Embracing the Shadows:
Inhabitation of an Infrastructural Landscape

by

Rebecca M. Luther

B.S. Architecture
University of Virginia, 1998

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARCHITECTURE
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FEBRUARY 2004

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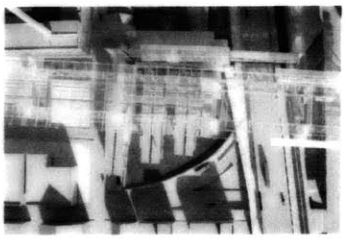
Submitted to the Department of Architecture
in Partial Fulfillment of the Requirements
for the Degree of Master of Architecture at the
Massachusetts Institute of Technology, February 2004

abstract

This thesis embraces the slots of space left behind by regional transportation infrastructure: It proposes an inhabitation of the places over, under and within existing enclaves and impasses, through an engagement of the specific, inherent forces of the site, both physical and sociological.

The site, a Community of Industrial Arts in Philadelphia, PA, is a multi-layered intersection of three functioning, but currently independent, entities: A live/work industrial arts neighborhood, the approach to the Delaware River Bridge, and the elevated I-95 Expressway. The inserted programs are site-specific, symbiotic, and catalysts for connection on a local scale: The School of Industrial Arts and Building Technology, which is modeled on collaborative research and development groups, supplements the existing workshops and emerging galleries of the neighborhood; the adjacent Public Transit Interchange becomes a hub for the school and community, and connects independent, multi-level rail lines. Through an architecture that is responsive to site-specific challenges such as light and shadow, acoustic vibration, wind load, water flow, and multiple cross-grain circulations, programmatic and experiential layers are woven into the existing infrastructure to create a system of mutually reinforcing connective tissues.

thesis supervisor Fernando Domeyko
title Senior Lecturer, Department of Architecture



contents
embracing the shadows

acknowledgements

thank you

to Fernando Domeyko,
for your wonderful happy sketches,
and for your unending inspiration.

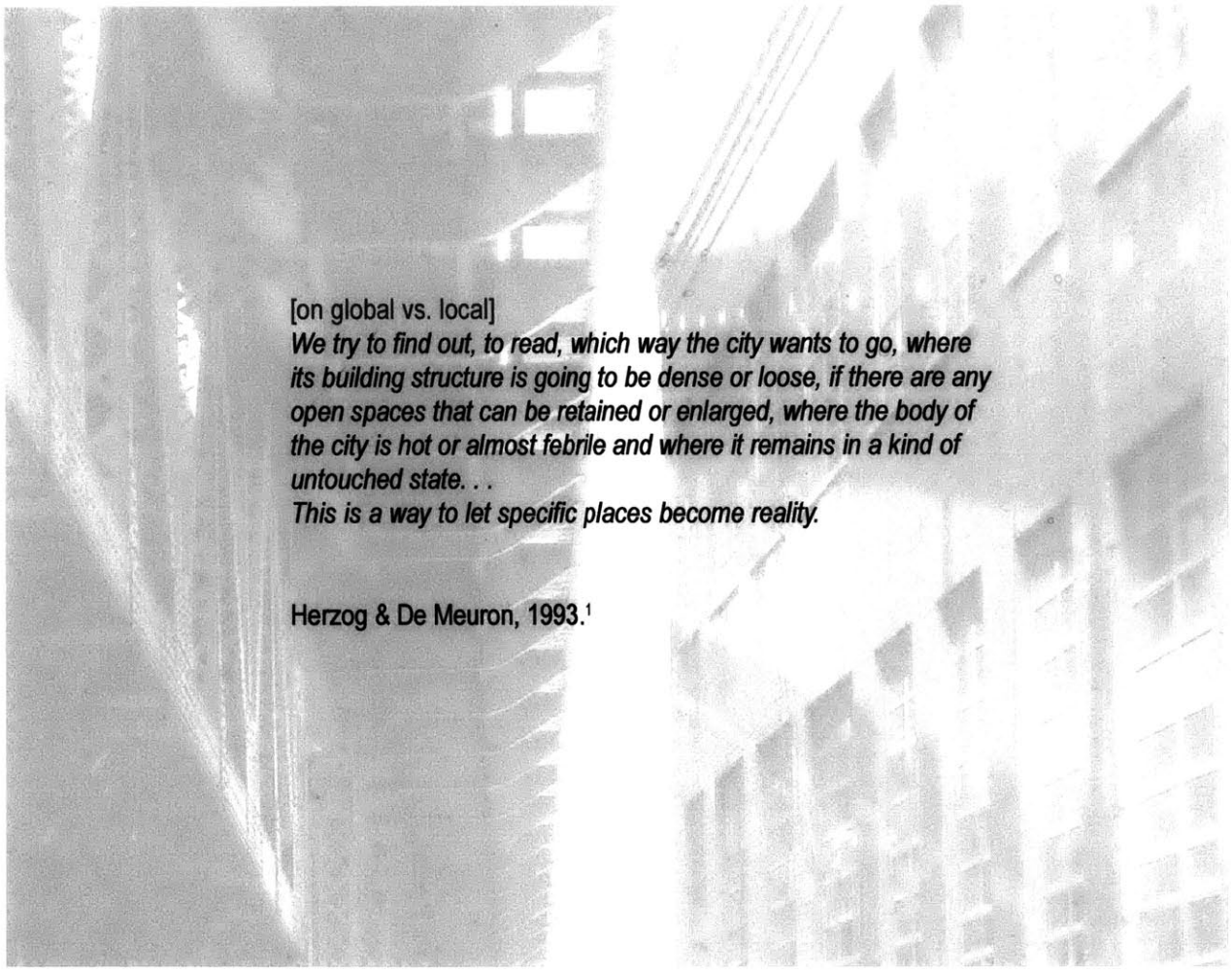
to Tracy Taylor,
my partner in crime, rivets and waxpaper.

to the Quarriers of 4.125,
for your infectious energy.

to Mike Spinello, Chris Johns, Brian Alex Miller,
Susan Morgan, Tim Morsehead, and Matt Pierce,
for your support and advice during thesis and
throughout our time together at MIT.

to my husband Brad Koerner,
always supportive, always loving.

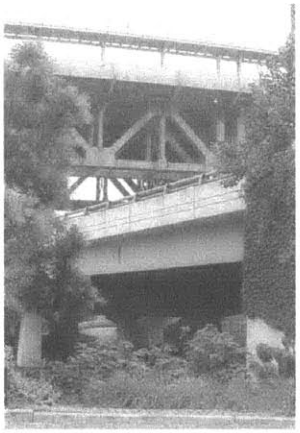
facing page:
desk crit sketches, F. Domeyko 2003



[on global vs. local]
We try to find out, to read, which way the city wants to go, where its building structure is going to be dense or loose, if there are any open spaces that can be retained or enlarged, where the body of the city is hot or almost febrile and where it remains in a kind of untouched state. . .
This is a way to let specific places become reality.

Herzog & De Meuron, 1993.[1]

introduction
embracing the shadows:
inhabitation of an infrastructural landscape



infrastructure *n. a sub-structure or underlying foundation; esp., the basic installations and facilities on which the continuance and growth of a community, state, etc. depend, as roads, schools, power plants, transportation and communication systems, etc.*[2]

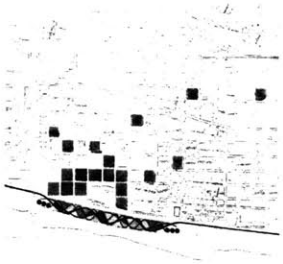
Infrastructures, which were mutually reinforcing and totalizing, are becoming more and more competitive and local; they no longer pretend to create functioning wholes but now spin off functional entities. Instead of network and organism, the new infrastructure creates enclave and impasse: no longer the grand recit but the parasitic swerve.

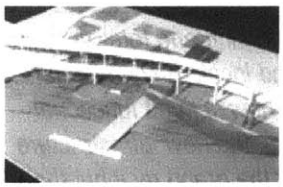
OMA, *The Generic City*, 1994[3]

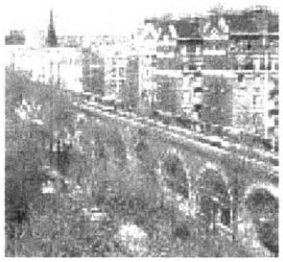
This thesis embraces the slots of space left behind by regional transportation infrastructure: It proposes a local-scale infrastructural inhabitation of the places over, under and within existing enclaves and impasses, through an engagement of the specific, inherent forces of the site, both physical and sociological.

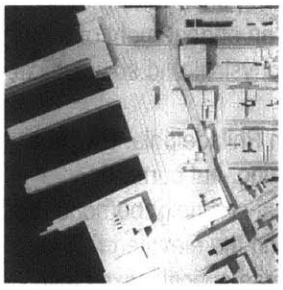
The site, a Community of Industrial Arts in Philadelphia, PA, is a multi-layered intersection of three functioning, but currently independent, entities: A live/work industrial arts neighborhood, the approach to the Delaware River Bridge, and the elevated I-95 Expressway. The inserted programs are site-specific, symbiotic, and catalysts for connection on a local scale: The School of Industrial Arts and Building Technology, which is modeled on collaborative research and development groups, supplements the existing workshops and emerging galleries of the neighborhood; the adjacent Public Transit Interchange becomes a hub for the school and community, and connects independent, multi-level rail lines. Through an architecture that is responsive to site-specific challenges such as light and shadow, acoustic vibration, wind load, water flow, and multiple cross-grain circulations, programmatic and experiential layers are woven into the existing infrastructure to create a system of mutually reinforcing connective tissues.

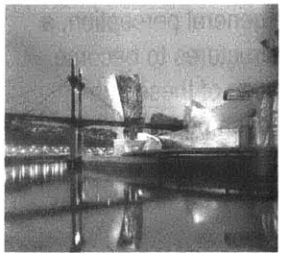
In the process, there might be a change in general perception, a realization of the potential of existing infrastructures to become sub-structures, and for the layered inhabitation of these sub-ststrustructures to be functional, beautiful, even poetic.











1,2 *p.9 and p.11: photos of neighborhood adjacent to site*
3 *Herzog & De Meuron, Diagonal Competition, Barcelona, 1989*
4 *Martha Schwartz proposal, Crescent Eastbank Riverside Park, Portland*
5 *Viaduc des Arts, Paris*
6 *my proposal for the High Line terminus, NYC*
7 *OMA, Lille Master Plan*
8 *Frank Gehry, Guggenheim Bilbao*

[precedents, studies and inspiration]

Herzog & De Meuron's Diagonal Competition in Barcelona, 1989, addressed the disconnect between the city and its waterfront. The proposal was a system of ponds that acted as both biological water purification plant and public garden.[3]

Martha Schwartz's proposal for the Crescent Eastbank Riverside Park in Portland, OR:

[T]he landscape concept for the site includes a series of tilted landforms or "fingers" . . . These fingers reach outward to the river connecting the adjacent neighborhood to the water. The character of these landforms differ from each other. Some have a hard surface, and some are soft. They also resolve at the water's edge in different ways. One becomes an overlook to the water and another resolves in amphitheater seating. Still others become steps to the water's edge or planted slopes, and one ramps to the water to provide boat access. . . In their many forms, the landform "fingers" successfully reconcile the conflicting demands of cultural, recreational, and environmental demands within a technically challenging setting.[4]

Viaduc des Arts (Promenade Plantee) in Paris and Tokyo's Ginza District are both examples of elevated rail viaducts (one disused, one active) that have been enlivened by activity on the street below. My own proposal for the High Line in New York City, *Choreographed Circulations*, imagines the High Line (currently an abandoned elevated rail viaduct) as public garden/ arts corridor with a performance facility at its terminus, extending the activity of the garden to the street below and river beyond:

Undulating bands of circulation stretch from the Gansevoort Street High Line terminus to the West Side Highway and Hudson River. Roofscape becomes landscape as choreographed circulation paths intertwine: Pedestrians, cyclists, climbers and dancers pass and interact with one another in an active negotiation between street level and the High Line. The building becomes a place to "see and be seen" and redefines the traditional notion of "performance space."[5]

Rem Koolhaas' Euralille: Centre International d-Affaires in Lille, France created a void from which to view all the surrounding site forces:

. . . an absence of building reveals the highway, railway, three levels of parking, and the metro, which dives underneath the whole complex, in one overtly metropolitan moment – Espace Piranesien.[6]

And Frank Gehry's Guggenheim Bilbao actively engages its complex site – the city, the river and the bridge, acting as a beacon on the waterfront.

notes

[1] A. Zaera, *Continuities: Interview with Herzog & De Meuron,* El Croquis, v.60, p.14.

[2] definition of *infrastructure, Webster's New World Dictionary, Third Ed.,* Prentice Hall, 1994.

[3] O.M.A., R. Koolhaas and B. Mau, *S,M,L,XL*, The Monacelli Press, 1995, p.1264.

[4] A. Zaera, *Continuities,* p.8.

[5] www.marthaschwartz.com

[6] from *Choreographed Circulations, Rethinking the High Line* exhibition, Municipal Arts Society, 2002 (based on studio work, J. Meejin Yoon, MIT studio, fall 2001)

[7] O.M.A., *S,M,L,XL*, p.1200.

1

2

1 welder
2 aerial photo of eastern Philadelphia and Delaware River shoreline

site + program

The site, a Community of Industrial Arts in northeast Philadelphia, is a multi-layered intersection of three functioning, but currently independent, entities: A live/work industrial arts neighborhood, the approach to the Delaware River Bridge, and the elevated I-95 Expressway.

The inserted programs are site-specific, symbiotic, and catalysts for connection on a local scale: The School of Industrial Arts and Building Technology, which is modeled on collaborative research and development groups, supplements the existing workshops and emerging galleries of the neighborhood; the adjacent Public Transit Interchange becomes a hub for the school and community, and connects independent, multi-level rail lines.

1

site

community of industrial arts, philadelphia

Philadelphia . . .
is at last laid out to the great content of those here . . .
The situation is a neck of land, and lieth between two navigable rivers, Delaware and Schuylkill; whereby it hath two fronts on the water, each a mile, and two from river to river.
Delaware is a glorious River . . .

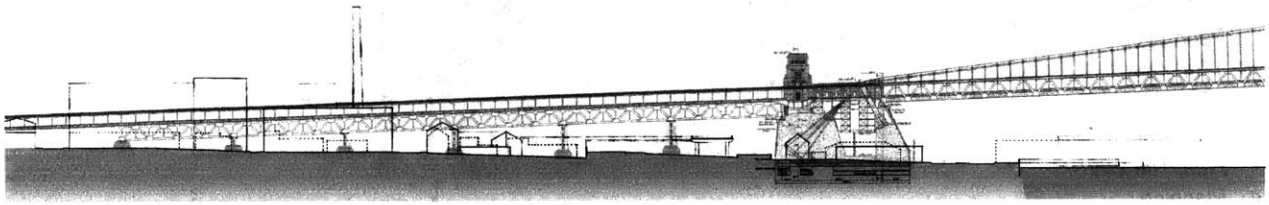
William Penn, 1863 letter to the Committee of the Free Society, London

Once the northeastern corner of an ideal rectangular city grid that extended from river to river, buffering Center City from the Industrial District to the north, the site is now lost amid a knot of regional-scale infrastructure. The Benjamin Franklin (Delaware River) Bridge descended onto the city grid in 1926 , and the elevated I-95 Expressway severed the city from its riverfront beginning in 1959.

The site continues to have tremendous potential, however, both in the unique sectional variation of its many infrastructures, and in its prime location between the community, the industrial district and the river. The site itself is a chameleon, entangled in transportation infrastructure, embedded in the streetlife of the city grid, viewed from the rooftops and bridge walkways, and punctuated by vistas to the city center and the river.

1 *diagram of Philadelphia between the two rivers, the Delaware to the east and the Schuylkill to the west*
2 *montage of aerial photo and 1951 Sanborn map*
3 *section montage with original anchorage drawing*
4 *plan of site*

2



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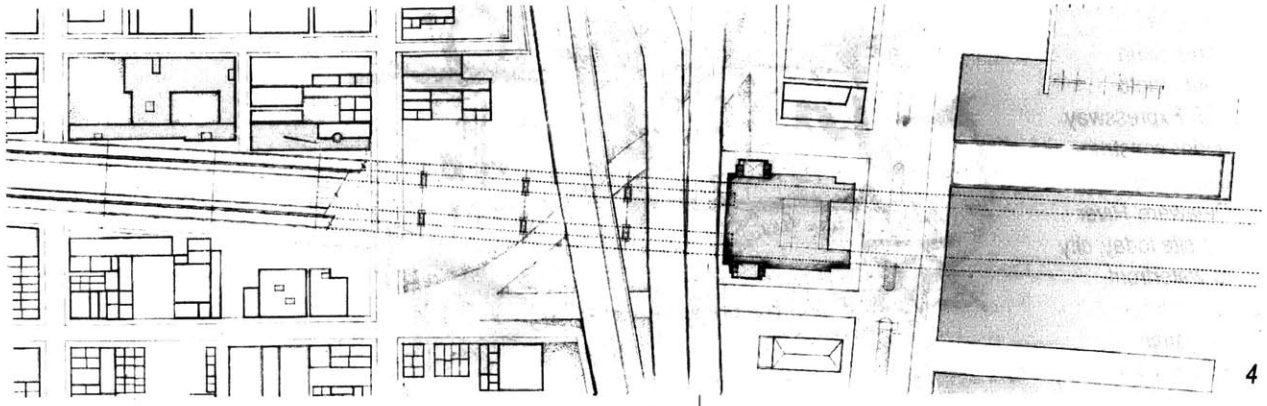

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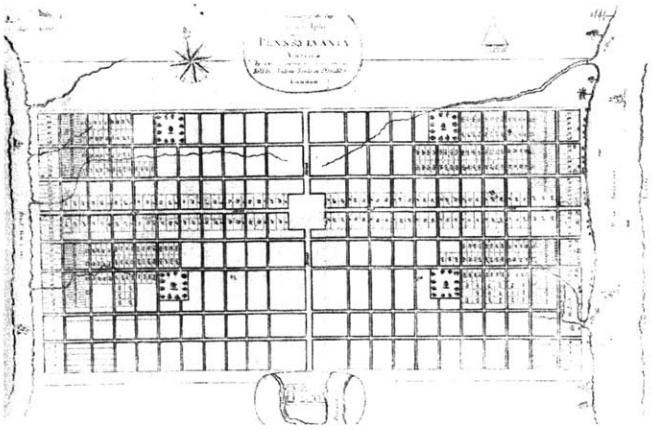

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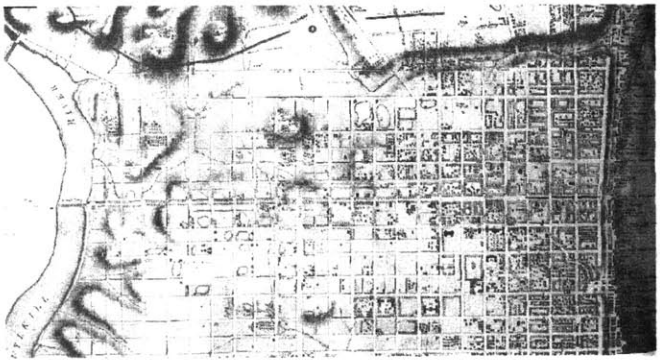

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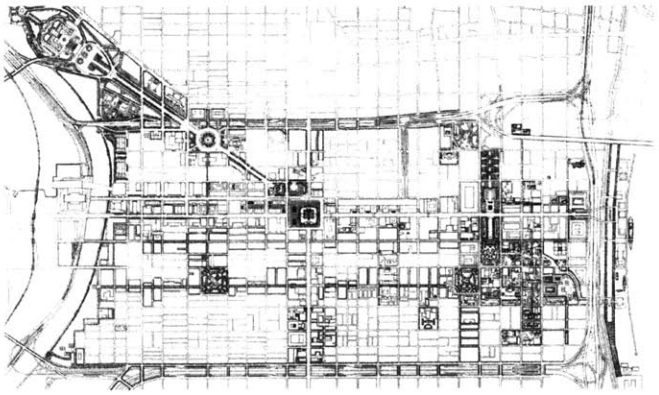

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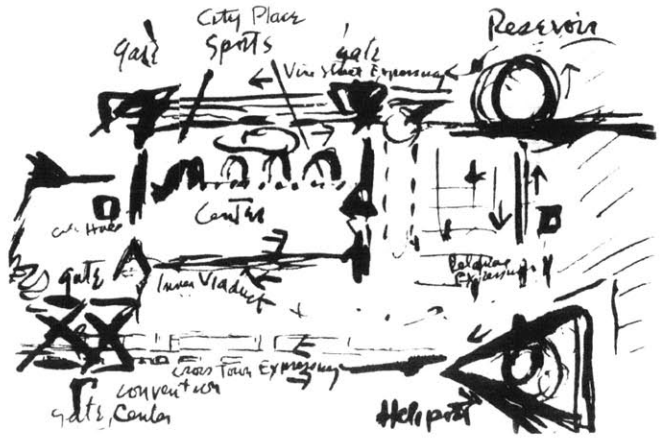
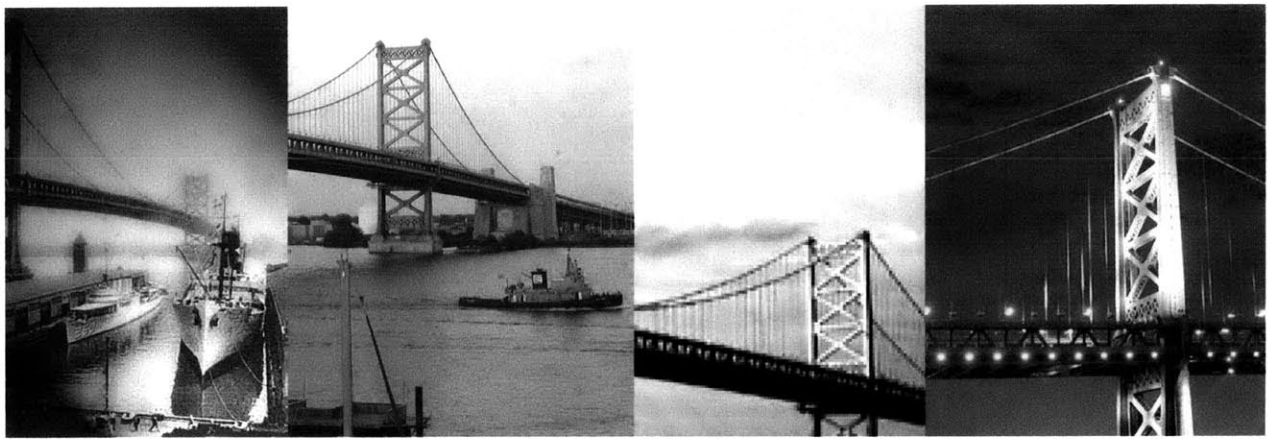


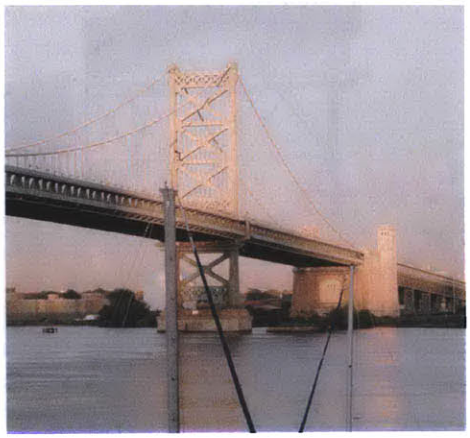
8

5 *1682 William Penn plan*
6 *1796 plan, John Hill*
7 *1960 Center City Plan, The City Planning Commission*
8 *1960s Center City Plan, Louis Kahn*
9 *1968 photo, I-95 Expressway under construction along Delaware River*
10 *the site today, city to waterfront, view from Benjamin Franklin Bridge*

9

10





11 ***The Benjamin Franklin Bridge***
(Delaware River Bridge)


SIXTH GRADE
STOMACH STILL
IN THIRD


P

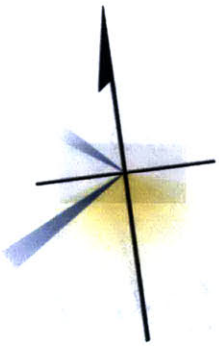
12 views of the Delaware River ***waterfront*** *and the walls that separate the city from its river*

13 views of the ***rooftops****, from the Benjamin Franklin (Delaware River) Bridge*

14 views of the ***street life*** *of this industrial arts neighborhood*

site studies

wind. water. sun. horizons. acoustics. circulations.

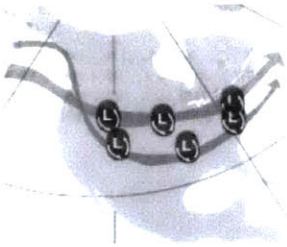


orientation of city grid 7 degrees off of north;
with sunpath and prevailing winds

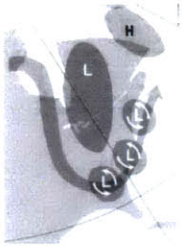
The elements of nature – water, wind, light, and sky – bring architecture derived from ideological thought down to the ground level of reality and awaken man-made life within it.[1]

Tadao Ando, *Toward New Horizons in Architecture*

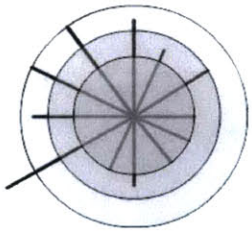
[1] K. Frampton, ed. *Tadao Ando: Buildings, Projects, Writings.*



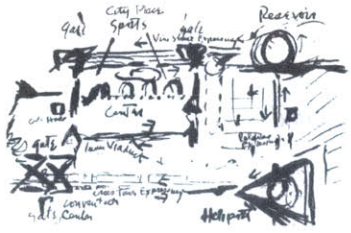
1 continental storm tracks from SW



2 noreaster conditions



3 windrose: prevailing wind from SW



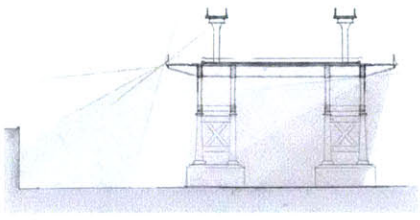
5 Louis Kahn sketch proposing reservoir on the site

6 diagram of Philadelhpia, between the rivers

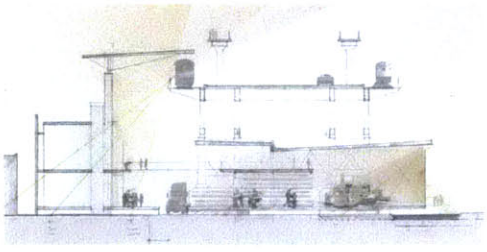
"Philadelphia . . .
is at last laid out to the great content of those here . . .
The situation is a neck of land, and lieth between two navigable rivers, Delaware and Schuylkill; whereby it hath two fronts on the water, each a mile, and two from river to river.
Delaware is a glorious River . . ."

7 William Penn, 1863 letter to Committee of the Free Society, London

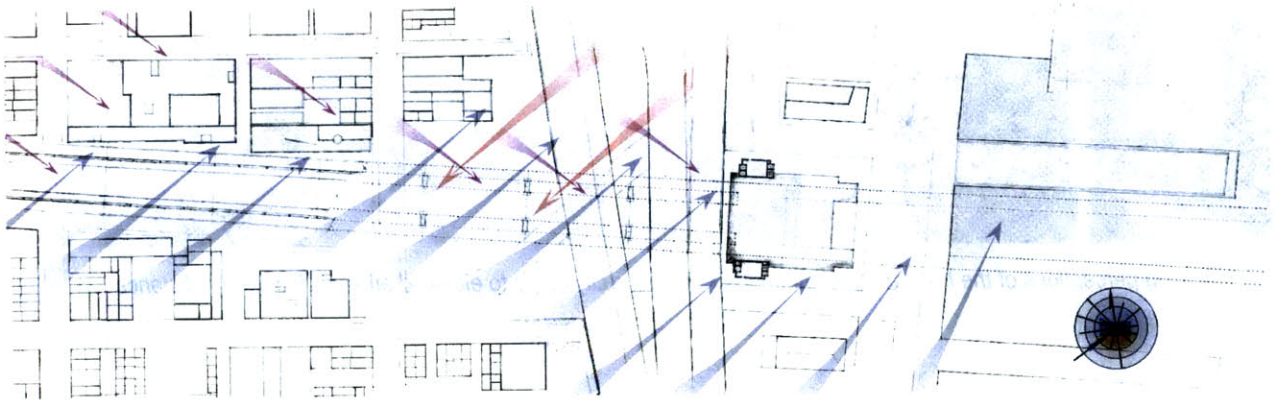
9 sunpath adjacent to site



10 sunpath section diagram: summer/winter

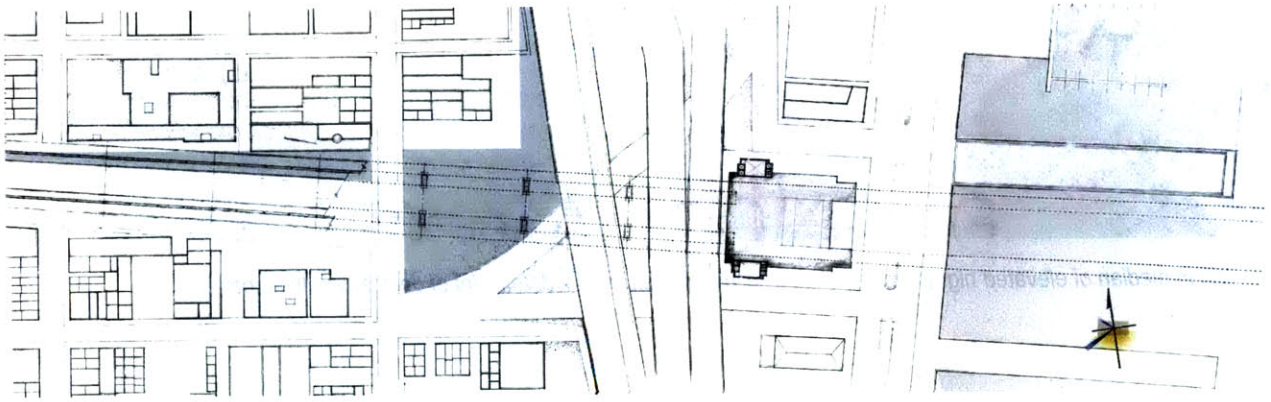


11 sketch montage with sunpaths



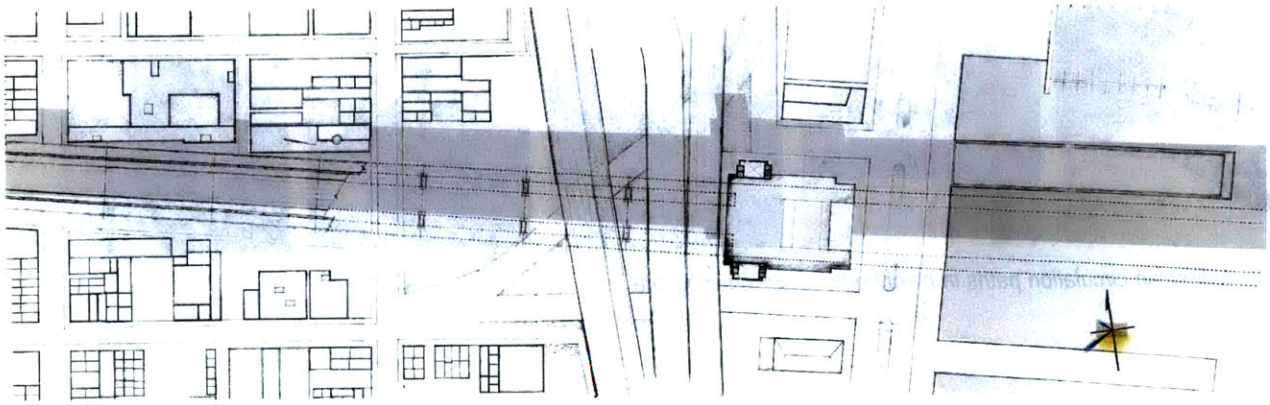
4 diagram of prevailing winds from SW, secondary winds from NW, and noreaster gusts

ventilation and gusts **wind**



8 diagram of proposed location of water and purification reservoir under bridge

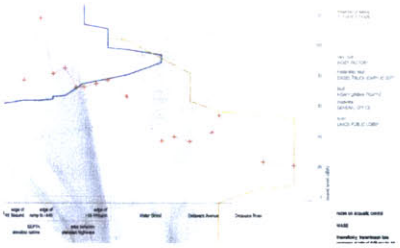
circulation and purification **water**



12 diagram of existing slot of shadow

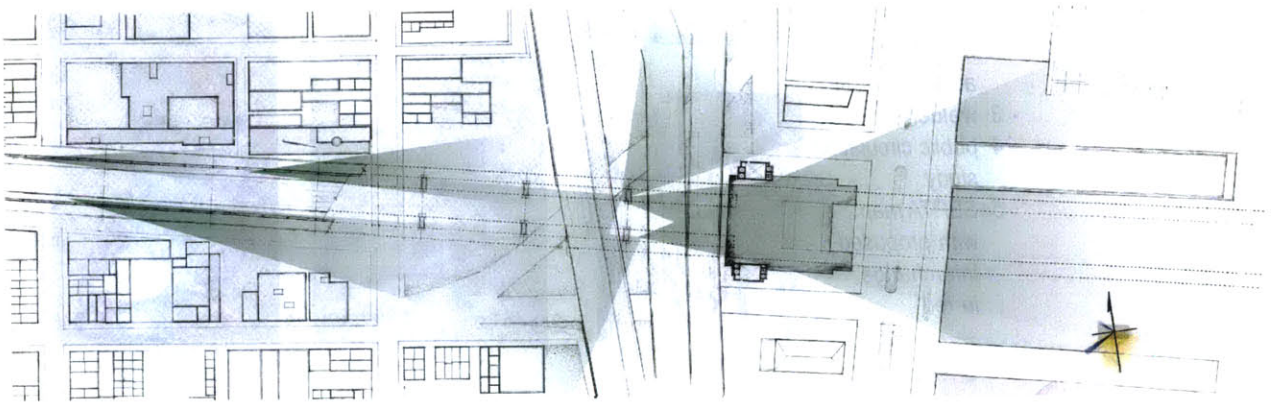
light and shadow **sun**

13 changing perceptions of the horizon, from embedded within the city fabric to elevated and viewing from a distance



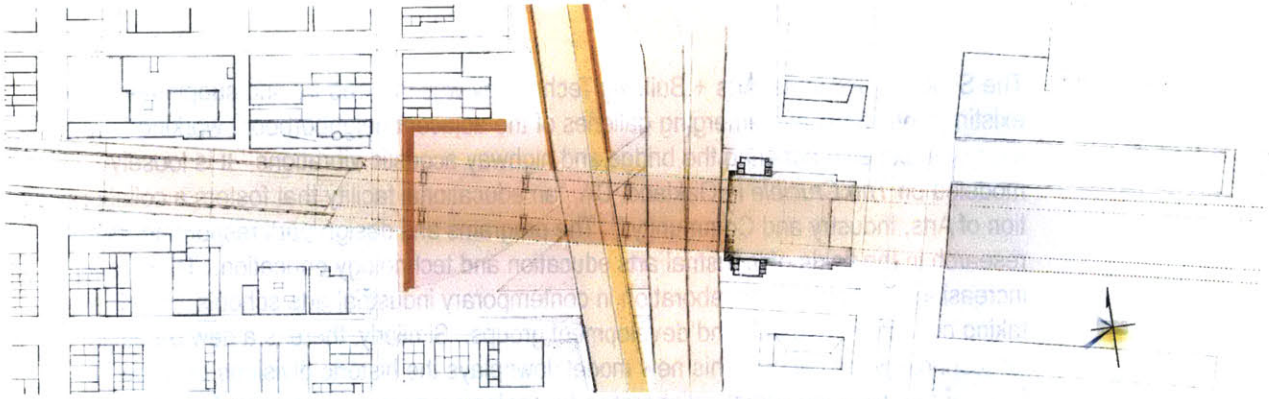
15 train in median of elevated highways *16 acoustic intensity study* *17 detail, plot of decibel levels across site*

19 pedestrian circulation paths in neighborhood surrounding site



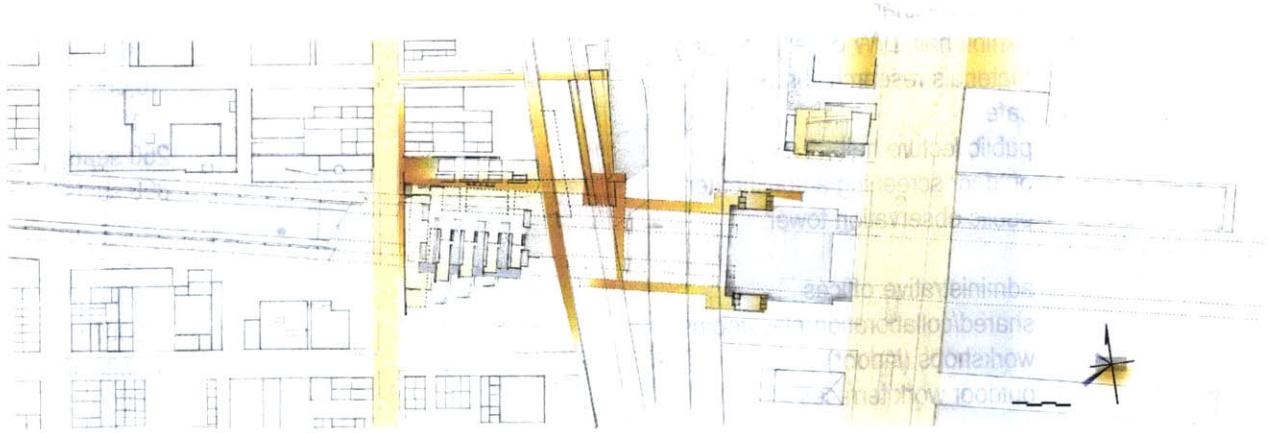
14 diagram of shifting views with elevational change

views and perception **horizons**



18 diagram of acoustic vibration and areas where buffers are needed

decibel level and vibration **acoustics**



20 diagram of proposed pedestrian circulation

public / pedestrian **circulations**

1,2 photos of neighborhood adjacent to site
3 welder
4 public circulation study
5 SEPTA map with proposed interchange in red

1

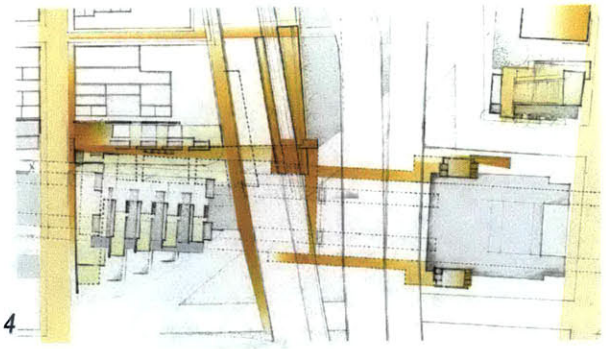

2


3

school of industrial arts + building technology

The School of Industrial Arts + Building Technology was inspired by and supplements the existing workshops and emerging galleries of the adjacent neighborhood, working alongside but also buffering the bridge and highway acoustic vibrations. It is loosely modeled on *The Crucible* in Oakland, CA, "an educational facility that fosters a collaboration of Arts, Industry and Community."[1] The programs and design parti respond to recent research in the fields of industrial arts education and technology education. There is an increasing emphasis on collaboration in contemporary industrial arts schools, which are taking cues from research and development groups. Similarly, there is a new paradigm for technology education: This new model downplays the historic divisions by trade in favor of four more universal collaborative technologies: communication technology, construction technology, manufacturing technology and transportation technology.[2]

N/S pedestrian bridge/park	1000 lf
exhibit hall, E/W gallery crossing	8000 sf
materials research library	10,000 sf
cafe	1500 sf
public lecture hall	250 seats
outdoor screening amphitheater	800 seats
public observation tower	
administrative offices	4000 sf
shared/collaboration classrooms	8000 sf
workshops (indoor)	12,000 sf
outdoor work terraces	6000 sf
materials storage/reuse depot	6000 sf
loading	3000 sf
water purification reservoir	



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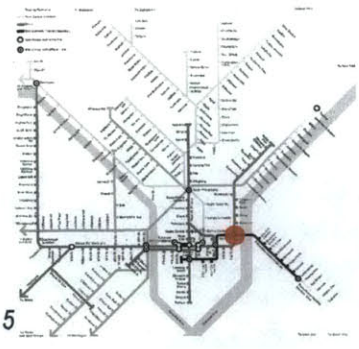

5

public transit station

The Public Transit Interchange is a hub for both the school and the community, and connects existing independent, multi-level rail lines:

N/S
SEPTA (Philadelphia Transit Authority) Market-Frankford Line
within median area of I-95 Delaware Expressway
+
E/W
Port Authority Transit Company Philadelphia-Lindenwold Line
along Benjamin Franklin (Delaware River) Bridge

extended platforms, Bridge Approach
(reuse of disused platform access elevators
in original anchorage)
new platforms, I-95 Expressway
new interchange building
with access to intermediate park and to
gallery crossing
transfer level with ticket booths, kiosks, etc.

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notes

[1] *The Crucible* is so named after a definition of "crucible": a place or situation in which concentrated forces converge and interact to cause or influence change or development, www.thecrucible.org

[2] S. Clark, *The Industrial Arts Paradigm: Adjustment, Replacement or Extinction?*, Journal of Technology Education, scholar.lib.vt.edu/ejournals/JTE/v1n1/clark.jte-v1n1.html

site + program studies

Rather than seeing artificial and natural processes as opposed to each other, we see them as one thing, as a continuity of things. We no longer believe that nature and society, or nature and the city, are dialectically opposing systems. If we say nature, we mean biological, chemical and physical processes, processes we can try to describe in order to understand nature. Too, we mean artificial and artistic processes we can operate in order to understand our own natures, our perception and sensation of nature and our effect on and changing of nature.[1]

Herzog & De Meuron, 1993

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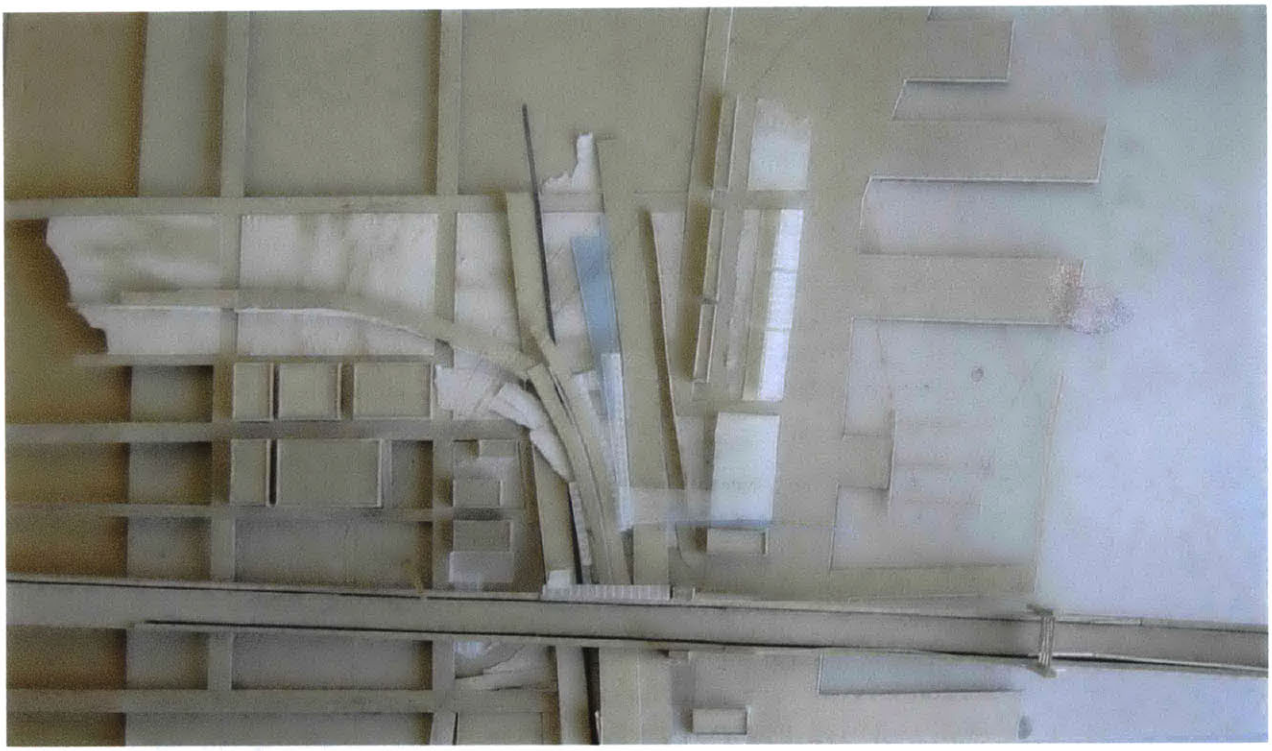
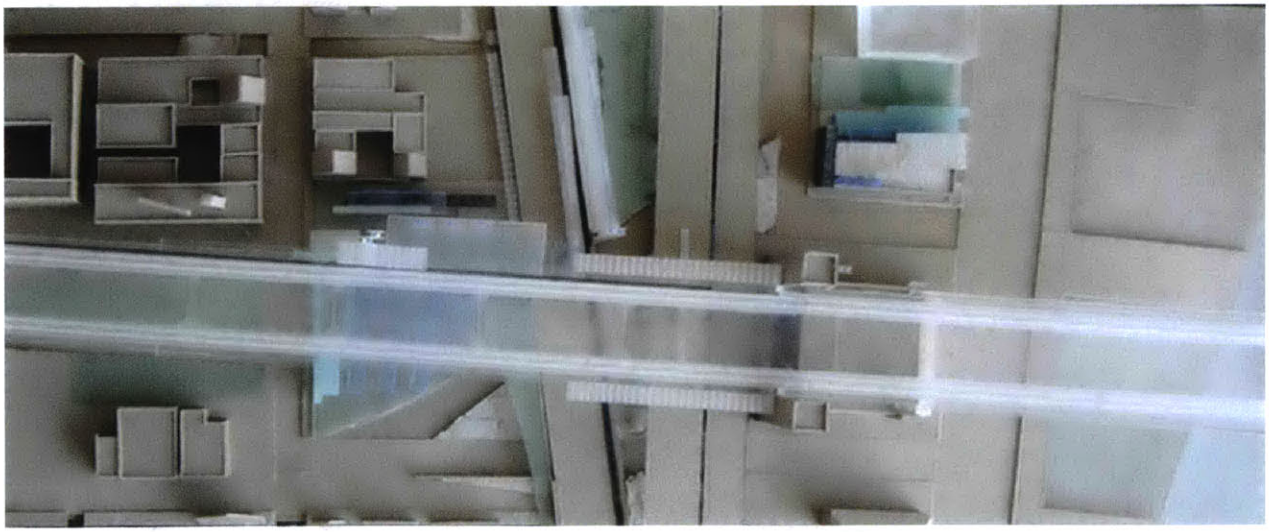
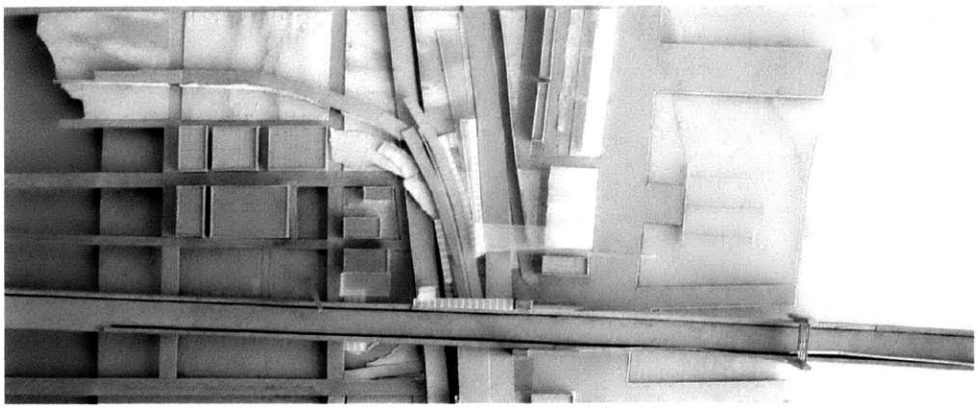
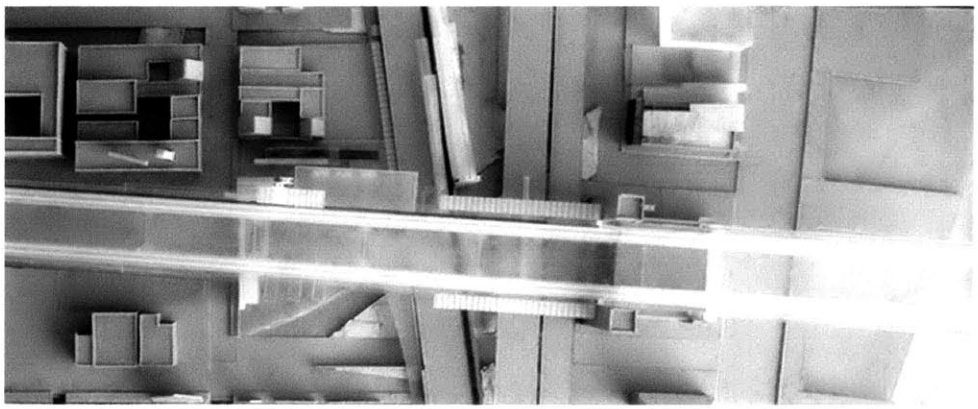
[1] A. Zaera, *Continuities: Interview with Herzog & De Meuron.*



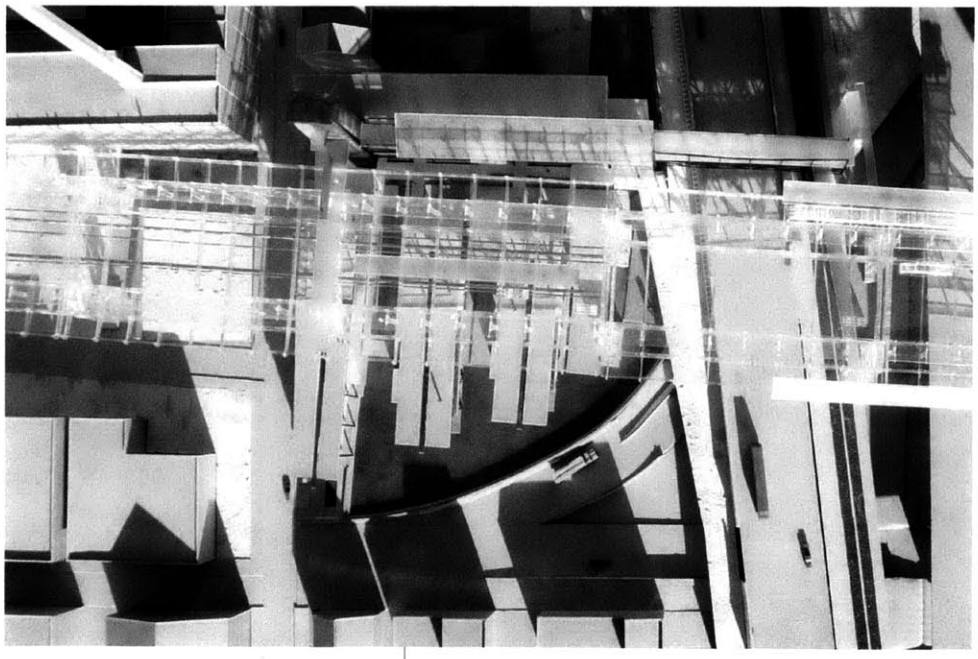




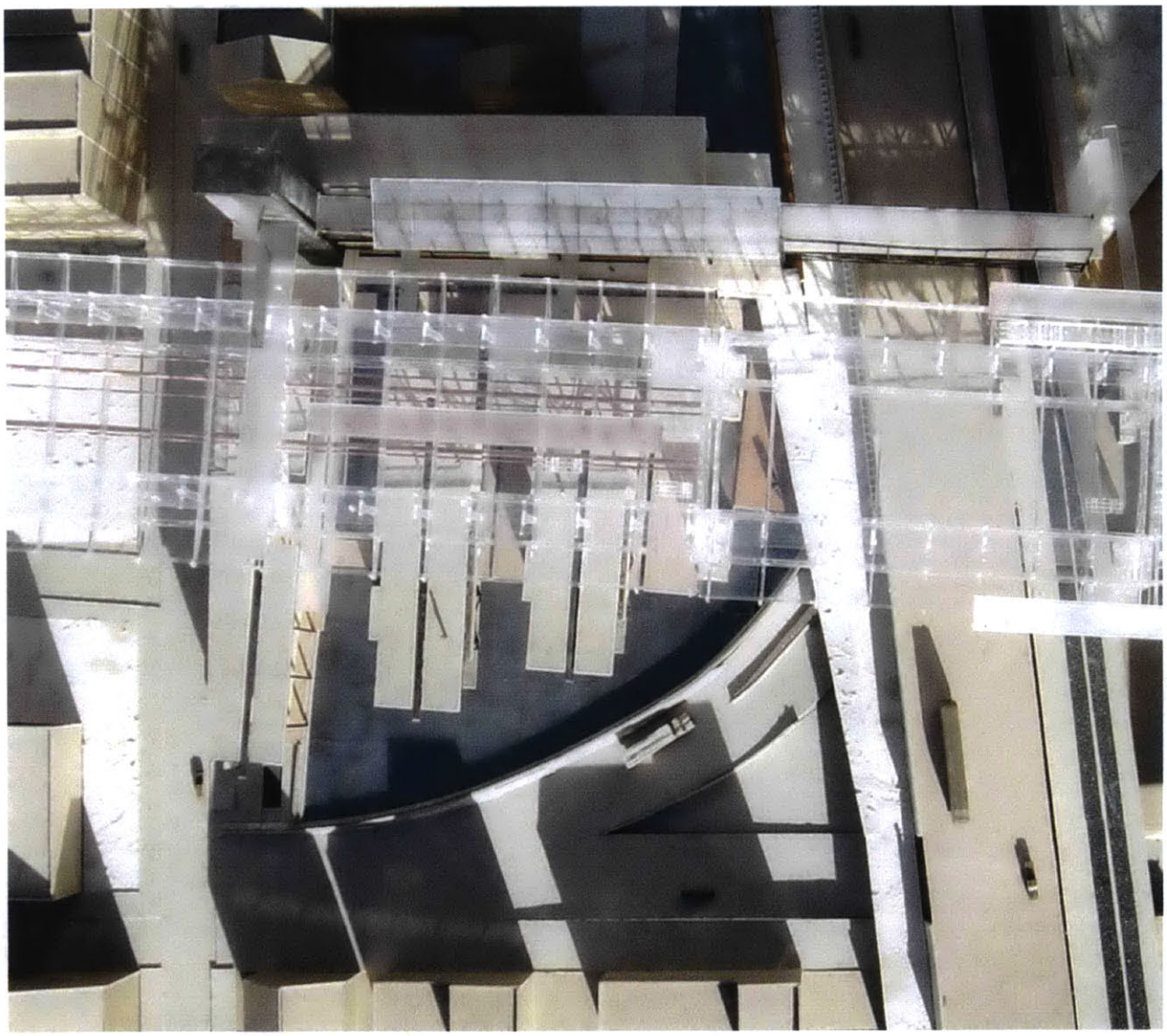
model, 1"=100'



model, 1"=40'



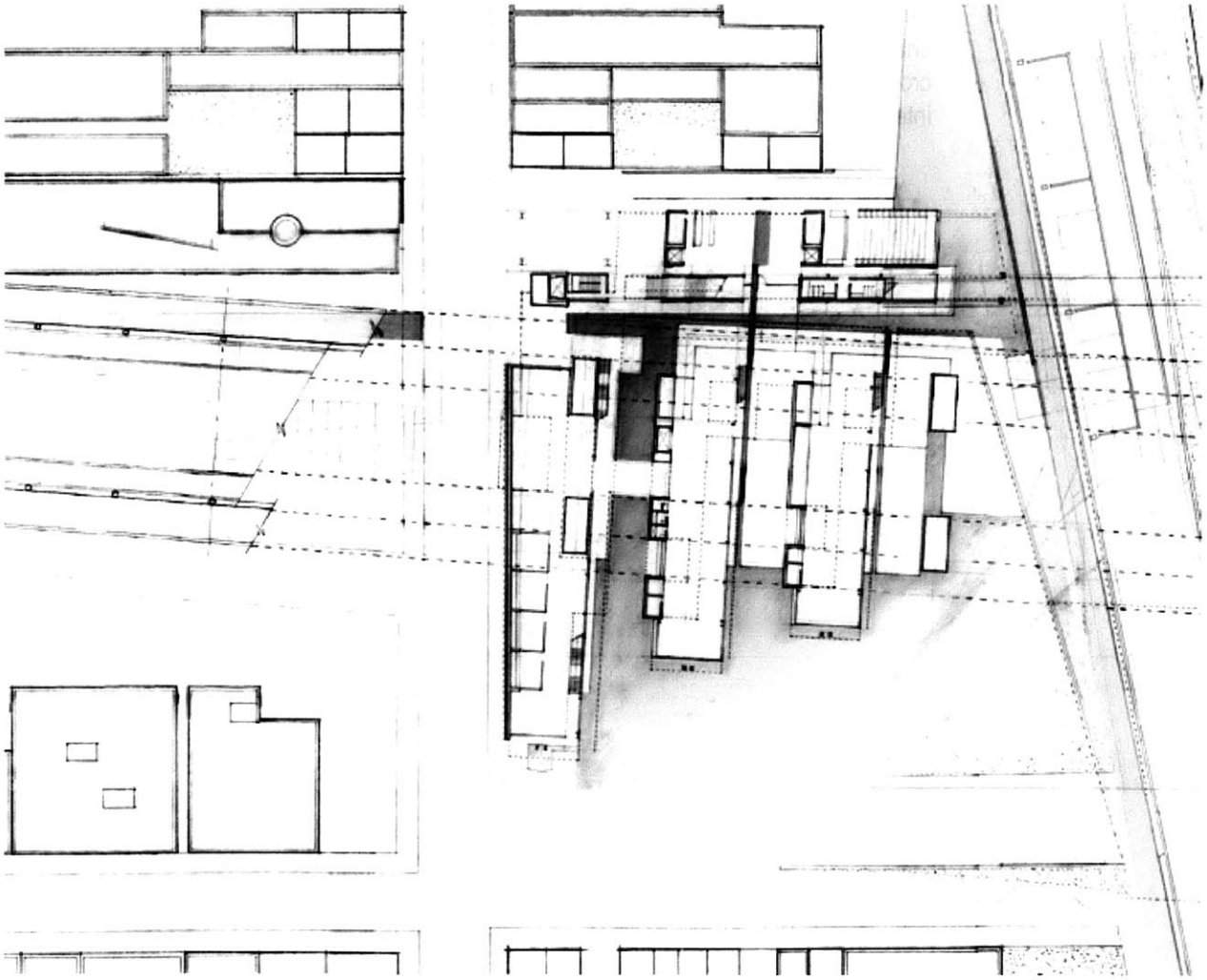
model, 1"=16'

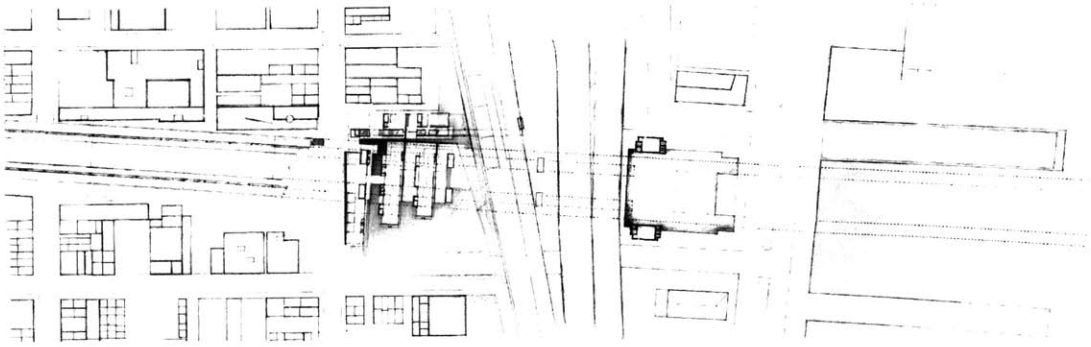


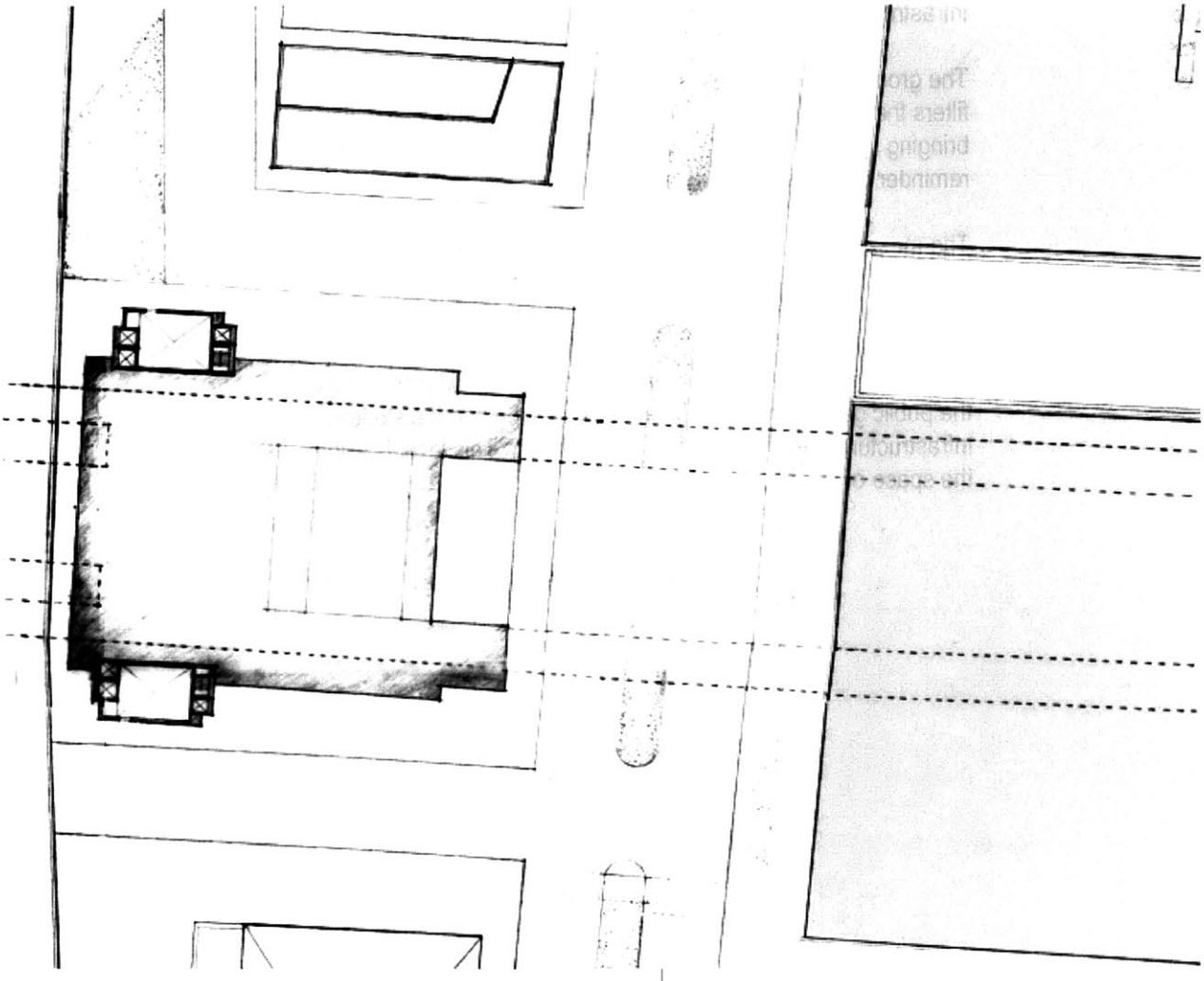
school of industrial arts + building technology

Through an architecture that is responsive, both in parti and in detail/materiality, to site-specific challenges such as light and shadow, acoustic vibration, wind load, water flow, and multiple cross-grain circulations, the school becomes not a building, but an integral local-scale infrastructure.

site plan
school of industrial arts + building technology







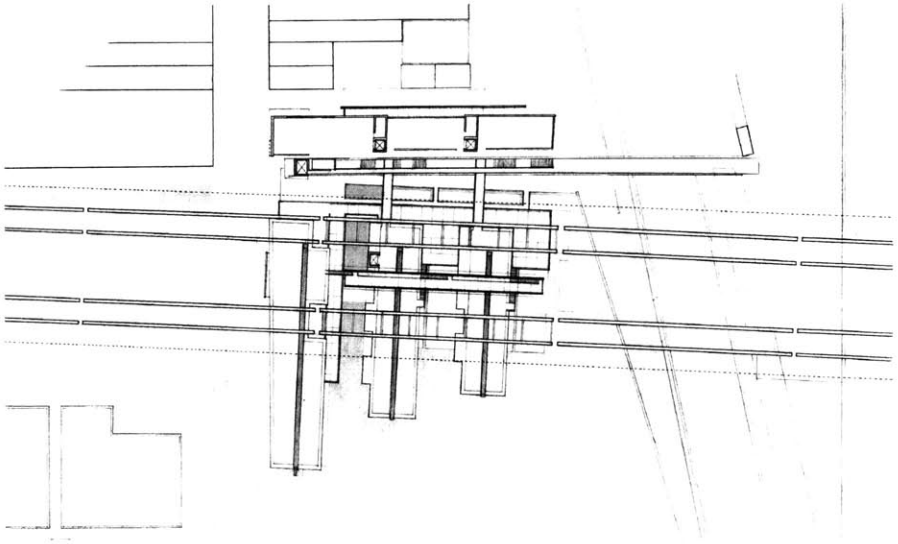
floor plans
school of industrial arts + building technology

The levels of the school correspond to the surrounding site and infrastructures:

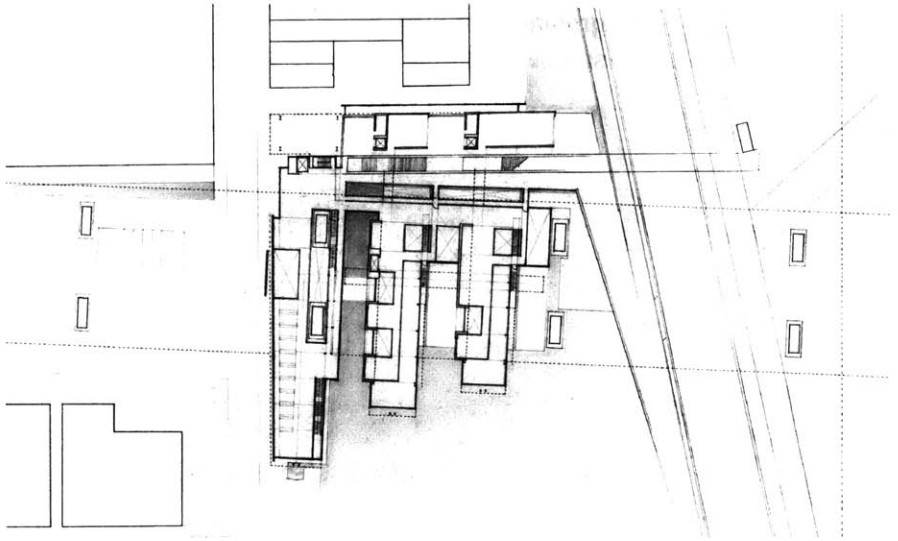
The ground level rests within a water purification reservoir that filters the polluted water from the bridge and expressways, aids in bringing light into the areas under the bridge, and serves as a reminder of the river to the east.

The mezzanine level is a connective tissue: public paths of all scales cross the site at this level, and are provided with views of the activity of both the school and the community.

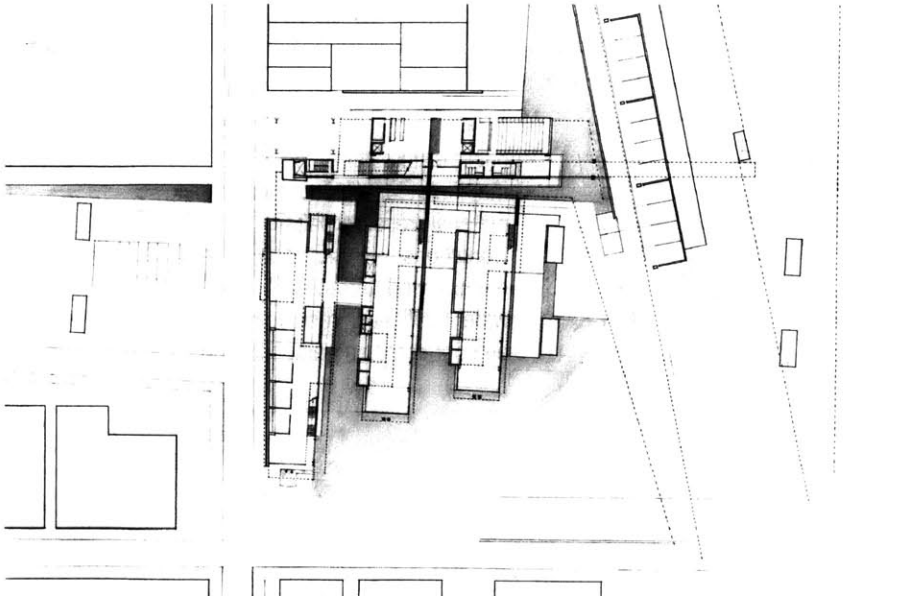
The upper level branches off of two primary east/west crossings, the public gallery crossing to the transit station and the student / infrastructure crossing above the workshops. This level is within the space of the bridge.



upper level / roof plan

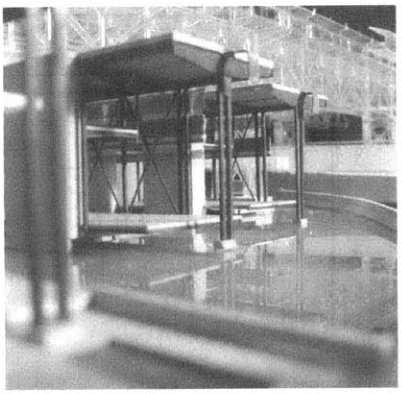


mezzanine level plan

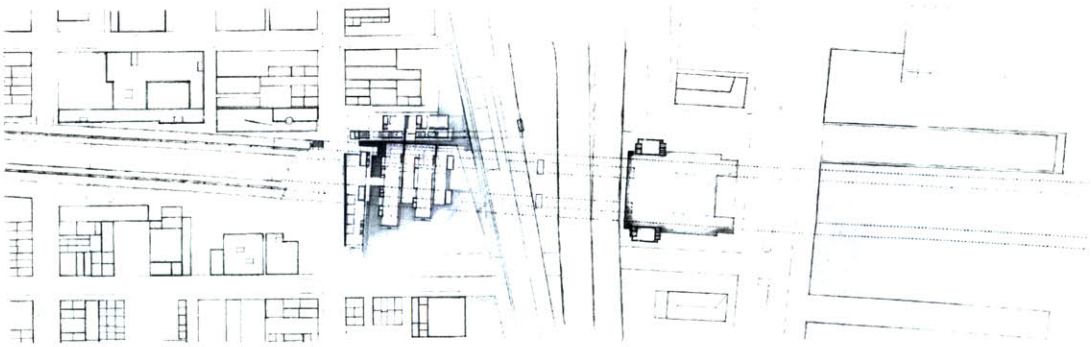


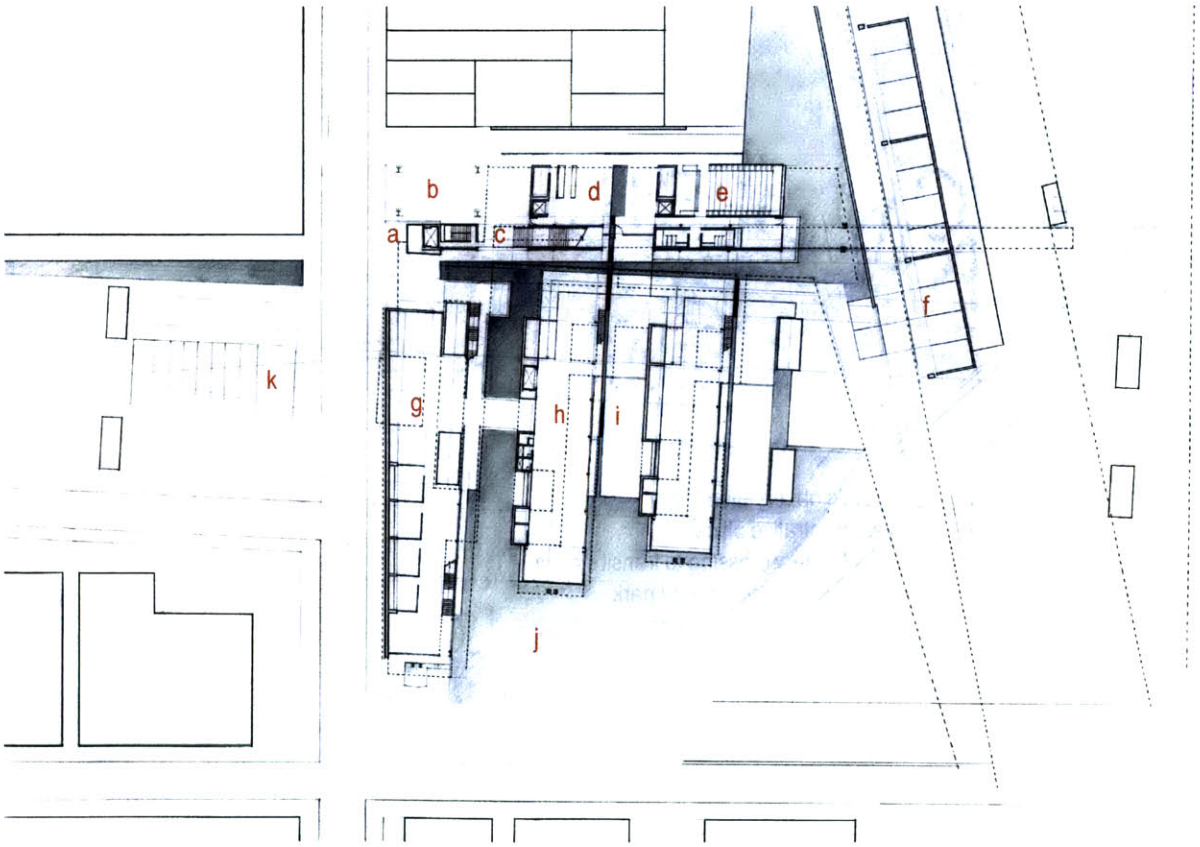
ground floor plan

ground floor plan
school of industrial arts + building technology



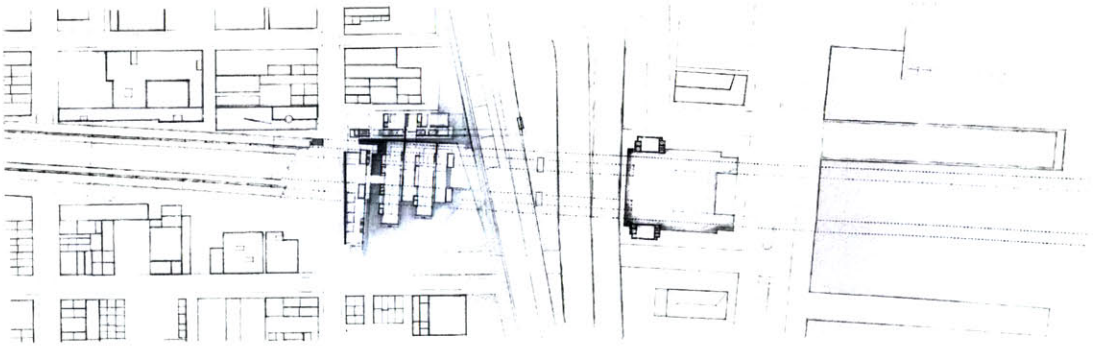
a public observation tower
b exhibit space
c entrance to E/W gallery crossing to transit station
d cafe
e public lecture hall
f materials storage depot and loading
g materials research labs
h workshops
i outdoor work terraces
j water purification reservoir
k outdoor screening amphitheater

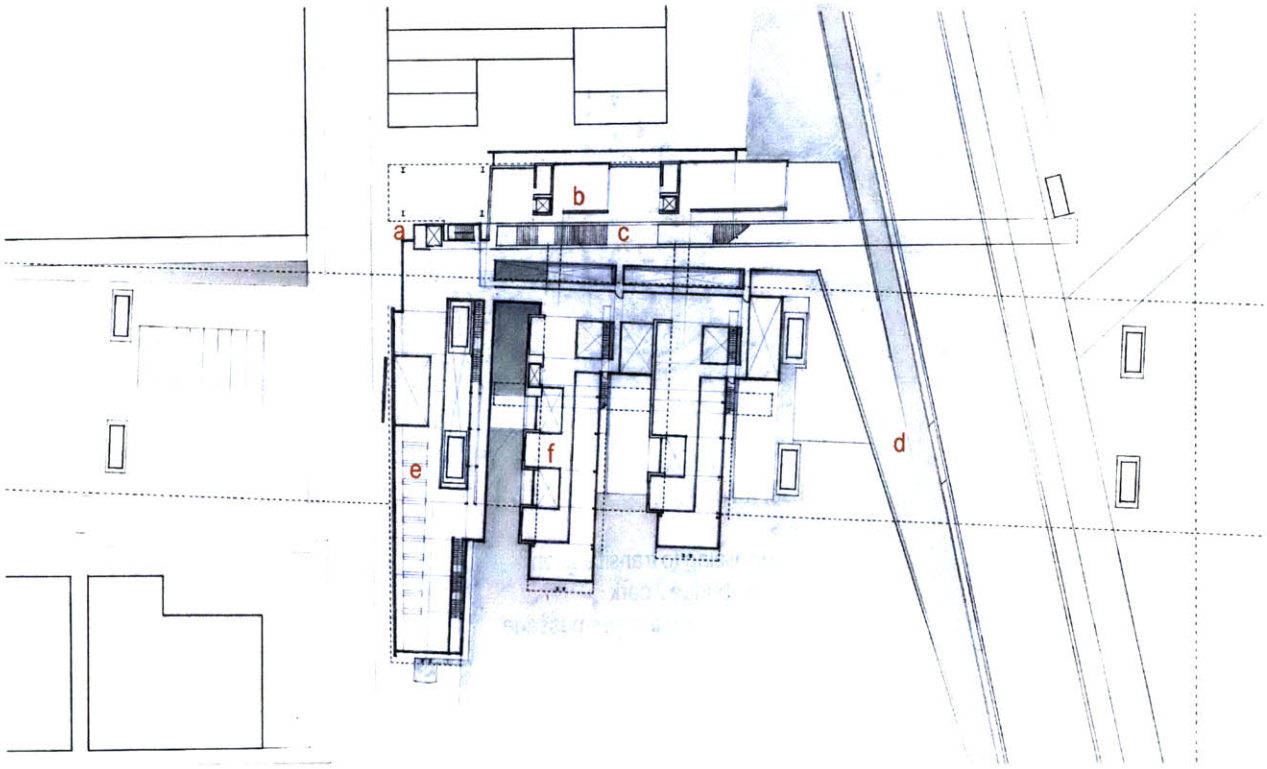



a
b
c
d
e
f
g
h
i
j
k

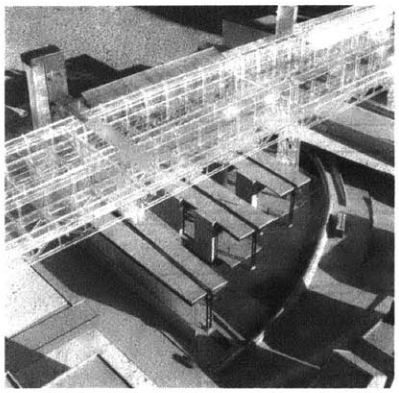
mezzanine level plan
school of industrial arts + building technology

a public observation tower
b administrative offices
c E/W gallery crossing to transit station
d N/S pedestrian bridge / park
e materials research library
f workshops

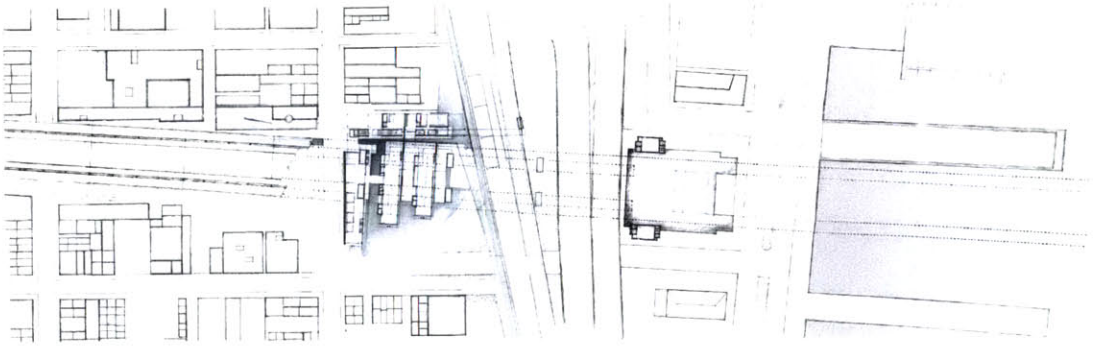


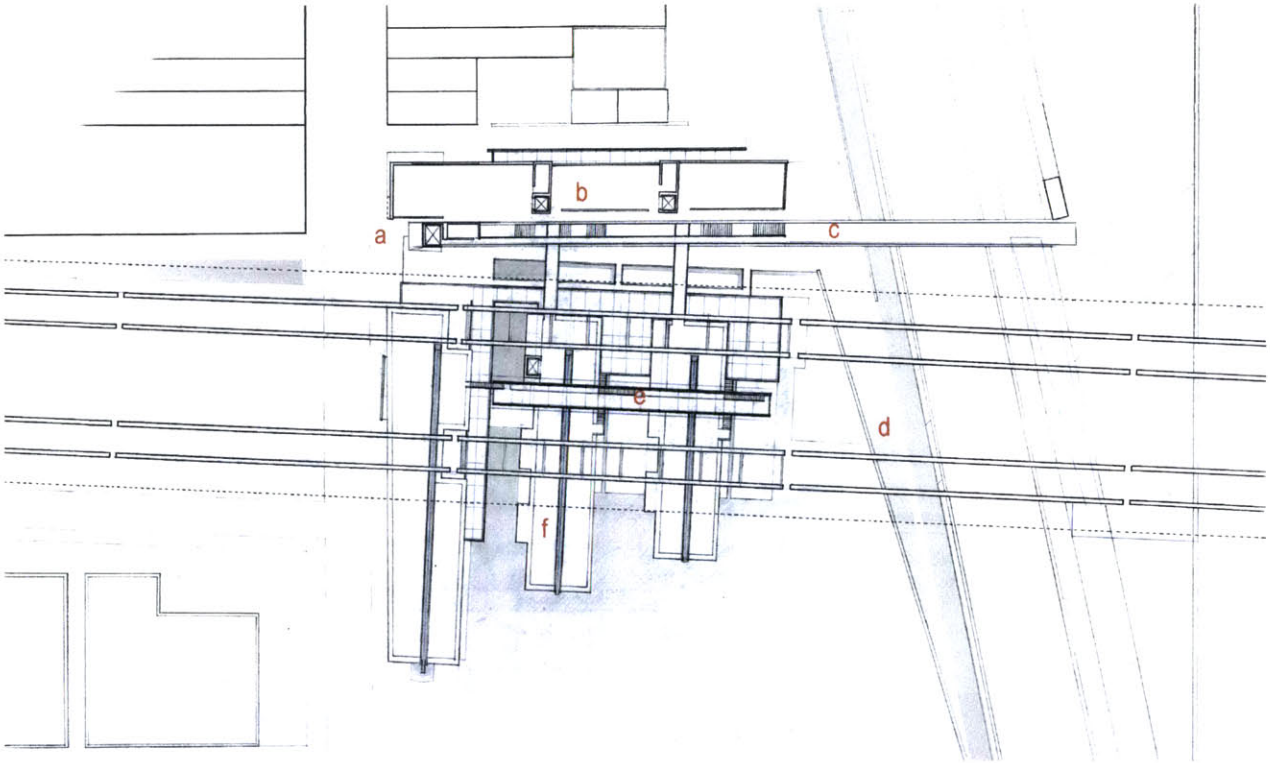

a
b
c
d
e
f

upper level / roof plan
school of industrial arts + building technology

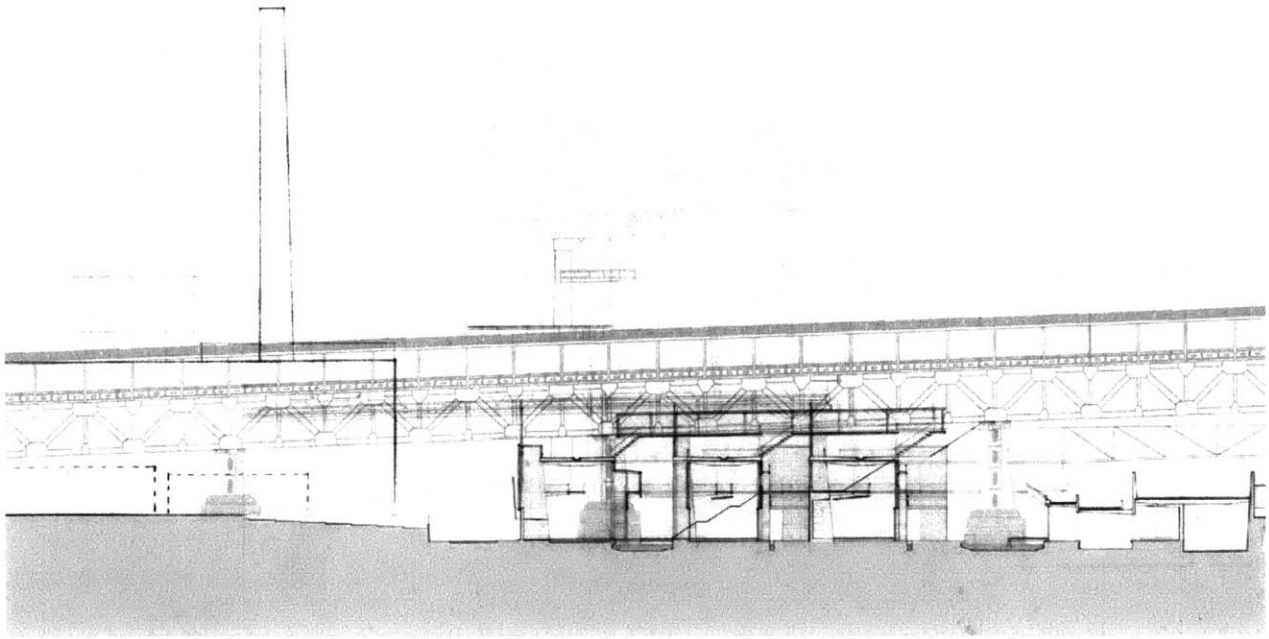


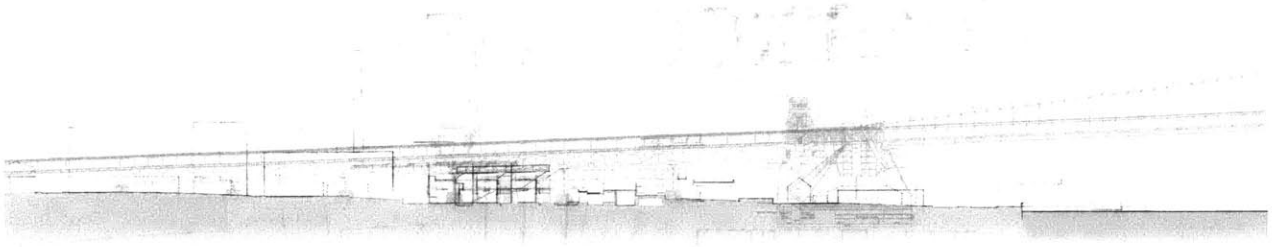
a public observation tower
b classrooms
c E/W gallery crossing to transit station
d N/S pedestrian bridge / park
e school walkway / infrastructure passage
f outdoor work terrace

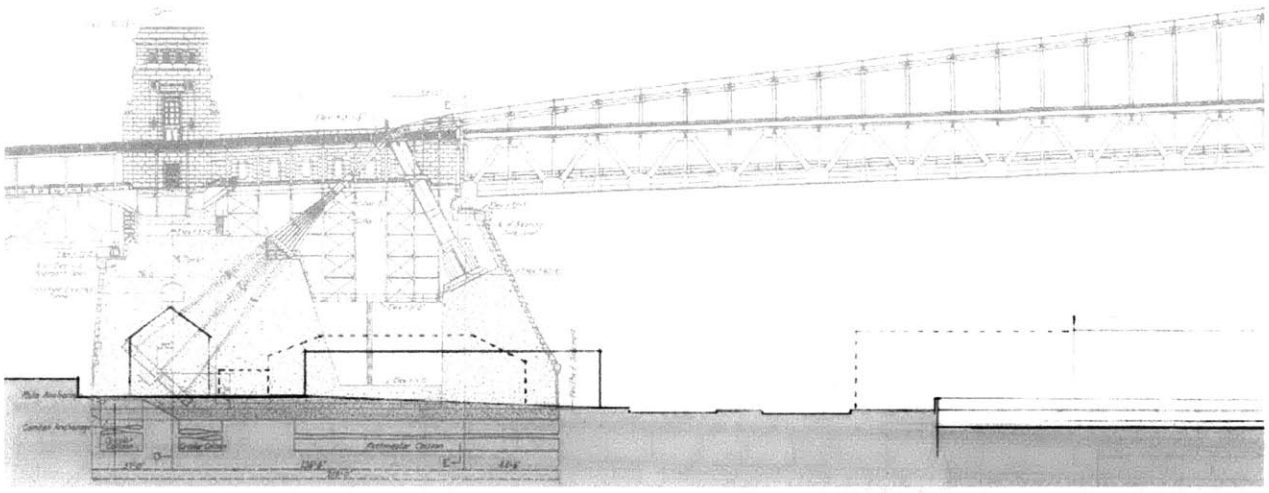


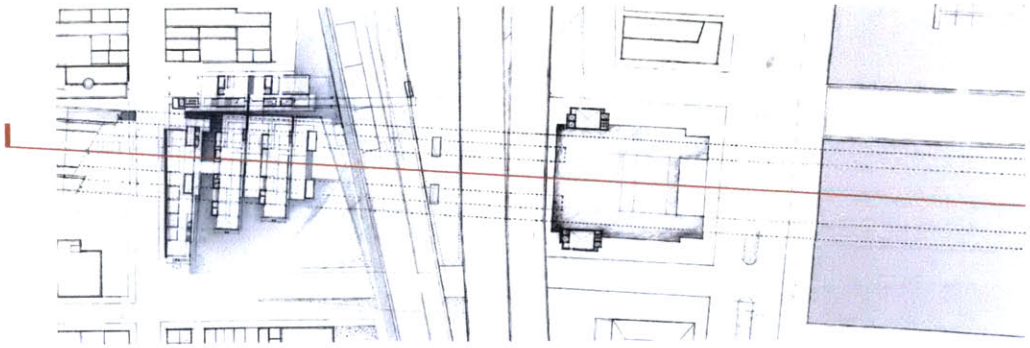

a
b
c
d
e
f

site sections
school of industrial arts + building technology

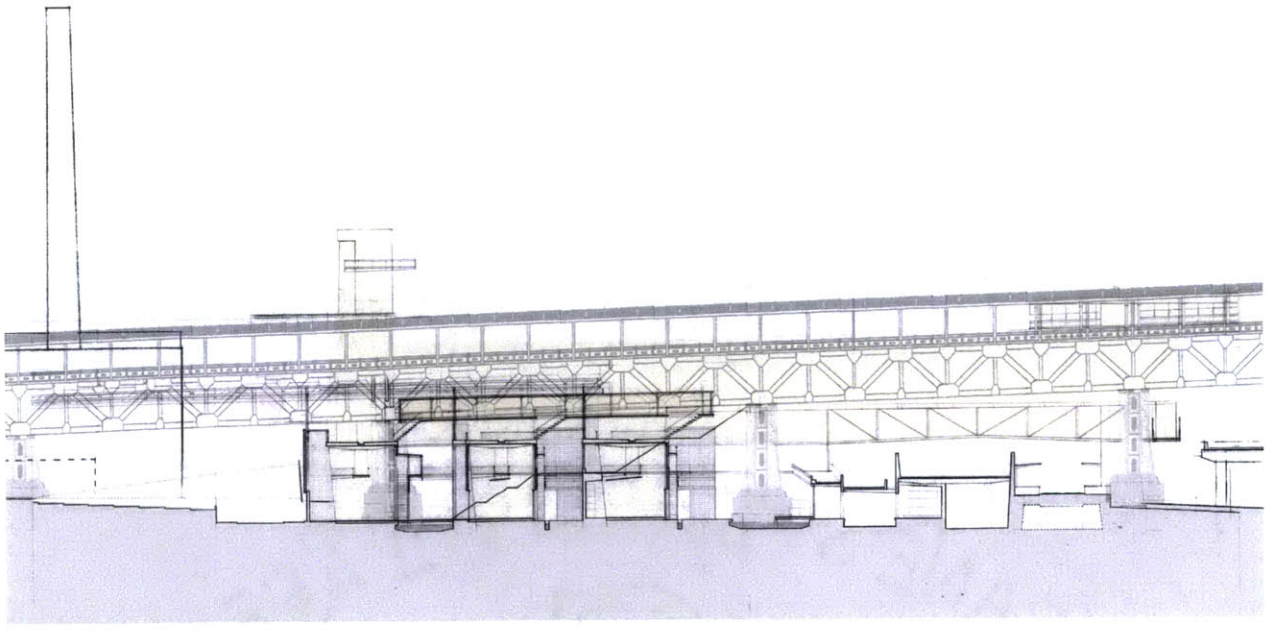


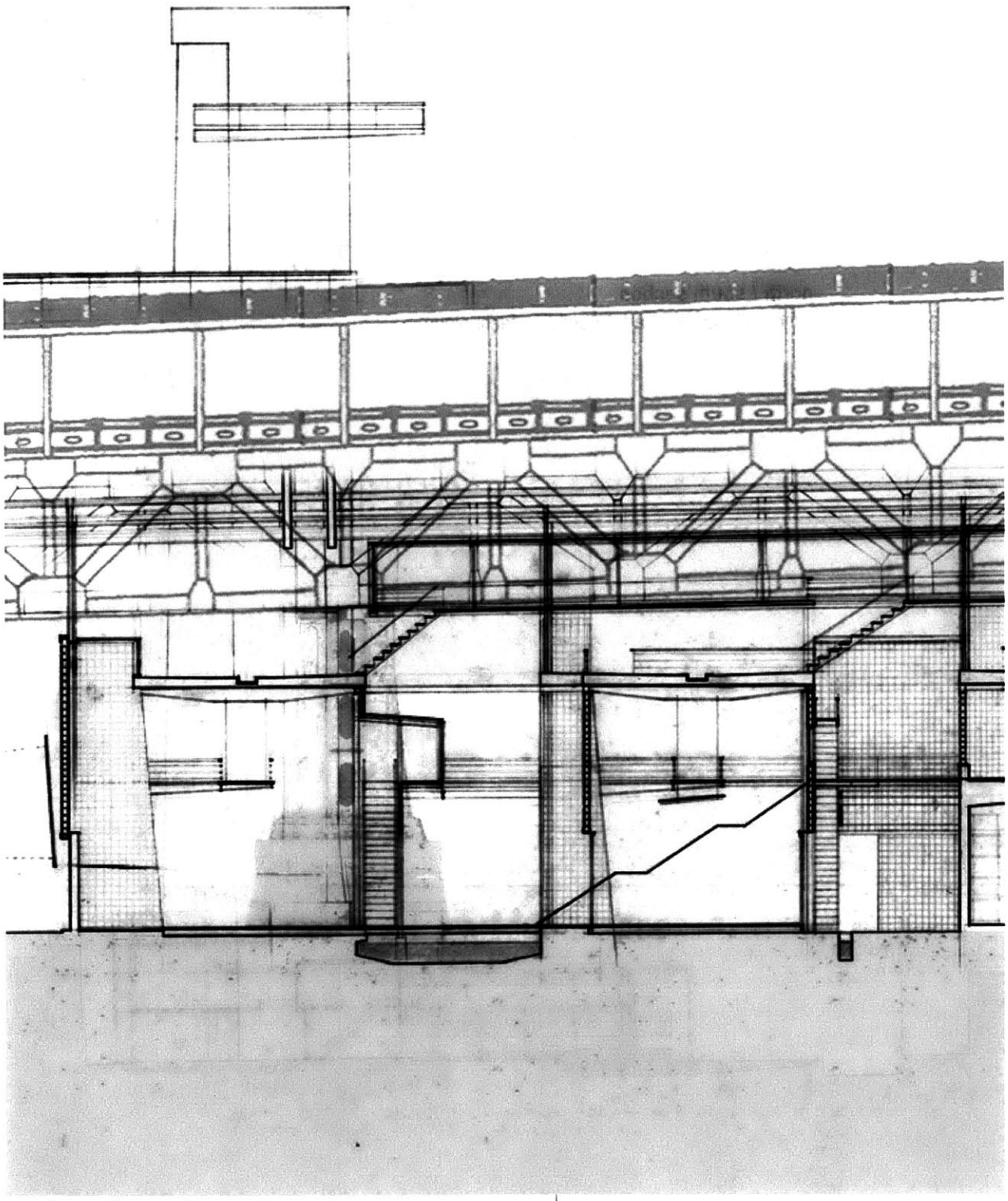


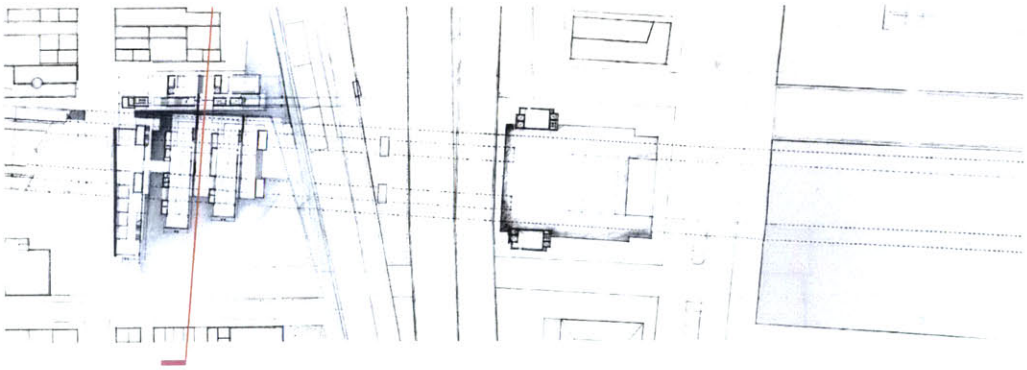




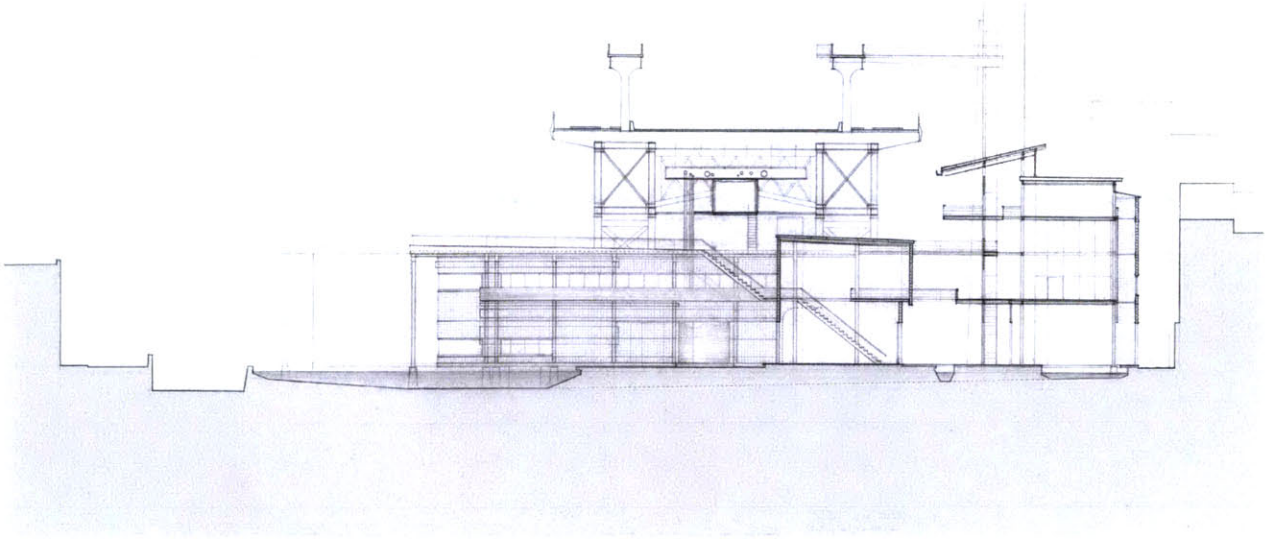
east / west section
school of industrial arts + building technology

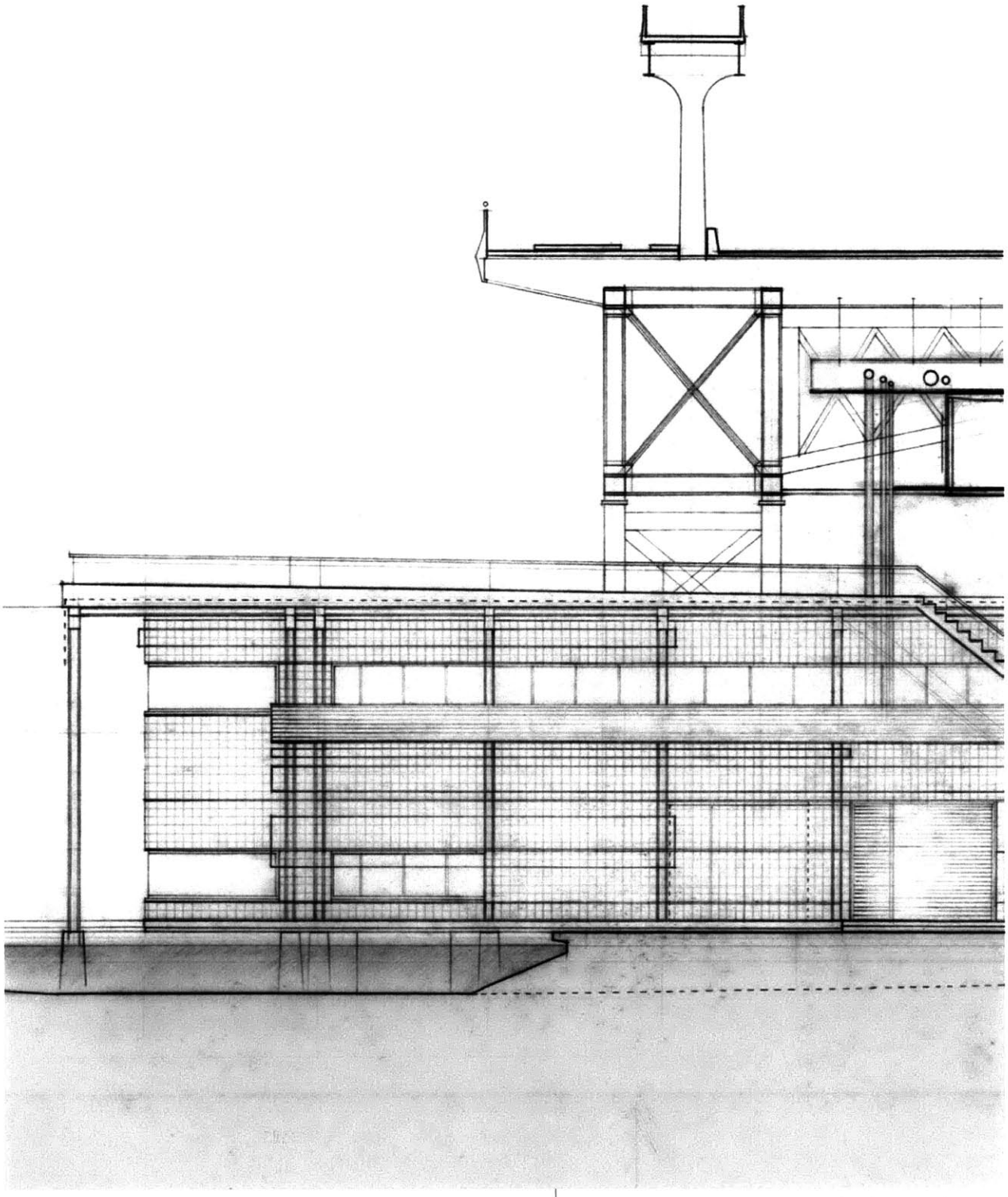


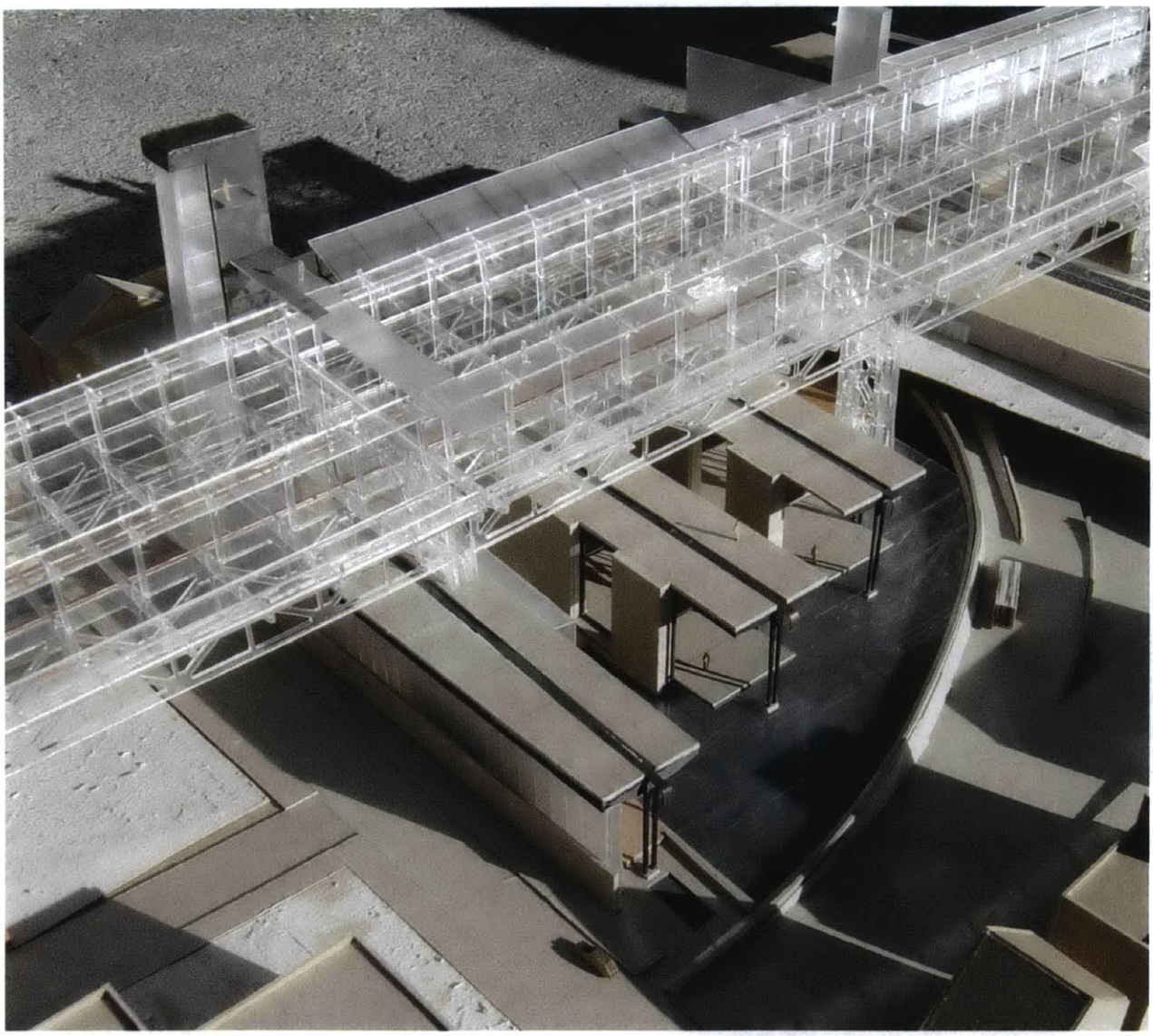


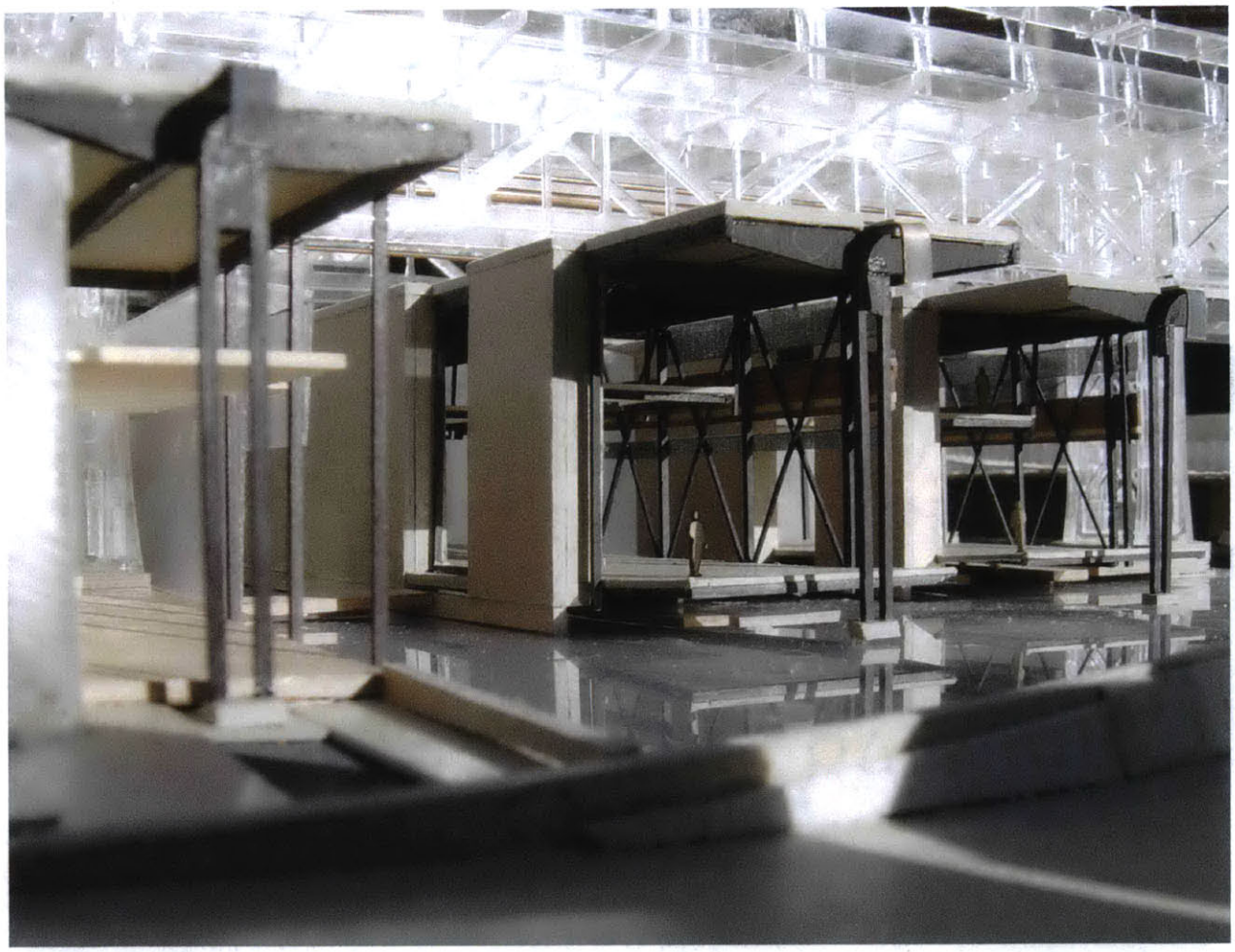


north / south section
school of industrial arts + building technology









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www.marthaschwartz.com
www.philadelphiabuildings.org
www.philaplanning.org
www.phillyroads.com
www.thecrucible.org
www.ushistory.org
www.viaduc-des-arts.com

image credits

introduction

1,2 site photographs
3 plan, Herzog & De Meuron, Diagonal Competition, Barcelona, 1989
A. Zaera, *Continuities: Interview with Herzog & De Meuron*, *El Croquis*, v.60, p.8.
4 model photograph, Martha Schwartz, Inc., Crescent Eastbank Riverside Park, Portland
www.marthaschwartz.com
5 Viaduc des Arts, Paris
www.viaduc-des-arts.com
6 site model photograph, *Choreographed Circulations*
group model by J. Meejin Yoon MIT fall 2001 studio; *Choreographed Circulations*
proposal exhibited in *Rethinking the High Line*, Municipal Arts Society, 2002
7 master plan, Lille, France, O.M.A.
O.M.A., R. Koolhaas and B. Mau,, The Monacelli Press, 1995, p.1175.
8 Guggenheim Bilbao, Frank Gehry Associates
J. Ragheb, ed., *Frank Gehry Architect*, The Solomon R. Guggenheim Foundation, NY, 2001.

site + program

1 photograph of a welder
www.aws.org
2 aerial photograph of eastern Philadelphia / Delaware River shoreline
www.library.upenn.edu/datasets/philamaps

site

1 diagram of Philadelphia between the rivers
2 montage of aerial photo and Sanborn map of site
www.library.upenn.edu/datasets/philamaps
1951 Sanborn fire insurance map, Free Library of Philadelphia
3 section montage, with original section drawing of Camden anchorage,
Delaware River Bridge Joint Commission of the States of Pennsylvania and New Jersey,
Final Report of the Board of Engineers, 1927, 87, plate XIII, section C-C,
J. Farnham, "Staging the Tragedy of Time: Paul Cret and the Delaware River Bridge,"
JSAH, 57:3, Sept. 1998, p.267.
4 site plan
5 1682 William Penn plan of Philadelphia
R. Wurman and J. Gallery, *Man-Made Philadelphia*, MIT Press, Cambridge, 1972, p.79.
6 1796 plan of Philadelphia by surveyor John Hill
R. Wurman and J. Gallery, *Man-Made Philadelphia*, MIT Press, Cambridge, 1972, p.80.
7 1960 Center City Plan of Philadelphia, The City Planning Commission
R. Wurman and J. Gallery, *Man-Made Philadelphia*, MIT Press, Cambridge, 1972, p.81.
8 1960s Center City Plan by Louis Kahn
R. Wurman and J. Gallery, *Man-Made Philadelphia*, MIT Press, Cambridge, 1972, p.82.
9 1968 photo, I-95 Expressway under construction along the Delaware River
The Philadelphia Enquirer
10 site photomontage, view from Benjamin Franklin Bridge to north
11 photomontage, Benjamin Franklin (Delaware River) Bridge
www.philadelphiabuildings.org/pab/app/image_gallery
12 photomontage, waterfront site photos
13 photomontage, rooftop site photos
14 photomontage, street life site photos

site studies

1, 2, 3 windpath diagrams
www.personal.psu.edu/faculty/j/e/jea4/earth/windsystem.html
4 site diagram: wind
5 1960s Center City Plan by Louis Kahn
R. Wurman and J. Gallery, *Man-Made Philadelphia*, MIT Press, Cambridge, 1972, p.82.
6 diagram of Philadelphia between the rivers
7 quotation from William Penn's 1863 letter to the Committee of the Free Society, London
A. Siegel, ed., *Philadelphia: A Chronological and Documentary History,* Oceana Publications, Inc., Dobbs Ferry, NY, 1975, p.76-78.
8 site diagram: water
9 site photograph
10,11 sunpath section studies
12 site diagram: sun
13 site photographs
14 site diagram: horizons
15 site photographs
16,17 acoustic studies
18 site diagram: acoustics
19 site photographs
20 site diagram: circulations

program

1,2 site photograph
3 photograph of a welder
www.aws.org
4 public circulation study
5 SEPTA map with proposed interchange in red
R. Wurman and J. Gallery, *Man-Made Philadelphia*, MIT Press, Cambridge, 1972, back cover.

site + program studies

model photographs by author

school of industrial arts + building technology

note: all drawings and model photographs by author, with the exception of the original anchorage drawing montaged into the sections on p.53: This is the original Camden anchorage section:
Delaware River Bridge Joint Commission of the States of Pennsylvania and New Jersey, Final Report of the Board of Engineers, 1927, 87, plate XIII, section C-C,
J. Farnham, "Staging the Tragedy of Time: Paul Cret and the Delaware River Bridge," JSAH, 57:3, Sept. 1998, p.267.

note: all site photos, architectural drawings and model photos by author unless noted otherwise