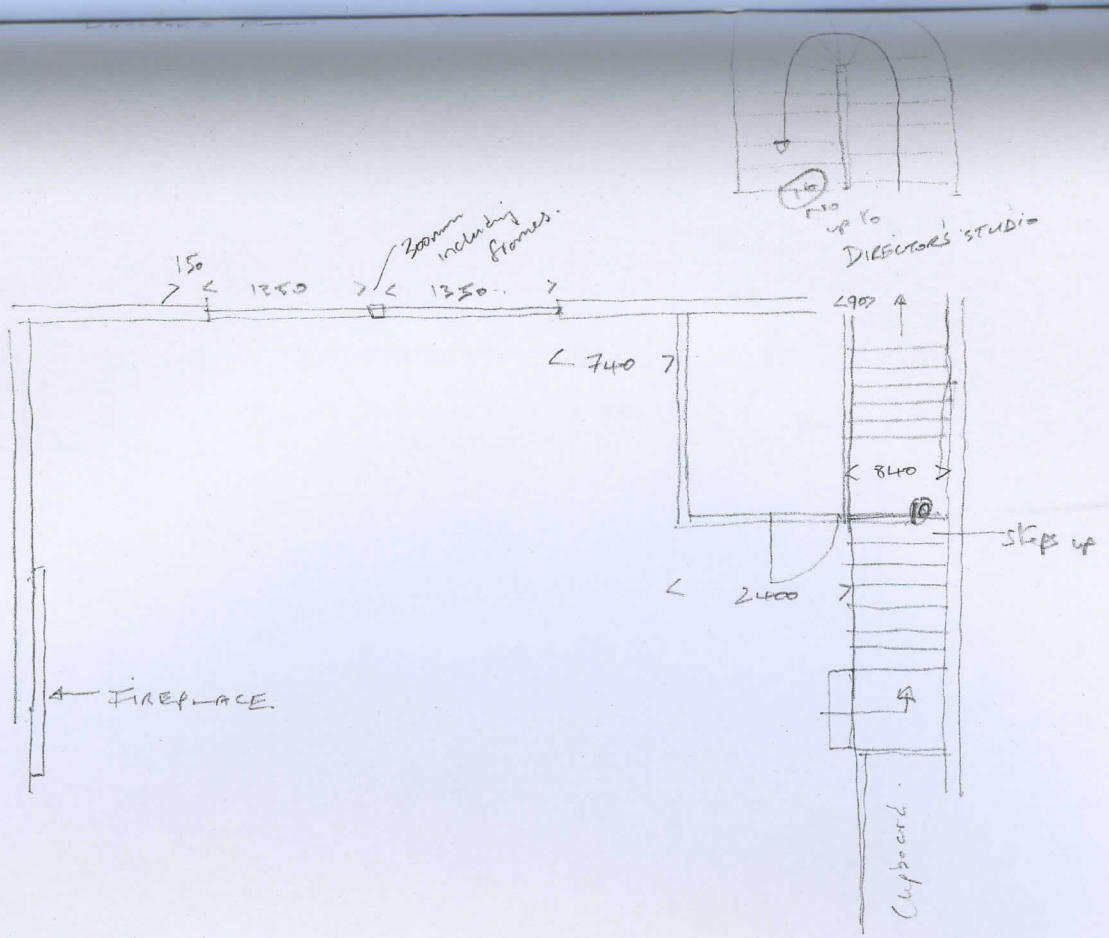

2100
5680
600
2150
600
5680
continue to train
A017

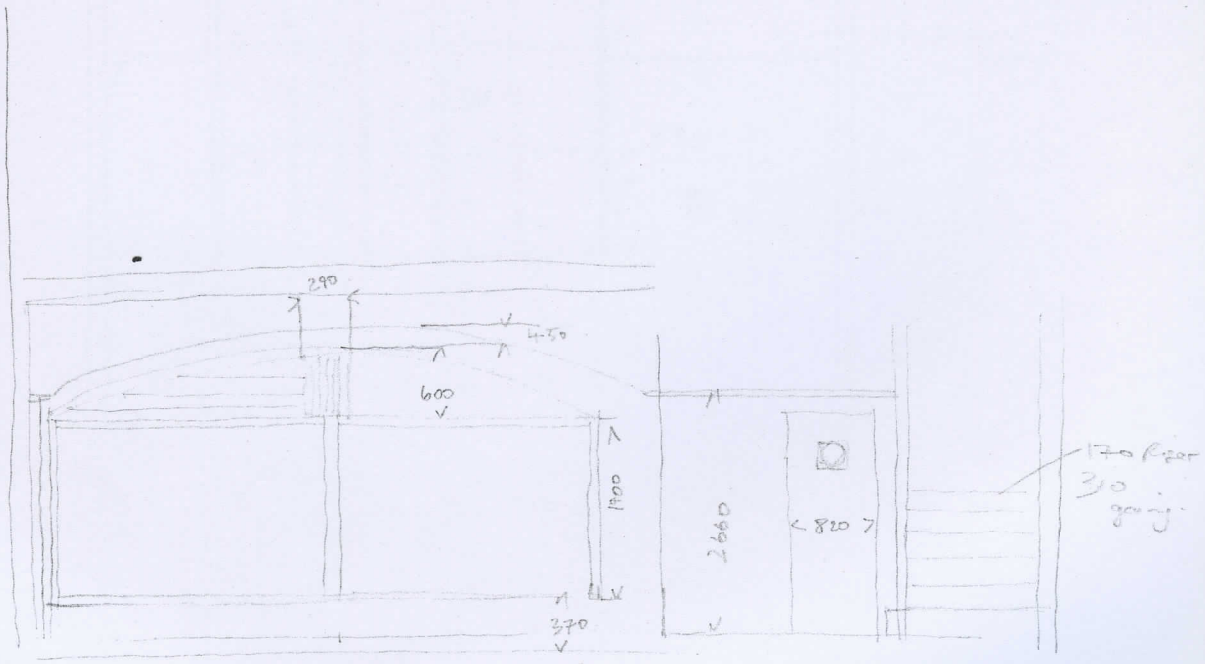

400
820
2850
panes of glass
400
window

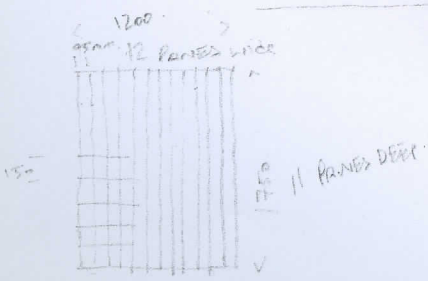

1670
1200
2150

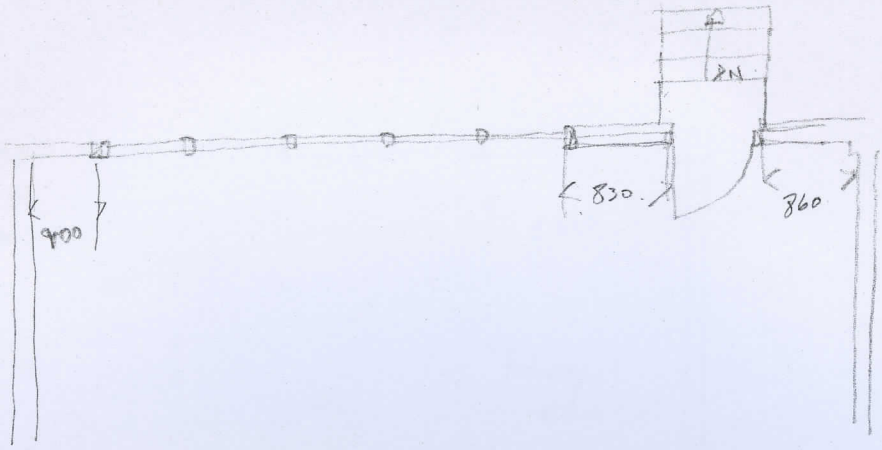

1350
5550
3700

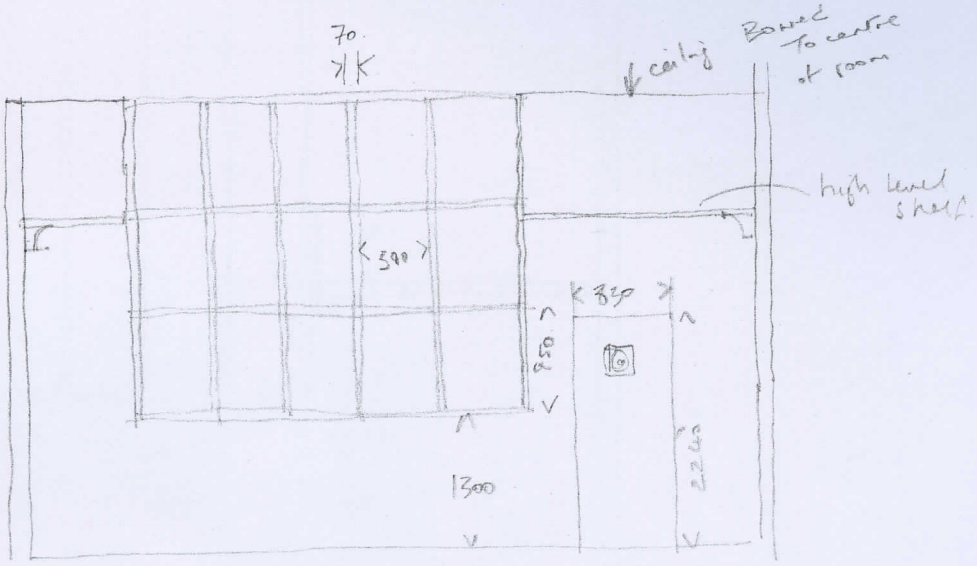

1540
1200

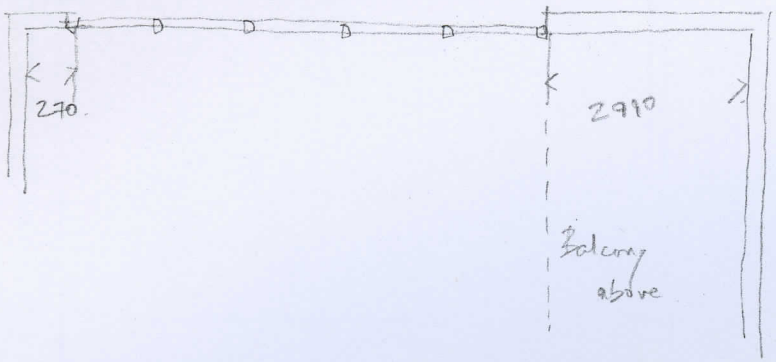

150
1250
300mm including frames.
1350
740
840
2400
FIREPLACE.
Steps up
Clupboard.
Directors' studio

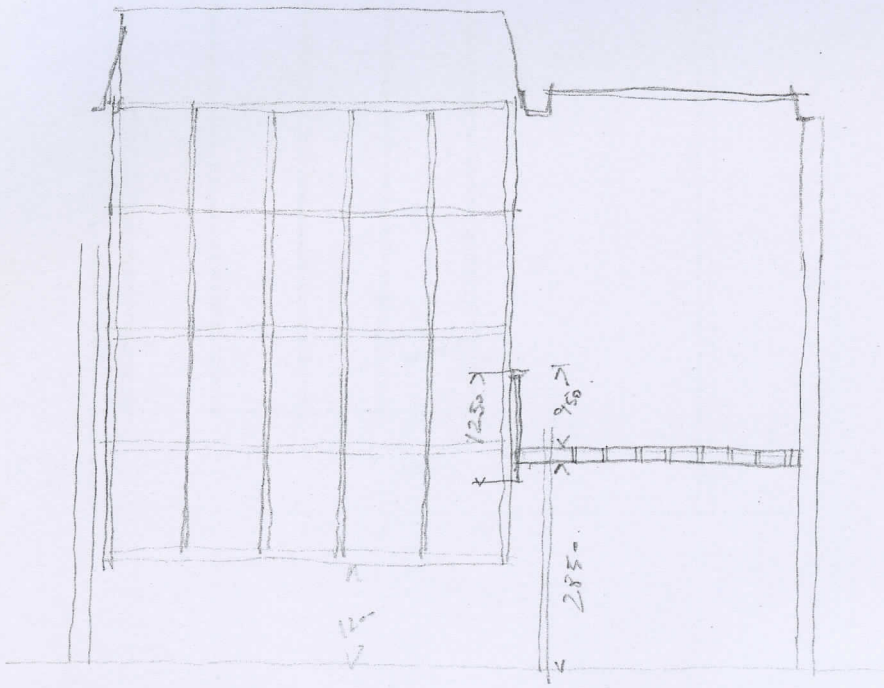

290
450
600
1700
370
2660
820
170 Rise
310 going

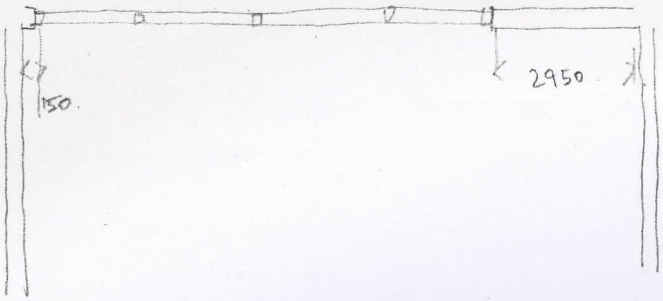

1200
12 panels wide
150
11 panels deep

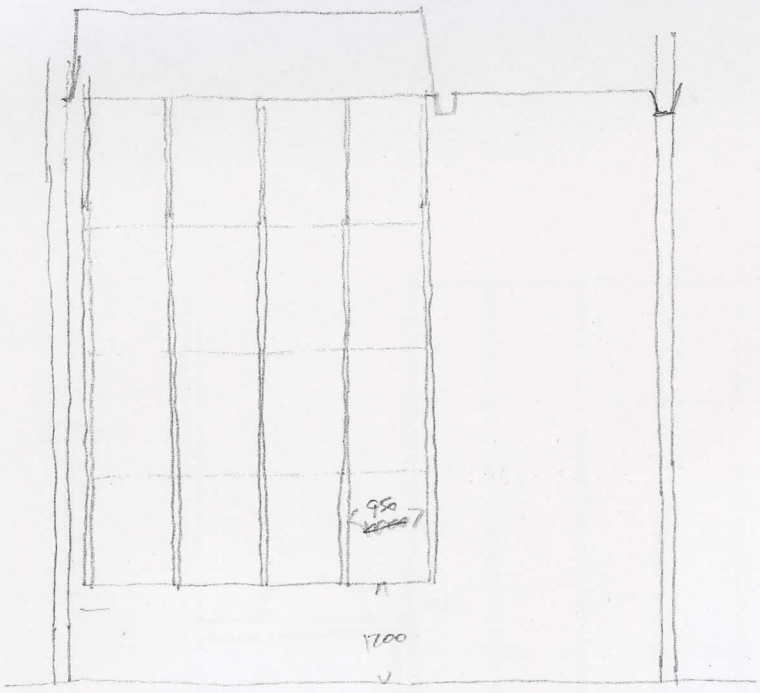

830
860
900


70
ceiling
Bonnet to centre of room
high level shelf
590
830
850
1300
2240


270
2990
Balcony
above


1250
950
2855


150
2950

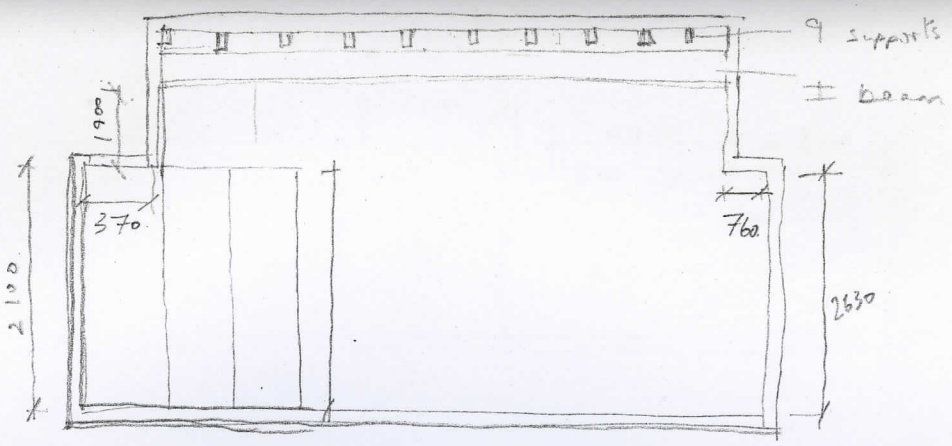

950
1200

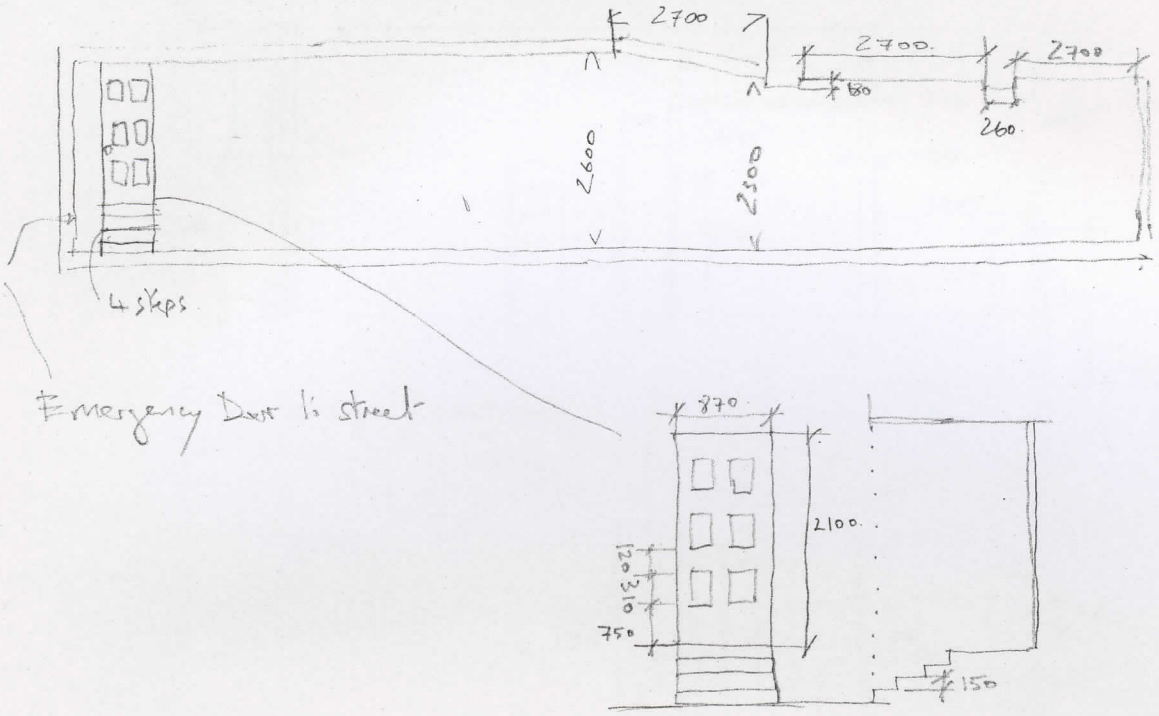
2000
2200
Balcony
1350

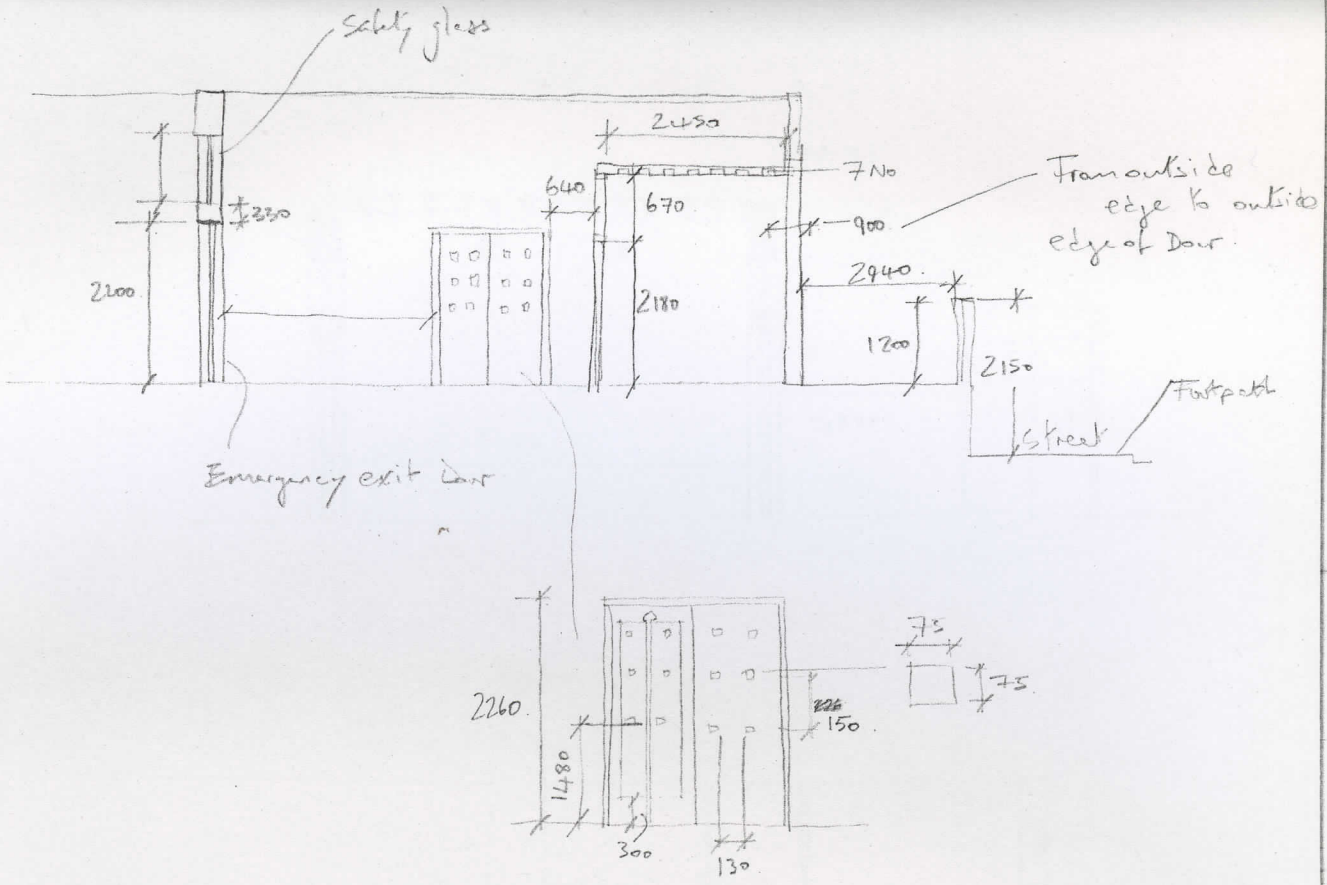
1350
950
1350
950
2600
1200

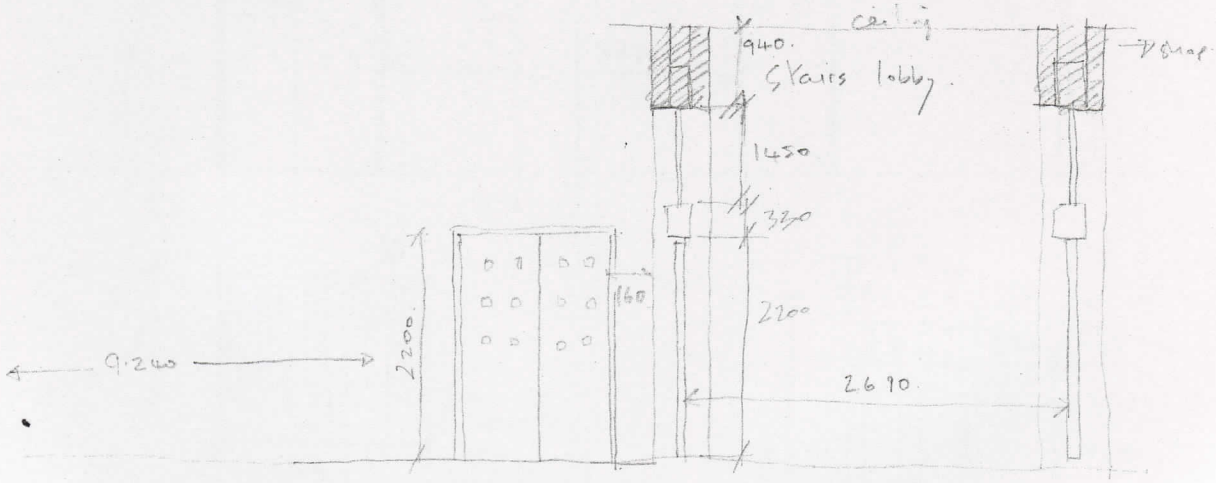
120
20

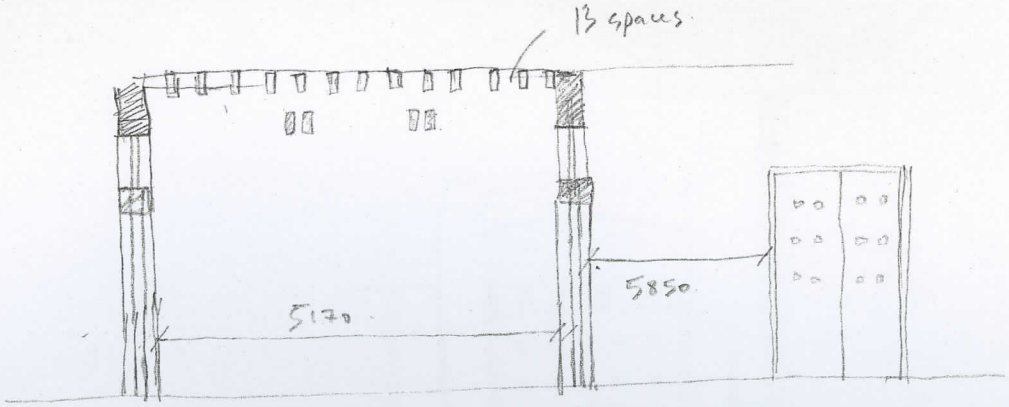
STORE ROOM

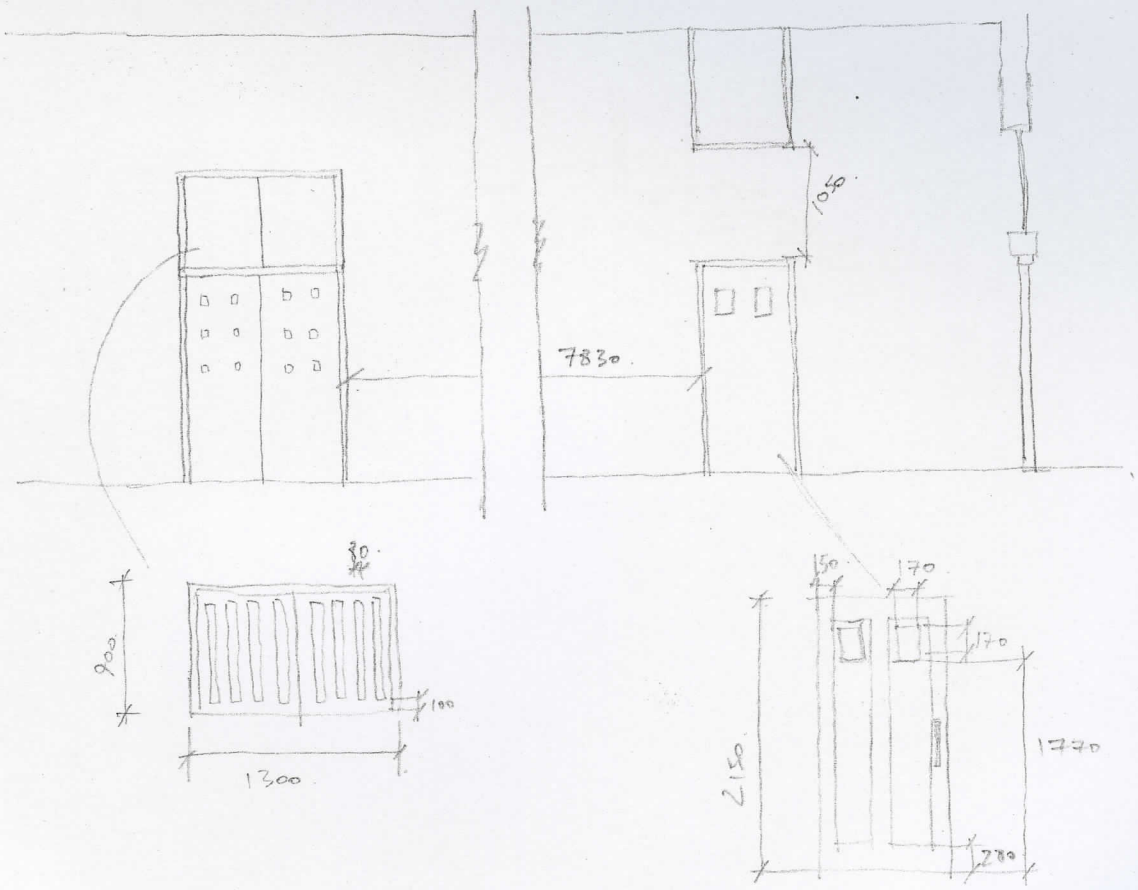



2700
2700
2700
80
260
2600
2300
4 steps
Emergency Door to street
870
2100
200
300
750
150

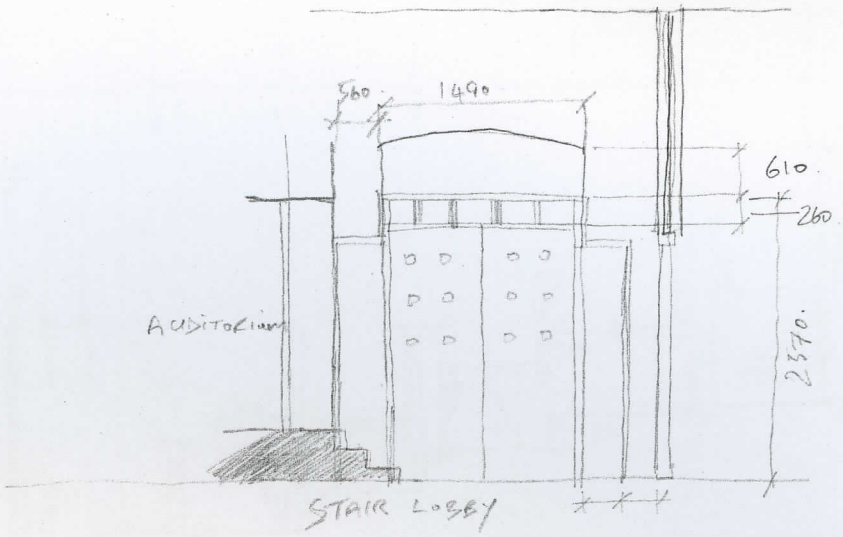

Safety glass
2450
7No
640
670
330
900
From outside edge to outside edge of Door.
2200
2180
2940
1200
2150
Footpath
Street
Emergency exit Door
2260
75
75
150
1480
300
130

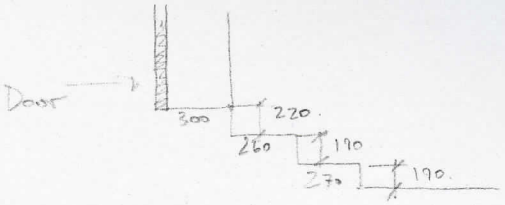

ceiling
940
Shop
Stairs lobby
1450
320
160
2200
2200
9.240
2690

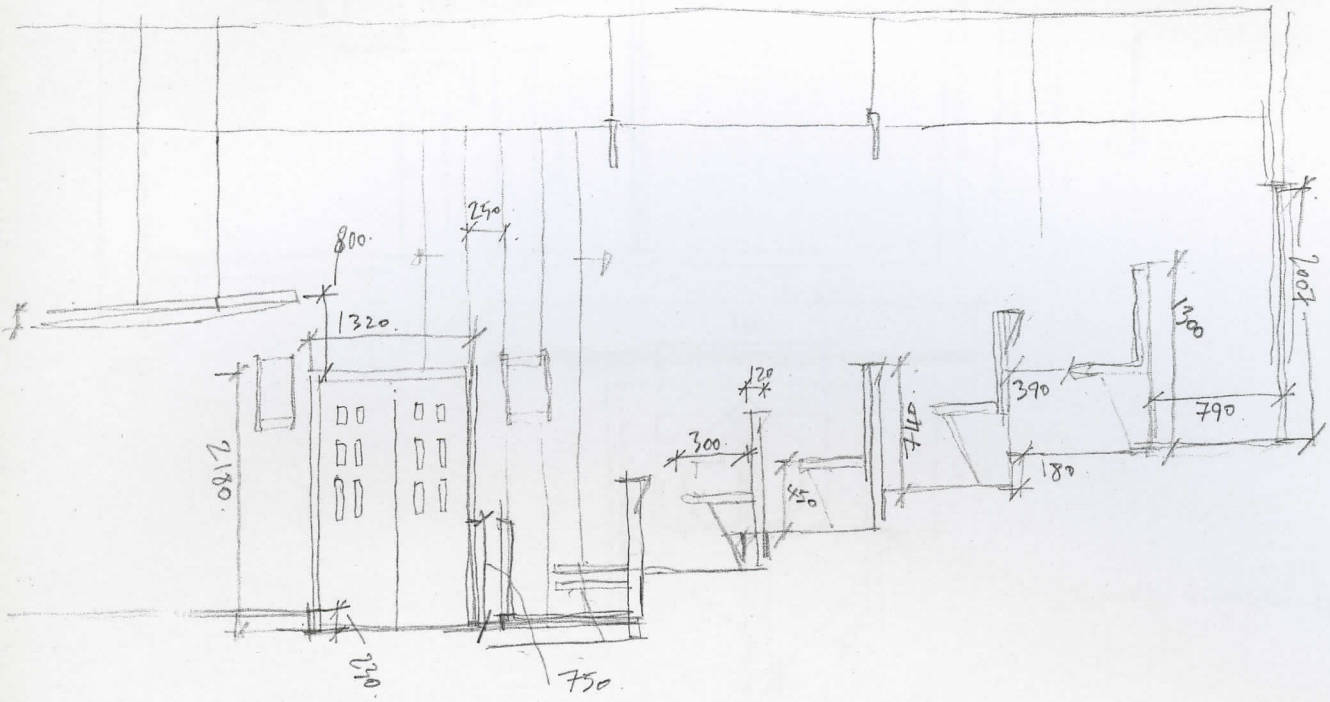

13 spaces
5850
5170

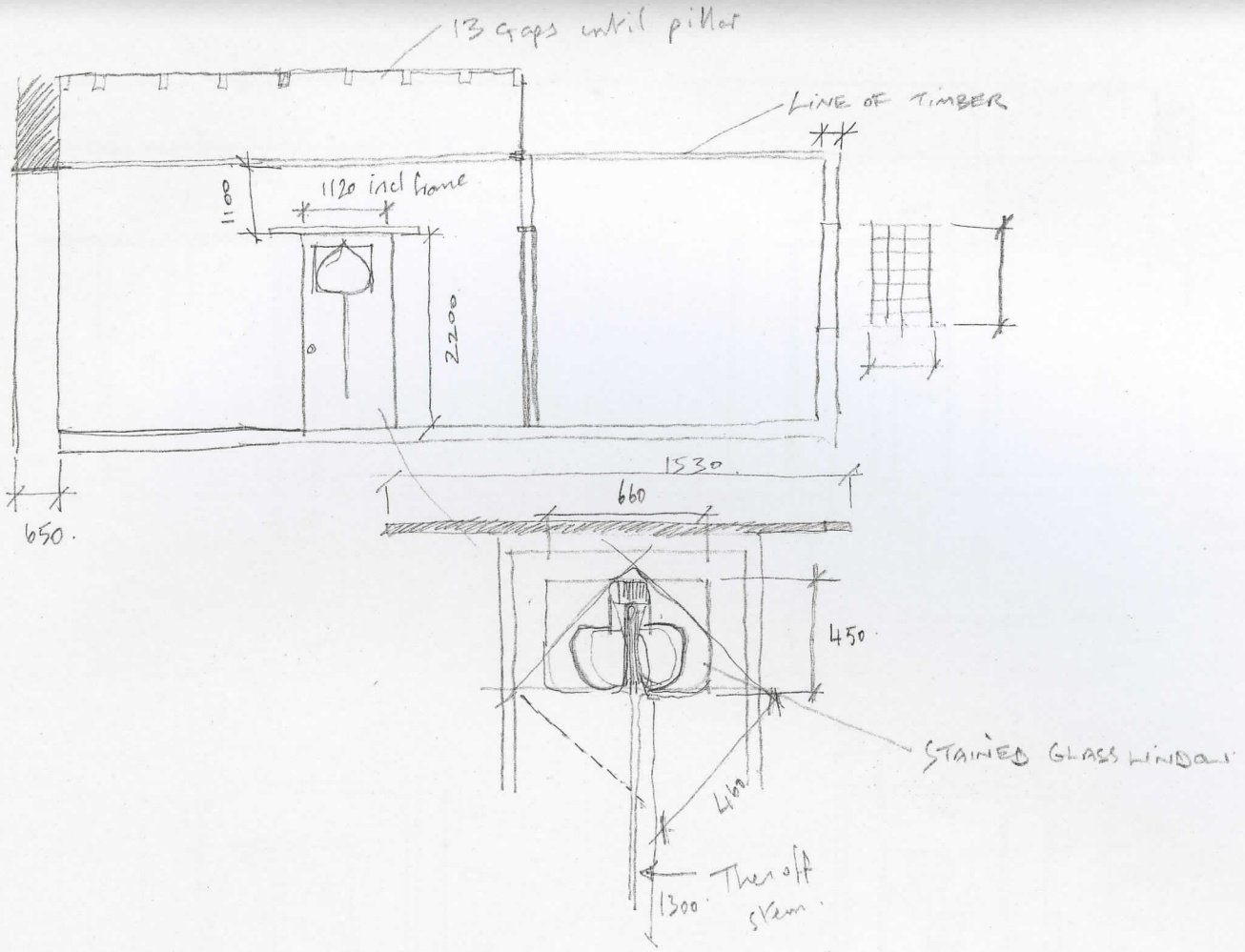

1050
7830
30
900
100
1300
150
170
170
2150
1770
280

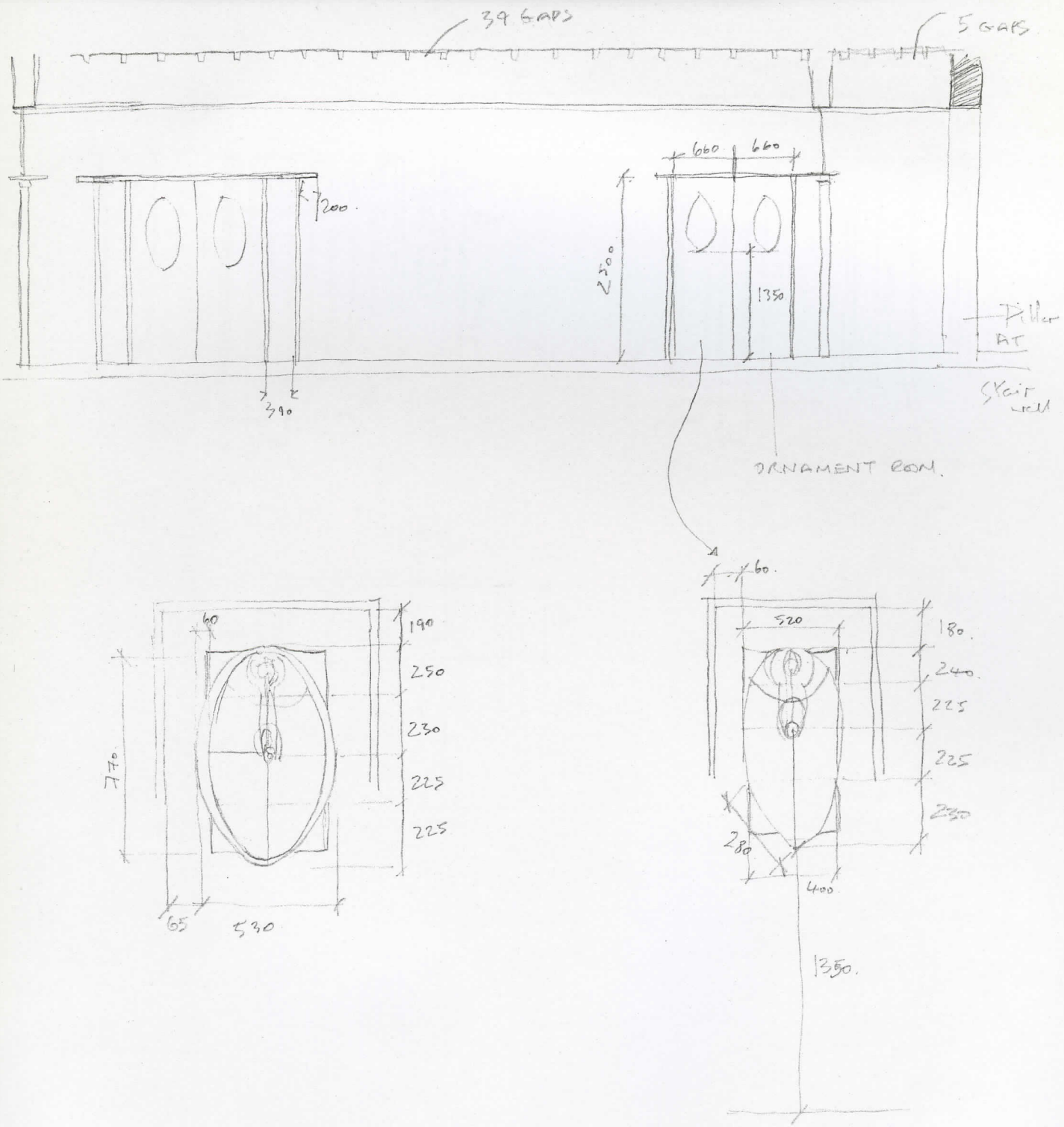
NEXT TO AUDITORIUM

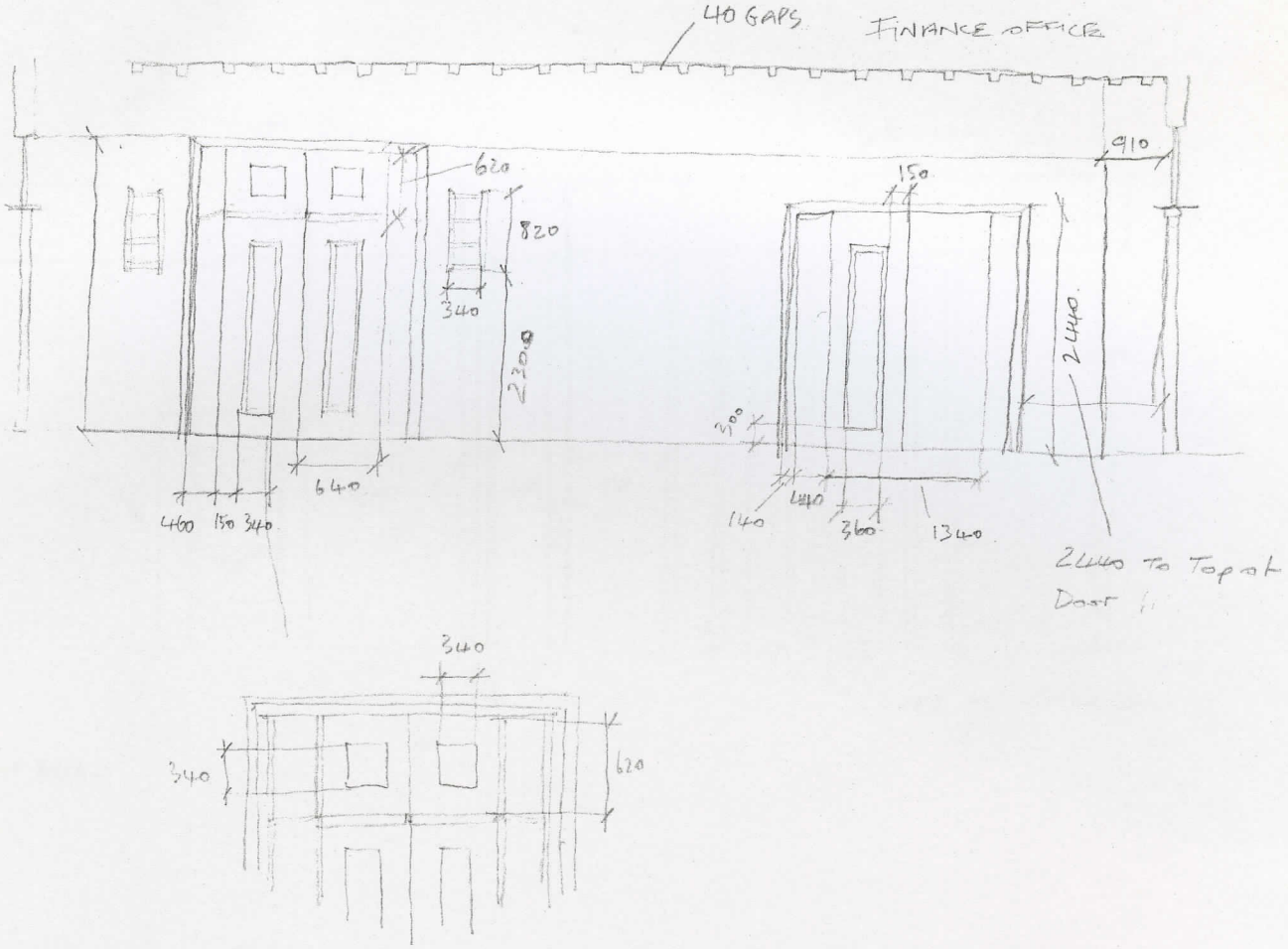




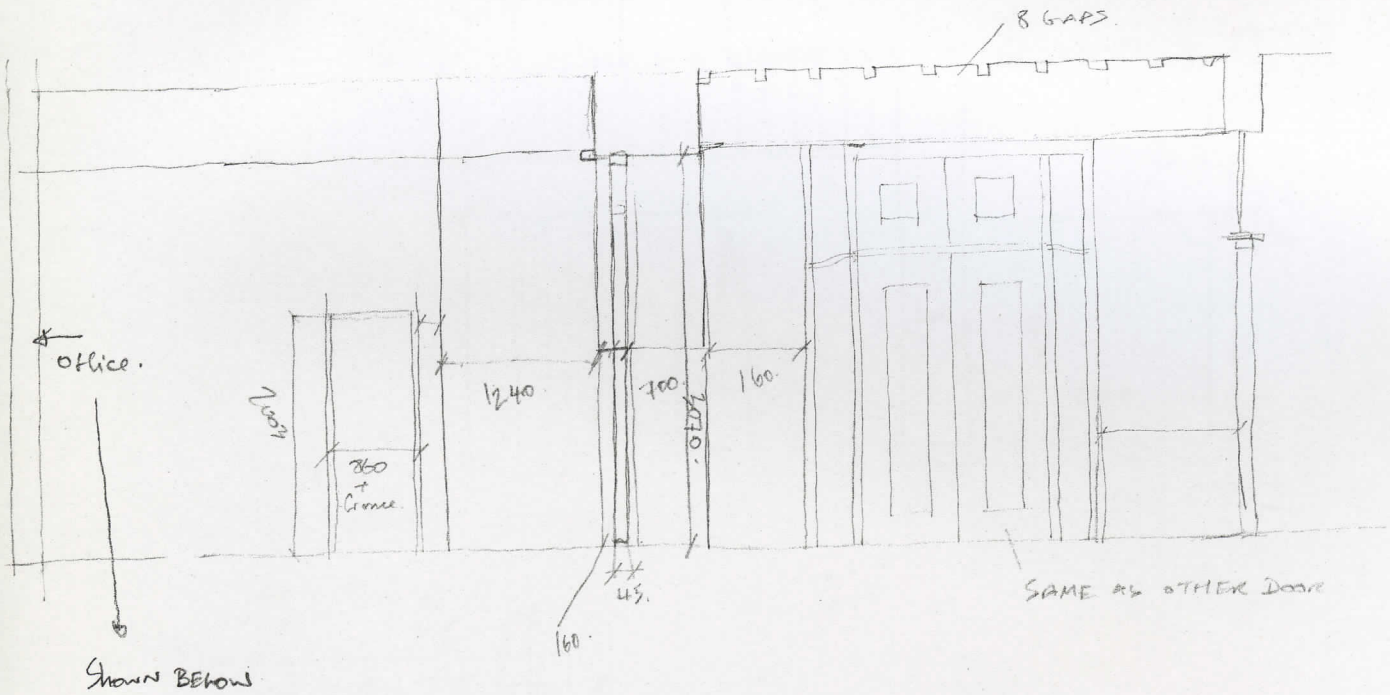

800
250
1320
2180
230
750
120
300
450
390
180
790
1300
2003

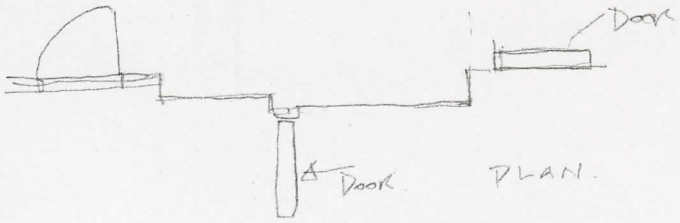

13 Gaps until pillar
LINE OF TIMBER
1120 incl frame
90
2200
650.
1530
660
450
STAINED GLASS WINDOW
400
1300. Then off
screen.

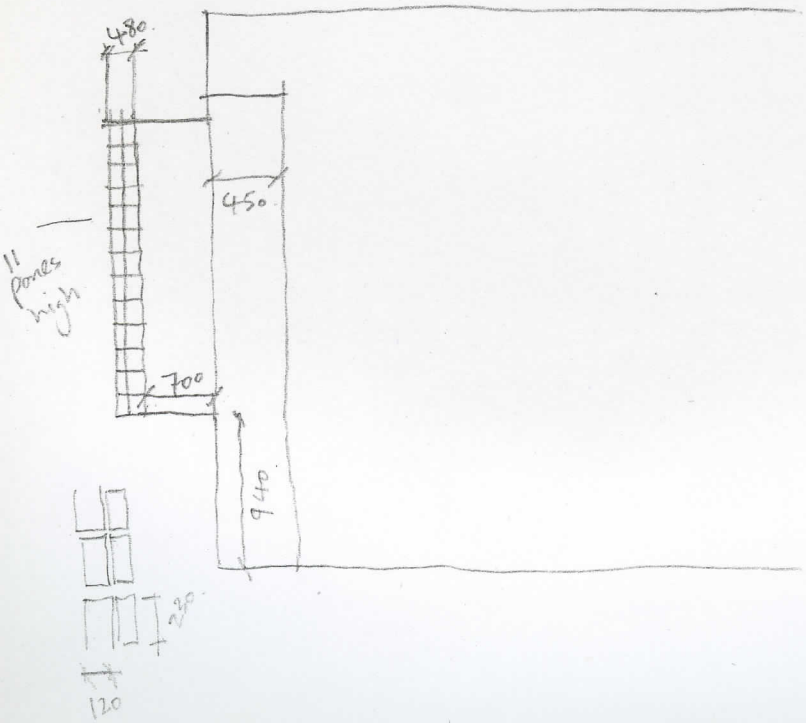

39 GAPS
5 GAPS
660
660
200
2500
1350
Pillar
AT
390
SKIRT WALL
ORNAMENT ROOM
60
190
250
230
225
225
770
65
530
60
520
180
240
225
225
230
280
400
1350

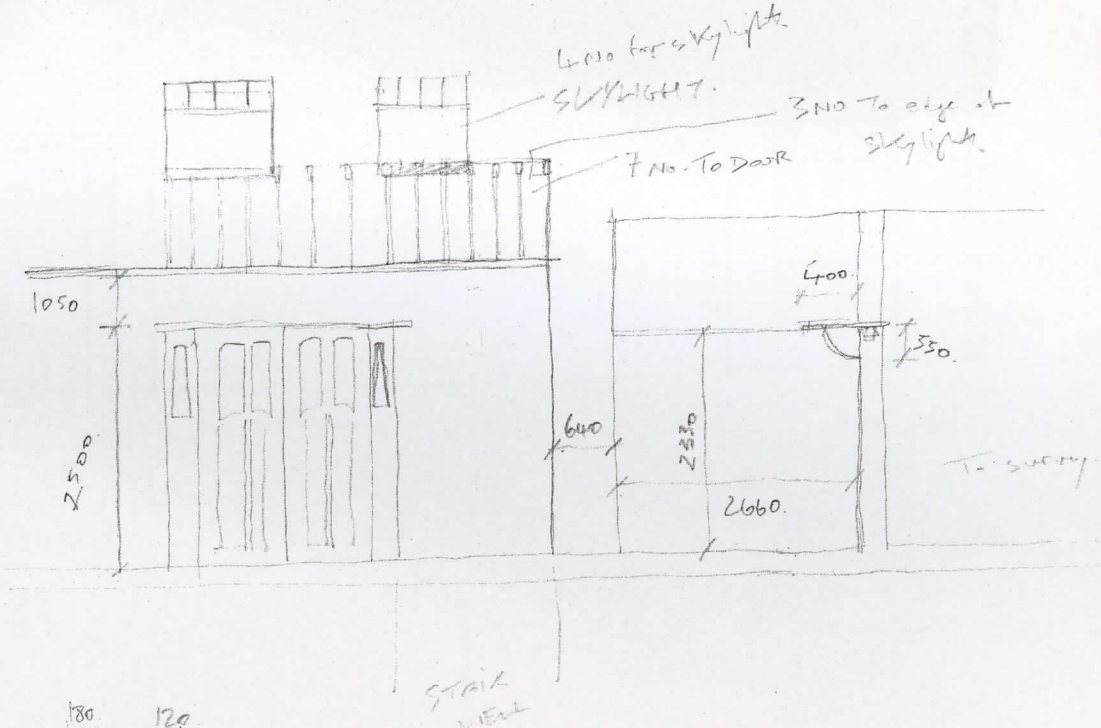

40 GAPS
FINANCE OFFICE
620
820
340
2300
640
460
150
340
910
150
2440
300
140
440
360
1340
2440 To Top of Door

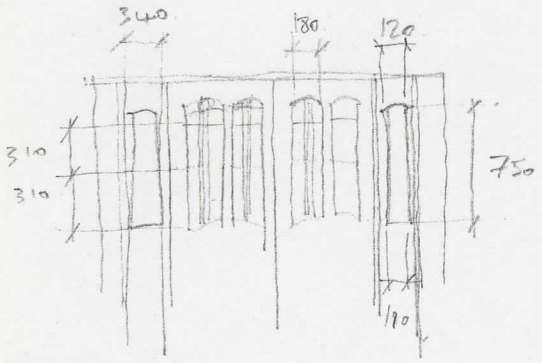
340
340
620

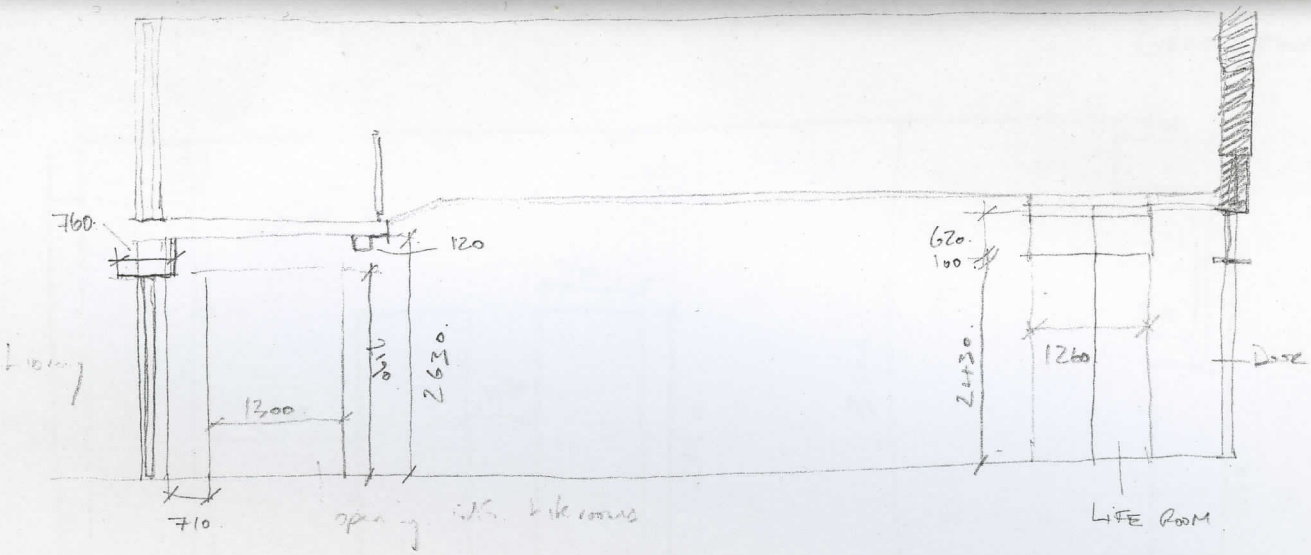

8 GAPS
office.
2000
860
+
Cornice
1240
700
160
2010
45.
160
SAME as OTHER DOOR
Shown BELOW

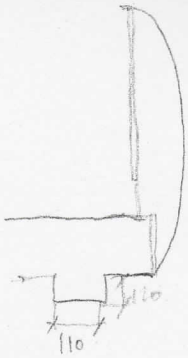

Door
Door
PLAN.


480
450
11
Ponies
high
700
940
20
120

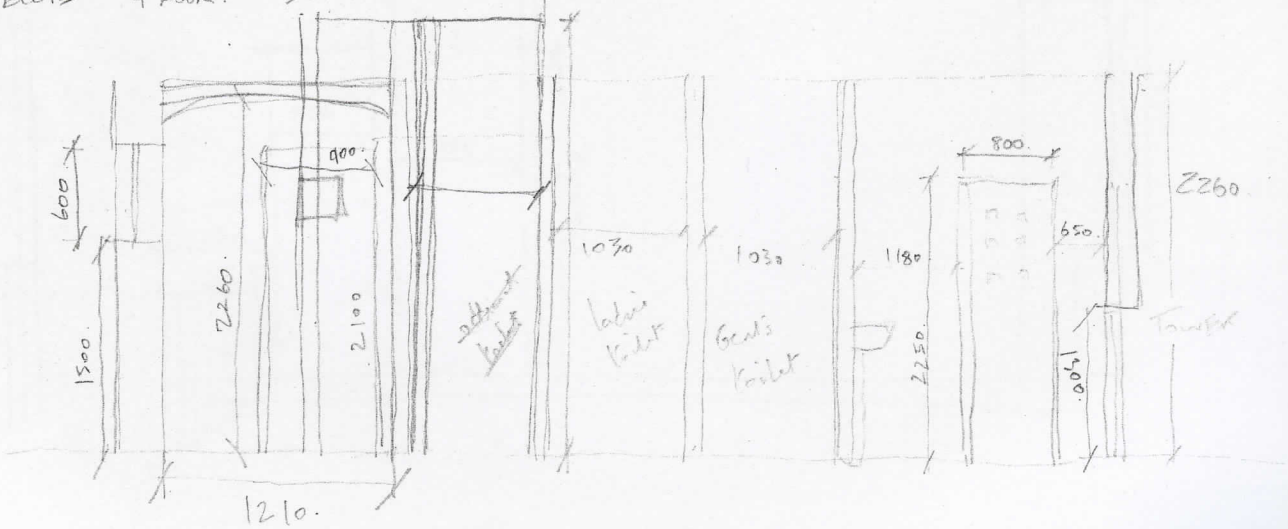

4 No for sky light
SKYLIGHT.
3 No To edge of skylight
7 No. To Door
1050
400
550
640
2300
2660.
To sunny
STAIR WELL


340
180
120
310
310
750
110



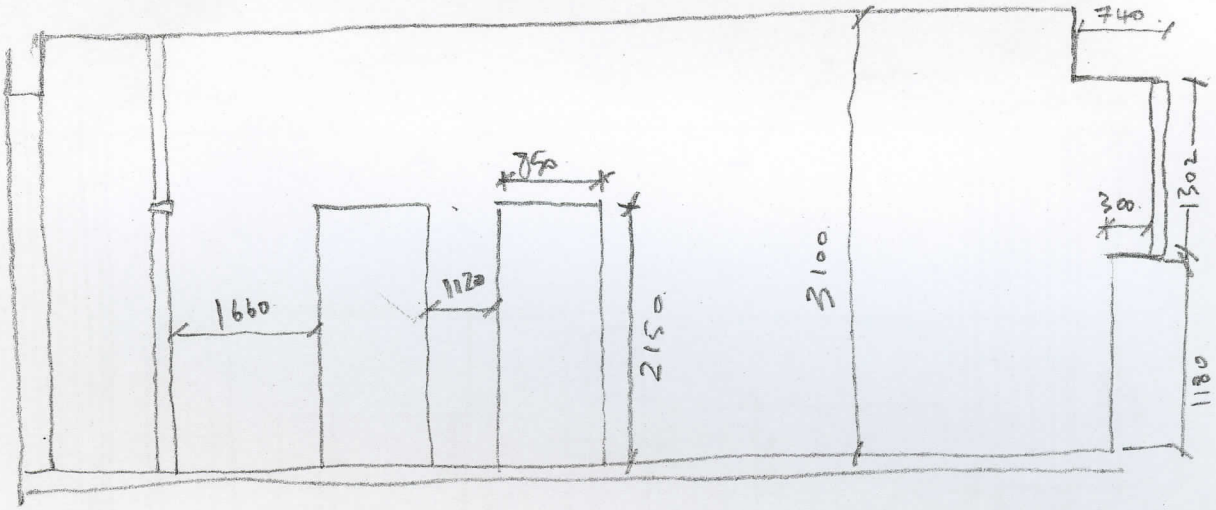


SECOND FLOOR. Section 3 EAST SIDE.



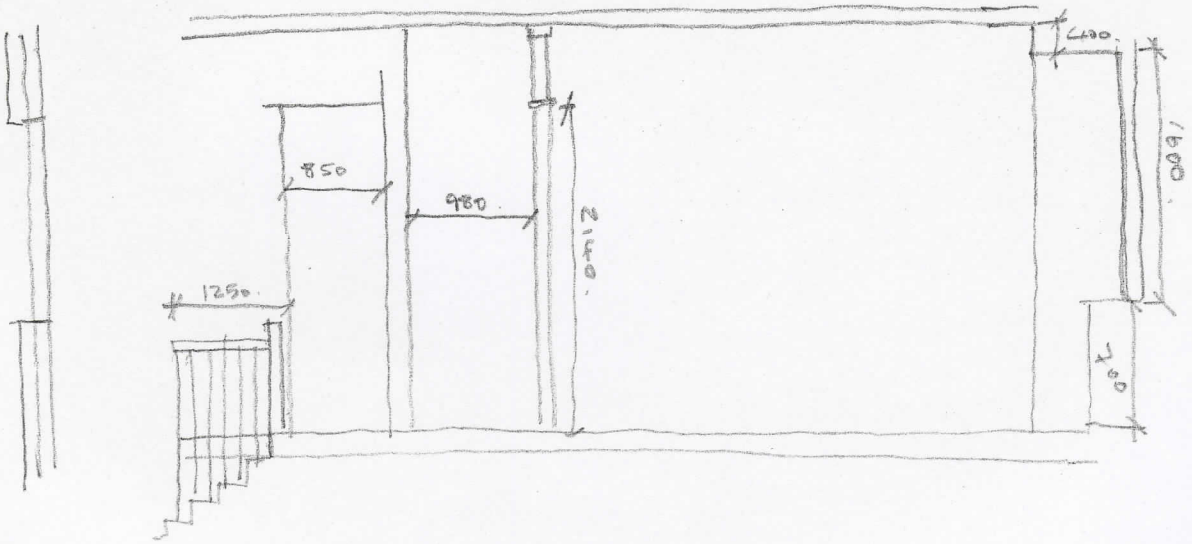
CARETAKERS HOUSE

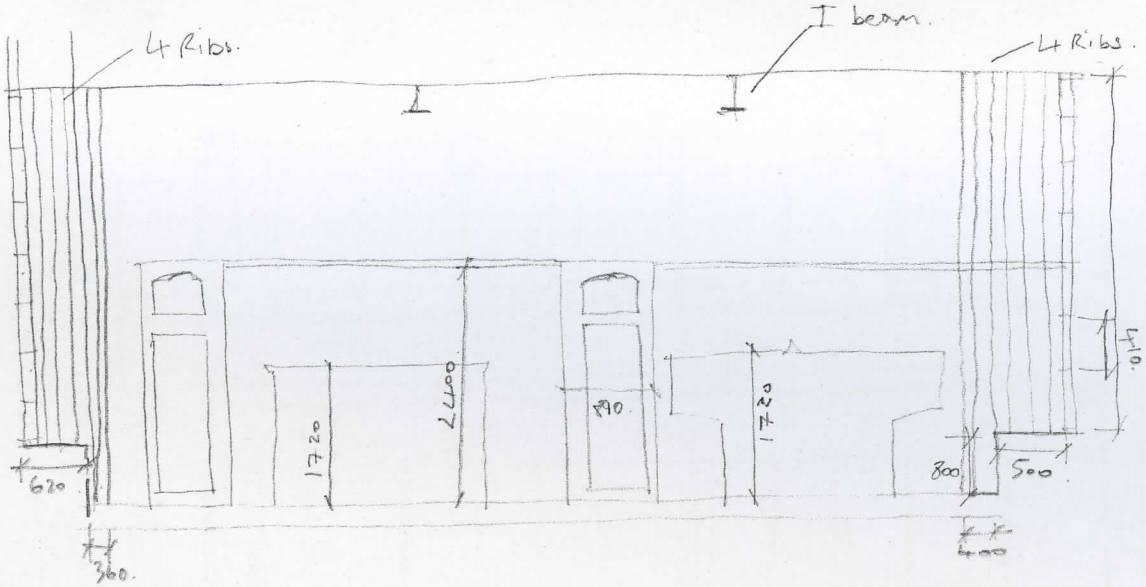
GROUND FLOOR.

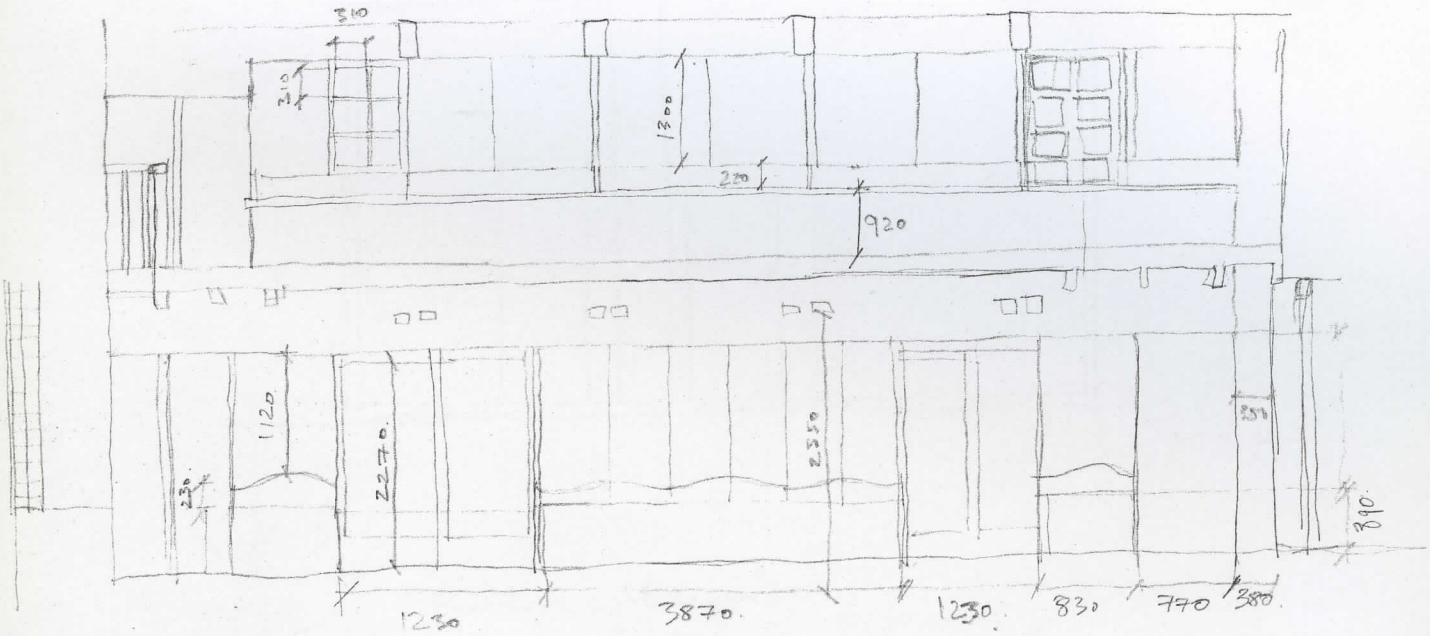


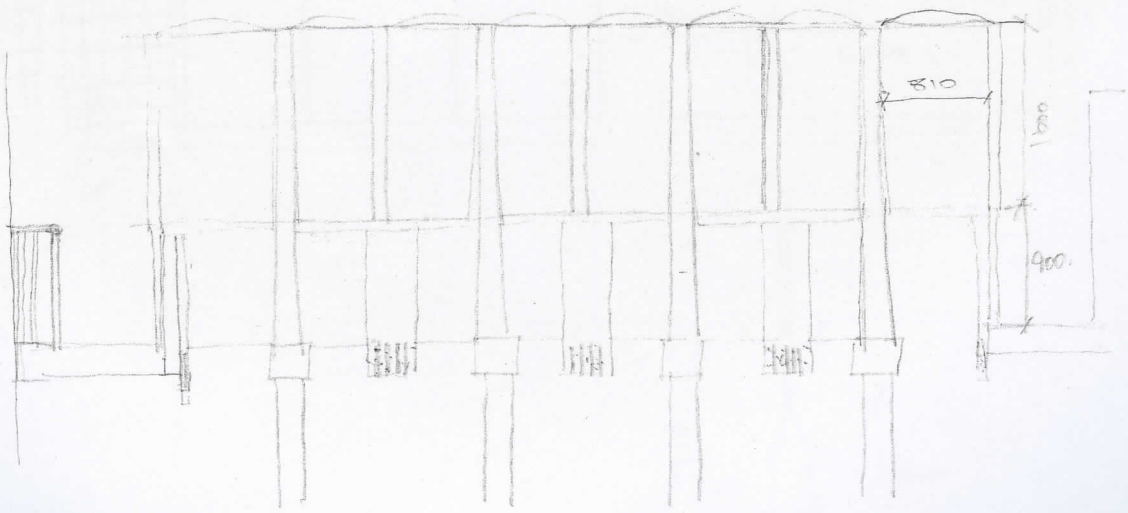
UPPER FLOOR.

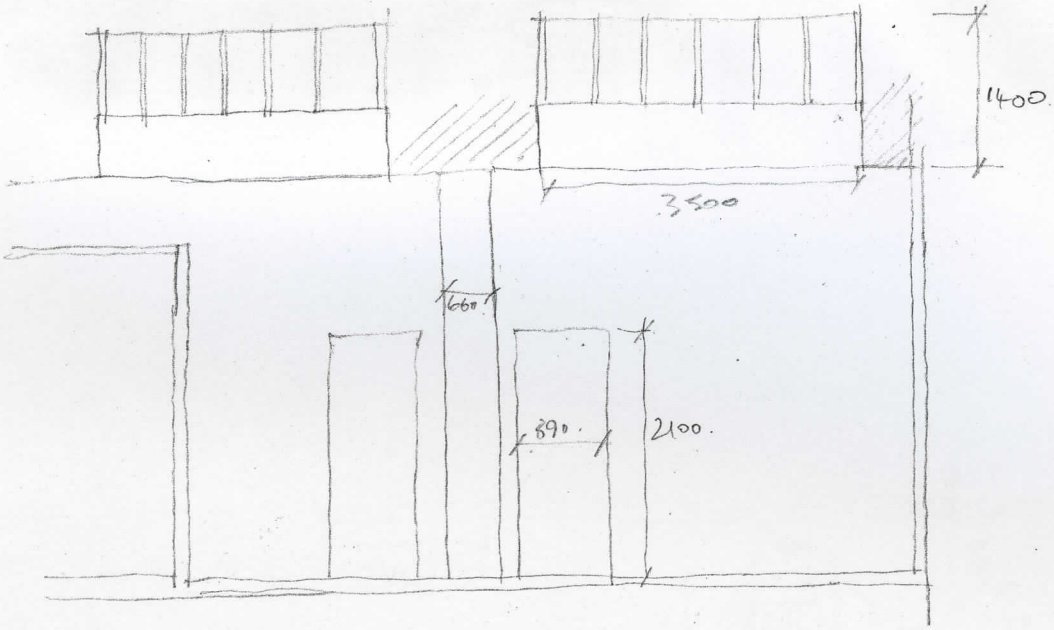
Estimate ottines.



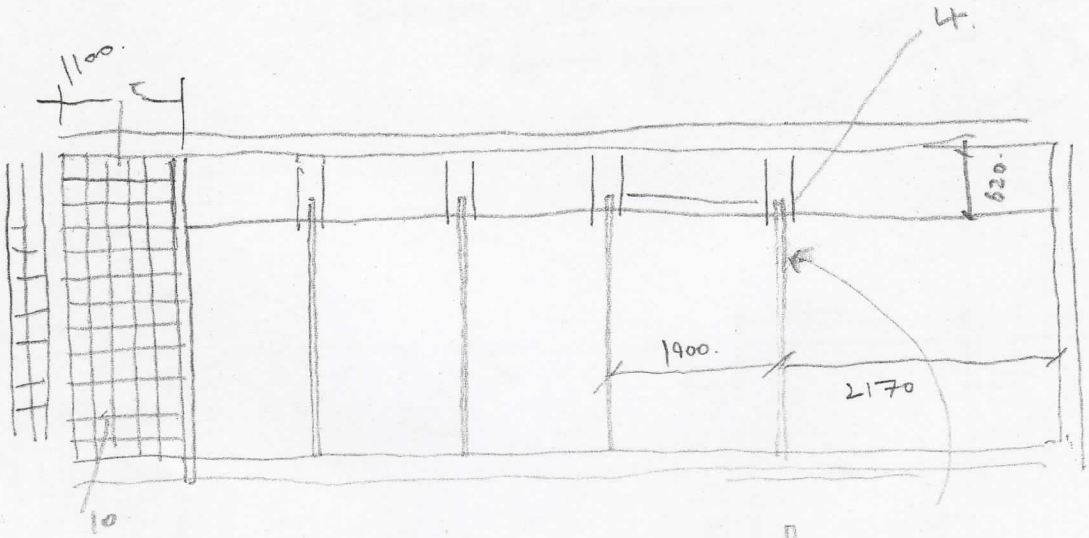

4 Ribs.
I beam.
4 Ribs.
620
360.
1720
2400
890
1720
800
500
400
410.

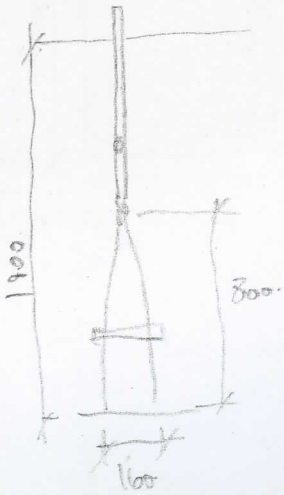

310
310
1300
220
920
1120
2270
2350
230
250
890
1230
3870
1230
830
770
380


810
1800
400

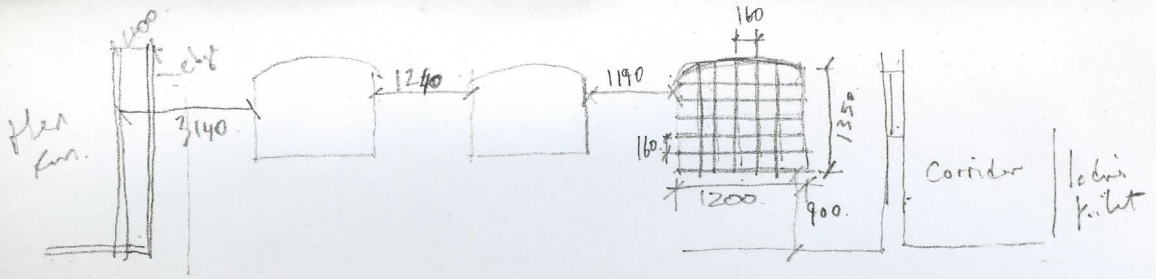


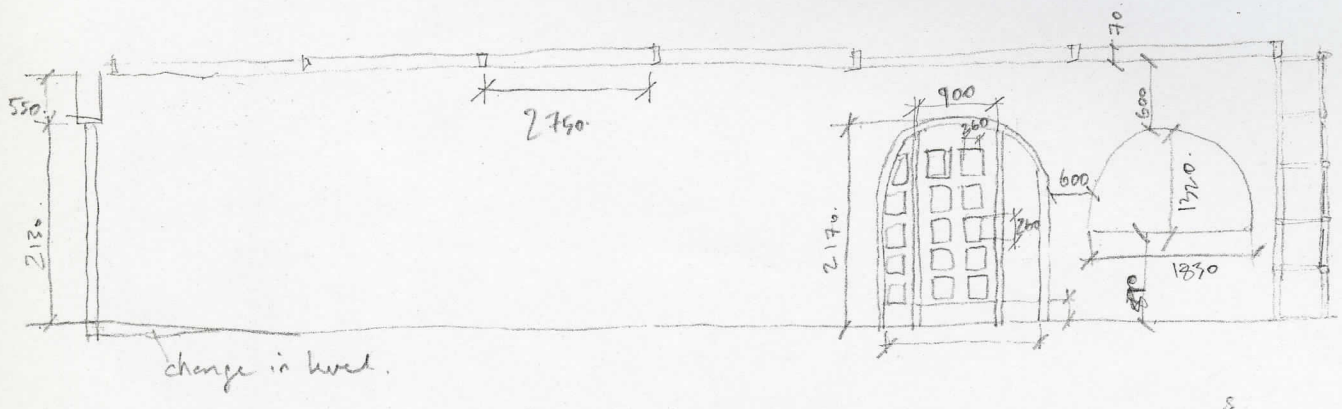
Furniture Museum.





Windows at 2nd Floor South Lounge





Each one is 420 x 420mm.
5 squares high.

42 squares windows running the length of the hen fan.