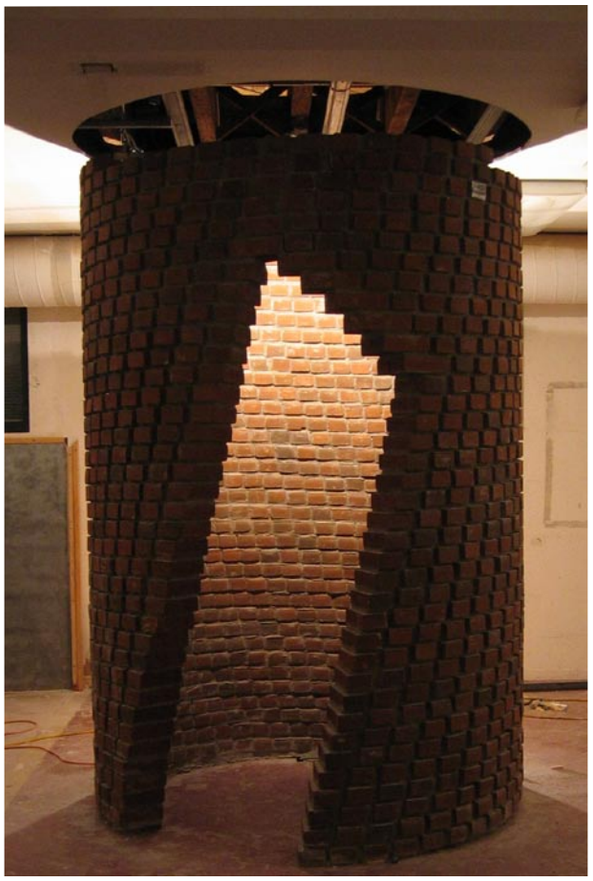

A Thesis on Craftsmanship

Patrick S. Cooke
Virginia Tech 2003-2005
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1001 Prince Street
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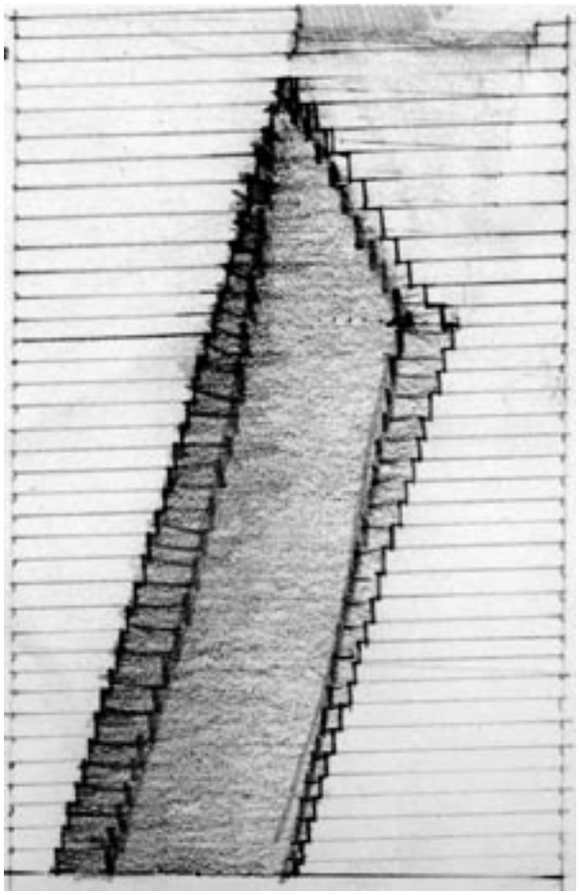
Thesis Defense 9-2-2005 Alexandria VA
Thesis submitted to the faculty of Virginia Polytechnic Institute and State University in partial fulfilment of the requirements for degree of Master in Architecture
Keywords: Architecture, Craftsmanship, Guastavino,

Susan Piedmont-Palladino

Dr. Paul Emmons

Jaan Holt



8-29-05

"that I am not in madness, but mad in craft"
-Douglas Darden

*

To my Parents Jane and Terence

Their own pursuit
of higher education
has been inspiration

enough.

**

For my wife Allison

Patience, encouragement

*Pietas filorum in parentes
**Fidei Symbolum
Alciato's book of Emblems 1531

An architectural thesis is an individual pursuit, one student facing his own question about architecture and design. It is to be answered through the study and creation of plans, sections, elevations, details, and models for a single work of architecture.

An architectural thesis is a group endeavor, a class of students, challenging each other with their own questions about architecture and design. It is to be pursued through discussion, debate, conflict, and critique for a series of architectural works.

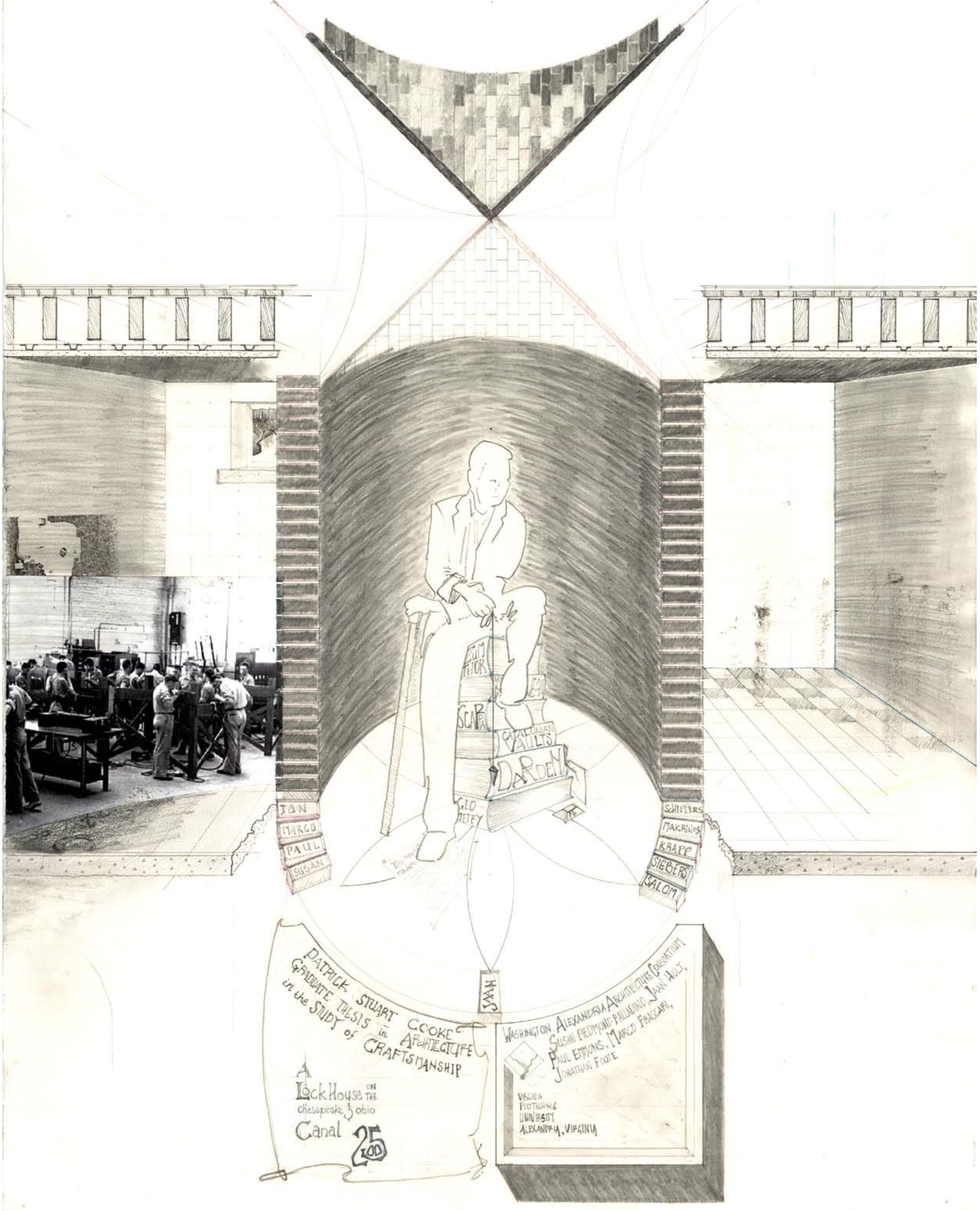
I wish to thank my committee who each have inspired me over the past two years:
Jaan Holt
Susan Piedmont-Palladino
Paul Emmons
Marco Frascari
Jonathan Foote

I wish to thank my friends, without whom the past two years would have been uneventful and unchallenging.
James Krapp
John Schippers
Steven Siebers
George Makrinos
Leo Salom

Craftsmanship as study	Word, Image, Craftsman as precedent
Craftsmanship as Making	Truth and knowledge through the makers hands
Craftsmanship as the Imagined	Plans, Sections, Elevations, Details, and Models for an allegorical work of architecture

12-12-05

ABSTRACT
A Thesis on Craftsmanship
Patrick S. Cooke


JON
MARCO
PAUL
SUSAN
SCHITTER
MAKRIDES
KRAFT
SIEBERT
SALOM
PATRICK STUART COOKE
GRADUATE THESIS in ARCHITECTURE
in the STUDY of CRAFTSMANSHIP
A LOCKHOUSE ON THE CHESAPEAKE & OHIO CANAL
25 100
WASHINGTON ALEXANDRIA ARCHITECTURE CONSORTIUM
SUSAN PIEDMONT-PALLADINO, JOAN ALT,
PAUL EMMONS, MARCO FRASCARI,
JONATHAN FOOTE
VIRGINIA POLYTECHNIC UNIVERSITY
ALEXANDRIA, VIRGINIA

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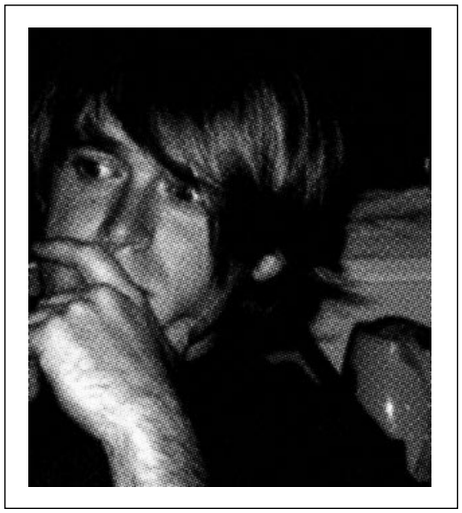
"Poetry results not from an excess of reasoning or intellectual power," wrote critic Alberto Perez-Gomez, "but rather [from] a lack thereof; it is, finally, an issue of making in order to know, not of harboring information in order to make." As architects we know this, but we rarely talk about it. To do so would propel ourselves immediately into the messy world of uncertainty, forcing us to confront again the existential fact that in order to know we must first act.

Through action we arrive at the privilege of reflection, which is the first step in uncovering new questions. The thesis is ultimately a deliberate gathering of questions founded in action: action, that is, as opposed to re-search, or the literal finding of what is already known. It is the seizing of situations, materials, conversations, and drawings as opportunities to discover new searches rather than reliving old ones. A thesis begins and subsists by the putting together of elements in unforeseen ways, rearranging them, pulling forth new relationships, assigning appropriateness, discarding, and regrouping. The site doesn't matter; the program doesn't matter.

What matters is the possession of nothing short of an obsession. Late nights, foggy minds, shabby bodies—the luxury of education is only discovered once we realize that architecture doesn't care about us, that actually we are in service to something greater than ourselves. We come to find pleasure in the search, not just in the answers. And through our searching, our action, we find only that we can't predict, and we see that a thesis is just the beginning.



12-12-05

FOREWORD
-Jonathan Foote

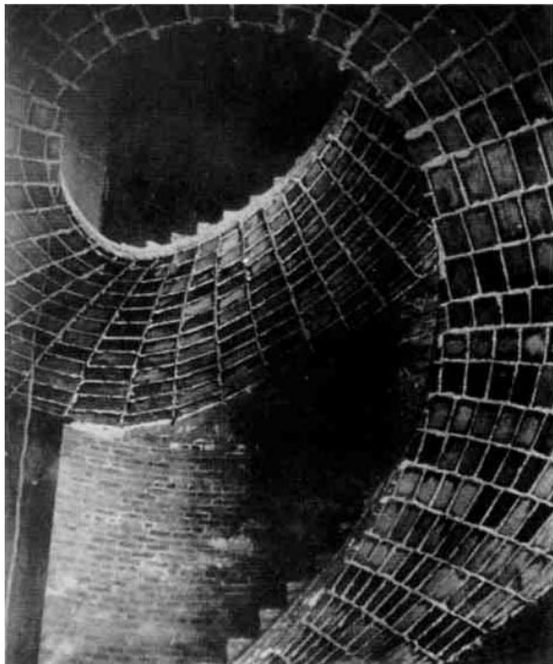
Chapter 1: Architectural Thesis

My thesis began with the study of Raphael Guastavino, an architect, and immigrant from Catalonia. My interest in Mr. Guastavino stemmed from a single image– a photograph dated 1900 taken of a spiral stair during a structural test (fig. 1). I had seen this image during my undergraduate study and had never understood the method of construction used. I found this image during my thesis and researched extensively the construction methods used to build a stair in this method. I found "cohesive construction", a masonry technique, popular in Catalonia, was brought to this country and implemented by Mr. Guastavino who employed this method in the construction of vaults, domes, stairs, ceilings, floors and walls. Thin terra cotta tiles (typically 3/4" thick, 6" by 12") are built in layers with simple form work using a base mortar of fast drying plaster. After the plaster has cured further layers follow using portland cement mortar and over-lapping joints. Through this method, individual tiles sandwich together to form a shell structure, of incredibly high strength- - with relatively little outward thrust (as is typically found in masonry vaulting). The method was simple, fast, inexpensive, fireproof, and strong.

Fig. 1 Structural Test performed on spiral stairway First Church of Christ Scientists New York, 1900

Fig. 2 Elliptical stair, First National Bank of Paterson New Jersey

Fig. 3 Elliptical stair New York Union Club New York 1901



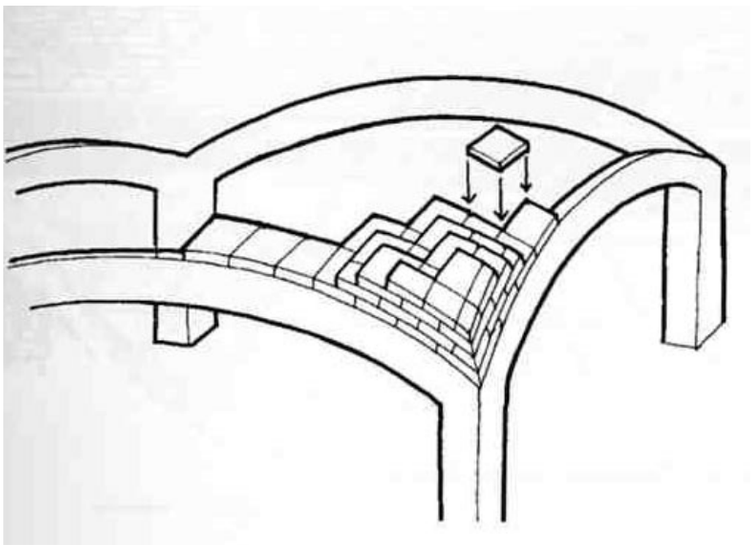


Fig. 4 The cohesive vault construction method.

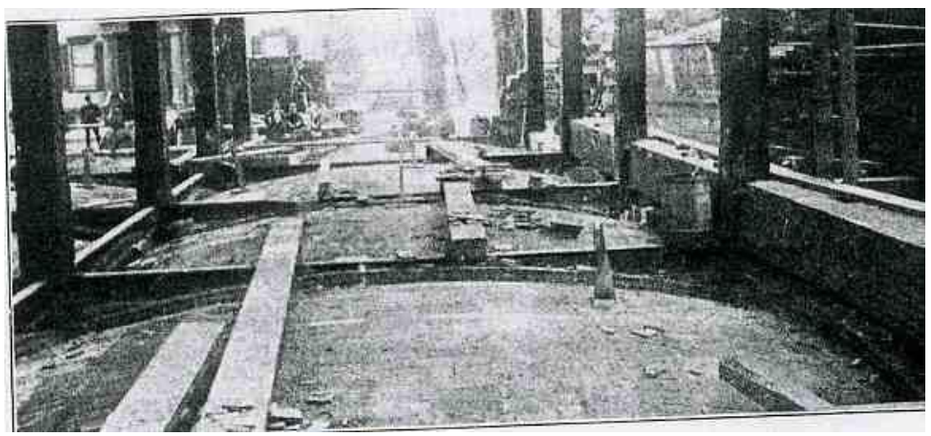


Fig. 5 The vaulting method applied to construct ceiling and floor in a large building

The study of cohesive construction led me to my thesis topic of Craftsmanship. A simple material could be elevated to create new and unique form, simply through the understanding of its limits. A principle component of this understanding came through experiment, in built example. Mr. Guastavino's work began as simple short span vaulted roofs in factories and grew to vast domes that spanned cathedrals. The forms were a direct result of the manipulation and experimentation of a single material. The study of these built works became a study in the methods of their making and the knowledge of their construction. Often times visually challenging - vaults as thin as 3 inches spanning 100 feet- their methods of construction had died with the craftsman who built them. The challenge of a simple material to produce varied forms embodied my own belief of what the study of craftsmanship would yield.

Fig. 6 Cohesive construction used to build a shallow vault with a single curved board as formwork

Fig. 7 Guastavino's tile vaults beneath the Queensboro Bridge, New York.

Fig. 8 Guastavino's tile vaults beneath Grand Central Station, New York.

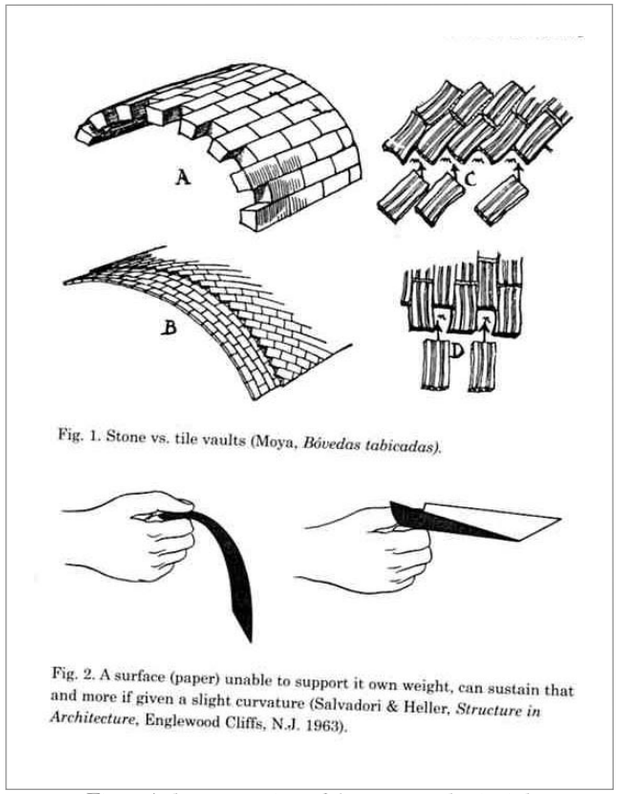


Fig. 1. Stone vs. tile vaults (Moya, *Bóvedas tabicadas*).

Fig. 2. A surface (paper) unable to support it own weight, can sustain that and more if given a slight curvature (Salvadori & Heller, *Structure in Architecture*, Englewood Cliffs, N.J. 1963).

Fig. 9 A demonstration of the structural principles found in cohesive construction

Application for
AIA Scholarship
December 2004

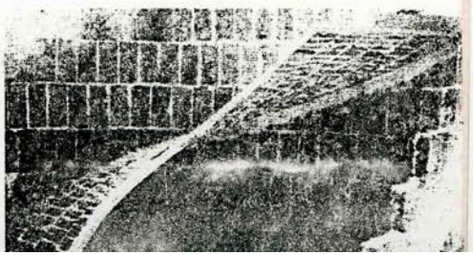
Patrick Cooke
1706 A1 Commonwealth Ave
Alexandria VA 22301 703.869.0071
Application for 2004 AIA Northern Virginia Scholarship
ATTN: Schools Connections Committee

During the past few months the Washington Alexandria Architecture consortium has been in the early phases of a renewal to both its interior and exterior. The school of 190 students has been steadily growing (170 students at this time last year) and has begun to expand to its adjoining building (1003 Prince street) acquired by Virginia Tech in 2002. The first phase of this expansion (to be completed December 2004) is the relocation of the school's woodshop to the new building freeing the basement level existing wood shop for use as additional studio space.

The school's director, Jaan Holt, has long been a proponent of his students taking an active role in the construction of their building and offers a course in design/build each semester that investigates new opportunities for construction and renovation within our own walls. The relocation of the woodshop has offered the opportunity for just such an investigation and I have taken this opportunity to propose the construction of brick cylinder to be built in the now vacant space. The purpose of this construction is to further my own graduate thesis study (the study of craftsmanship) as well as to become a permanent installation in the school as the basis for the future expansion of the school's library to three floors.

The decision for a brick cylinder arose from my own study of the tile vaults built by the Raphael Guastavino Company (1885-1962). Mr. Guastavino patented a technique of vault building from his home country of Spain that used thin flat terra-cotta tiles that, when layered carefully, could be used to span great distances without the use of traditional centering or framework. This technique came to be known as cohesive construction and was a viable building alternative to traditional masonry construction at the turn of the century. Much of Mr. Guastavino's work still stands today and is easily identified by the vault's trademark herringbone arrangement of tiles. My own studies of craftsmanship led me to discover this method of vaulting and towards experiments in it's application ultimately leading to the decision to construct a brick cylinder for experiments in a helical stair form built from terra cotta tiles.

As a student of material I struggled with the idea of constructing a masonry form whose use was to be discarded. Further investigation of the cylinders construction led me to approach the faculty of the University with the intentions of constructing this as a permanent installation. Current plans are for this cylinder to house the staircase that will connect the first floor library with its future expansion to the basement level. The $2000 grant is to be used for the purchase of approximately 2000 bricks, their delivery to school, cement, sand and the necessary hand tools.



photos by Patrick Cooke

My early studies of Guastavino's work quickly centred on the study of how his work was made. It was in the construction of his forms that I saw the real mystery and the most possibility for my thesis study. I decided early to build something, hoping even to replicate some of the cohesive construction work I had studied. With this in mind I submitted an application for the Virginia AIA Scholarship – a sketch of mine, done to investigate a method for building a cylinder of bricks. In the study of tile cohesive construction I had found many images of a helical stair being constructed within a cylindrical form. As I studied the stair construction I naturally studied the construction of the cylindrical form important in its making. Eventually my interest gravitated from the materials I did not possess (terra cotta tiles) to the materials I could easily obtain (brick). I began to practice with brick building low walls and began drawing their construction – not as lines but drawing each individual brick in a wall, arch, or vault. This study began to influence my understanding of what my thesis study was. My study began to evolve towards a knowledge of a very basic building material: the brick.

The Brick Cylinder
Early Construction
April 2005

photos by Patrick Cooke

To know something is to have made it. I set about to make a brick cylinder as one who has little knowledge of brick might. I mathematically constructed a jig, using a threaded rod as my center point, that would control the placement of each brick in all three dimensions, X, Y, and Z. If the jig was constructed well, it would guarantee the difficult task of coursing my bricks, and maintaining their plumb. The threaded rod's pitch allowed for the coursing to spiral, and mathematical study revealed that I could control this further, allowing the spiral to begin in three places at once, taking the form of a triple helix. The diameter of the cylinder was set at the size of a man, arms outstretched, and from there it was determined the threading pitch of the rod, the length of the radius arm, and the number of bricks per course (3 points, 16 bricks per segment, with 8 bricks removed from the final segment to form the opening). The geometric dissection of the circle into 6 parts gave me my three starting points and the dimension of my opening: 1/6th the circumference, the 8 bricks removed from a segment of coursing.

The Brick Cylinder
Early Construction
April - May 2005

photos by Patrick Cooke

The design of the opening presented itself as both an elegant doorway, and also a structural experiment. In order to add strength to a brick wall, the joints must be staggered, I chose to off-set each course by 3/4"– which would allow the opening to corbel outwards, a full 1/6th the circumference of the cylinder by the final course. This opening responds to the technique of the cylinders making, but also allowed me to experiment with brick corbelling. The original design called for the opening to remain open to the ceiling, with no lintel, the corbel spanning 1/6th of the circumference of the cylinder. This was later modified.

photos by Patrick Cooke

It was decided during construction to add a lintel to the corbeled opening of the cylinder. I had worked with the brick as a repetitive construction for almost two months and saw the design and implication of a lintel as a new challenge. By turning the bricks as stretchers I found that I could continue to use the central jig for their placement, as well as attempt a more difficult corbeling experiment. The lintel, once complete functions as an arched opening -- made stronger by the weight of the coursing above.

The Brick Cylinder
Construction
June 2005

photos by Patrick Cooke

The cylinder, at its completion, had become a study in making. The final course contains a brick cast in lead with the inscription "verum ipsum factum" translated as "the truth and the making are one". The knowledge of material can only be found through its first hand construction.

The Brick Cylinder
Construction Final
June 28 2005

photos by Patrick Cooke



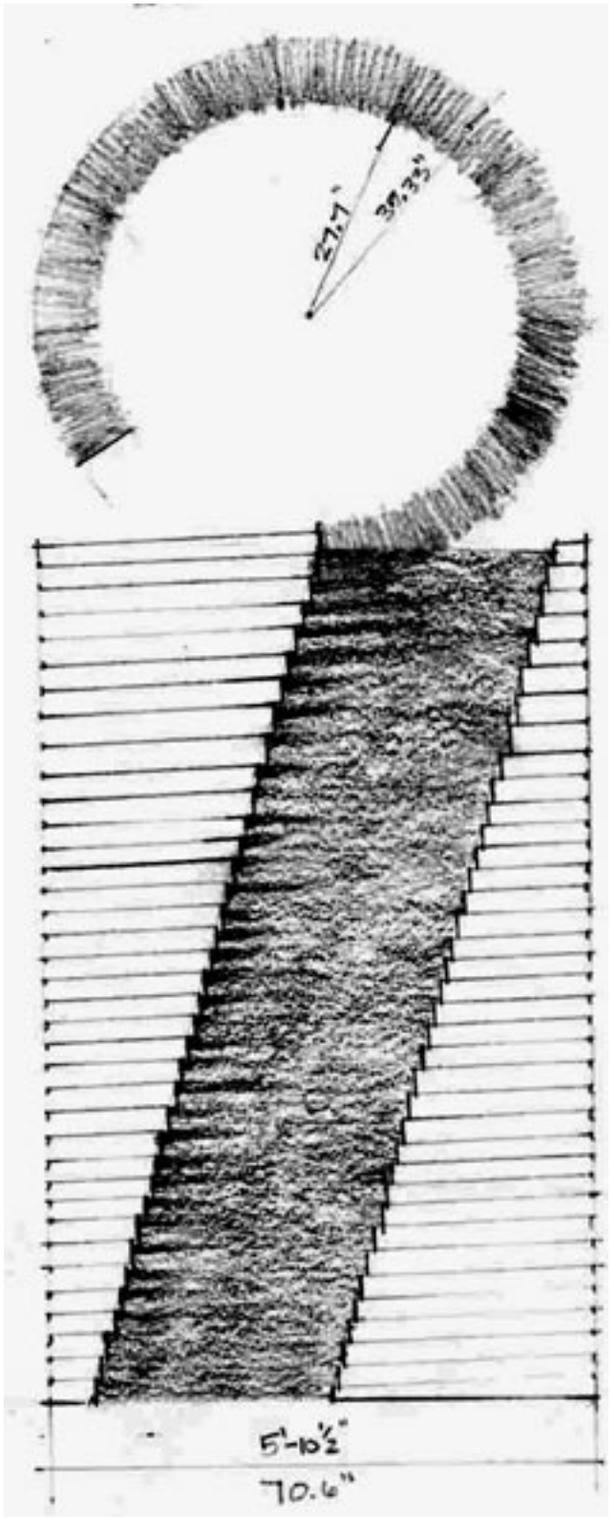




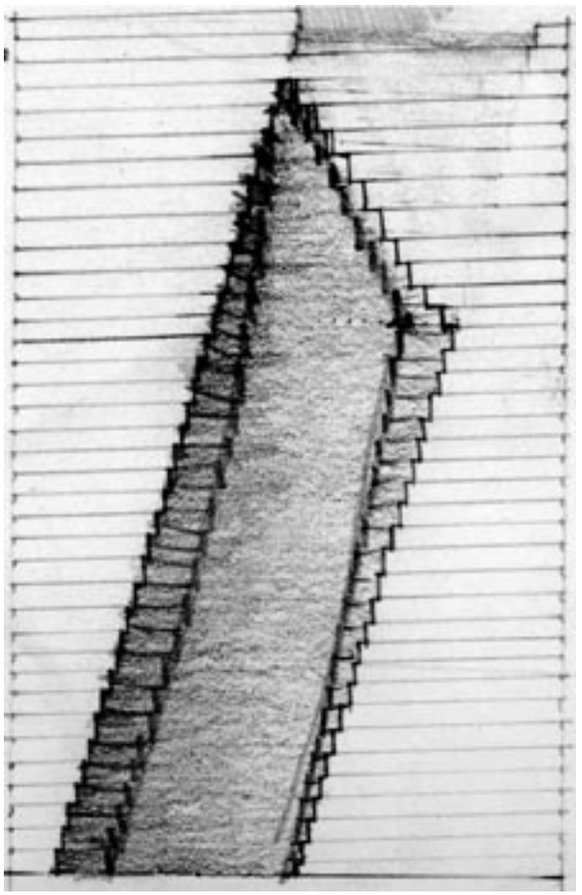




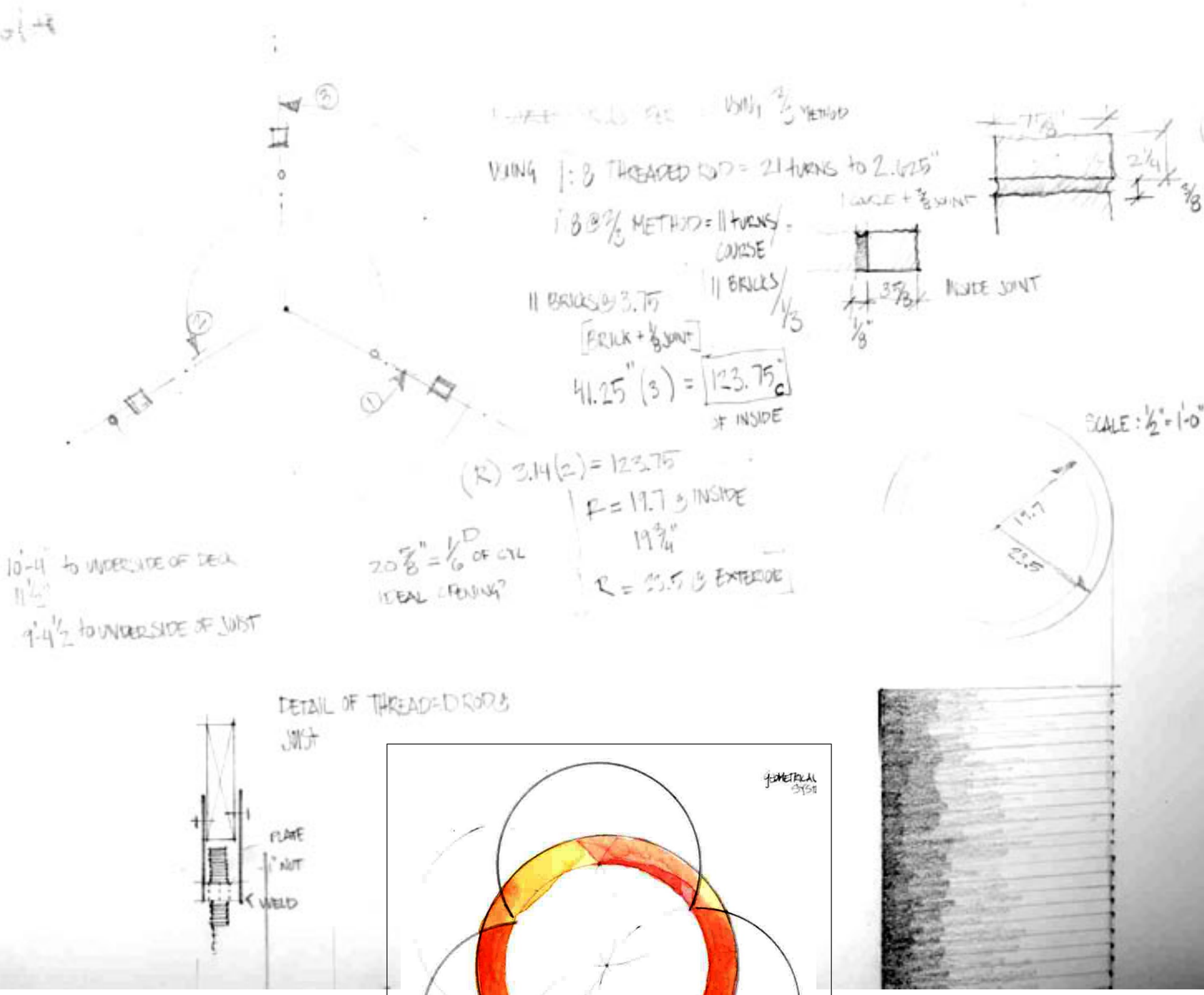
photos by Patrick Cooke

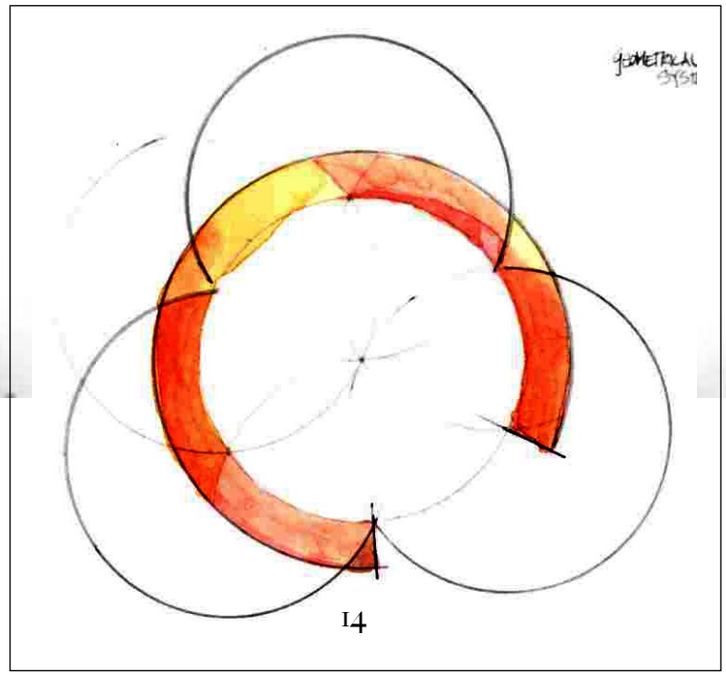


Early elevation sketch November 19, 2004.



Original sketch revised to study new lintel condition at opening May 22, 2005
The depth in the sketch now reflects the influence of the making.





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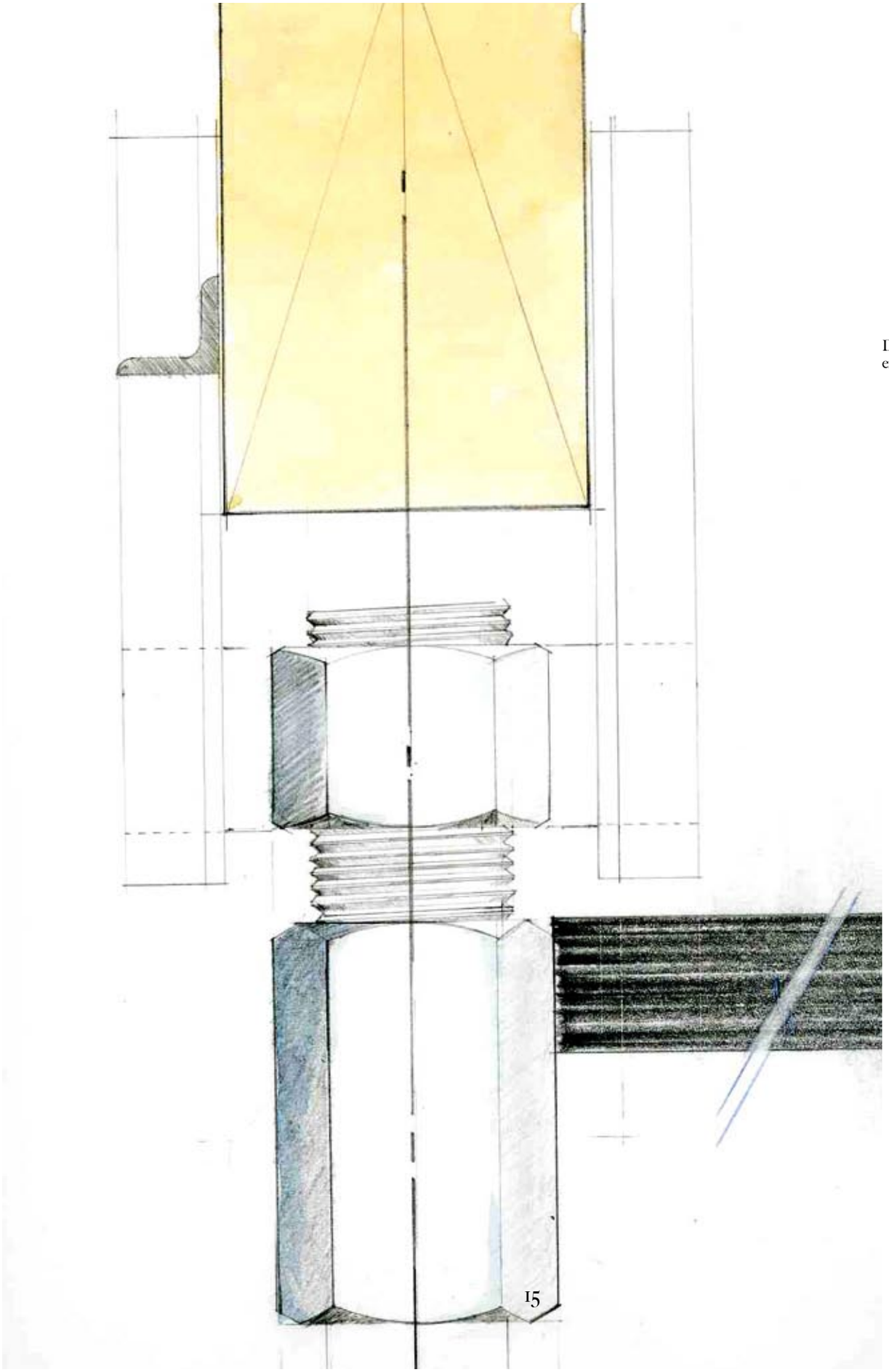
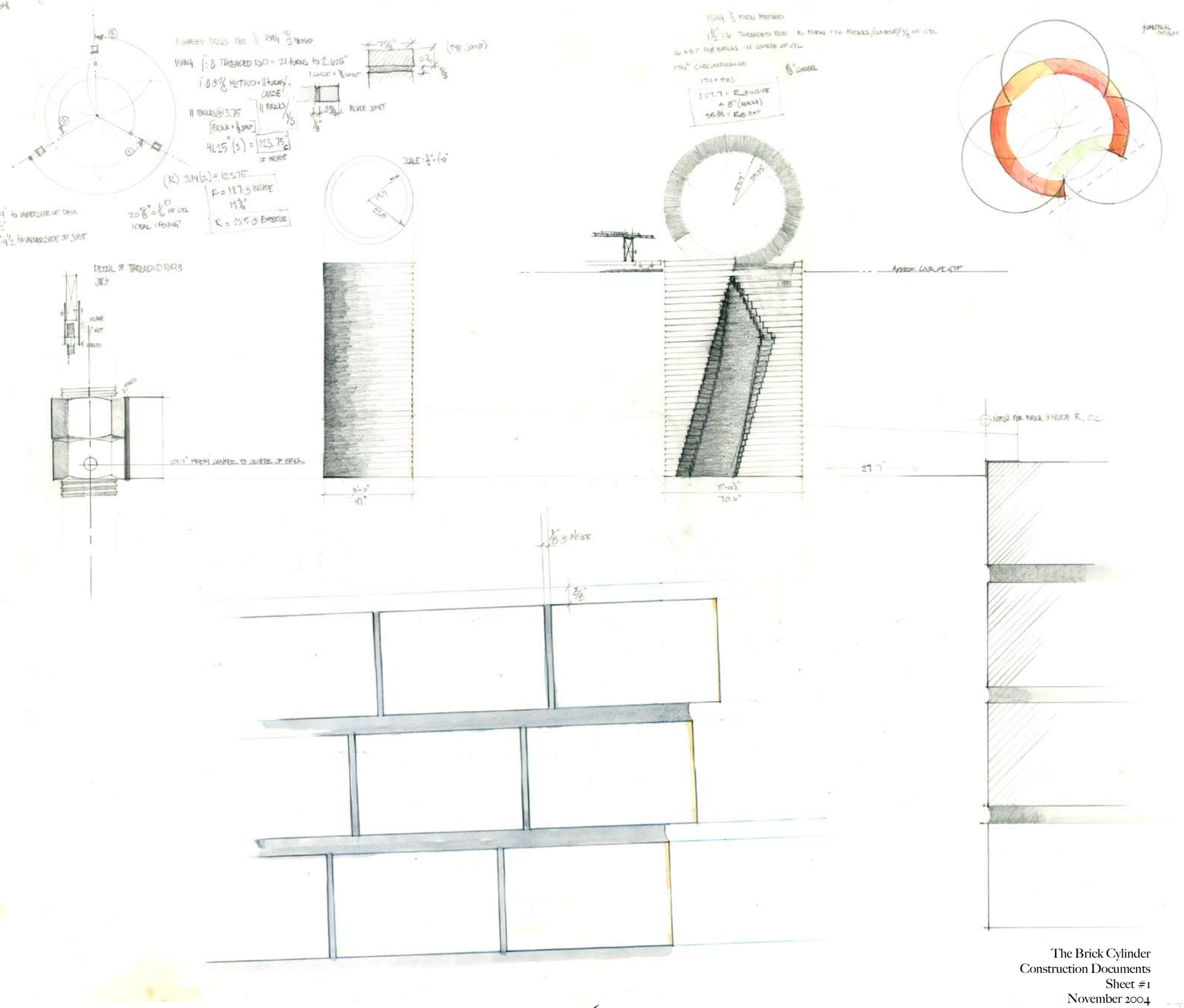
Geormetrical division of cylinder plan - used to locate starting points and opening size

The Brick Cylinder
Construction Documents
November 2004
Original Calculations for cylinder proportions and jig construction

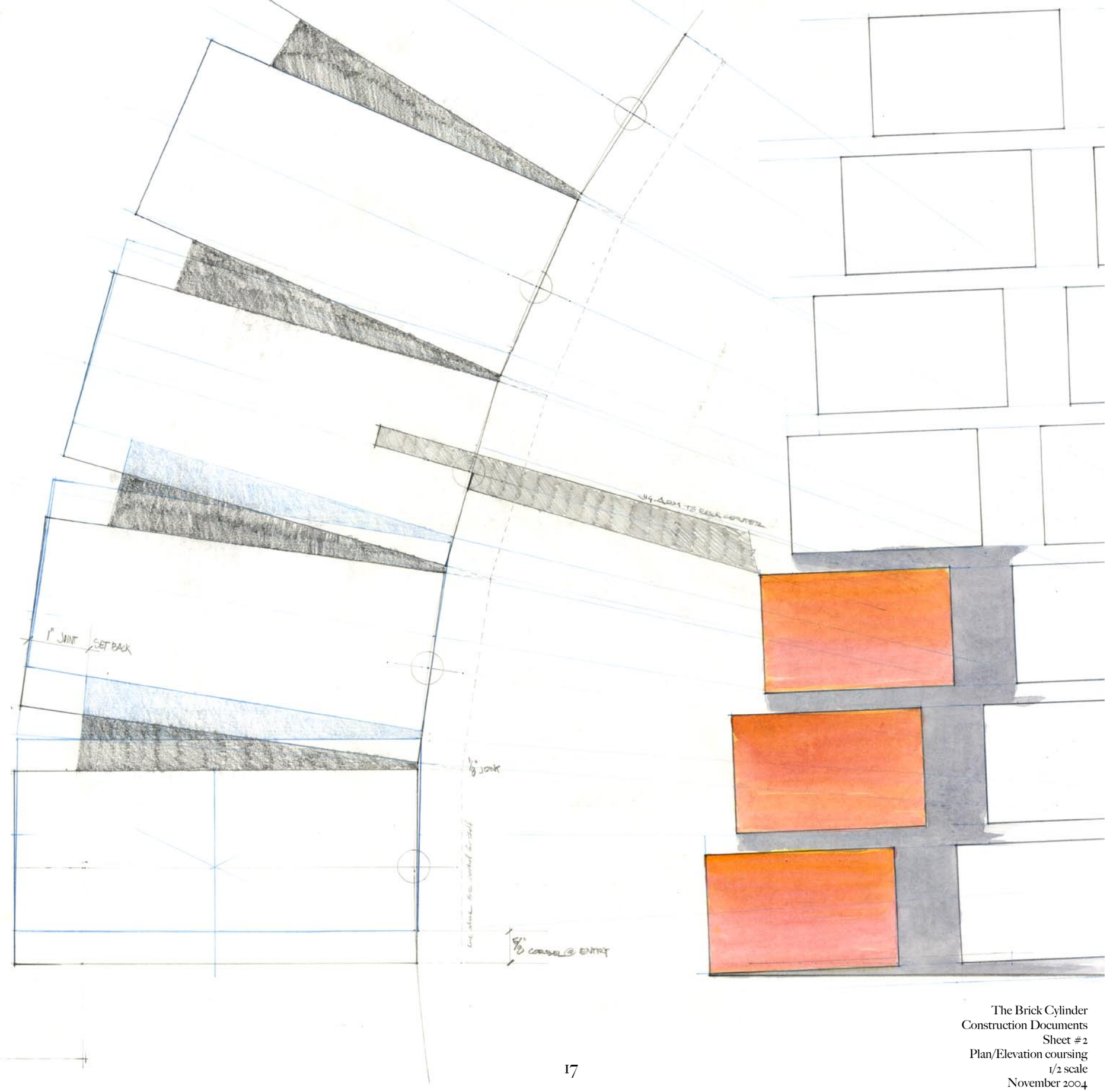


Detail of Jig construction as it mounts to the existing ceiling joists. Drawn at 1:1 scale

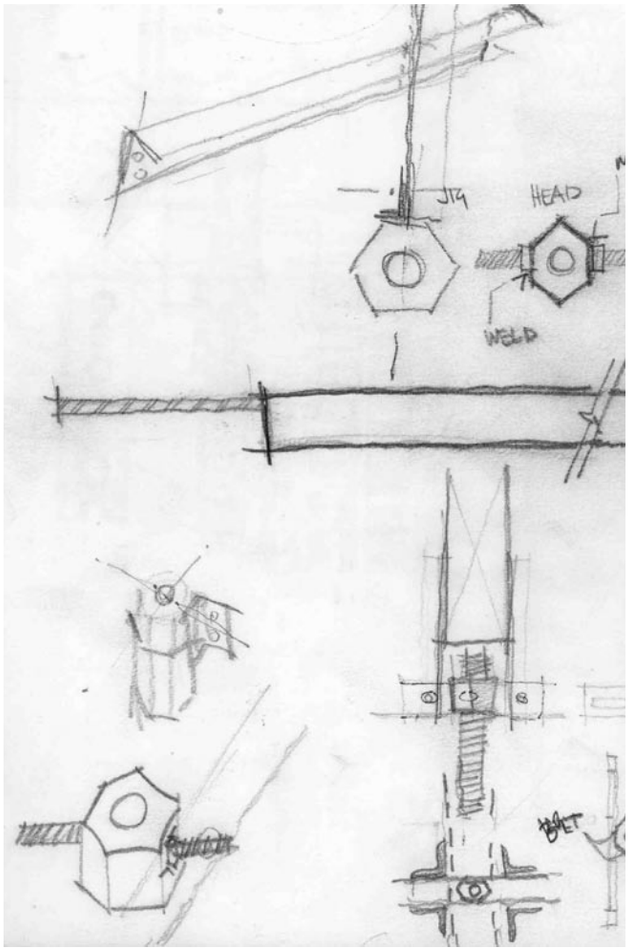
The Brick Cylinder
Construction Documents
November 2004

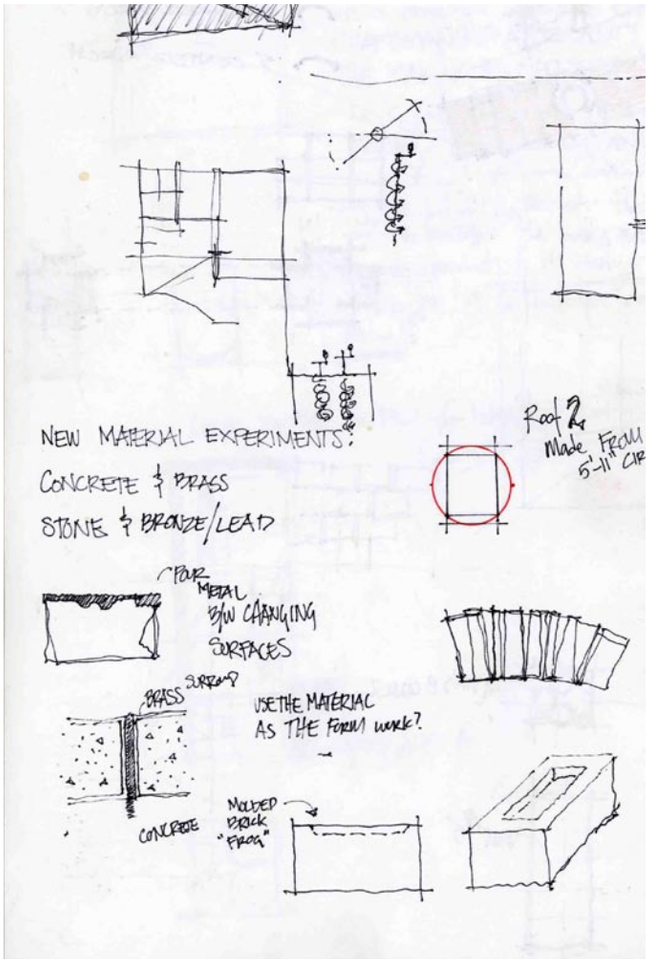


The Brick Cylinder
Construction Documents
Sheet #1
November 2004



The Brick Cylinder
Construction Documents
Sheet #2
Plan/Elevation coursing
1/2 scale
November 2004





The Brick Cylinder
Early sketches of the jig
October 2004

Lockhouse

A STATION OF A CROSS[ROADS]

Georgetown Terminus, C&O Canal

The Lockhouse borders the C&O Canal at its terminus in Georgetown, Washington DC. The building is craftsmanship imagined through the rendering of material with drawing. The site is an allegory of the exapansion and settlement of the United States.

The building - a hostel - is a place to stay for the travelers who hike the 180 miles of the [now abandoned] canal. The site - a division - is a place of once great commerce [now reformed] between the formal city and the working river. The design - an abstraction - is a study in drawing [now evolved] informed by the lessons of making.

photos by George Makrinos

Host

The Lockhouse as a building typology had existed a century prior along the canal. Owned by the commercial canal and occupied by a family it was a modest working home, serving to maintain the canal locks, and as Hostel for the nightly stay of the canal traveler.

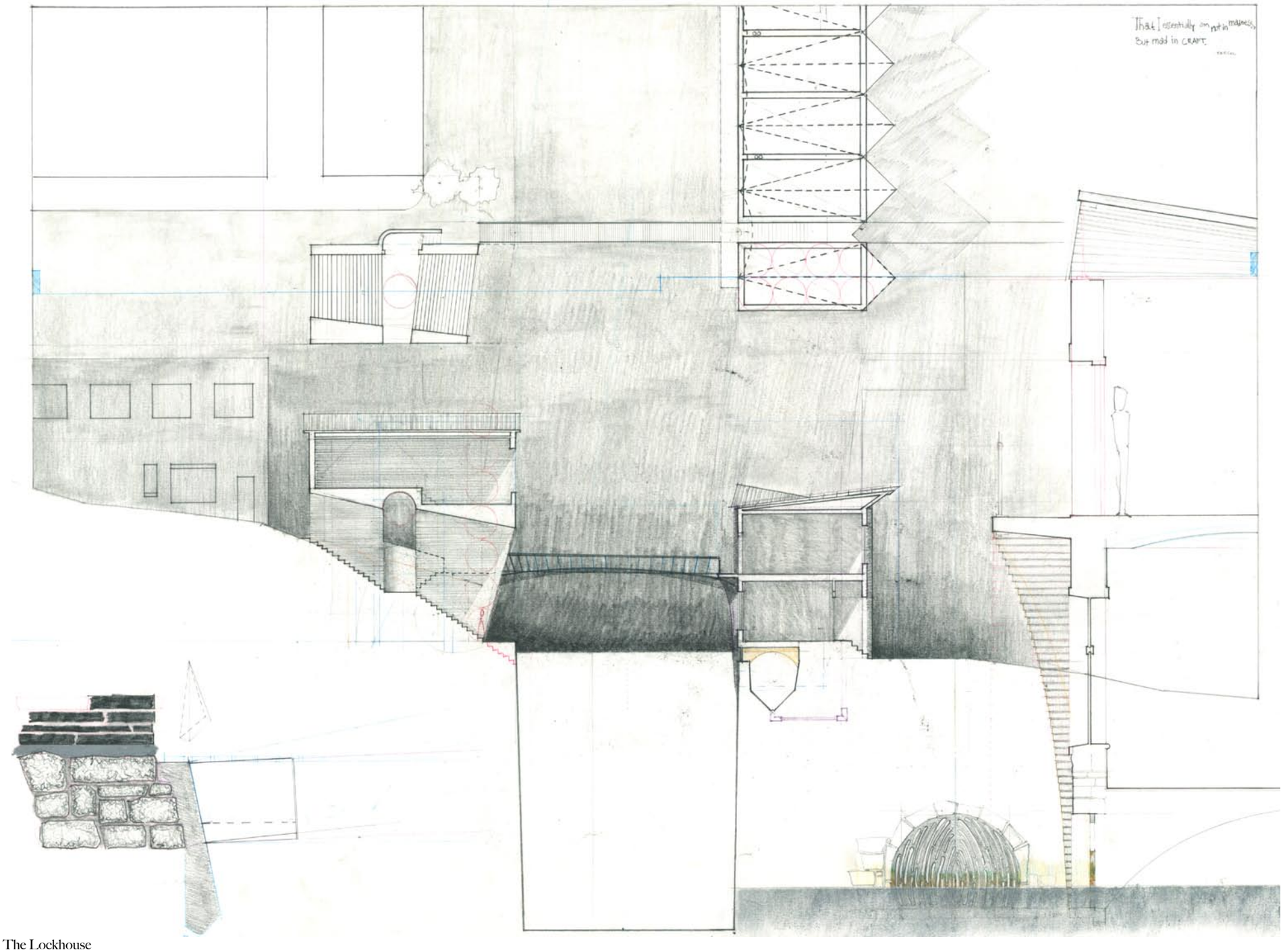
Guest

The Traveler, as a means of living, exists as a shepherd of goods, either for oneself or ones obligation. The traveler leaves one house for another at a schedule of his/her choosing.

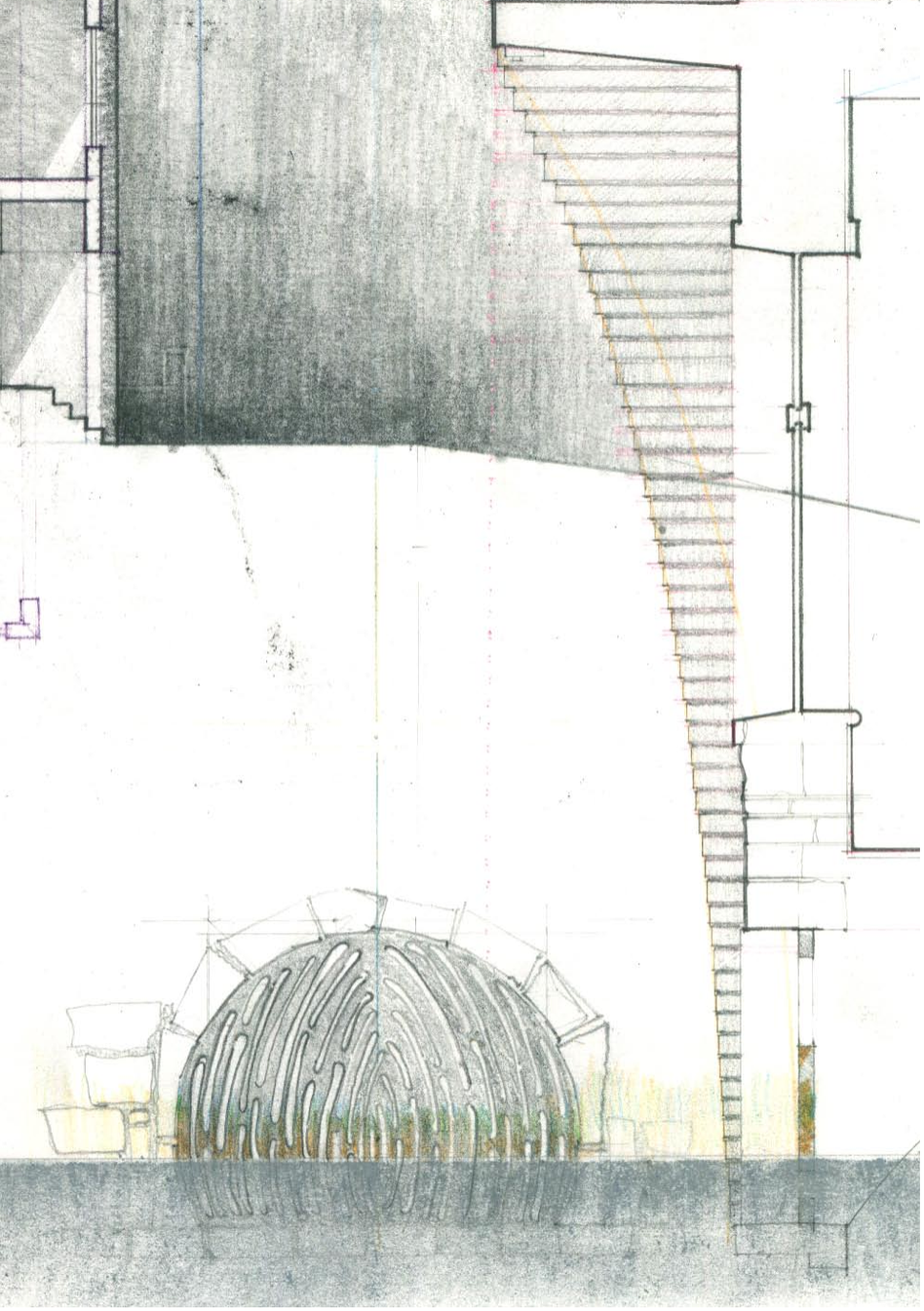
The site, C&O Canal Georgetown
Looking North
photo by Patrick Cooke

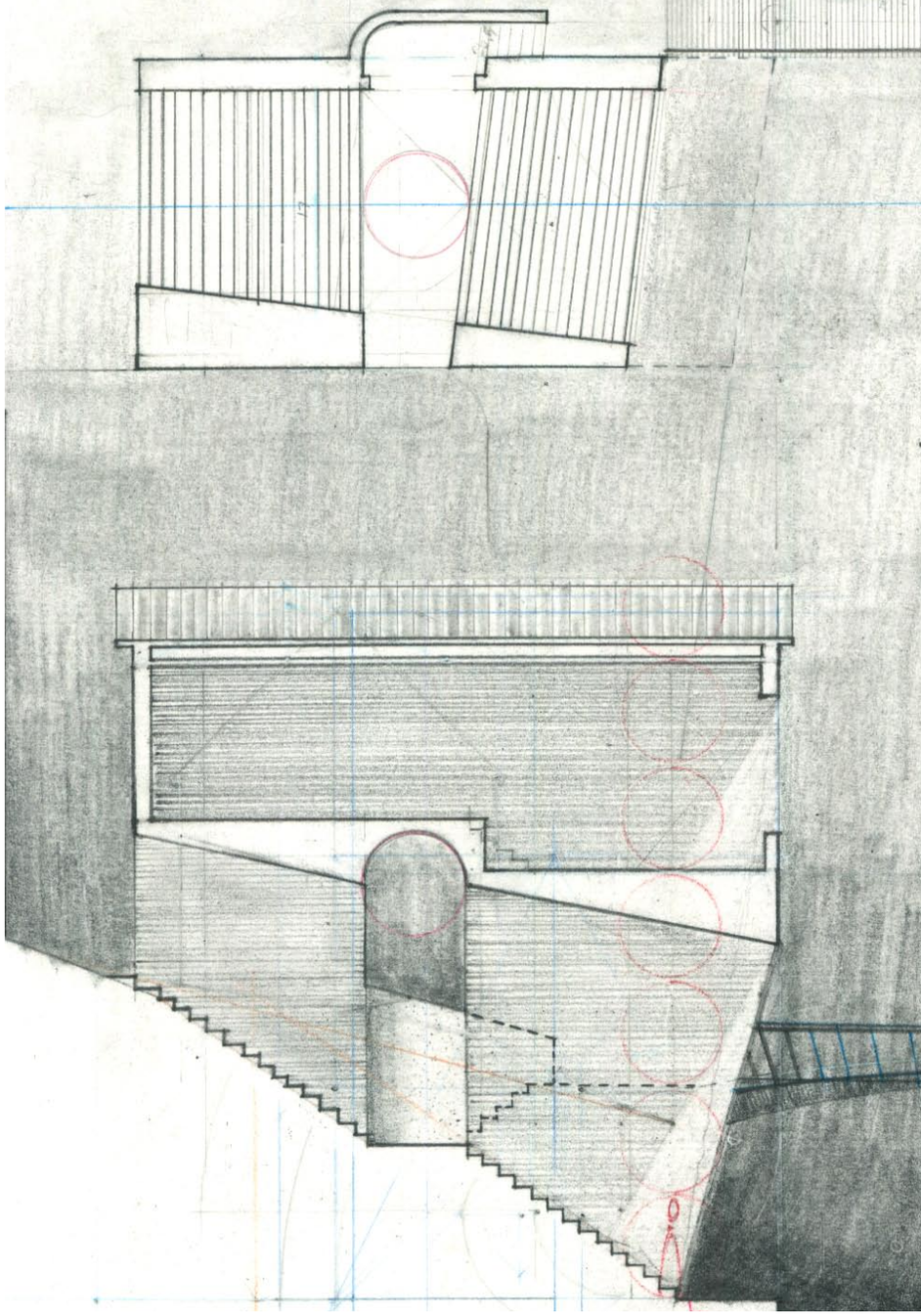
The site, C&O Canal Georgetown
Looking West
photo by Patrick Cooke

The Lockhouse
Site



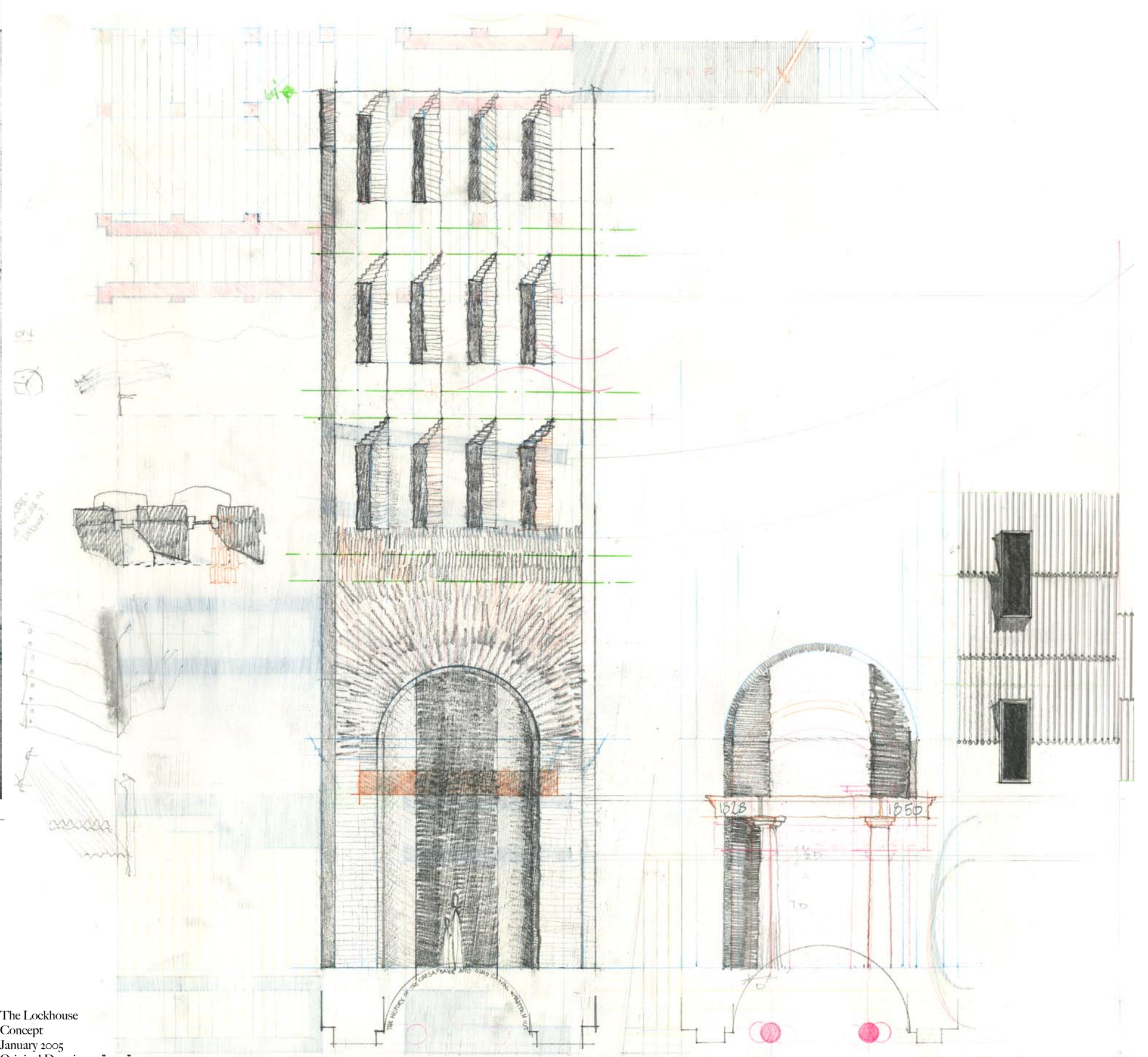
The Lockhouse
Concept
December 2004
Original Drawing 22" x 30"



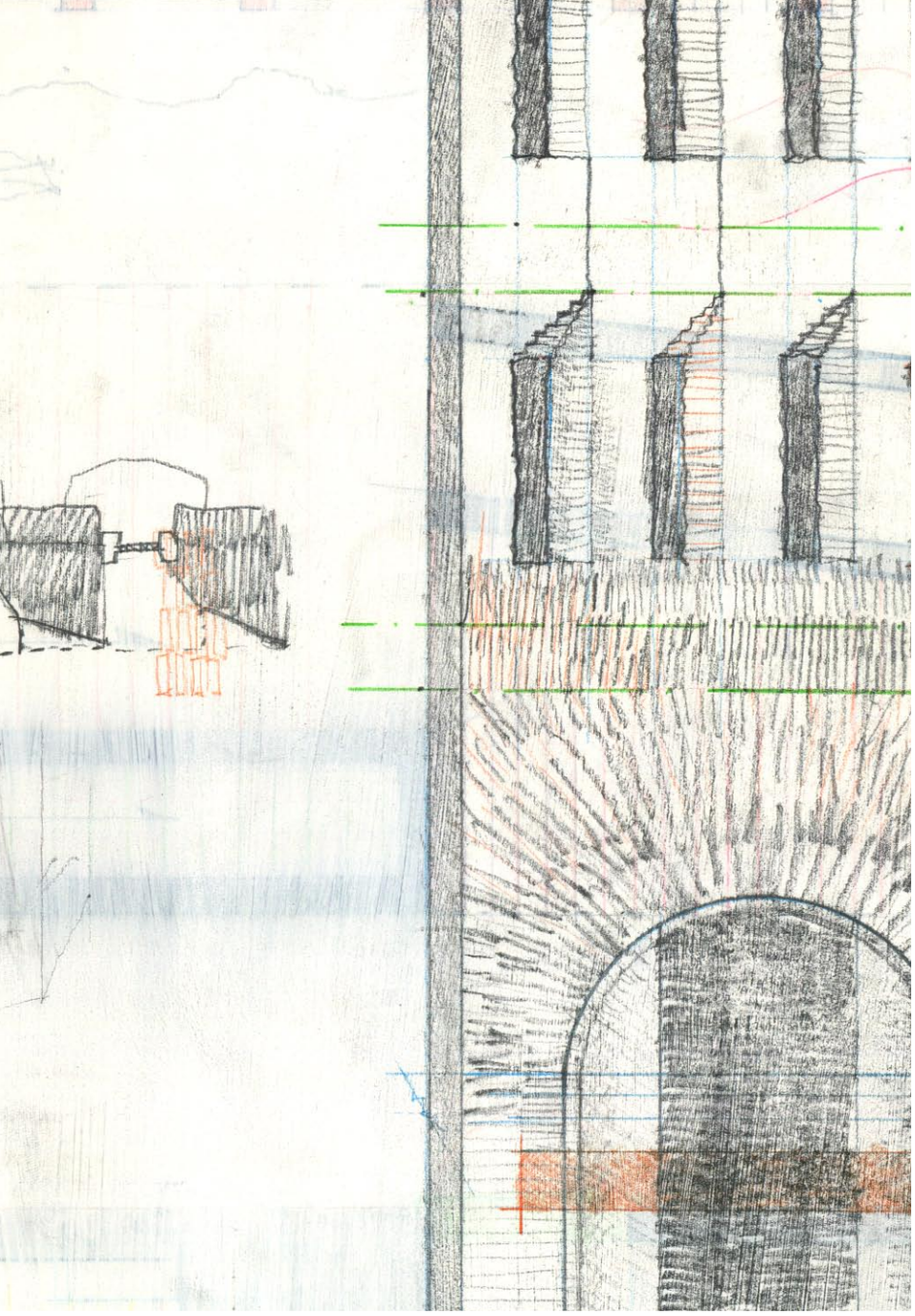


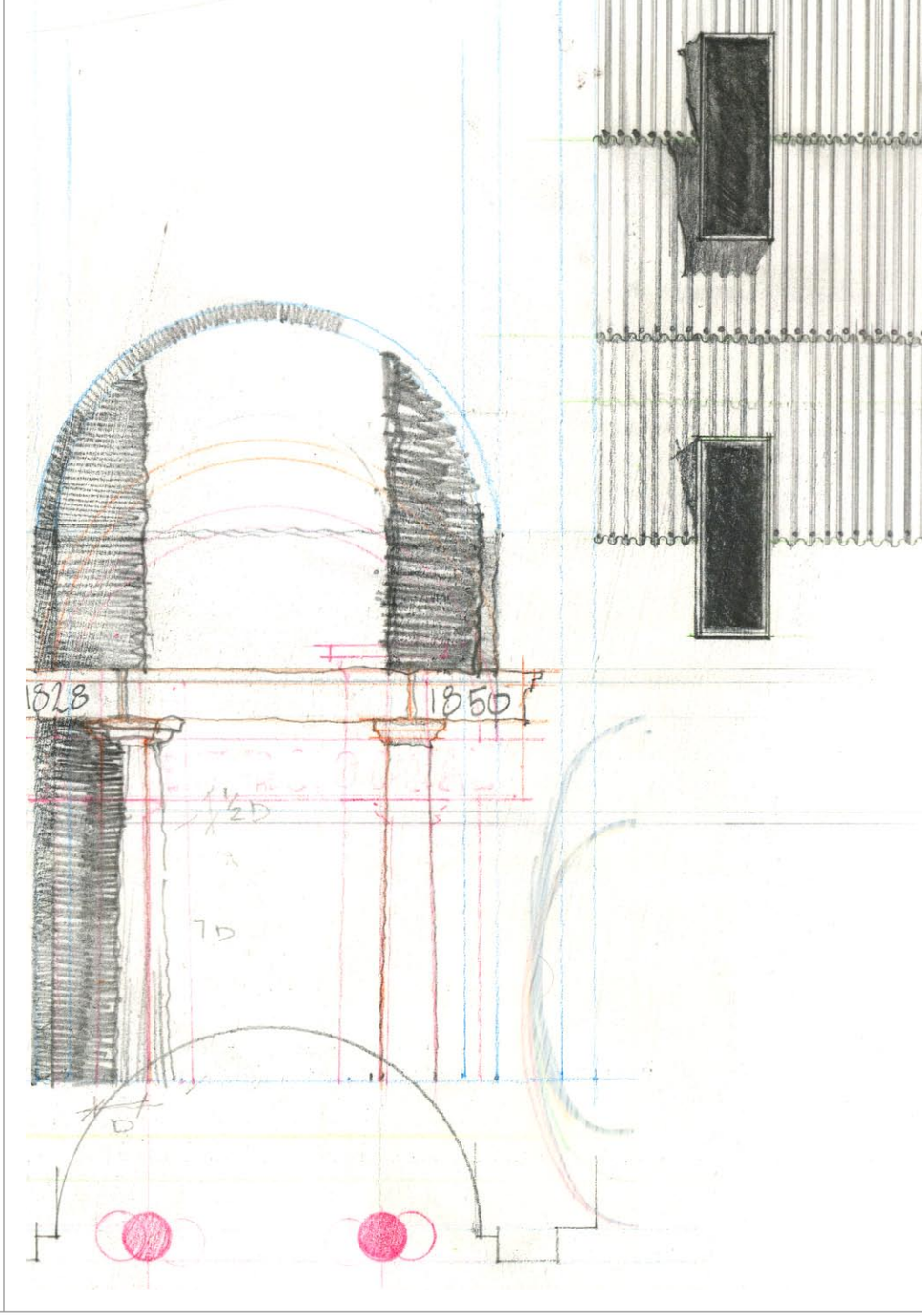
The Lockhouse was a house and seperate Hostel connected by a pedestrian bridge. The site occupied both the north and south of the canal.

The early sketches focused on connecting two sides of the canal through a building that bridged the water.

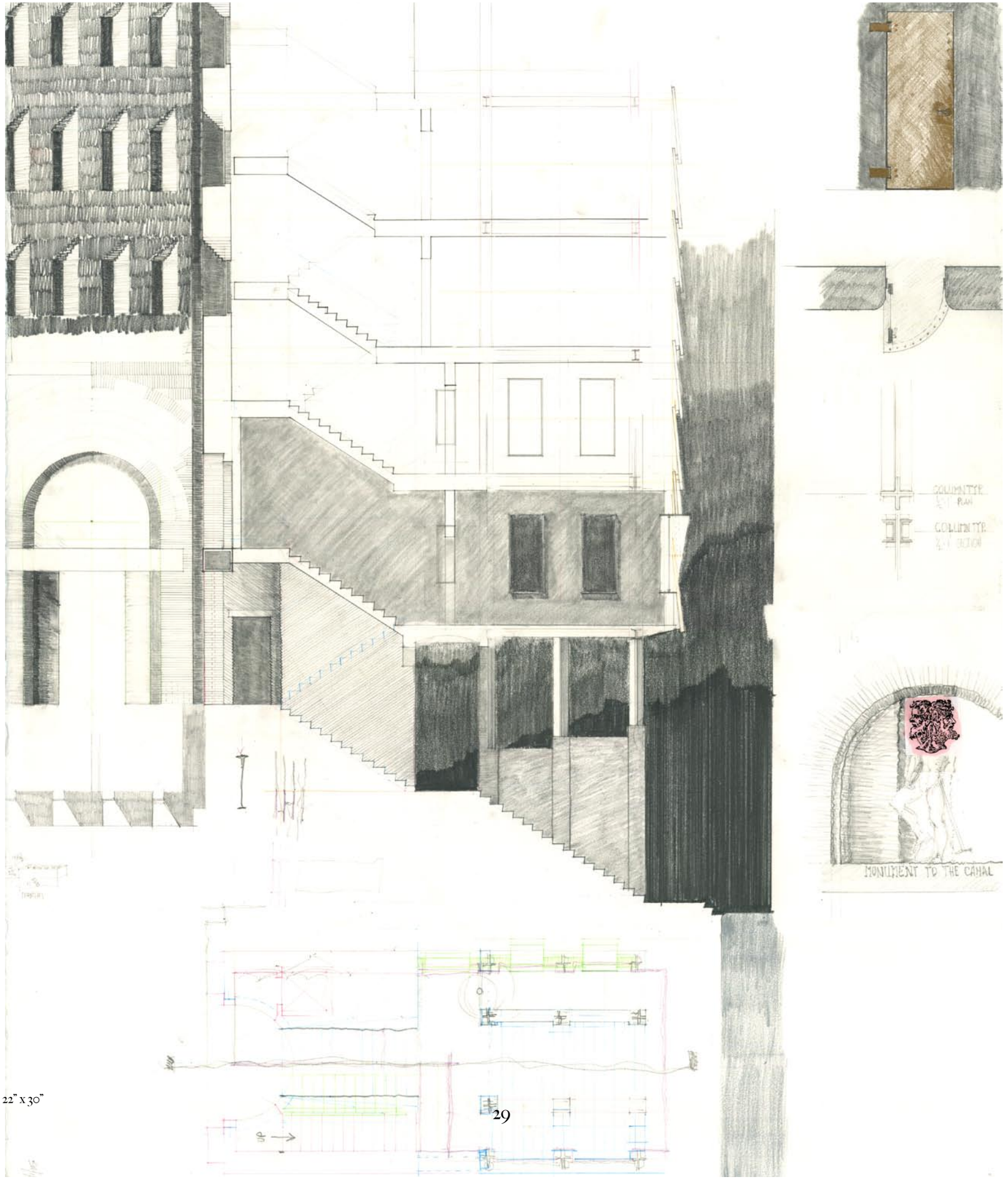


The Lockhouse
Concept
January 2005
Original Drawing 22" x 30"

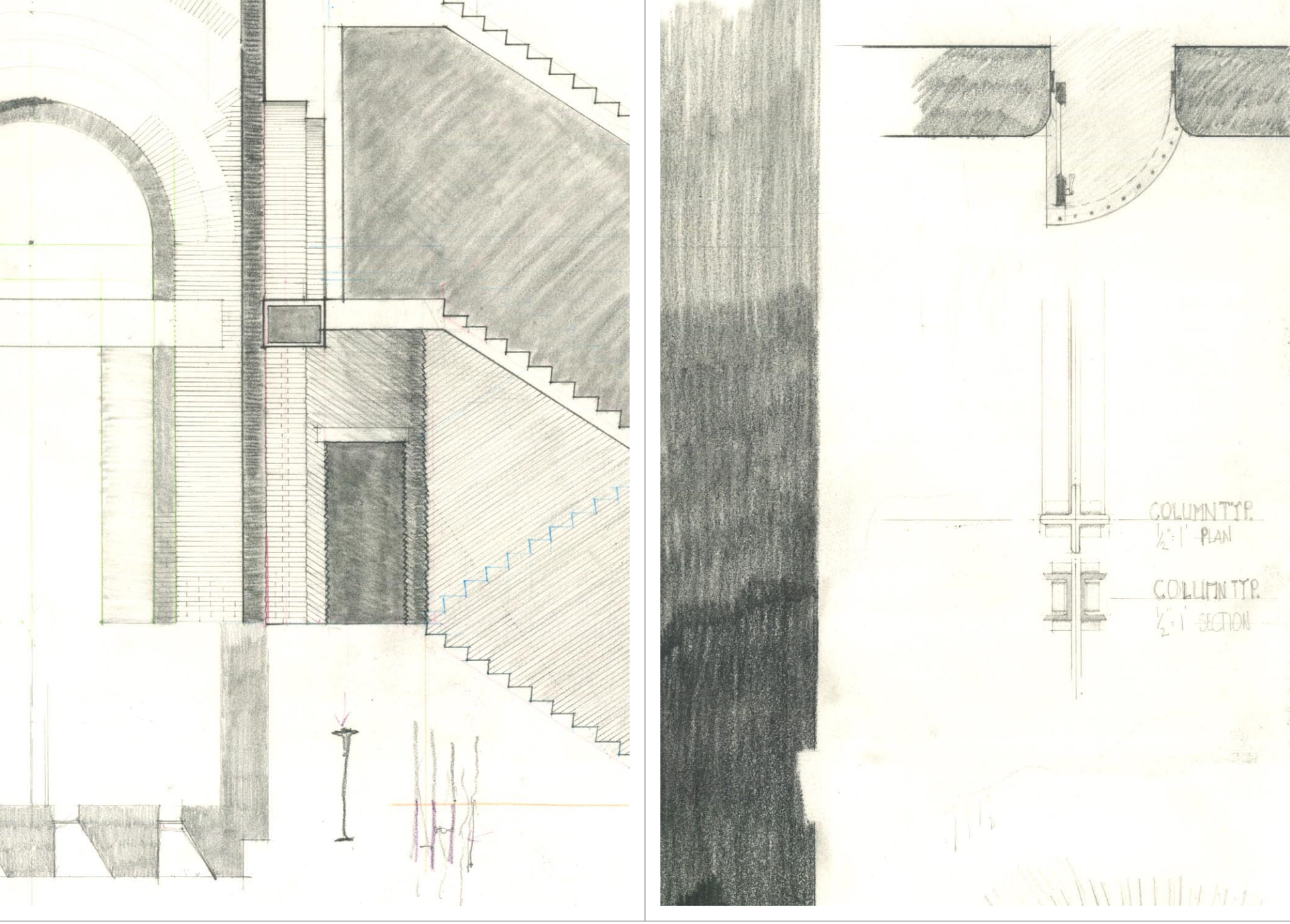




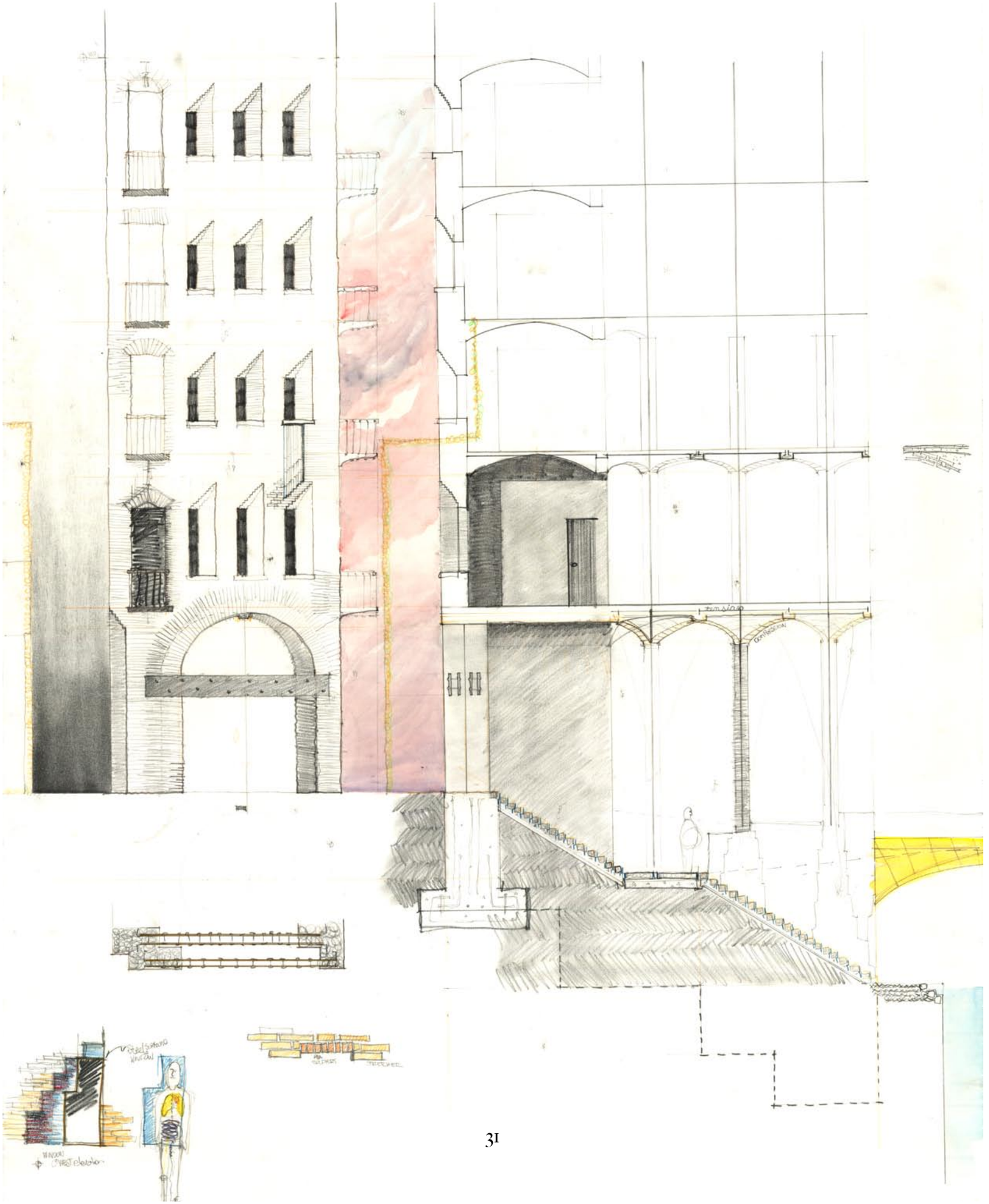
The design evolved into a single building that was a reaction to the site itself and the way of life it represented. At the point of this design the building had become a monument to the site and the people who made a life from it.



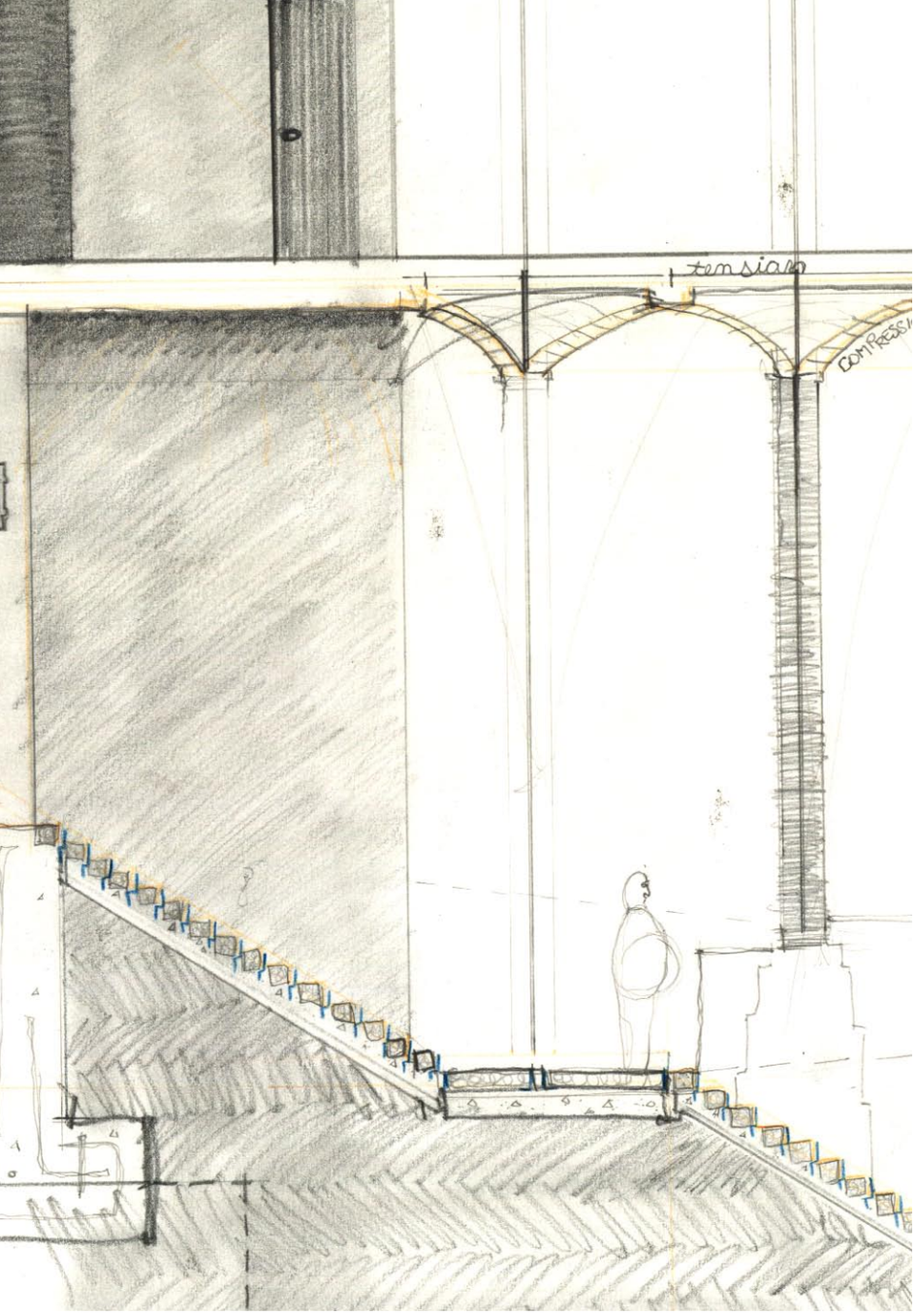
The Lockhouse
Concept
February 2005
Original Drawing 22" x 30"

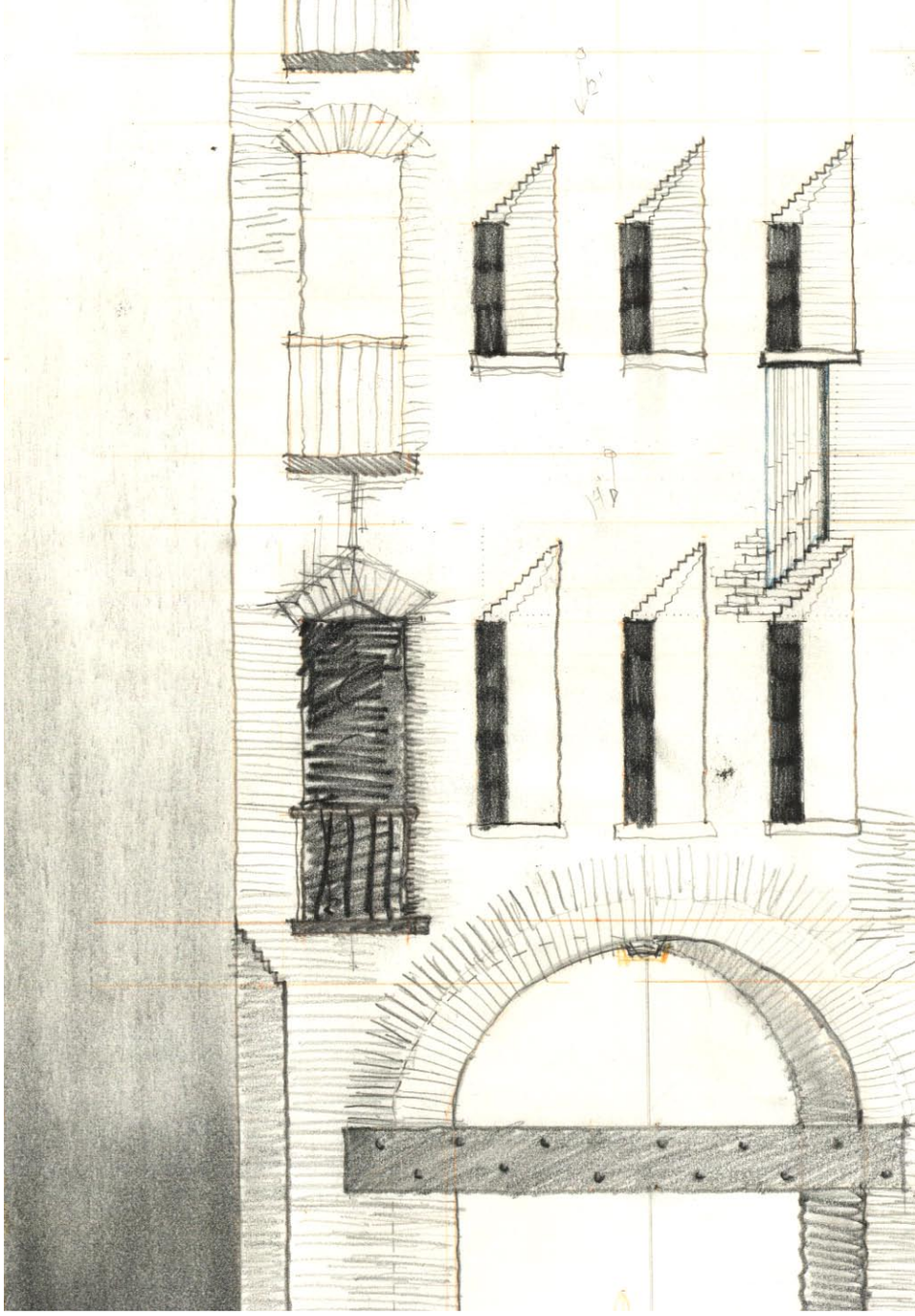


Early study of the masonry cylinder proved that a structure's form will grow from the study of its details. Details, drawn at large scale sharing the same page as the building section and elevations, force the architect to render material during the early design.

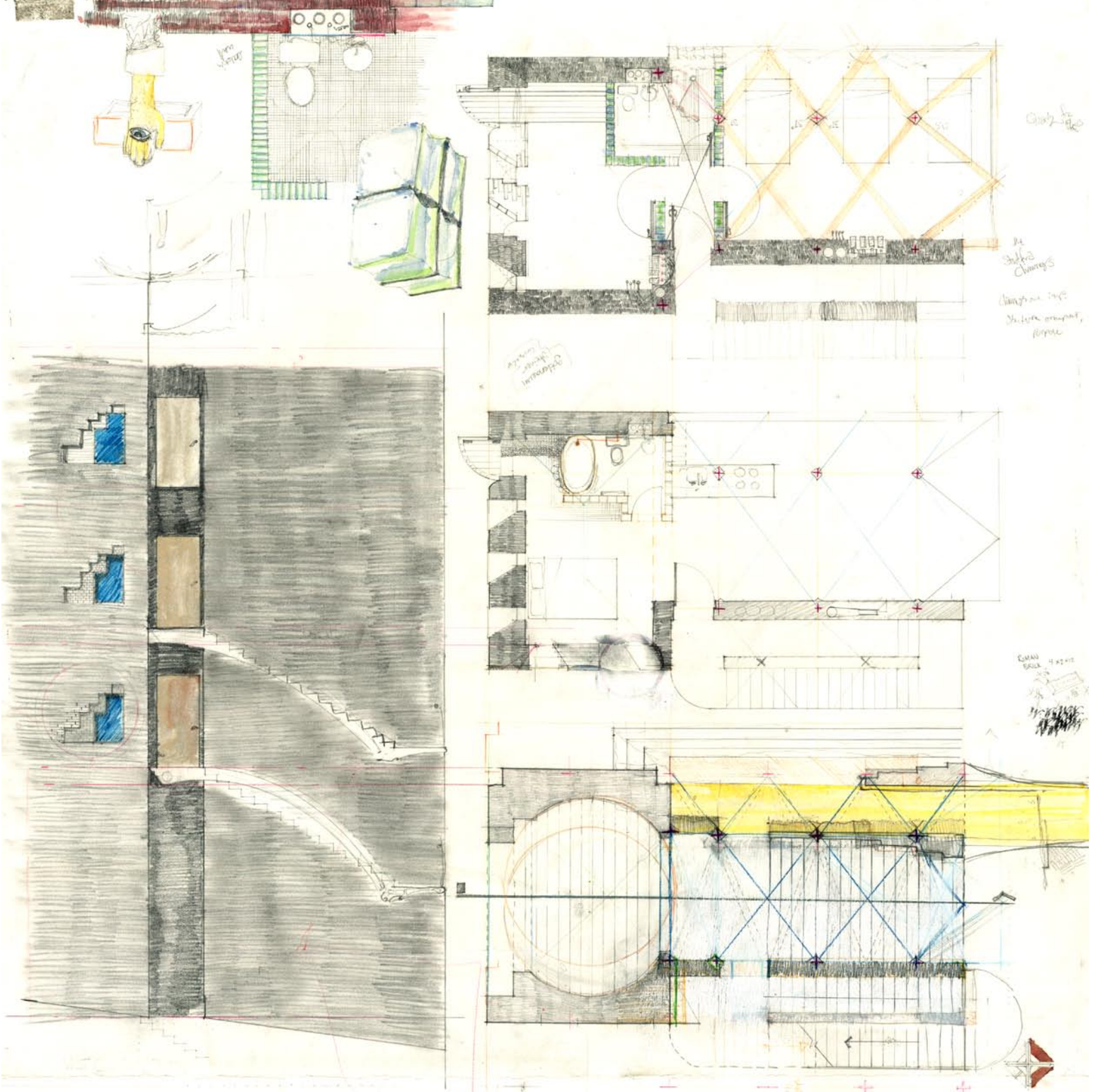


The Lockhouse
Concept
March 2005
Original
22" x 30"

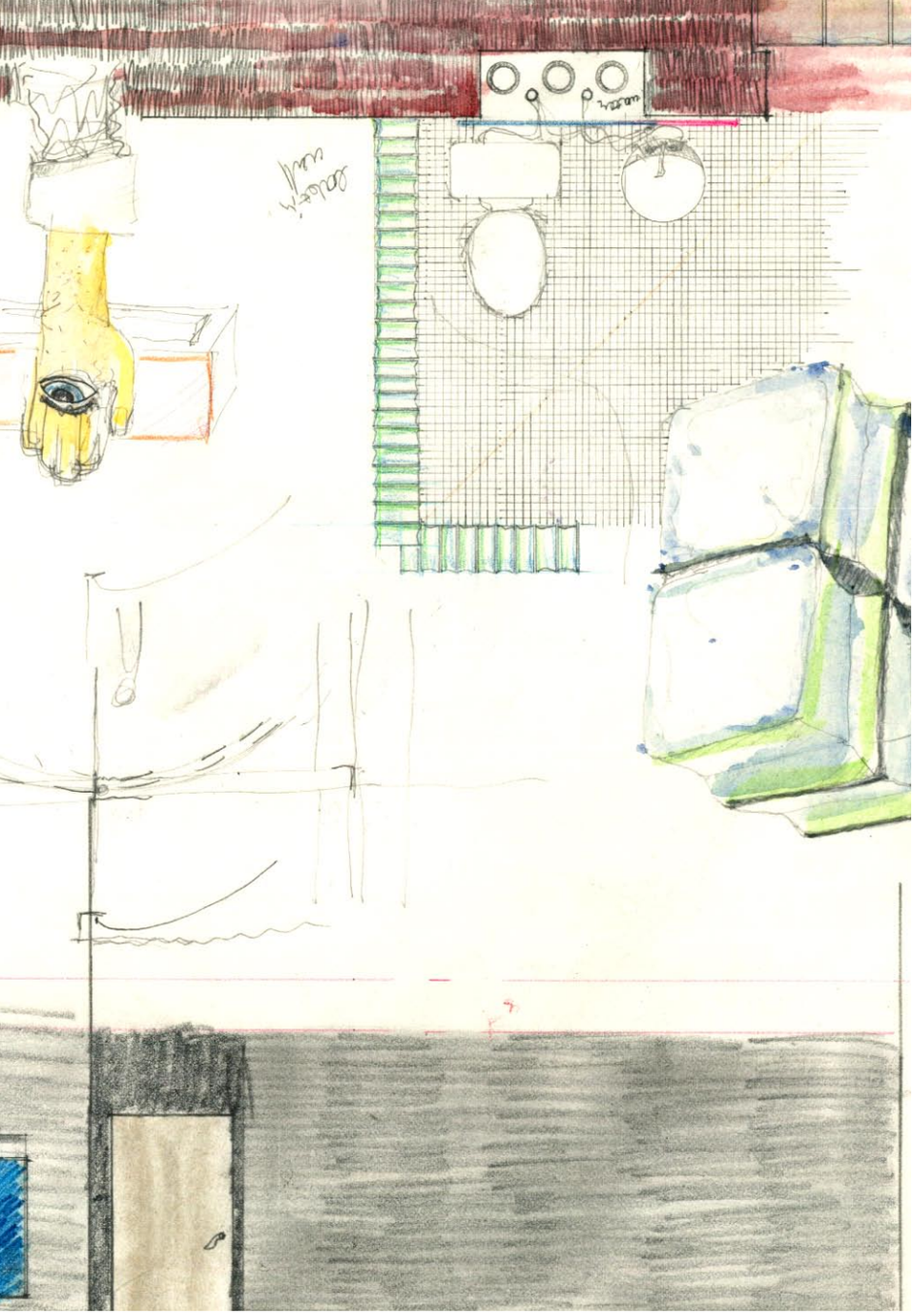


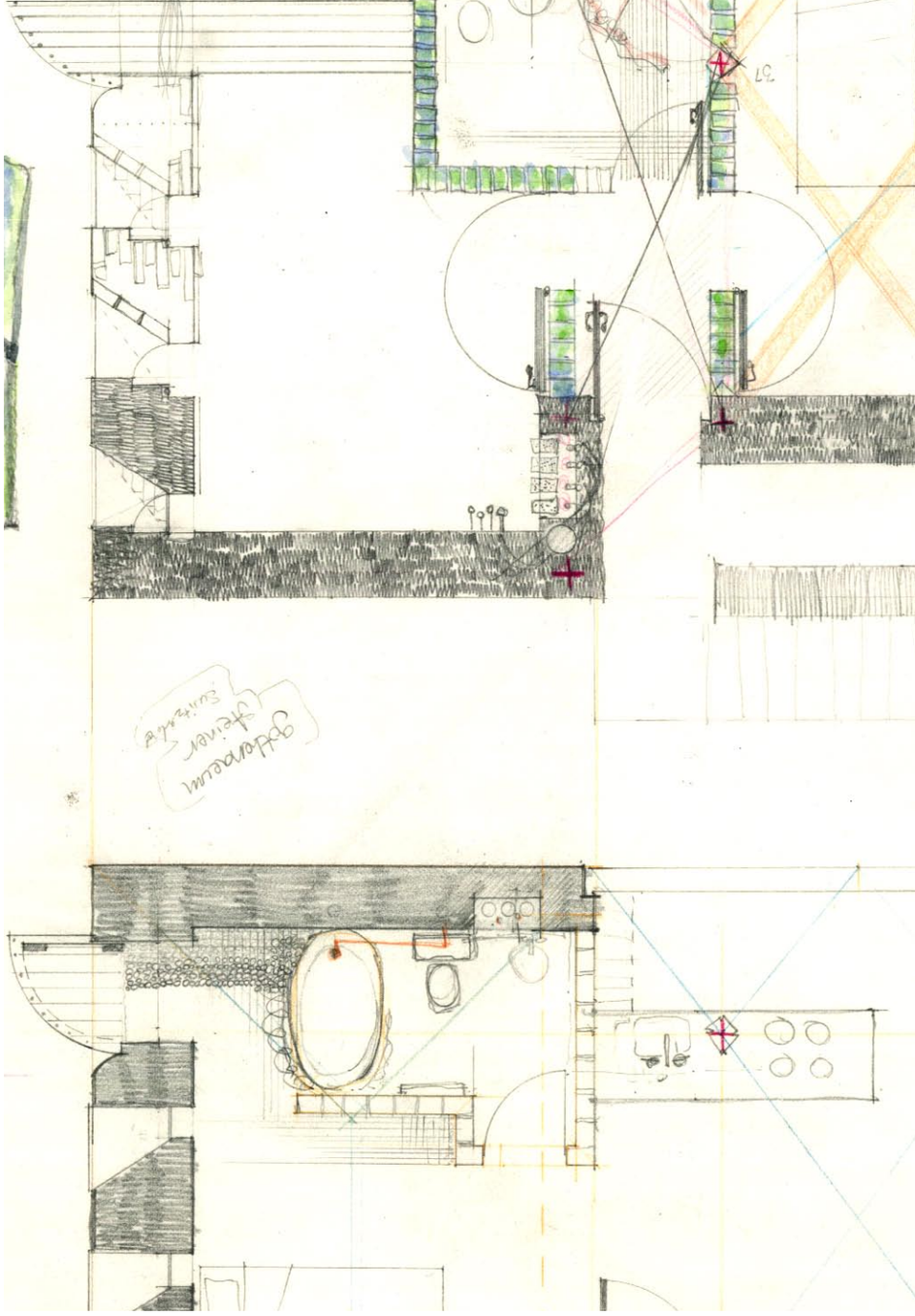


Quick free-hand details can be rendered as material but must share the same page as mechanical study. The detailed coursing of the window is calculated on the large elevation and quickly applied throughout to examine its effect on the building form.



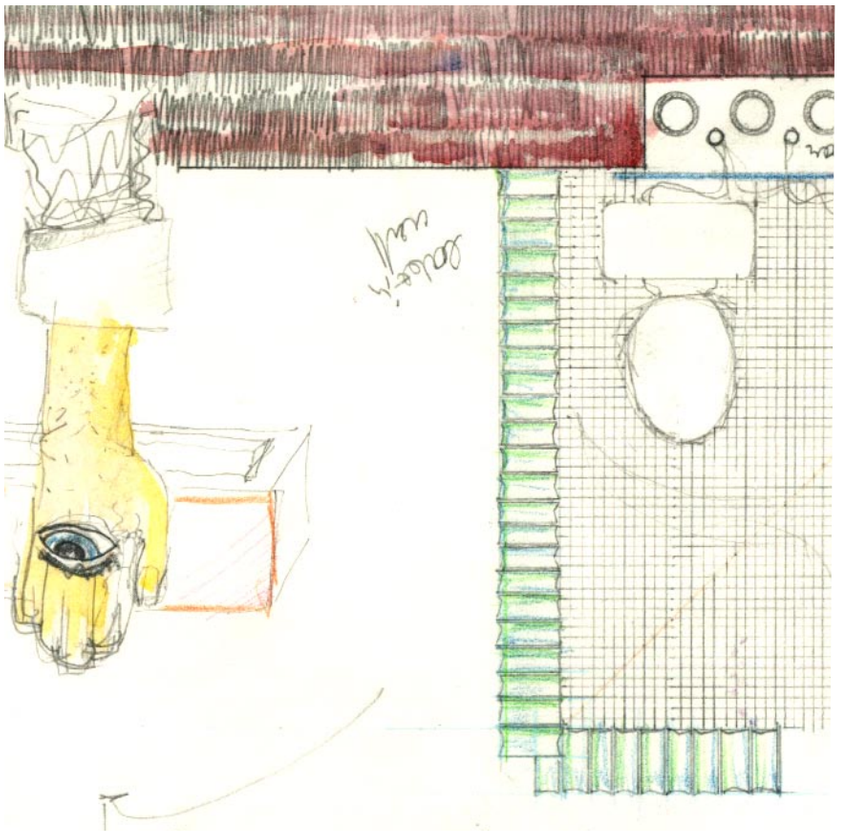
The Lockhouse
Concept
April 2005
Original Drawing 22" x 30"





Working on a large sheet allows for several drawings to take place at one time. Mistakes or changes cannot easily be discarded and are instead painted over with gesso and altered. The paper retains the memory of the past work.

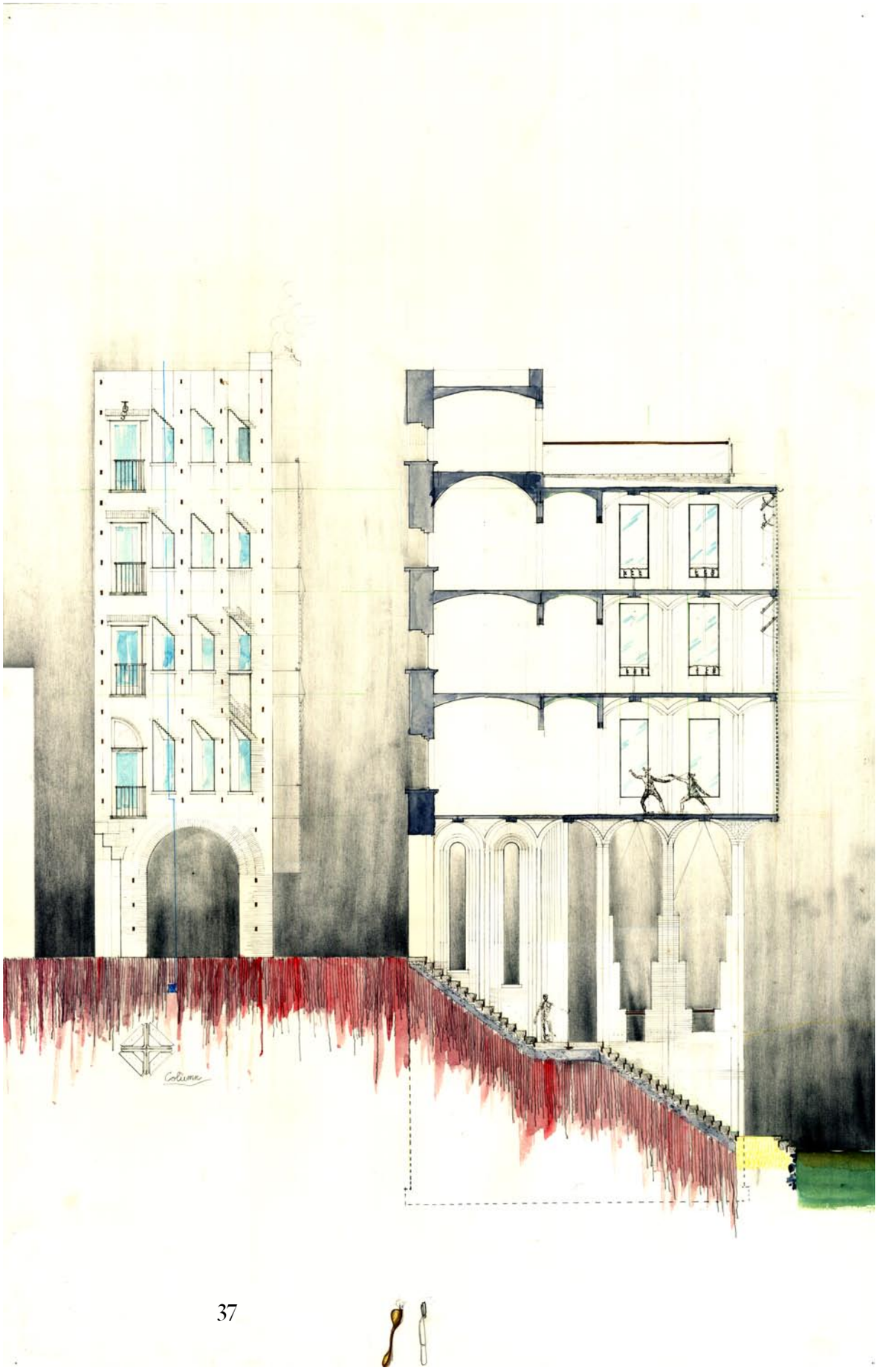
THE THESIS REQUIRES A FINISHED DRAWING



THE THESIS REQUIRES UNFINISHED DRAWING

Elevation North

Section North South

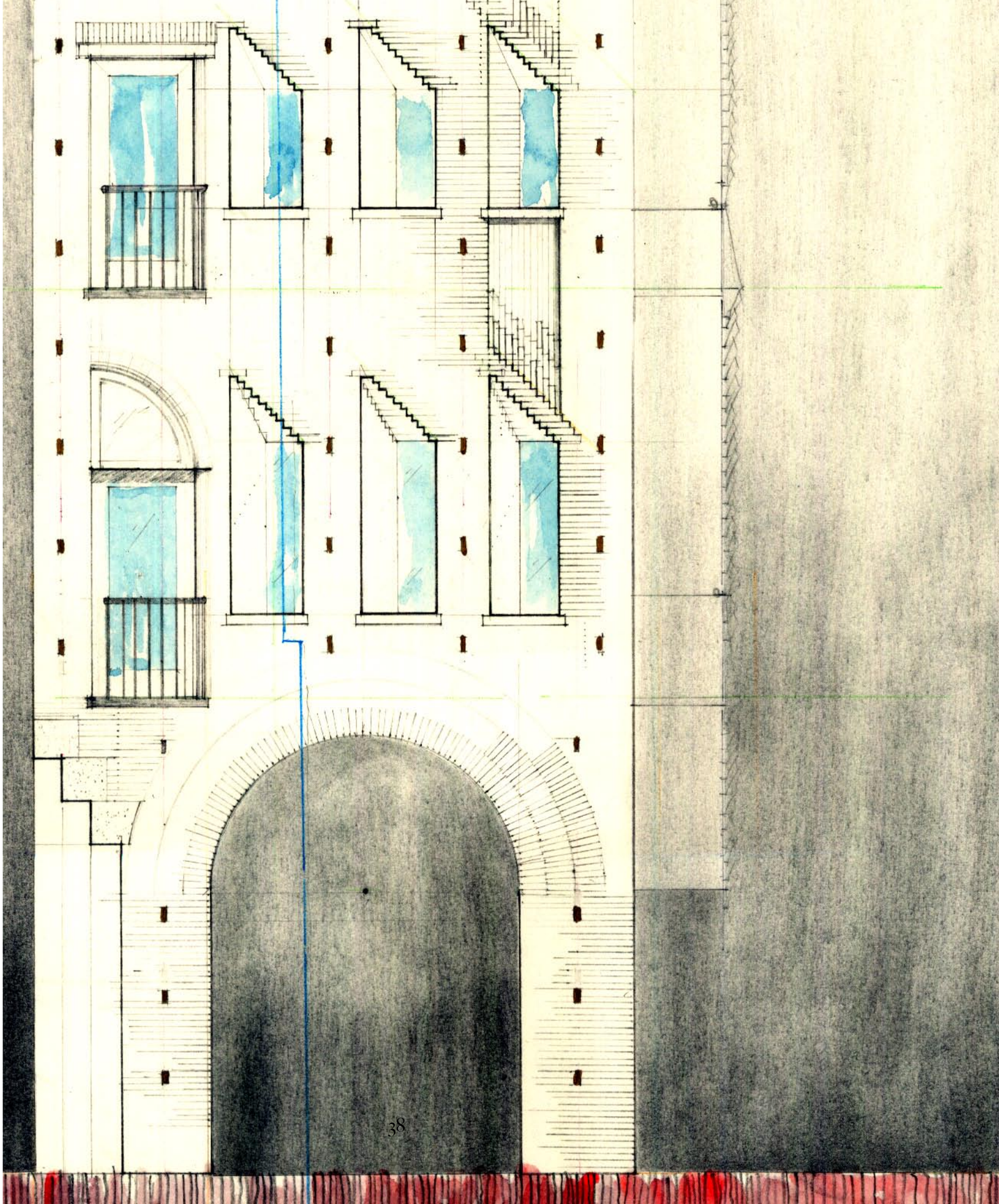


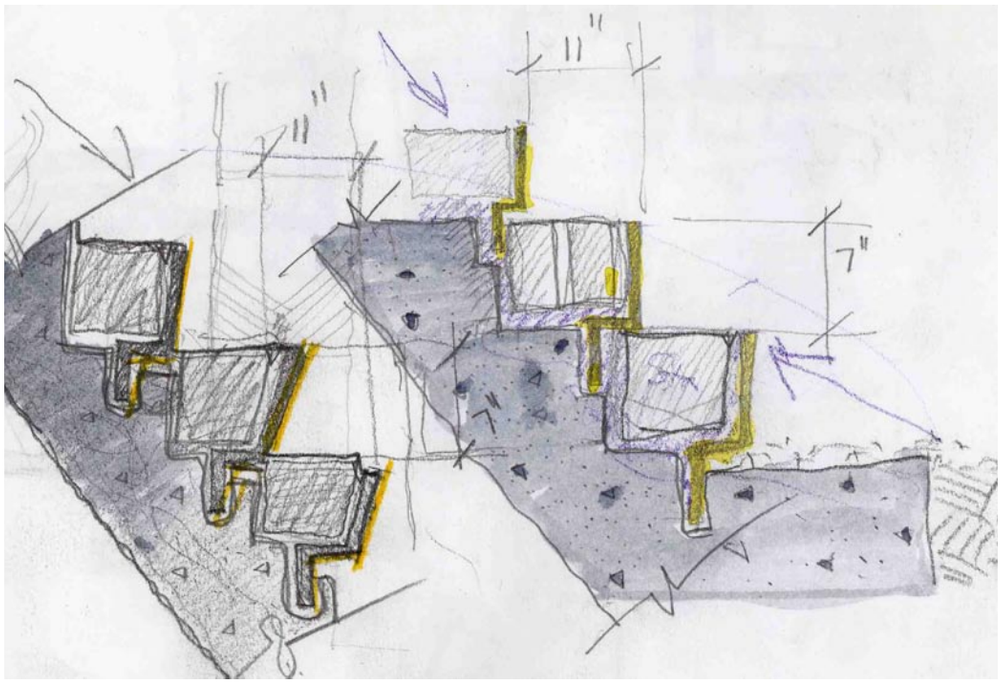
The Lockhouse
Final Drawings
August 2005
vvvva

Hostel Rooms

Caretaker's Residence

Public Entry



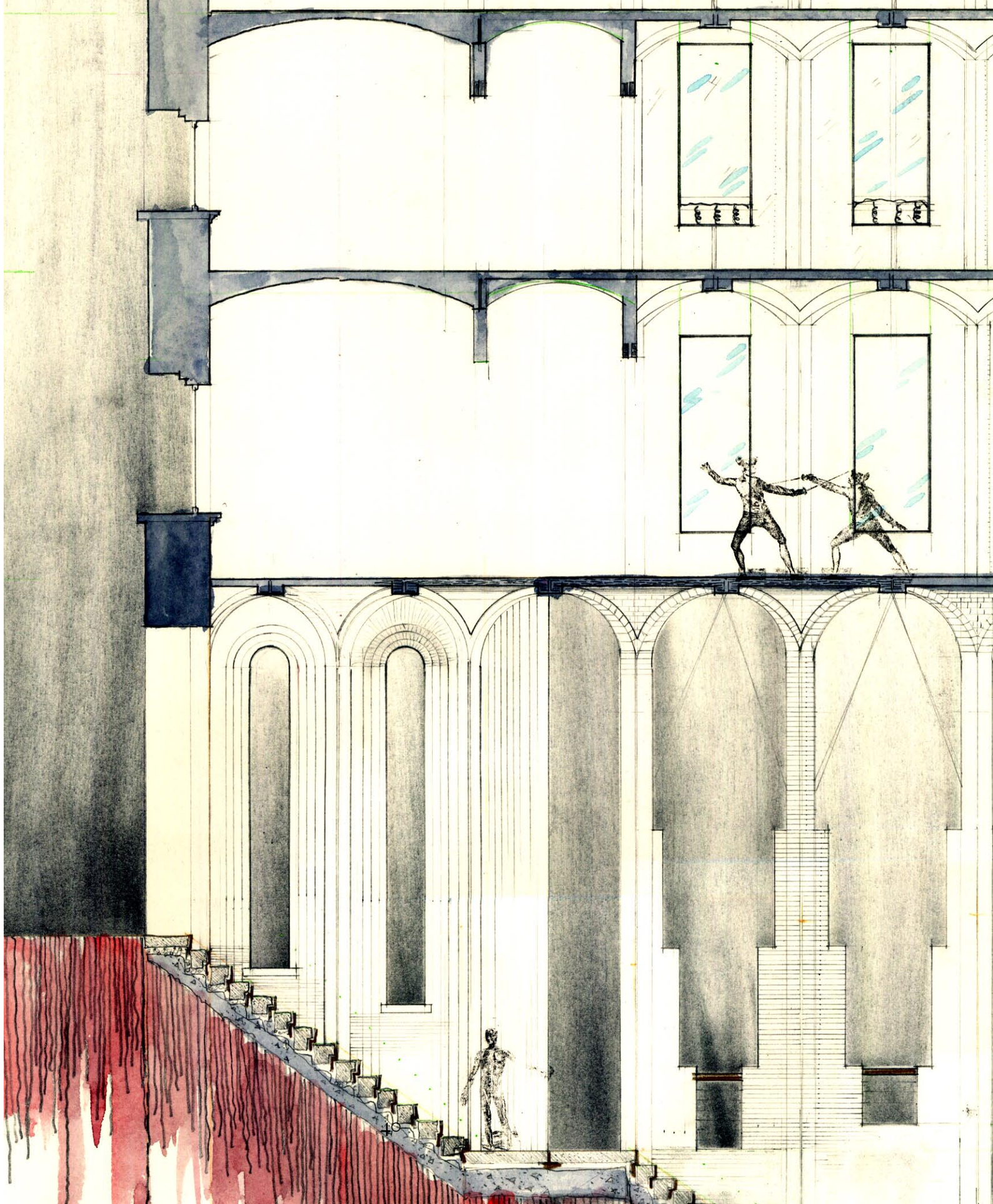


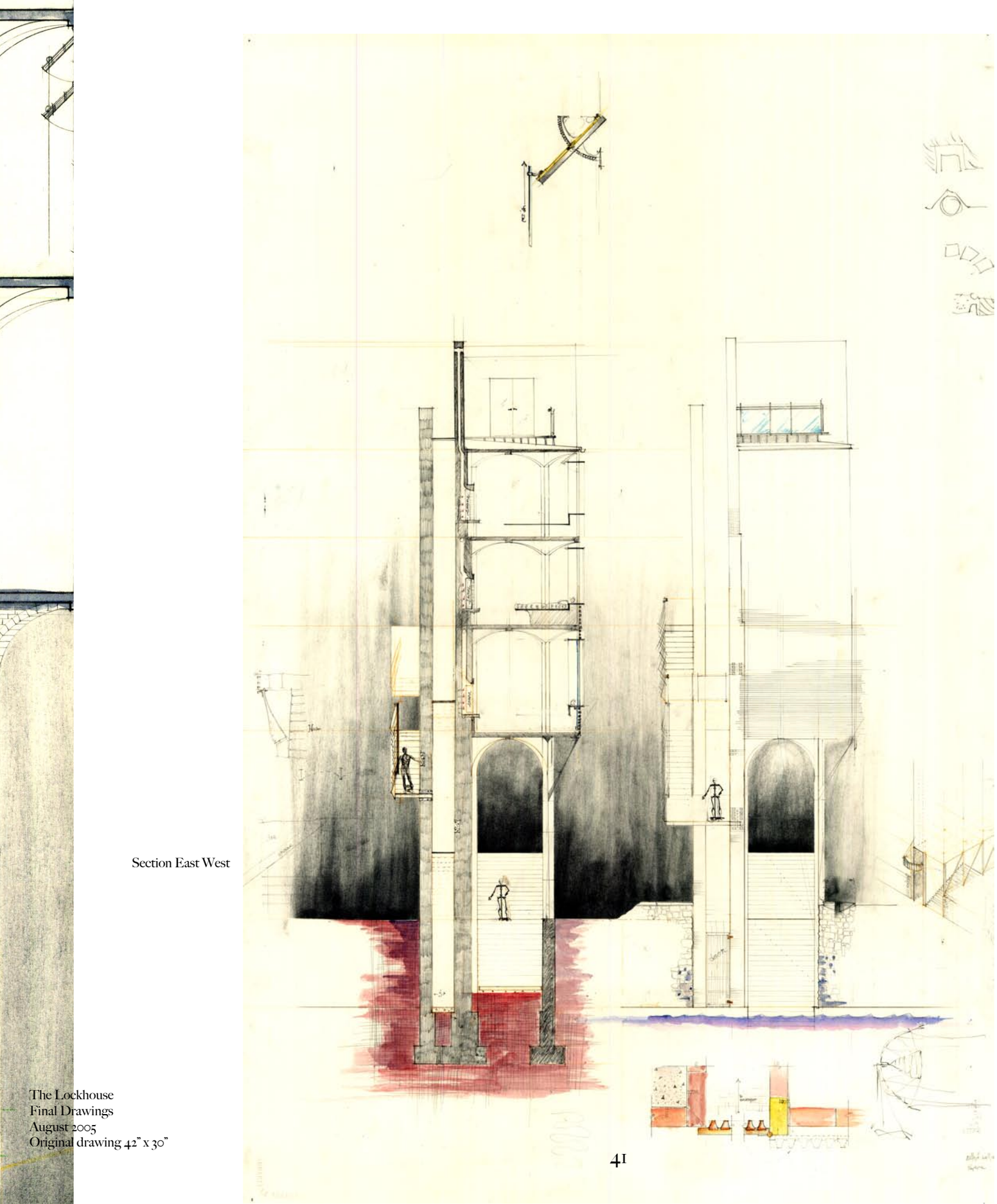
Early sketch main plublic stair
II-04
Stone treads with bronze risers

Hostel Rooms

Caretaker's Residence

Public Entry



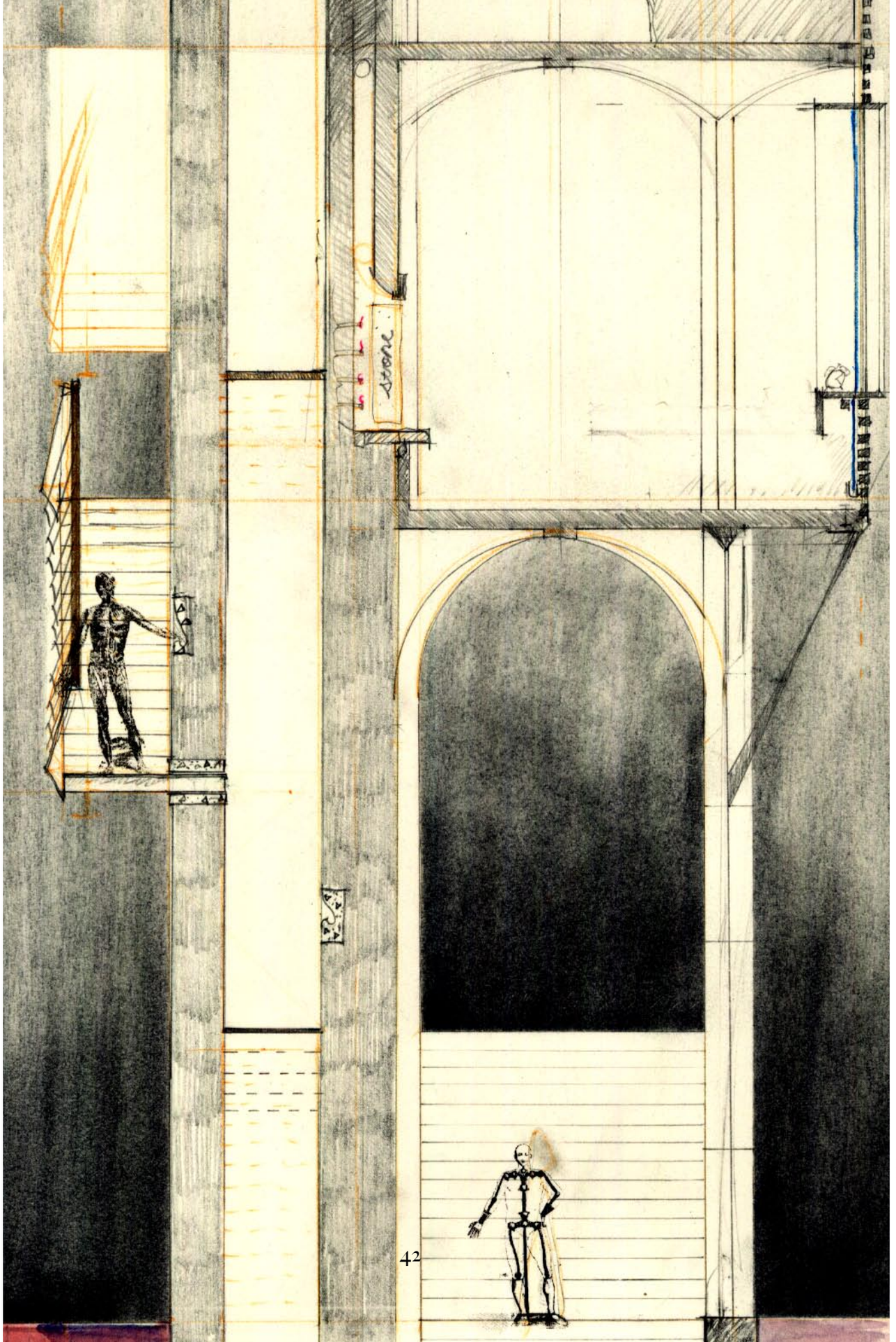


Elevation South

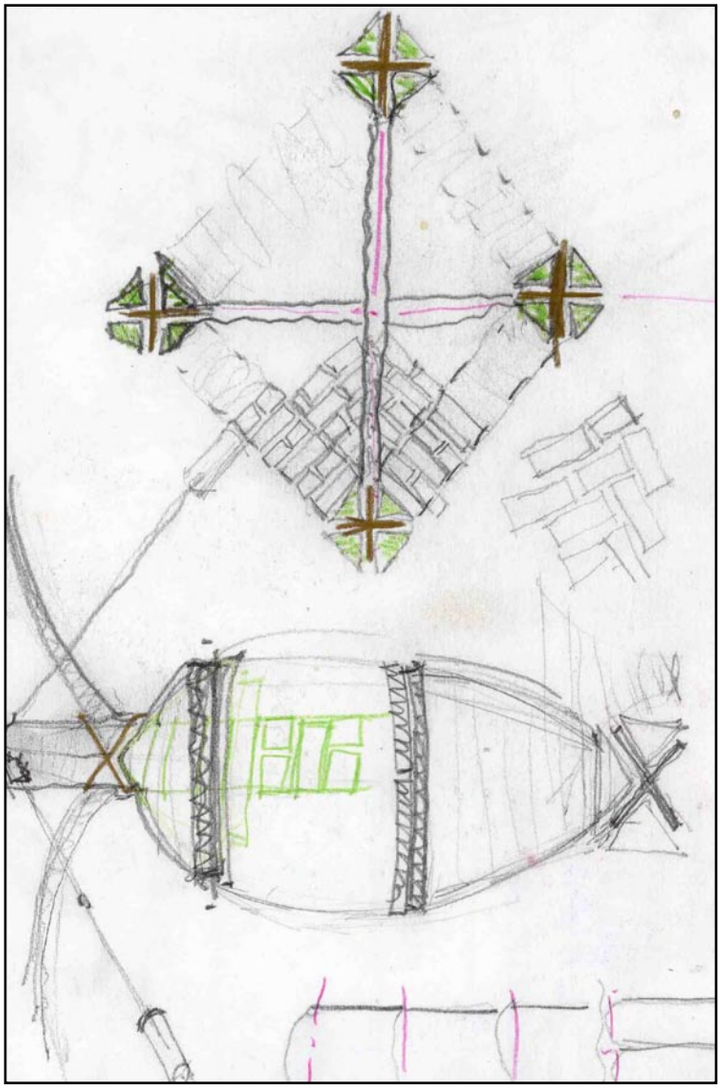
Section East West

The Lockhouse
Final Drawings
August 2005
Original drawing 42" x 30"

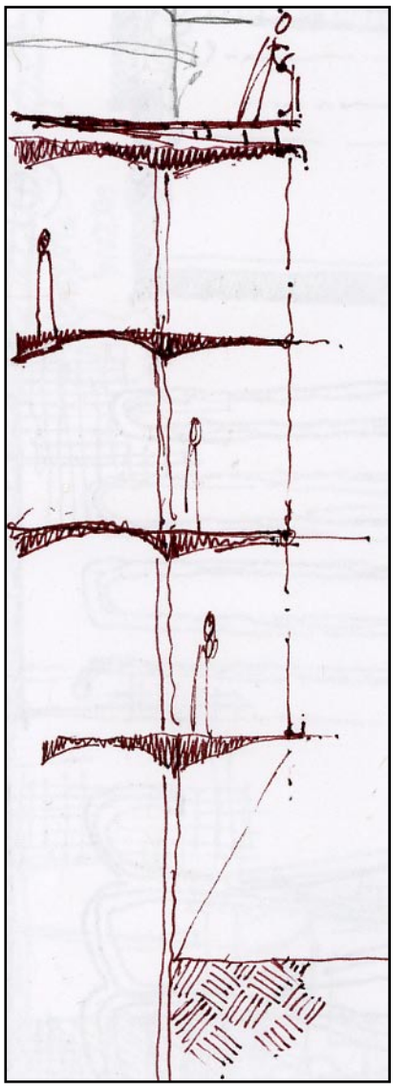
Private stair
Ascention to hostel rooms



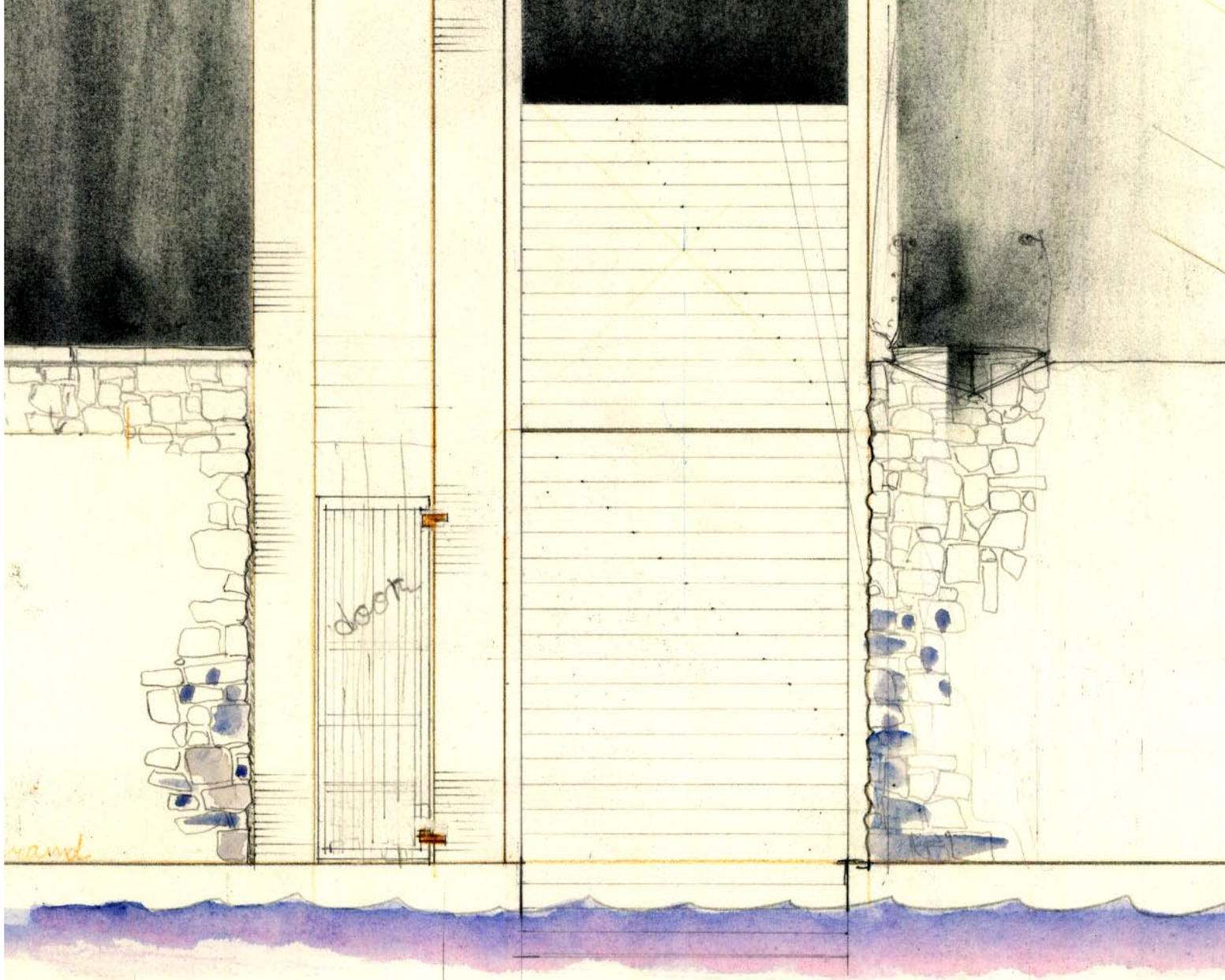
Public stair
Decention to canal



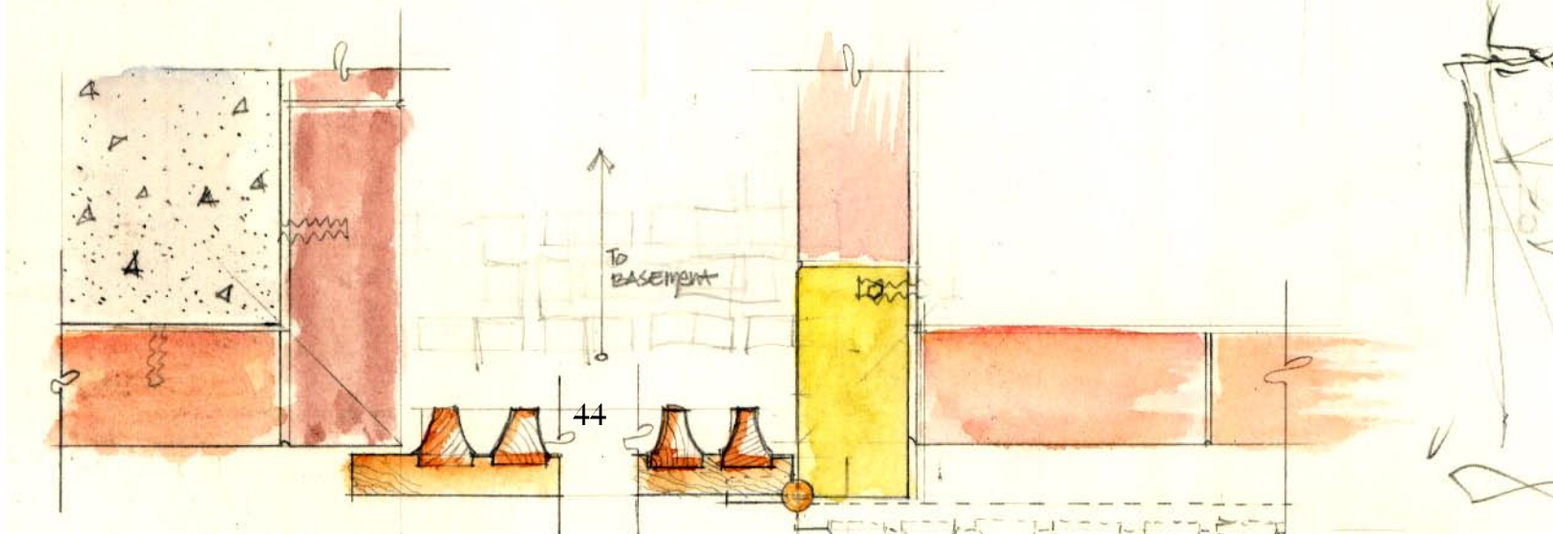
Early sketch
Columns and Vaults at entry level



Sketch of floor cantilever
7/05

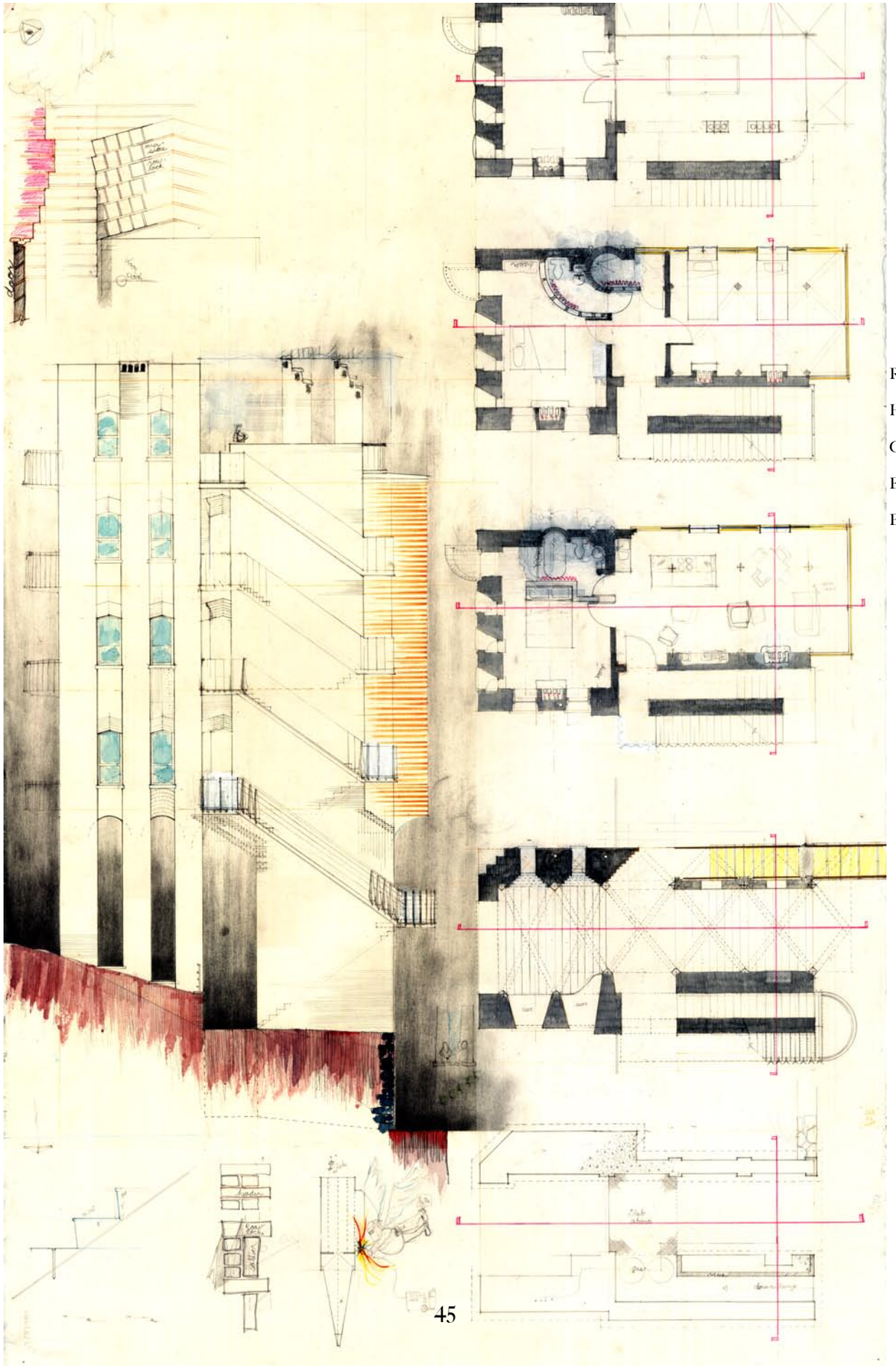


Detail Elevation
Doorway to
Lockhouse Basement



Detail Plan
Doorway to
Lockhouse Basement

Doorway lintel



Roof Terrace Plan

Hostel Floor Plan Typical

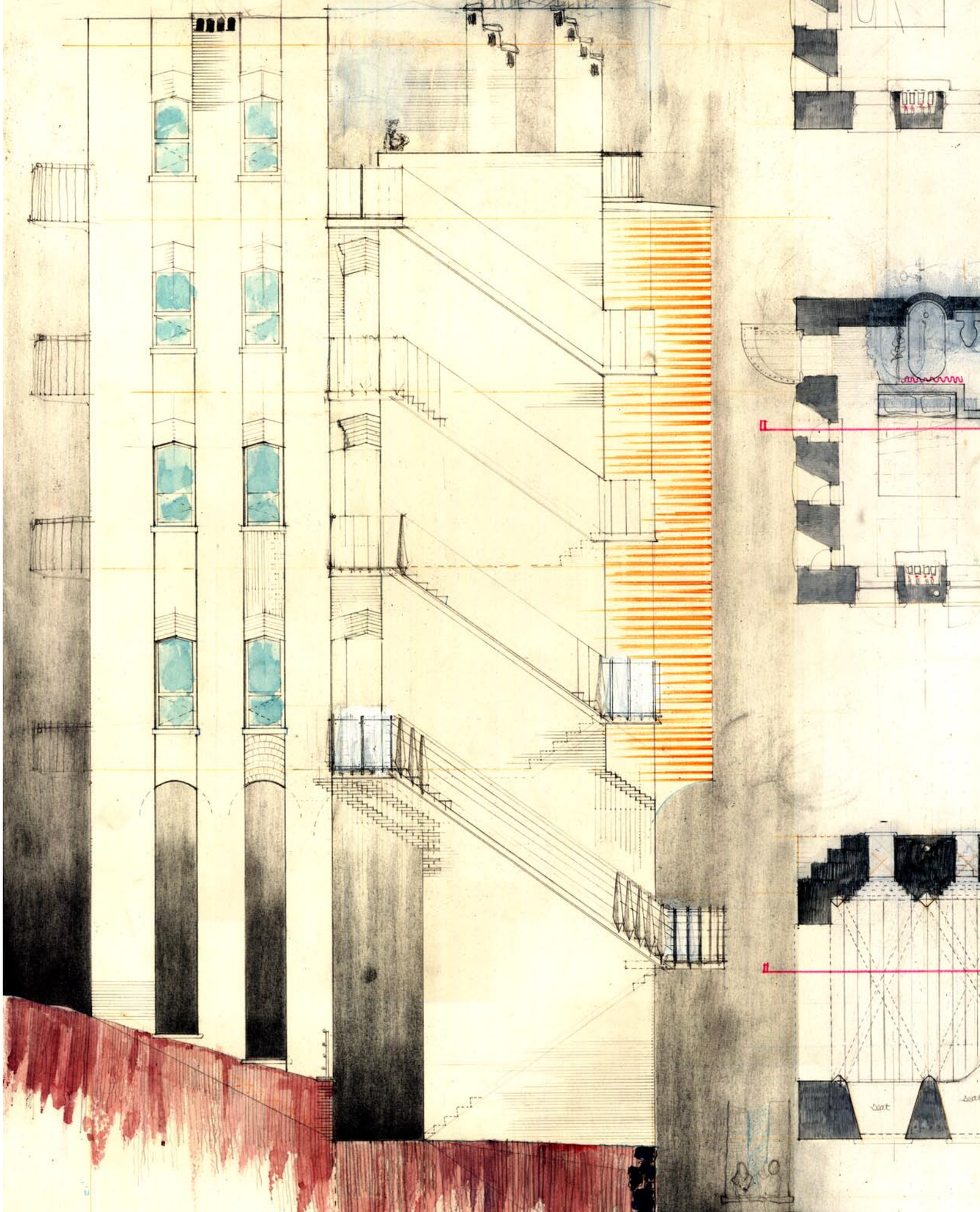
Caretaker Floor Plan

Entry Plan

Basement Plan

Elevation West

The Lockhouse
Final Drawings
August 2005
Original drawing 42" x 30"



Stations

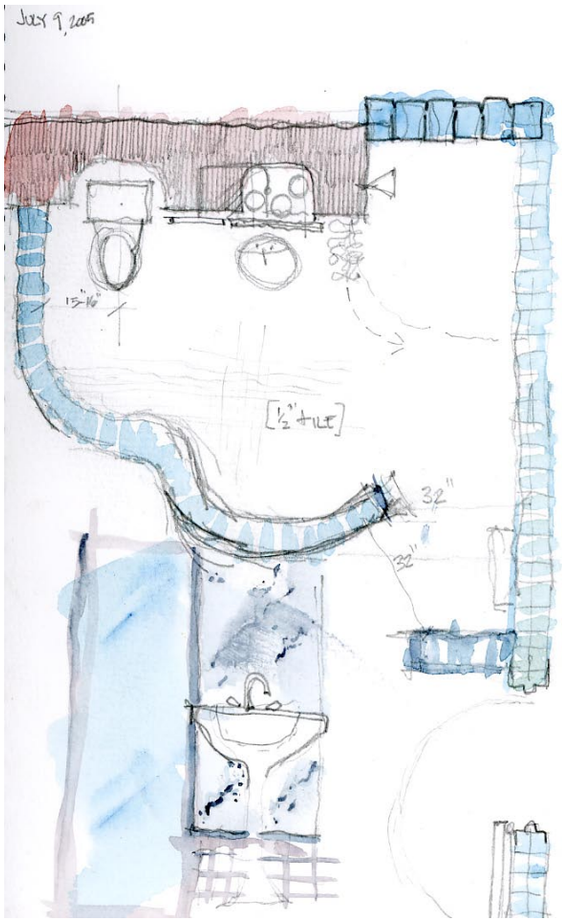
1: Arrival at monumental stair
Stair decends to canal

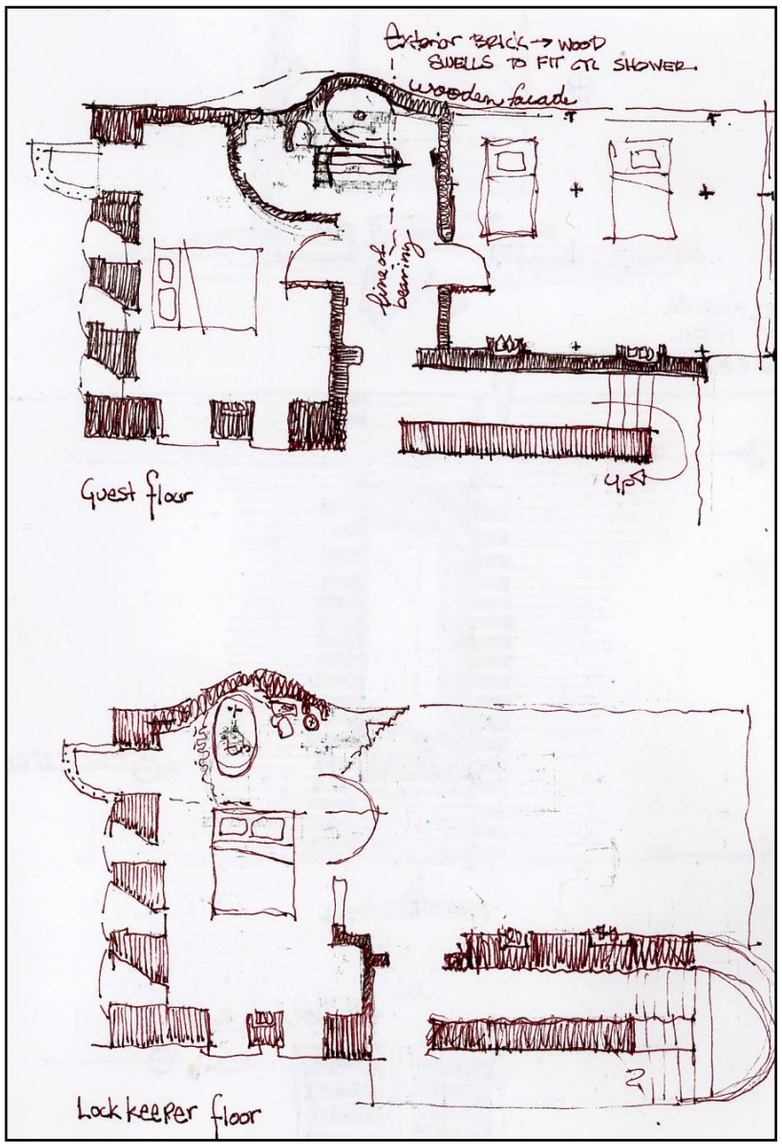
2: Passage at landing
Private stair acends to rooms

3. Confirmation at Hostel Room
Rest / Recovery

4. Amortization to Caretaker
Decend privat stair

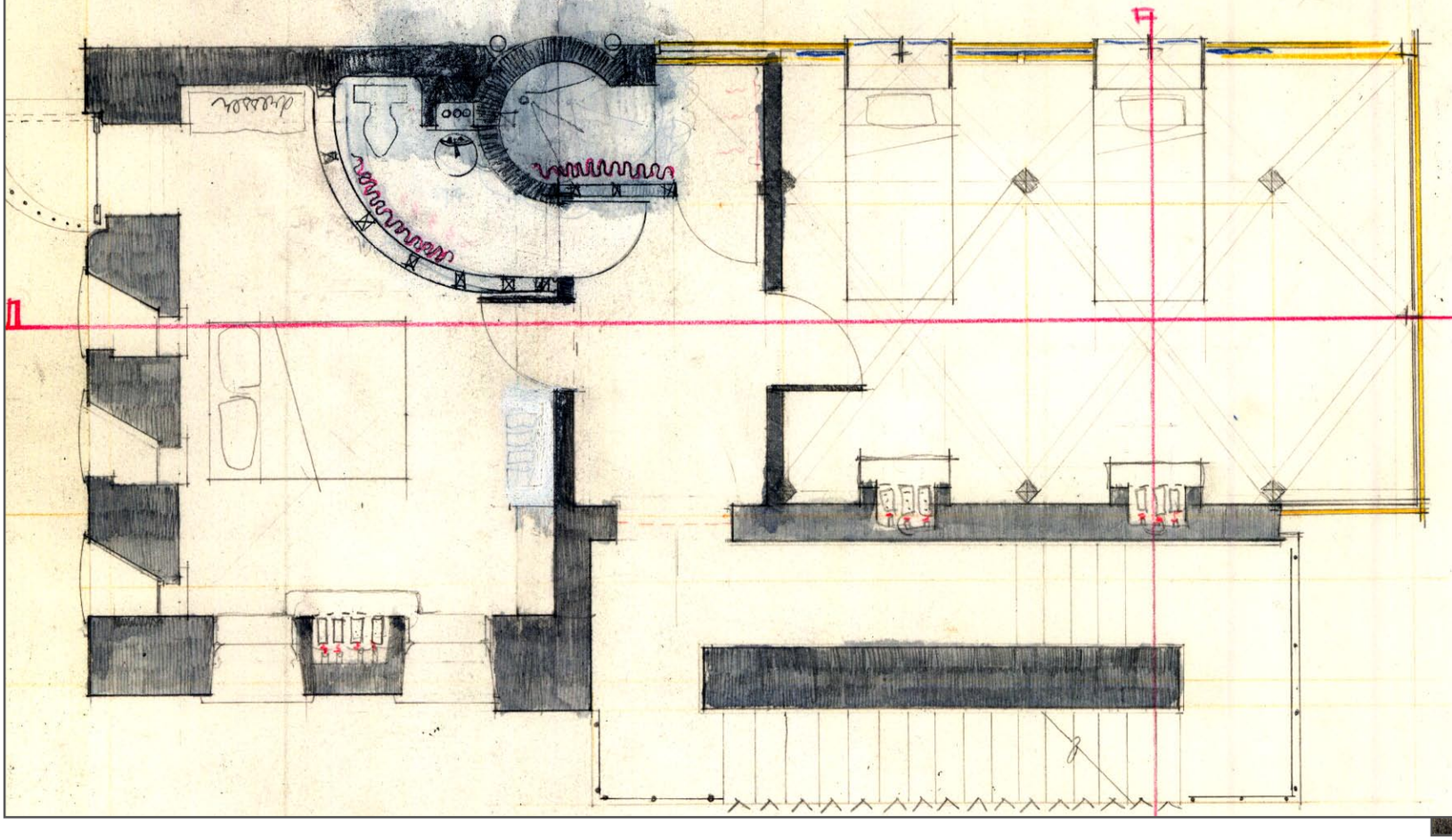
5. Embarkation
Passage across pedestrian bridge



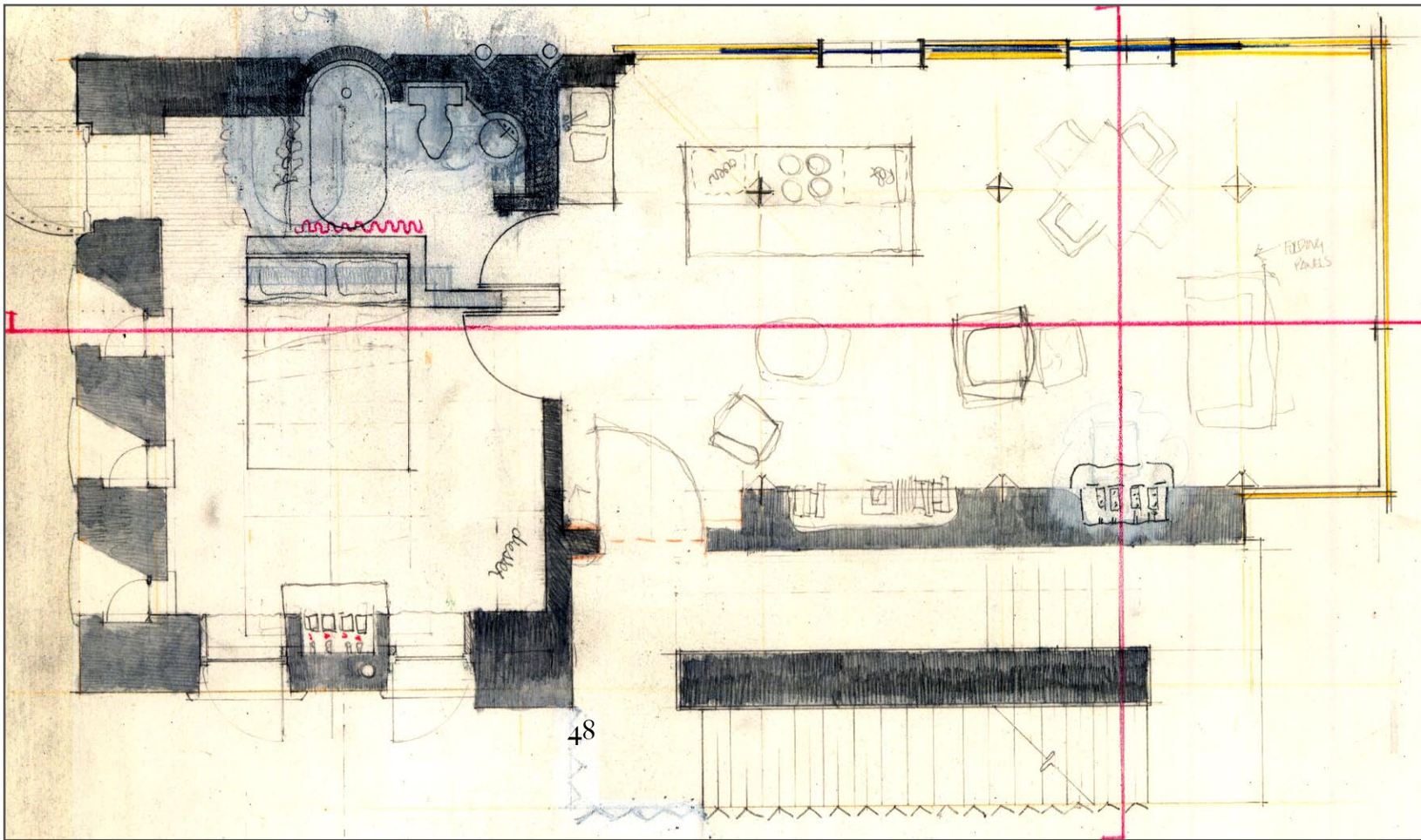


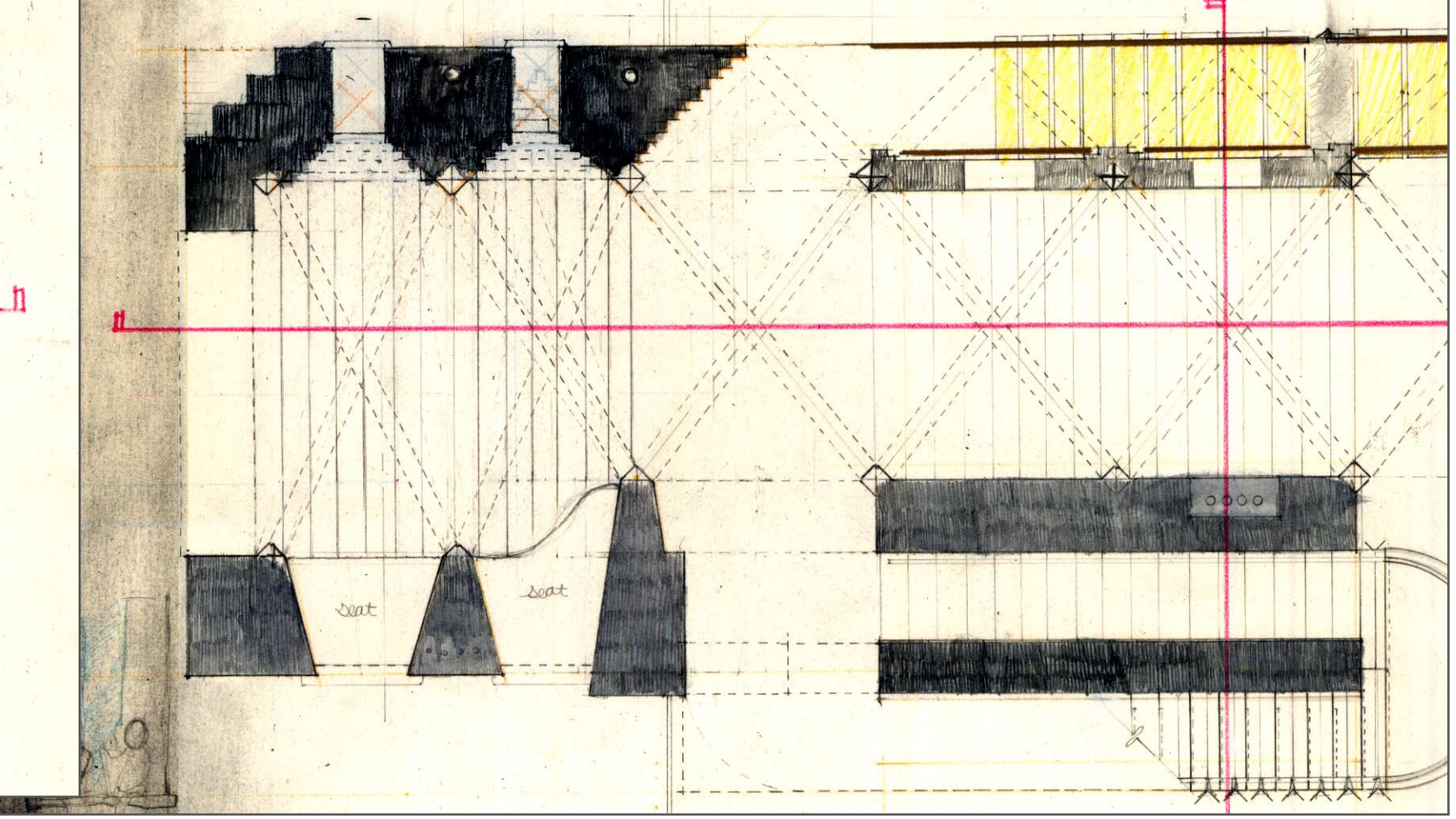
Plan sketches, 6-05 - 7-05
Studying the relationship
of the bath to the bedroom

Hostel Floor s(2)
Single Occupancy North
Double Occupancy South
Gas-fired stone hearths
Sharedbathroom

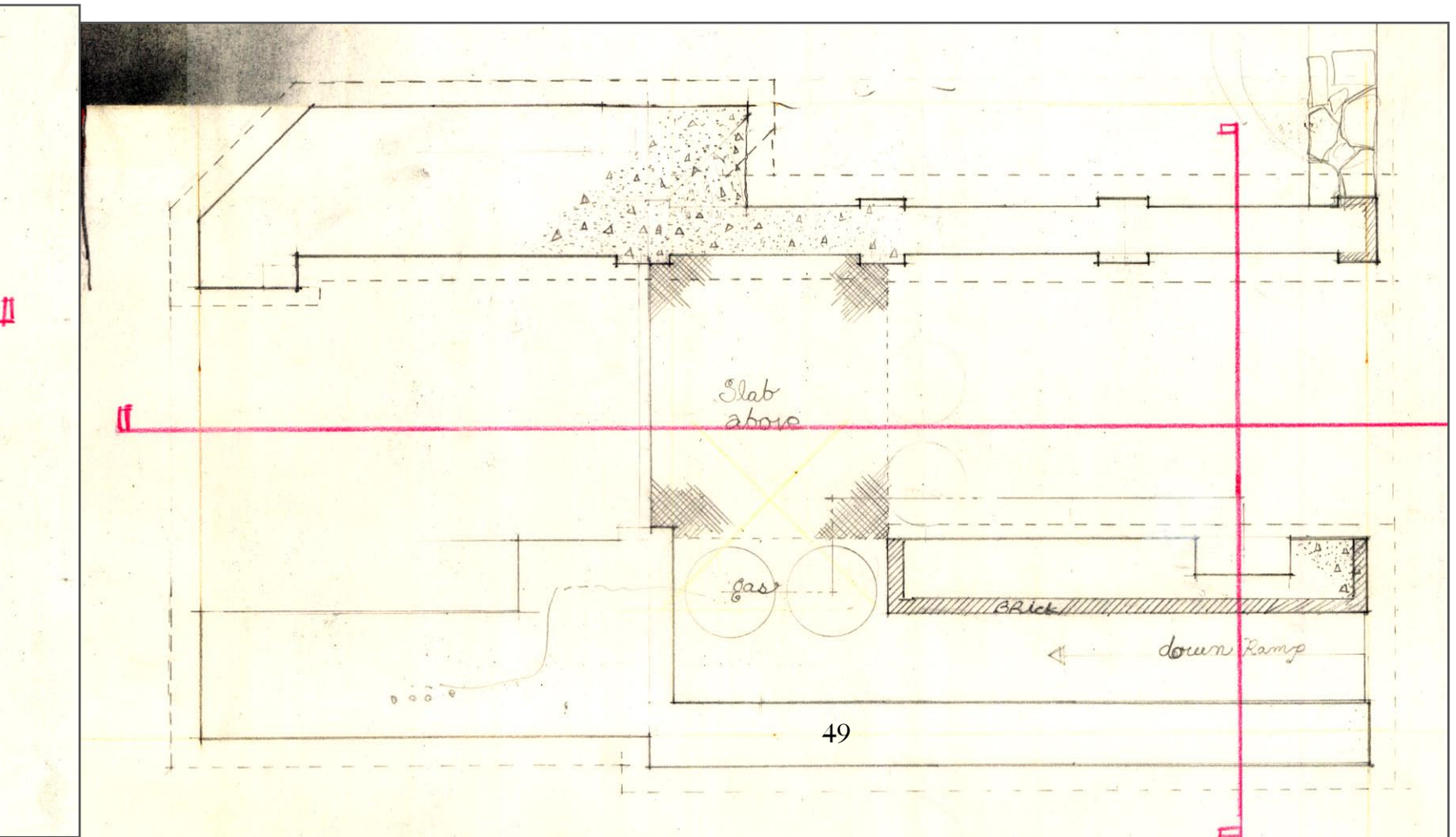


Caretaker's Floor
Balcony (Egress)
Sleeping North
Living South

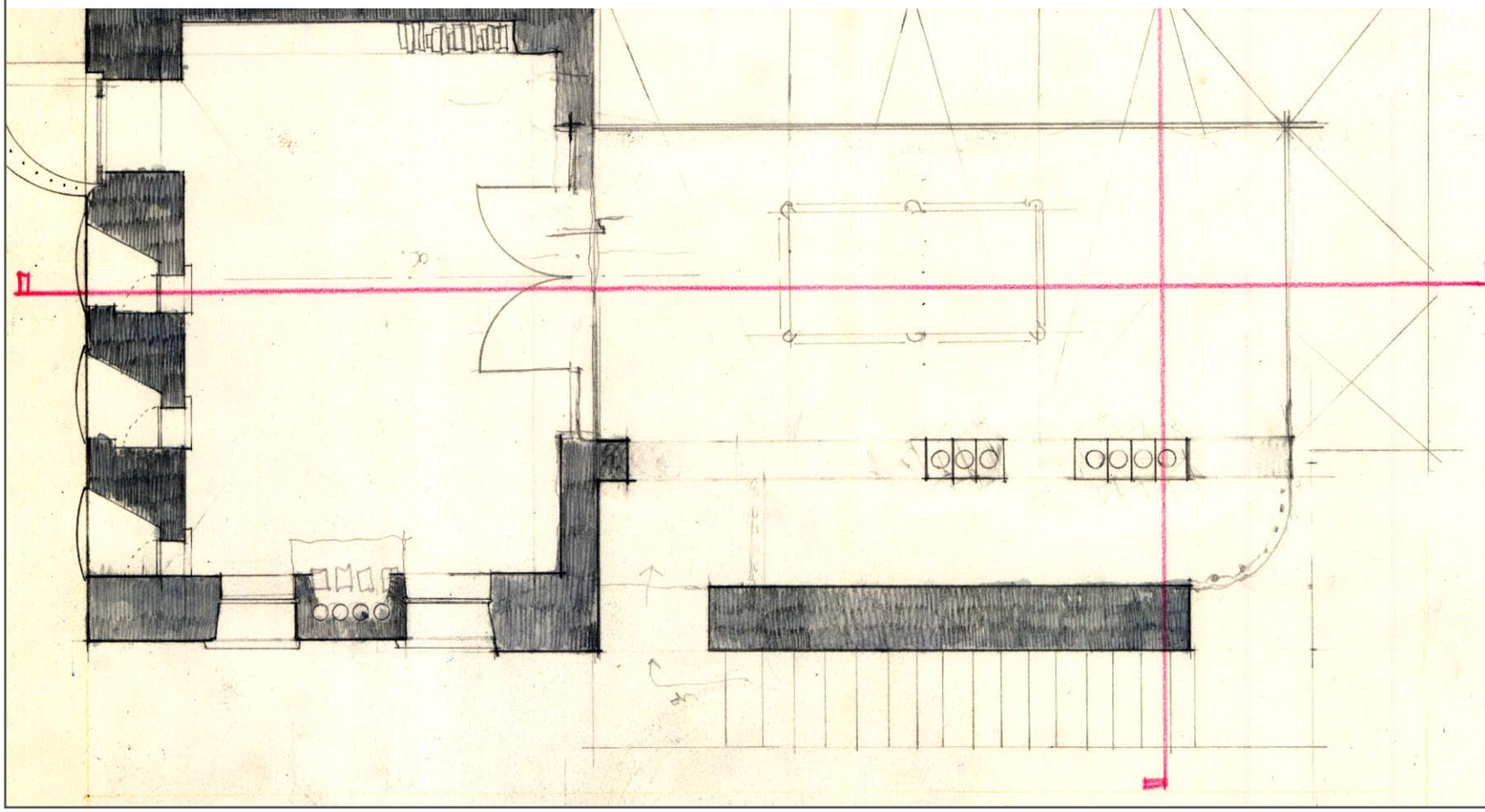




Ground Floor
Monumental stair
Pedestrian bridge
Landing- Private stair

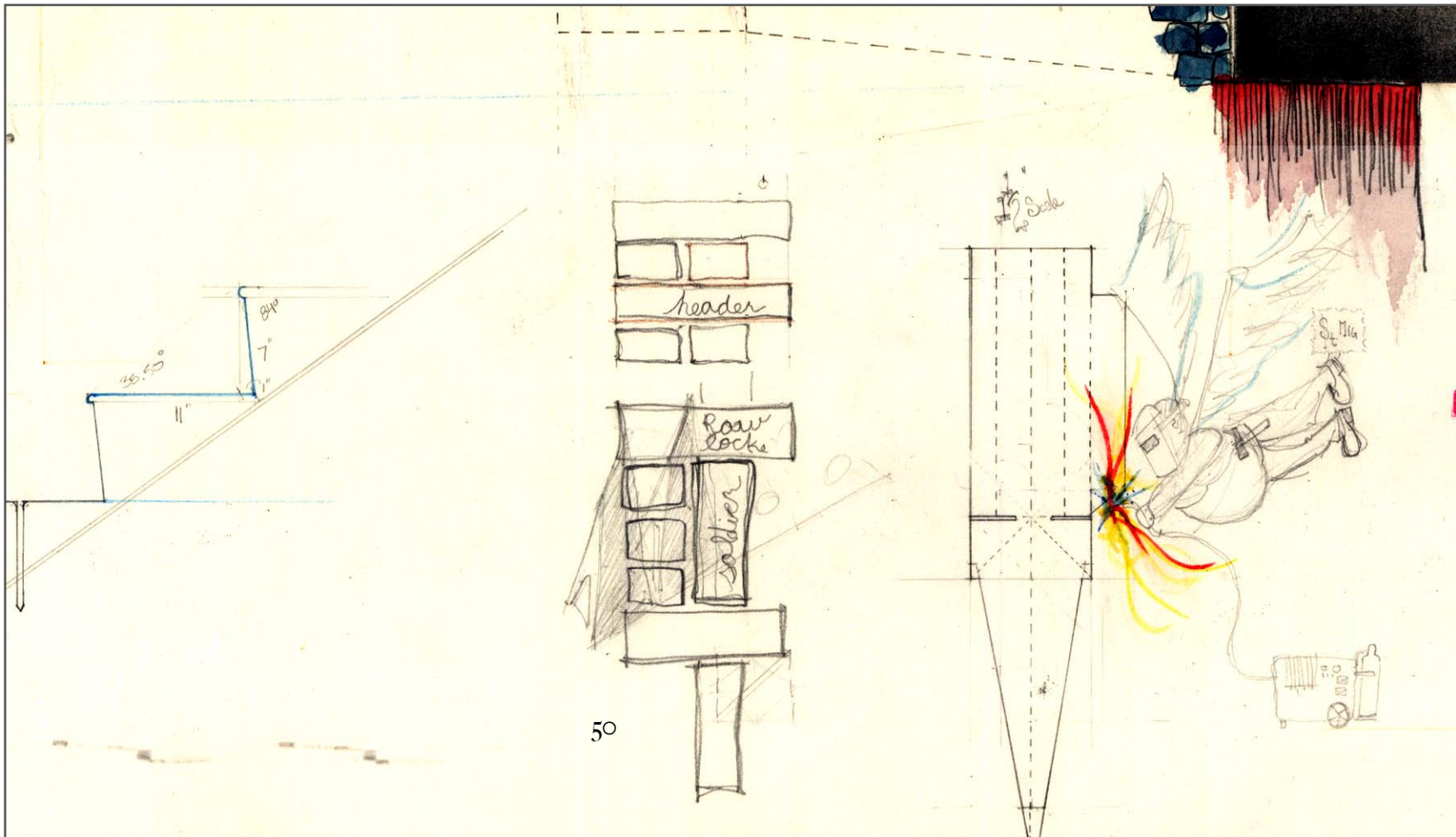


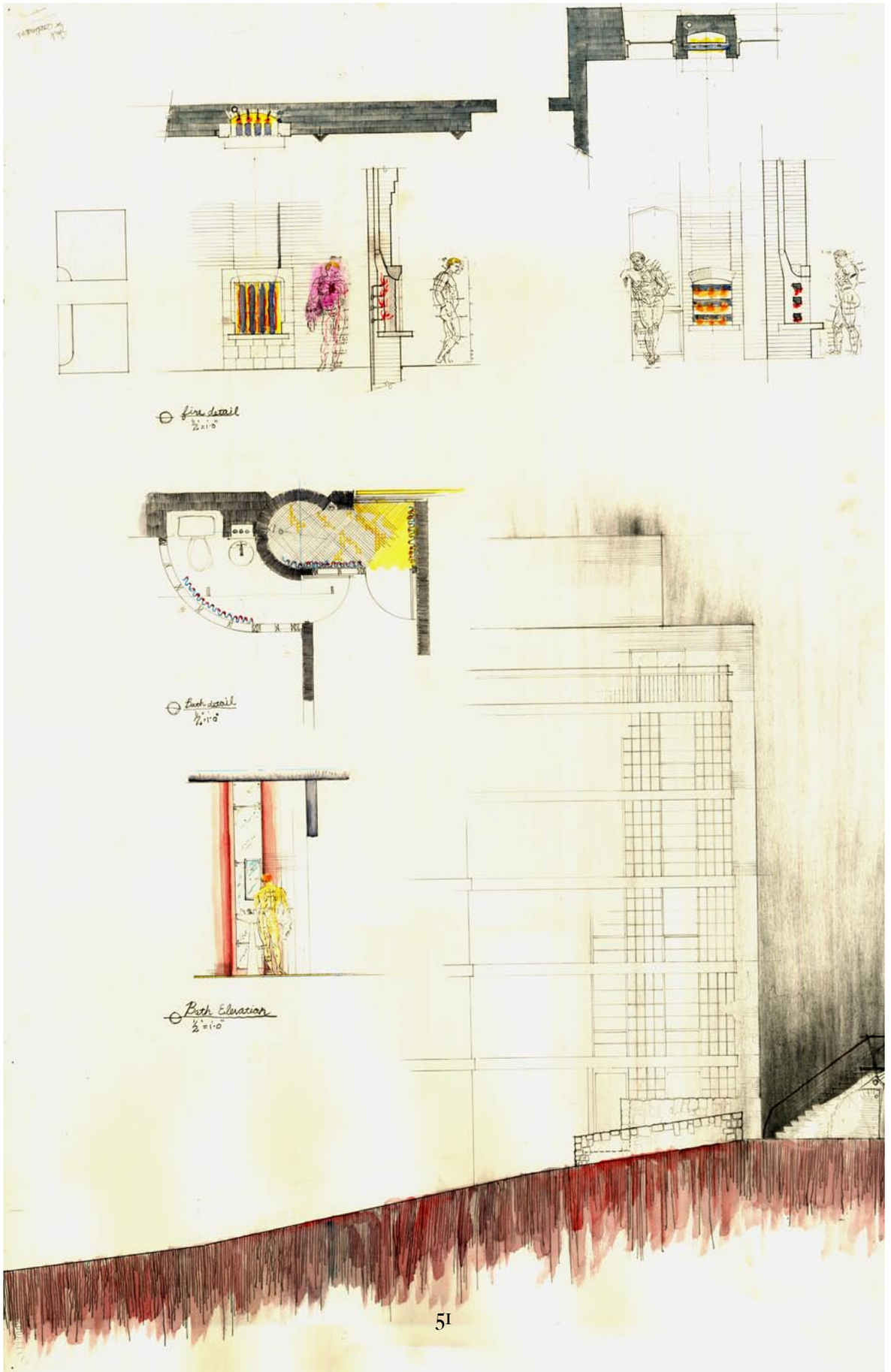
Basement
Gas storage
Foundation



Roof Terrace
Public reading room
Roof Garden

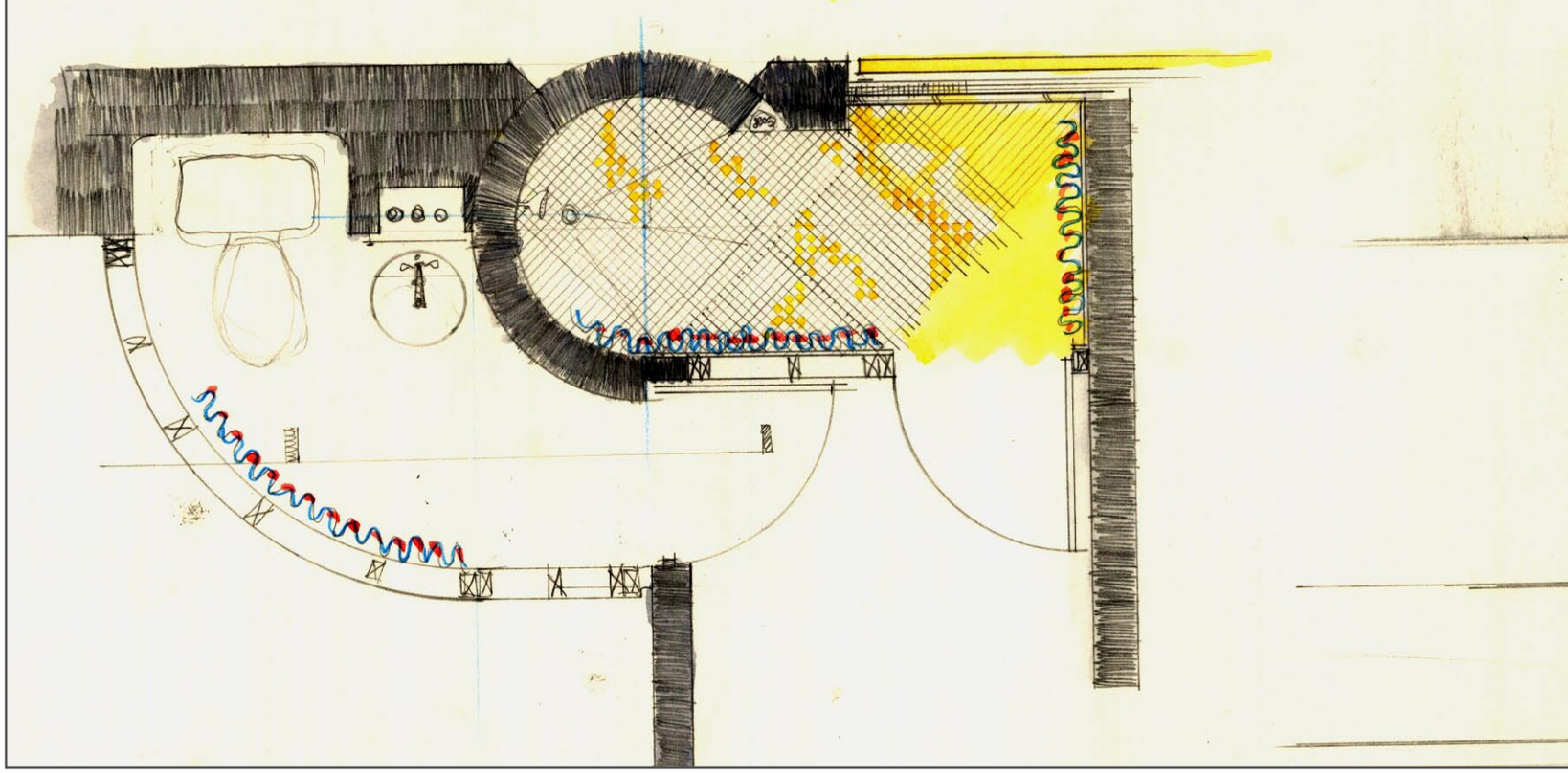
Stair Details





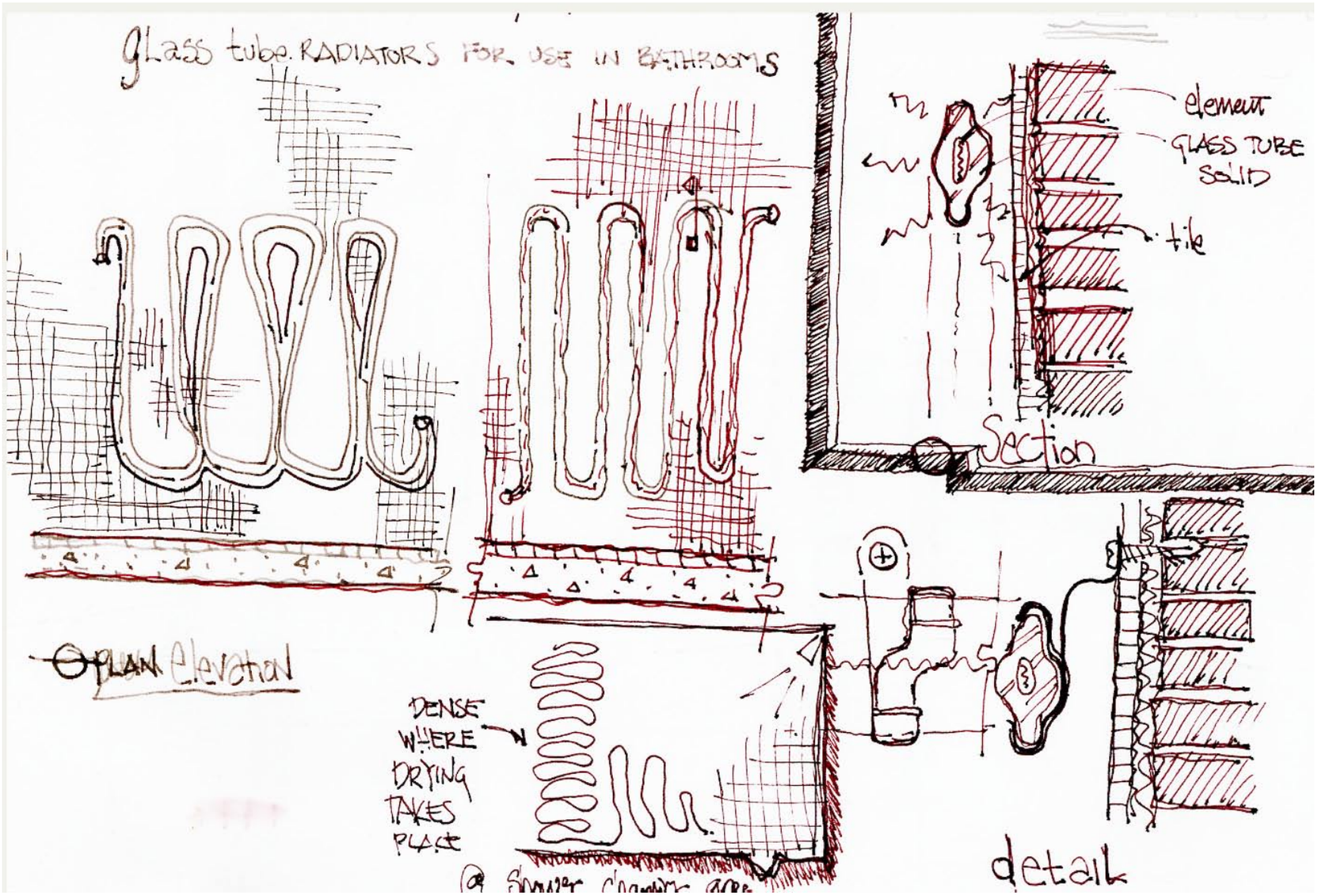
Details

The Lockhouse
Final Drawings
August 2005
Original drawing 42" x 30"



The plumbing fixtures and glass wall mounted radiators

room Interior Elevation study. A arble panels covers the plumbing chase behind the sink.



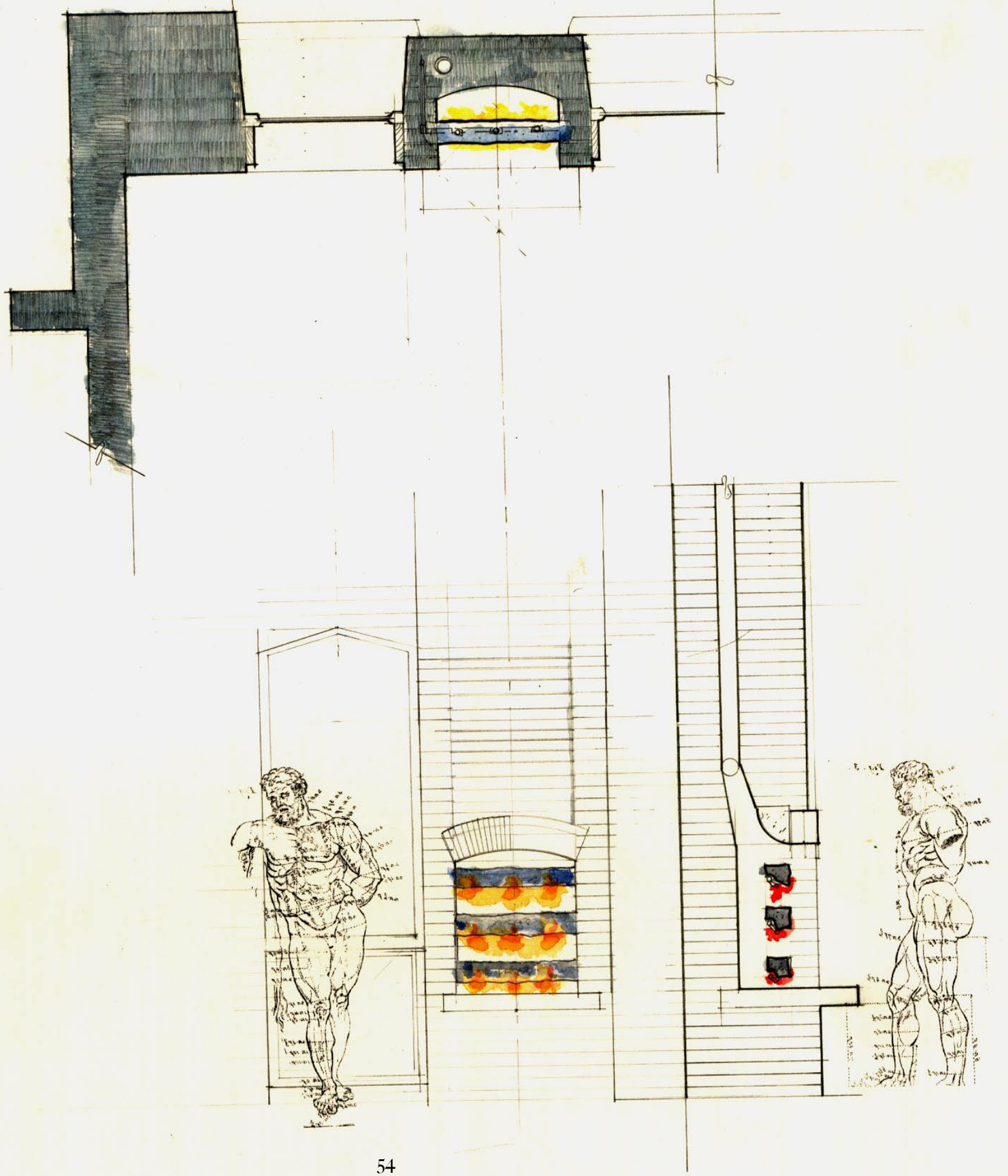
Electric current passes through an element embeded in a coiling glass to heat the bath

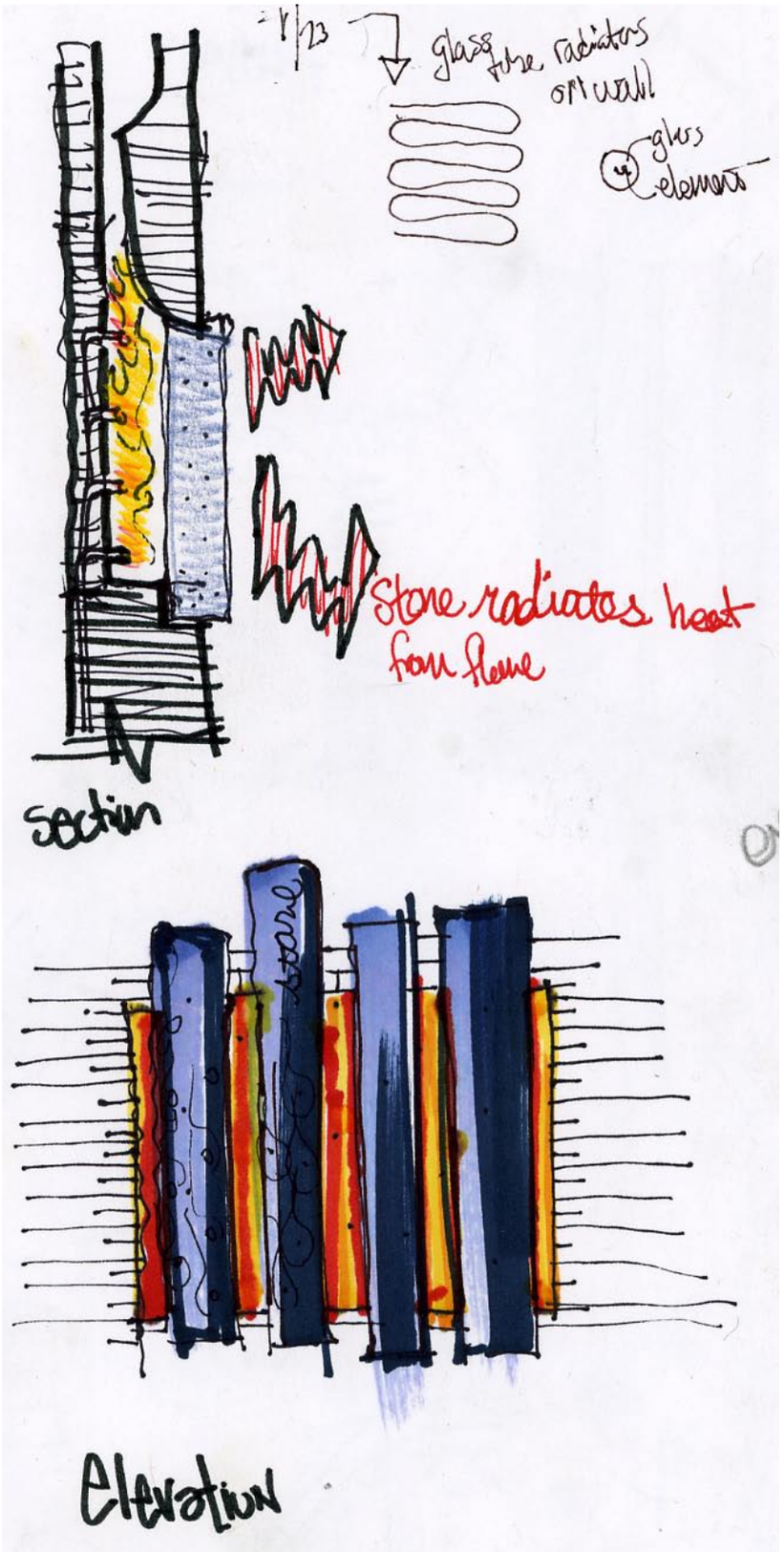
The hearth
North Room

Plan

Elevation

Section





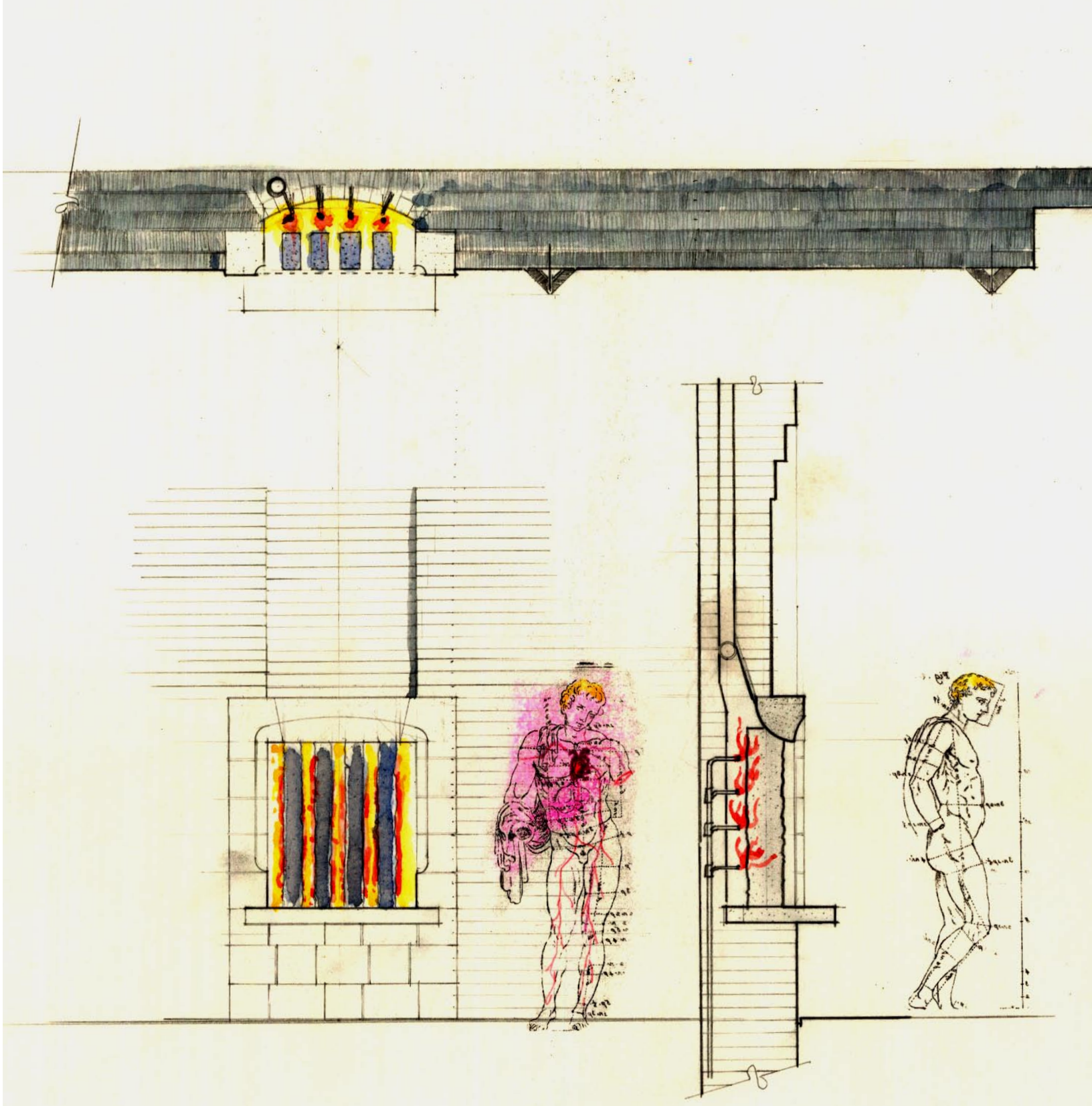
Fireplace Sketches 6-05
Gas fired hearth is controlled by resident, as principle heating element for space

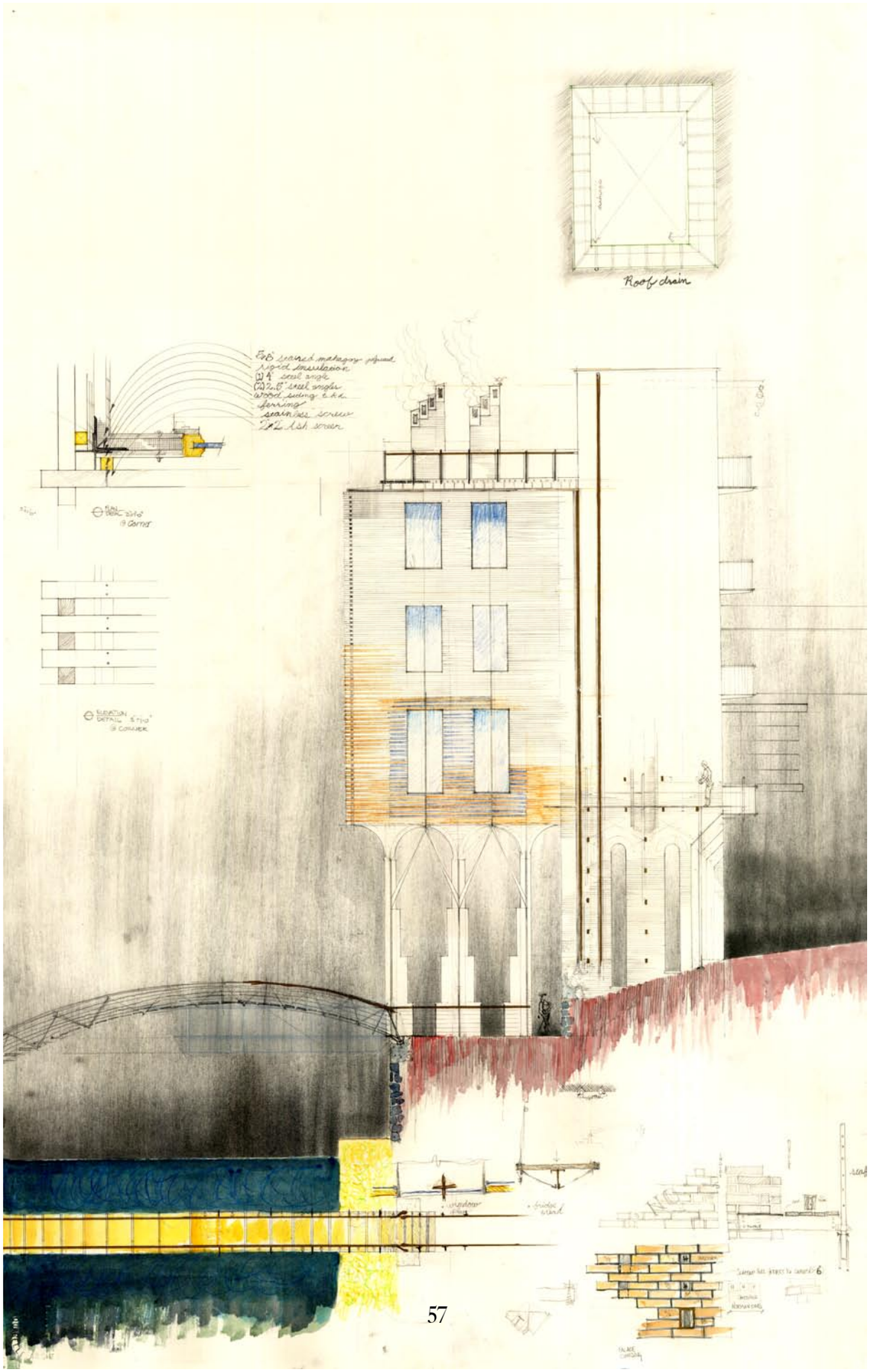
The hearth
South Room

Plan

Elevation

Section

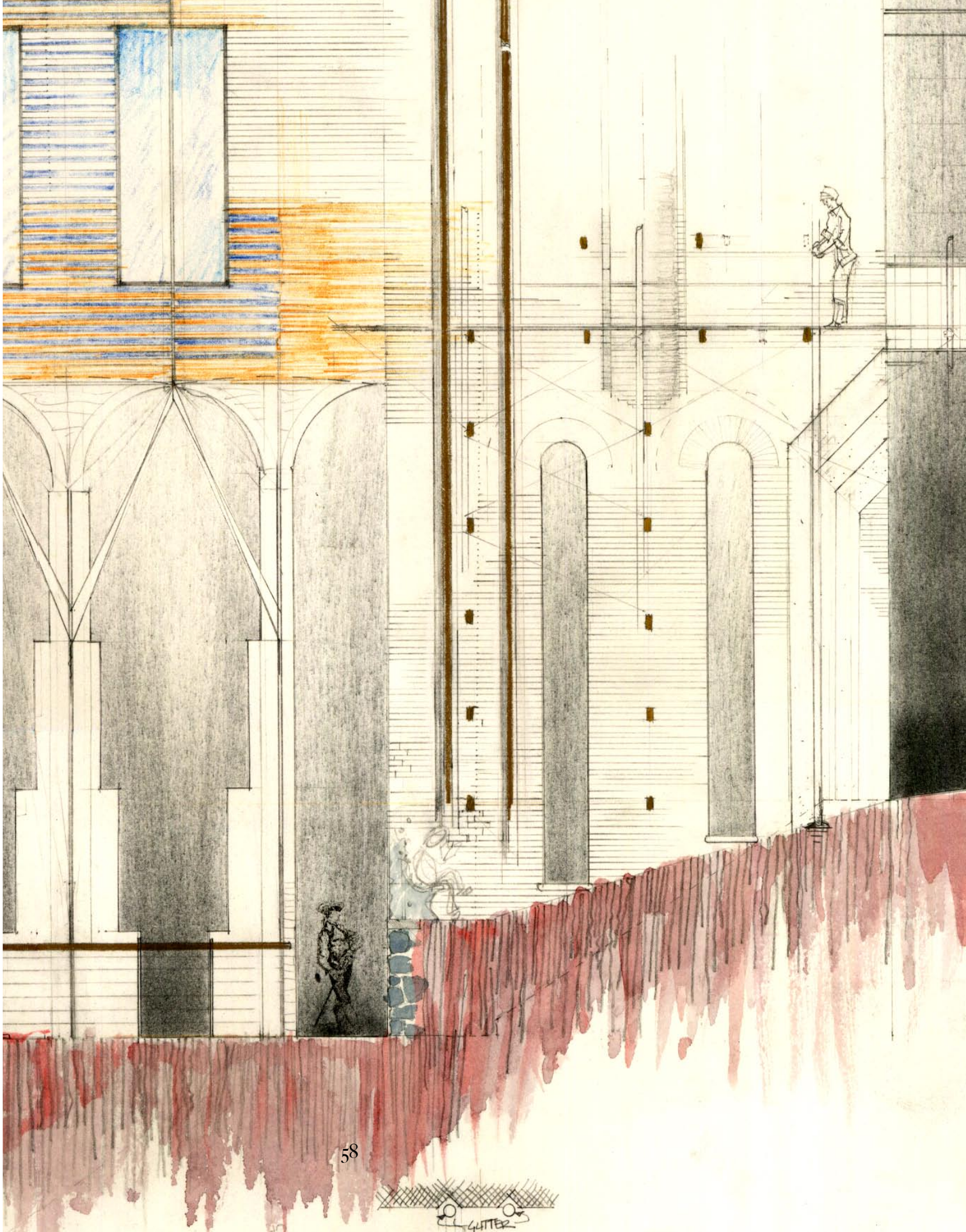




Elevation East

Pedestrian bridge

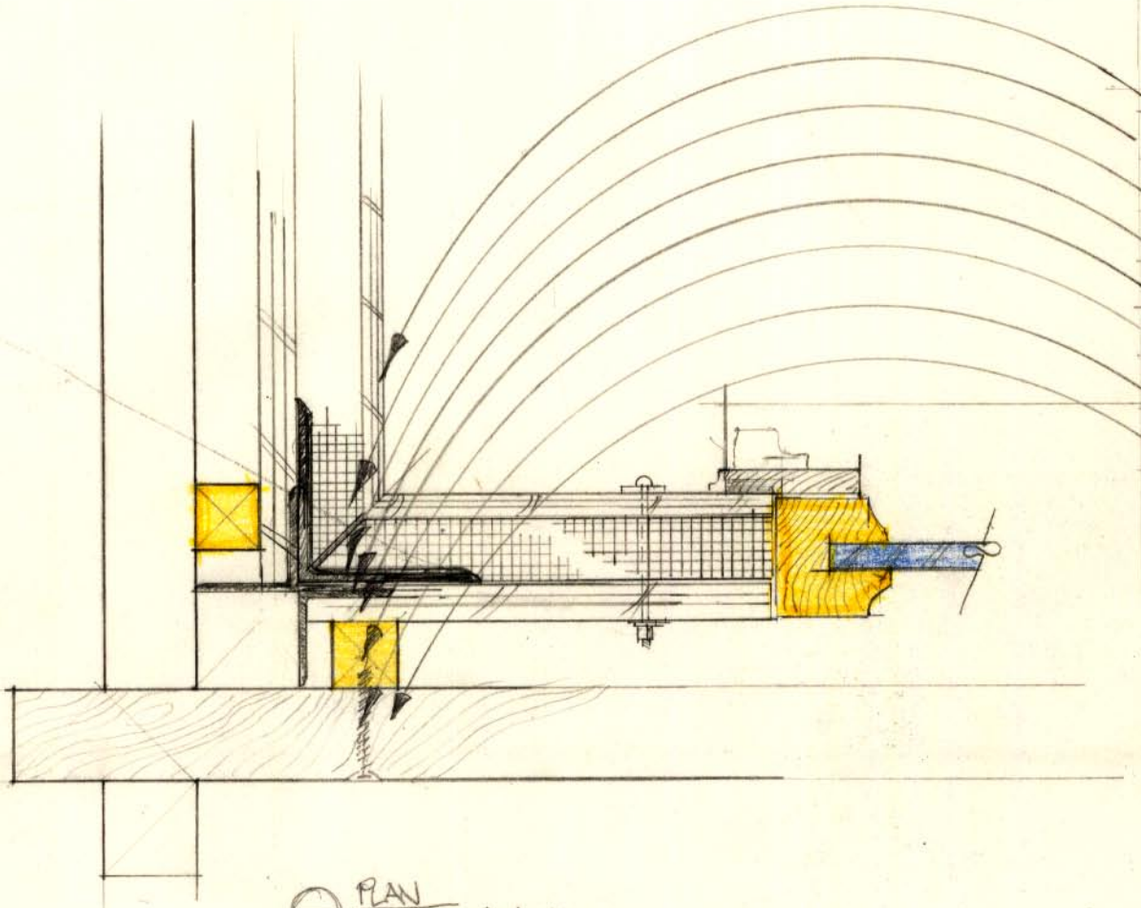
The Lockhouse
Final Drawings
August 2005
Original drawing 42" x 30"



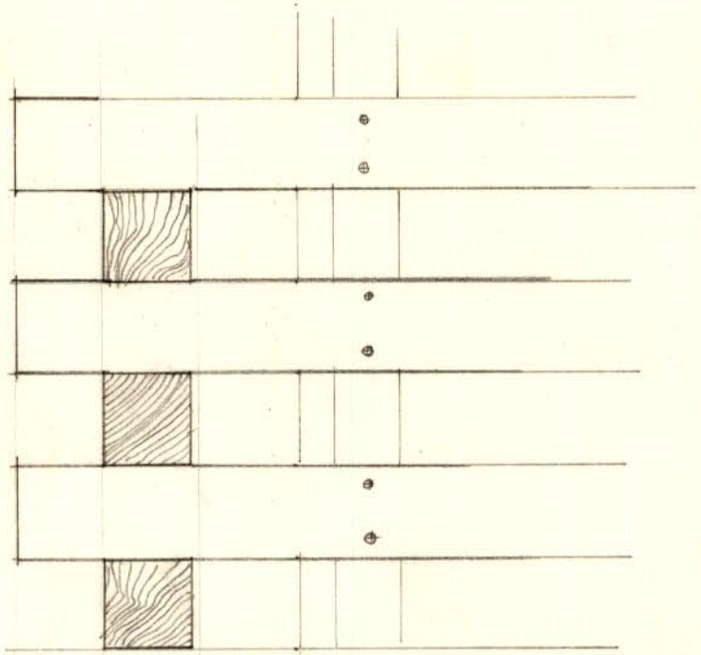
Construction thru Drawing

East Elevation

A brick is ommited at every 16 courses, replaced with a bronze sleeve. Scafolding out-riggers are inserted into the sleeve and work continues. The sleeves remain, a record of the making, a mount for future repair.

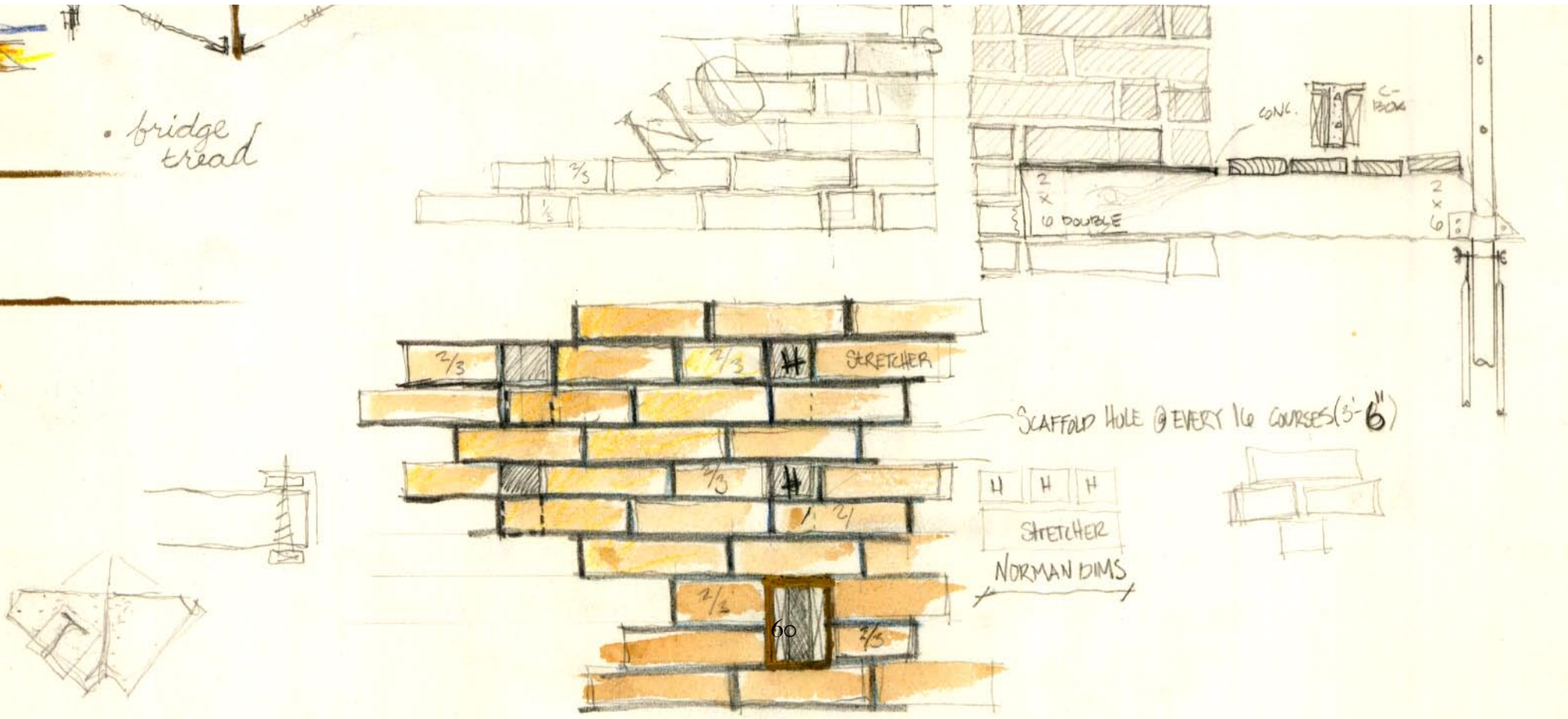


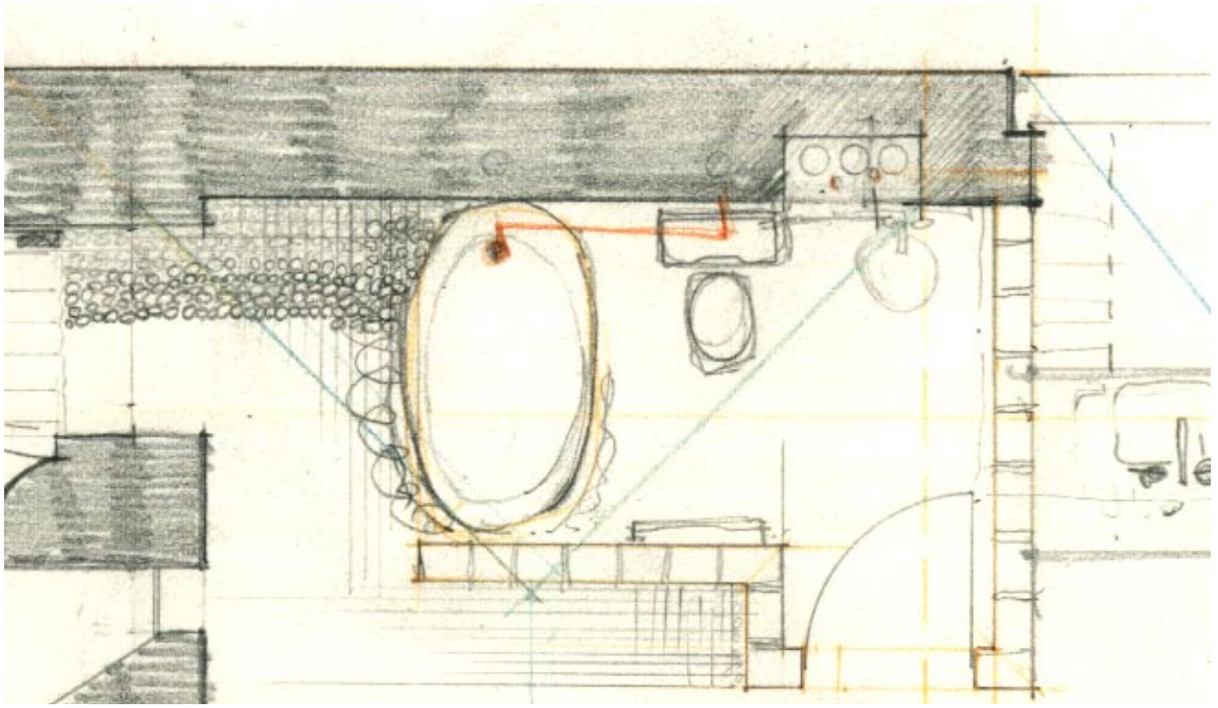
PLAN DETAIL 3"=1'-0"
@ Corner



Detail sketch of the bridge, and second floor window plan

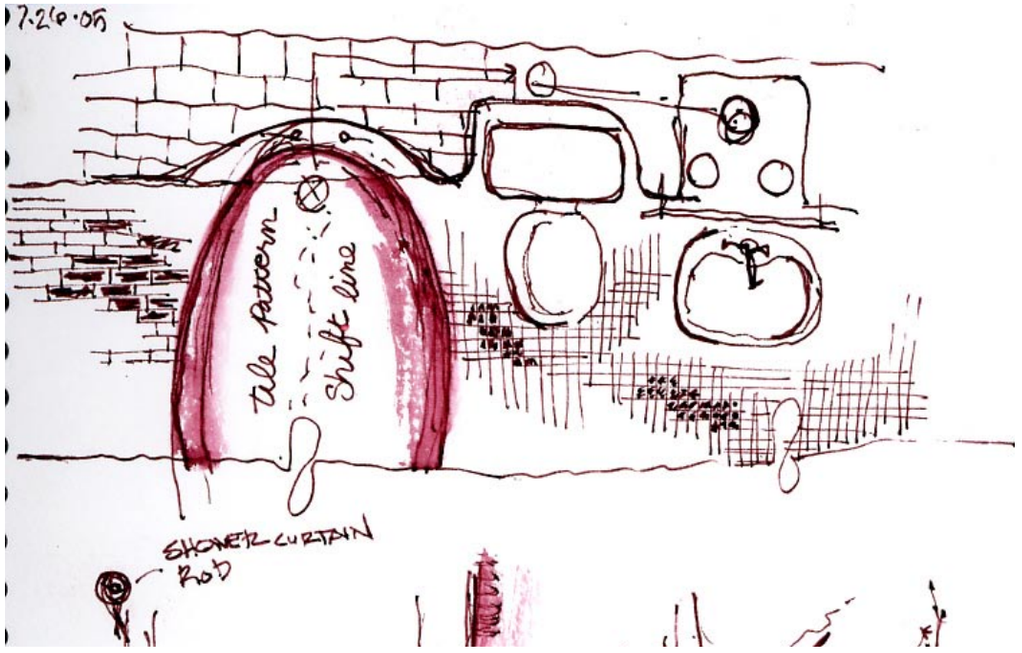
Detail sketch of the scafolding and brick coursing

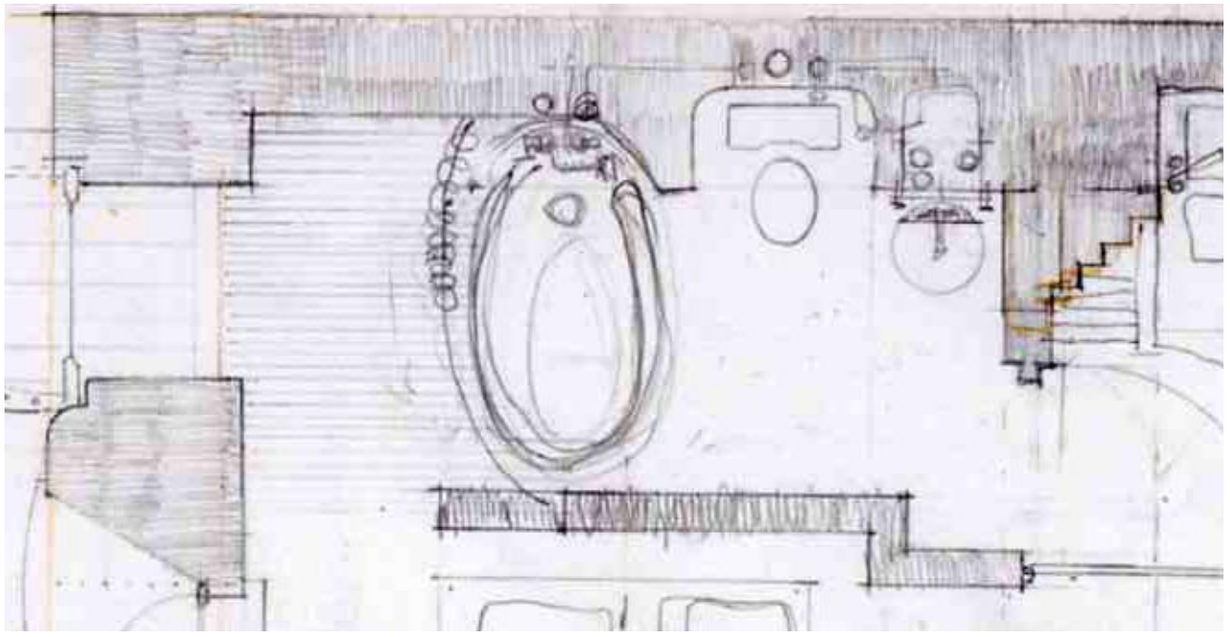




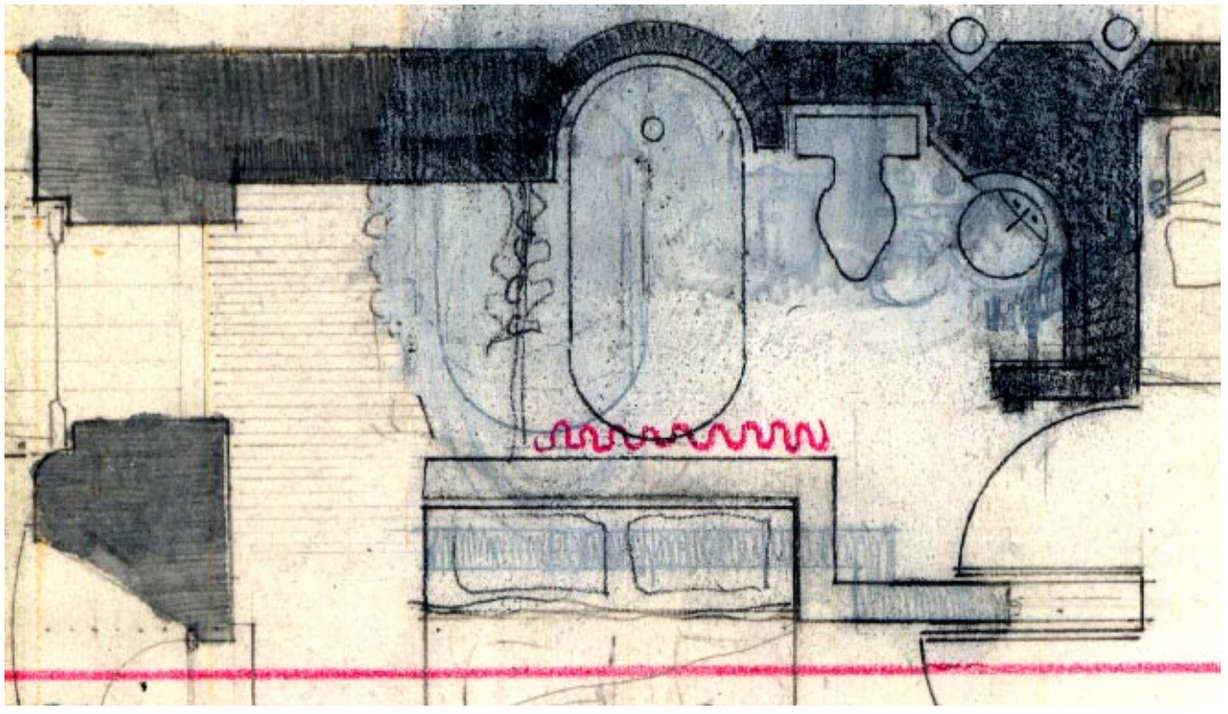
A series of drawings illustrates the development of the Caretaker's bath.

From the first design





To the Last



Patrick Stuart Cooke
Born July 23, 1979
Fairfax, Virginia

Undergraduate

Bachelor of Arts in Architecture
Miami University
Oxford, Ohio 2001

Graduate

Master of Architecture
Washington Alexandria Architecture Consortium
Virginia Polytechnic Institute
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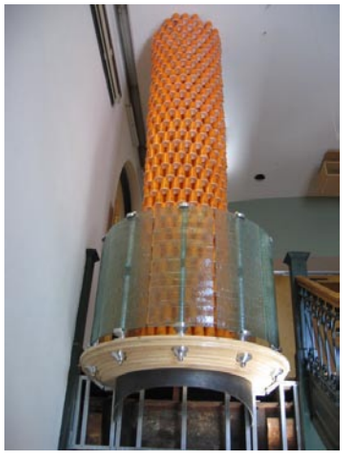
Professional

Cooper Carry, Architects and Planners
Alexandria 2001-2002

Shalom Baranes Architects
Washington DC 2002-2004

Merle Thorpe Architects
Washington DC 2004-



Tarrago, Salvador.	Guastavino Co. (1885-1962) Catalogue of Works in Catalonia and America. (Actar press 2002)
Darden, Douglas	Condemned Building an Architects Pre-text (Princeton Architectural Press New York 1993)
Noever, Peter	Carlo Scarpa:The Craft of Architecture (Hatje Cantz Verlag Germany 2003)
Guastavino, Raphael	Cohesive Construction, Second Edition. (Ticknor Press, Boston 1893)
Author not Credited	"The Works of Raphael Guastavino" Brickbuilder, Vol. X (April, May, September, October, 1901), pp. 79-81, 100-102, 184-188, 211-214 & Plates.
Patents held by Raphael Guastavino	323,930 336,047 336,048 383,050 430,122 464,536 466,536 468,296 468,871 471,173 481,755 548,160 670,777 914,026 947,177 1,057,729 1,119,543 1,197,956

Image Credits

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Forward	photo by Patrick Cooke
Fig. 1	Guastavino Archive, Columbia University Tarrago p. 28
Fig. 2	Guastavino Archive, Columbia University Tarrago p. 28
Fig. 3	Guastavino Archive, Columbia University Tarrago p. 28
Fig. 4	Drawing by Patrick Cooke
Fig. 5	"Brickbuilder, Vol X"
Fig. 6	Tarrago p. 20
Fig. 7	Tarrago, Hisao Suzuki p. 111
Fig. 8	Tarrago, Hisao Suzuki p. 117
Fig. 9	Moya, Salvadori and Heller Tarrago p.17
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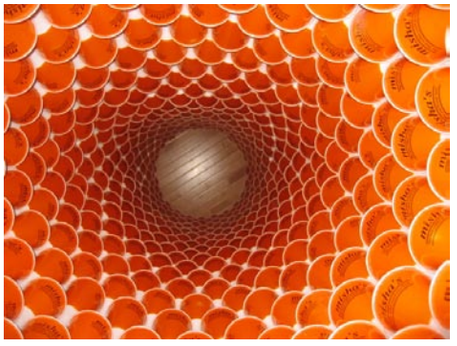

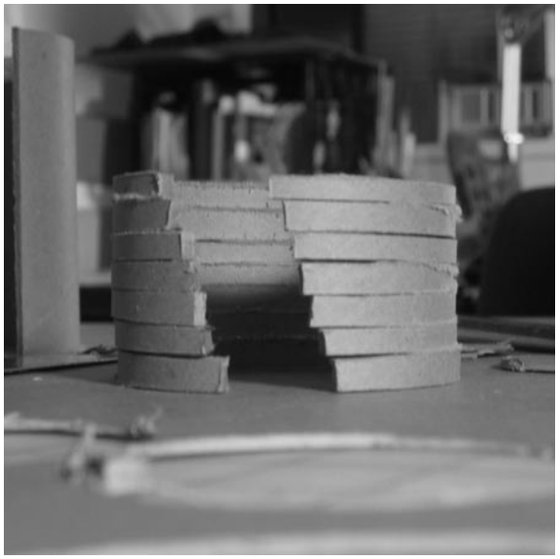

It was easy to become absorbed in thesis study as a series of steps, a site, a program, a building, a thesis. On the surface, a thesis project could be completed like any other student project but more refined with the advantage of extra time. The goal was completion, the object was a building.

My study began as refined architectural thinking, and evolved into primitive understanding. My idea of craftsmanship was only that, an idea, until I touched trowel to mortar, mortar to brick. The making became the goal, and the object was simply the result.

The decision to act forced a reaction to the unknown, and the confrontation, that as architects, we sometimes approach our constructions with a blindfold and a hand towards faith - the lines on paper can be perfect, but the construction is an imperfect thing. For four months I worked towards the construction of a cylindrical form made of bricks- first drawing an idea, then acquiring material, calculating its making, and ultimately constructing the form. As I worked, the subtleties of the material reinforced my understanding, and informed new ways of approaching the drawings, that we rely on. The drawings I produced in the months after the cylinders completion reflect my new understanding of form, and material. By the completion of my study it became clear that the will of the architect to design an object can never be separate from how the object is made.

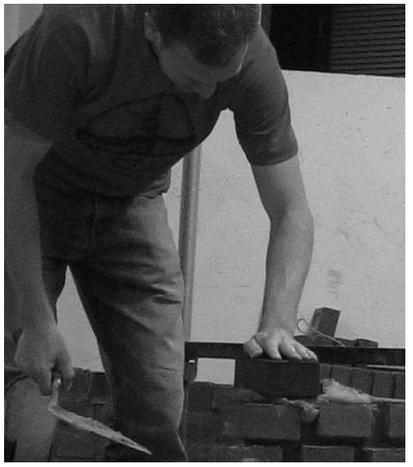

photo by Patrick Cooke

2-20-06
AFTERWORD
-Patrick Cooke

The following is excerpted from Douglas Darden's "Condemned Building".

Six Aphorisms Envisioning Architecture

I Architecture is the meditation on finitude and failure.

II Architecture is the symbolic redistribution of desire.

III Architecture is the execution of exquisite barriers.

IV Architecture is the fiction of the age critiqued in space.

V Architecture is the history of a place told in broken code.

VI Architecture is carried out by resistance to itself.