

THESIS SUBMITTED TO THE FACULTY OF  
THE VIRGINIA POLYTECHNIC INSTITUTE  
AND STATE UNIVERSITY IN PARTIAL FUL-  
FILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARCHITECTURE

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July 2003 BLACKSBURG VA



# FOLDED INTERSECTION

## ACKNOWLEDGEMENTS

This book is dedicated to my lovely daughter, my wife, my parents who have always supported me on my way in life.

I would like to thank

College of Architecture and Urban Studies, Virginia Polytechnic Institute & State University  
for offering me the opportunity to explore, learn and grow.

My committee Prof. Heinrich Schnoedt, Prof. William Galloway and Prof. Dr. Joseph C. Wang  
for the guidance and encouragement. I have enjoyed every moment of their mentorship.

My special thanks go out to my studio friends, for the joy, critique, humor and the great time we shared;  
My friends Zheng Xu, Jun Xu for your nice suggestions in the making of the book.

“The nature of space depends on the continuity of reference to deeper structures of the human world, that these structures are in a certain sense related to the earth as a primary reference (arche) and that the integrity of space is reflected in the coherence of human experience.”

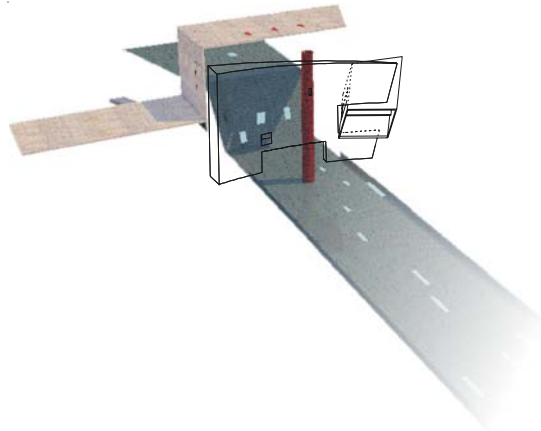
---The nature of communicative space, Dalibor Vesely



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## ABSTRACT



This project proposes a performing art center in Chattanooga, Tennessee, a 170-year-old industrial city. As part of the city revitalization, the design seeks to build up a “stage”, and create a piece of edge at the city’s northern boundary. Two folded bands, one made of skeletal steel and surfaced with copper connecting the river and the mountainous landscape beyond with the city, the other made of reinforced concrete folded to form a spatial intersection housing a series of activities: performing, spectating, and exhibiting. A curved metal screened circulation wall opens at the bottom to allow the copper band to pass as an entrance into the lobby to develop its folded intersection. Through it, an industrial stack in the middle of the site is isolated from busy city, and anchored with the building as a monument. Along the west side, an additional element characterized as the education box hovers over the ground, with unobstructed views of the river and the old steel bridge on one end, and the green hill on the other.





ABSTRACT

THE SITE

LOCATION  
HISTORY  
LOCAL CONTEXT  
PLANNING STRATEGY OF DOWNTOWN  
AREA CIRCULATION  
MISSION

CONTEXT AND BUILDING

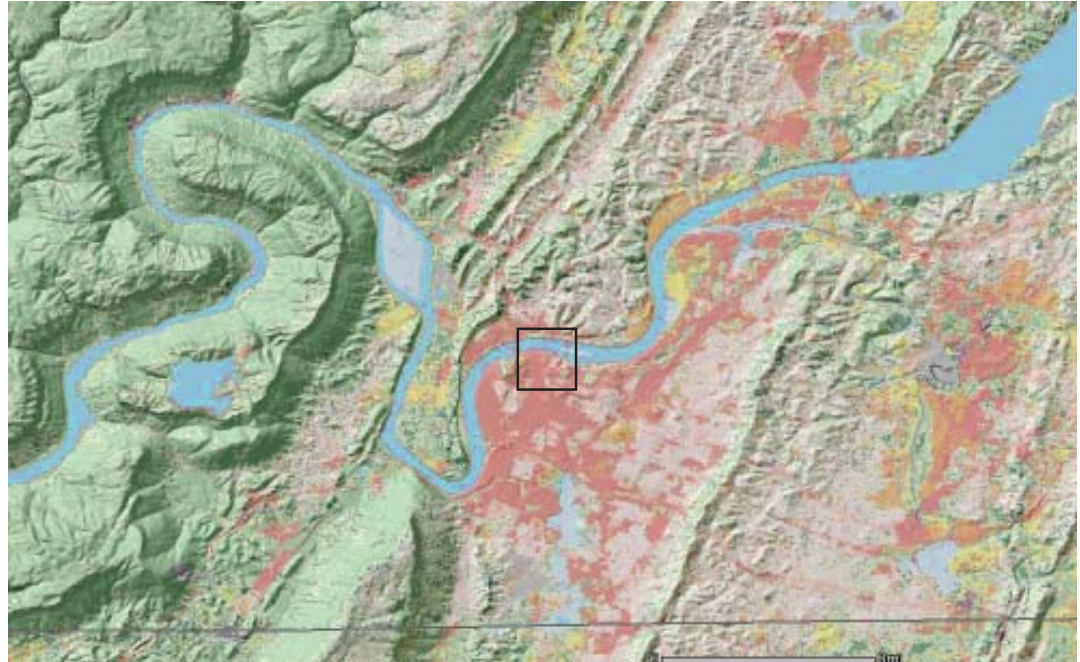
COMPONENTS

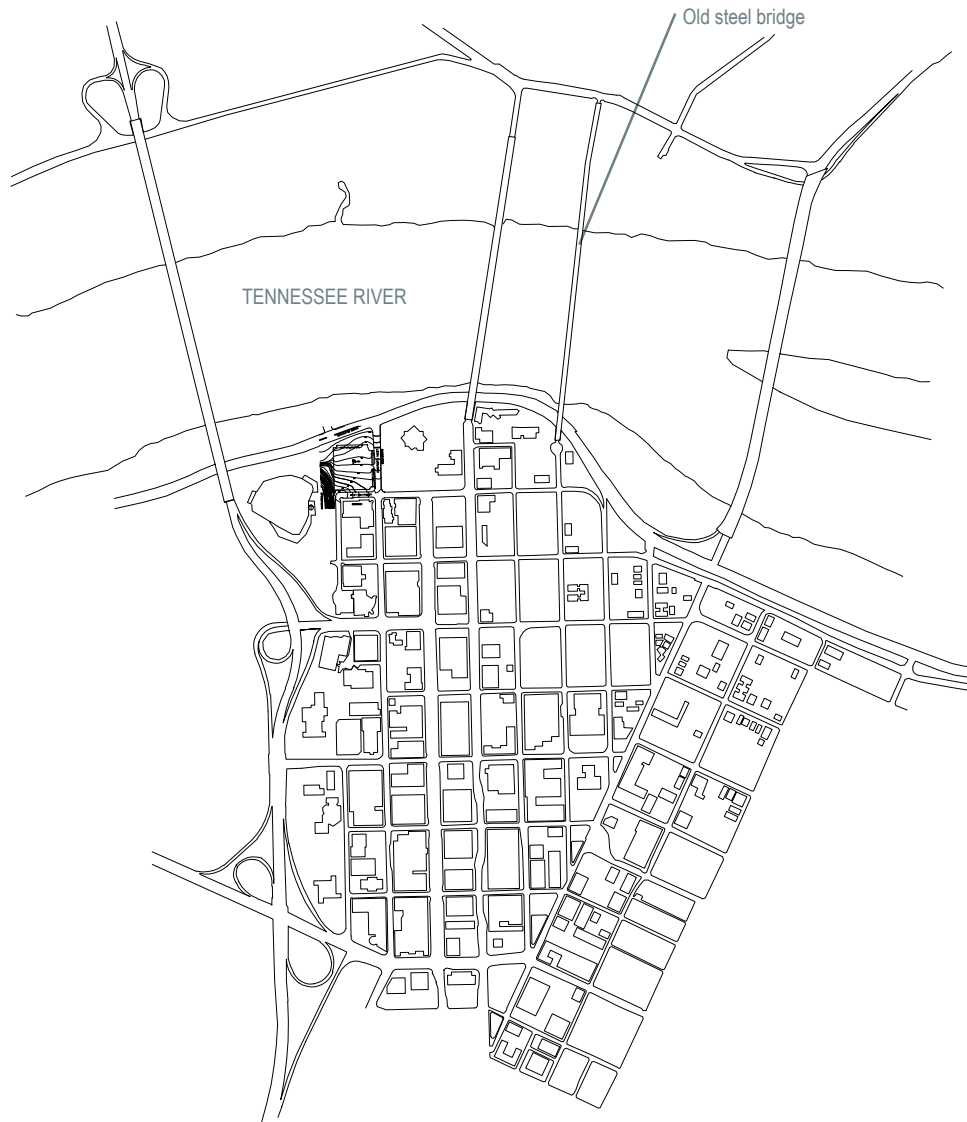
CONCLUSION

LOCATION



Chattanooga, a city in southeastern Tennessee, and the seat of Hamilton County, is a port on the Tennessee River, near the Georgia border. Bridges span the river to link the two sections of the city, which is almost surrounded by mountains as the center of an area with many scenic attractions, including Lookout Mountain, Ruby Falls, and Raccoon Mountain Caverns. Its general climate is hot and humid during the summer, cool in the winter.





## HISTORY

The community now known as Chattanooga was laid out in 1838 and grew as a river port; it was incorporated as a city in 1839. After the Civil War, Chattanooga was built as an industry base. By 1880, it had become one of the leading manufacturing centers in the nation. And, by 1950 the city had the highest number of manufacturing employees per capita of any city in the country.



The city also had a growing pollution problem, which was endangering its citizens...and killing its downtown.



Between 1990 and 2001 over six hundred million dollars were spent in improving its urban area. The city has received national recognition for the renaissance of its beautiful downtown.

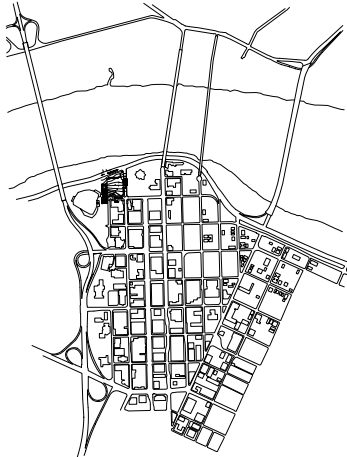


The city's focus on development that meets the needs of future generations has earned Chattanooga world-wide recognition. In the 1990s, Chattanooga attempted to build its economy around environmental principles, and today the city's air is again clean. Tennessee Riverpark Master Plan, created in the mid-1980s, has been the outline for the ongoing revitalization of the 35 km (22 mi) riverfront.



**LOCAL CONTEXT**

The site of the Experimental Performing Arts Center building is located at the intersection of West 2nd Street and Chestnut Street, at the edge of downtown Chattanooga. It lies between the Tennessee Aquarium and the IMAX 3D Theater, facing the Tennessee river. The Arts Center replaces existing surface parking on the site.



Chestnut street



EAST

SOUTH

WEST

The site offers an opportunity to contribute to the development of downtown's edge and the connection of downtown with the river and mountains beyond. The program requires that an existing industrial stack in the middle of the site must be incorporated into the design solution as a monument to many manufacturing facilities that once line the riverfront and provided an economic base for Chattanooga.

What is the proper relationship between the industrial stack and the building, and how to create the relationship is a crucial point in the building design.



THE SITE LOOKING FROM CHESTNUT

CONTEXT OF THE SITE



WEST

NORTH

EAST



## PLANNING STRADEGY OF DOWNTOWN



Buildings are approaching the city boundary in lines stretching from the center of downtown. Matching with the urban context became a starting point of the concept of the design, extending the lines towards the river and the mountains.

## AREA CIRCULATION ANALYSIS



An analysis of local circulation shows that the main approach takes place on the site through Chestnut Street and merges together at the intersection of West 2nd Street and Chestnut Street. The corner is a significant space in which the building communicates with other important existing buildings, forming a node and connecting the site with downtown space.





## MISSION



The program

The mission of the Center will be to nurture excellence and innovation in the performing arts through education and presentation. The center will provide a teaching lab for young people in the performing arts and will invite outstanding professional artists to perform and teach with the ultimate goal of establishing the Center as a model of innovation in drama, music and dance.

The program includes :

Public Spaces

Theater

Theater Support Areas

Educational Spaces

WorkShops

Administrative Suite



ABSTRACT

THE SITE

CONTEXT AND BUILDING

DEVELOPEMENT OF IDEA  
GEOMETRY OF THE INTERSECTION SPACE  
RELATIONSHIP BETWEEN GEOMETRY AND CONTEXT  
DIALOGUE BETWEEN INTERSECTION SPACE AND CONTEXT

COMPONENTS

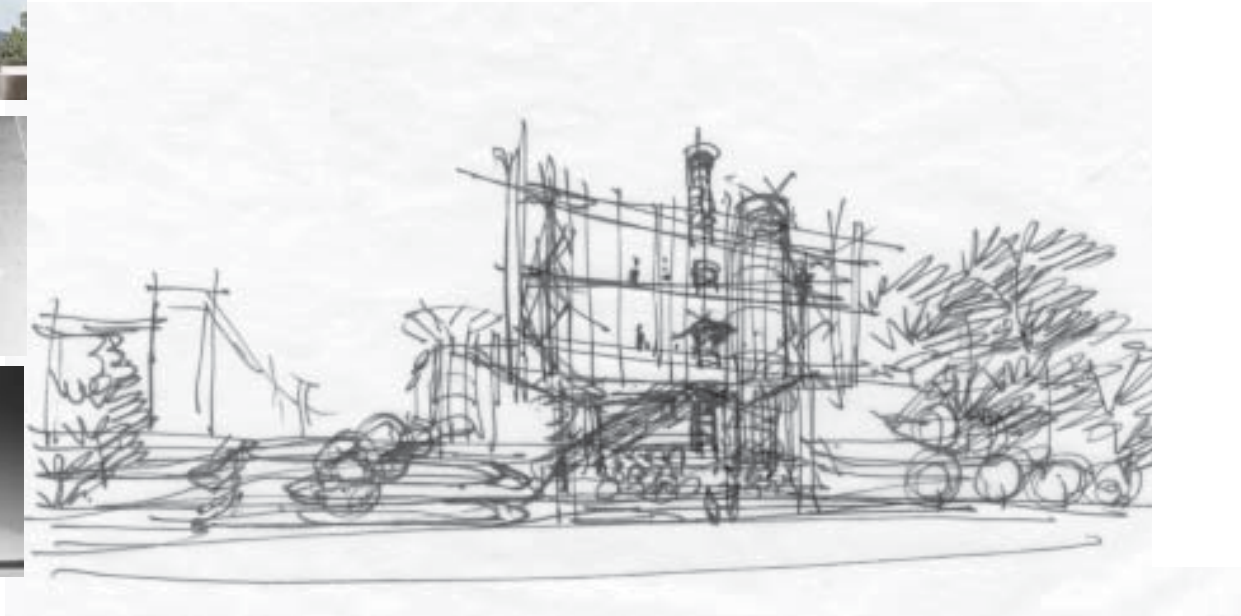
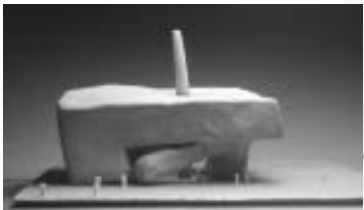
CONCLUSION

## UNDERSTANDING THE RELATIONSHIP

- Initial ideas

### Idea 1:

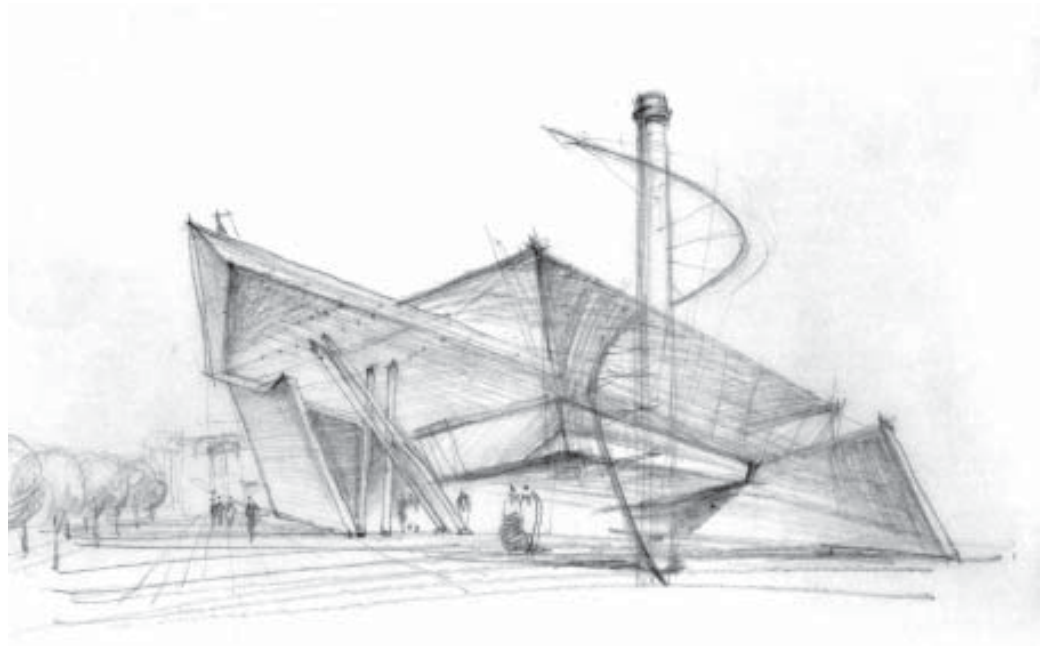
The stack is a fragment of the city's industrial history. It penetrates the building in the middle leading light into inside space. The building leaves a public green plaza underneath, which faces the riverfront area and frames the scenery on the opposite side of the river. But this scheme was abandoned because the building would block the view to the stack from the public urban spaces, and the relationship between them couldn't be articulated.





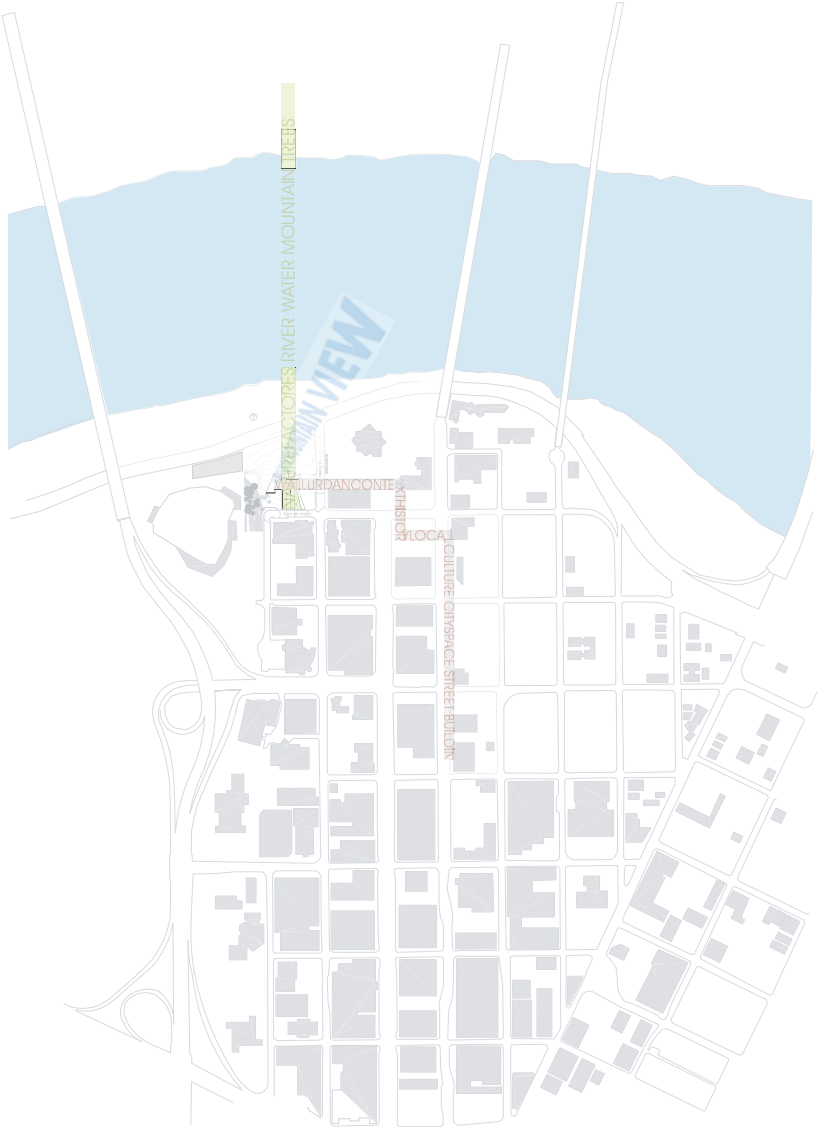
**Idea II:**

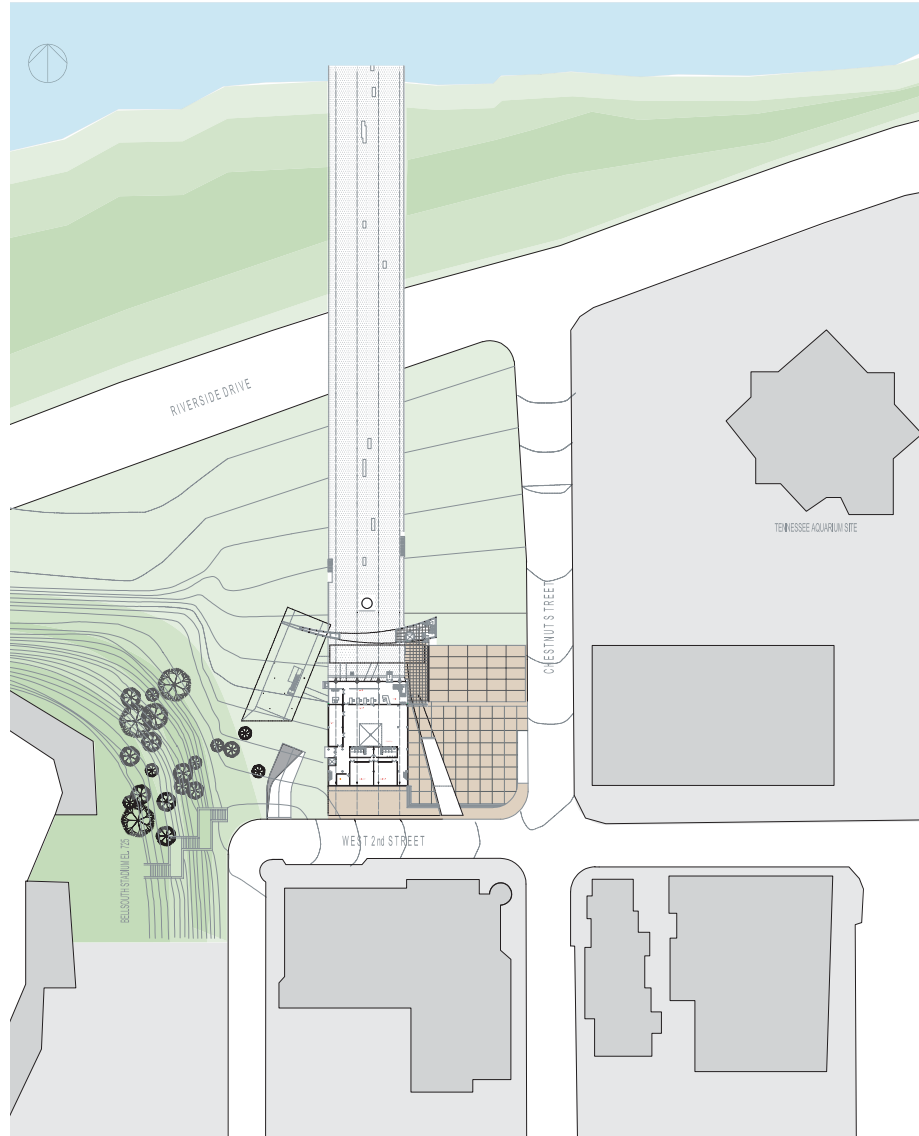
The building withdraws from the stack, adjacent to West 2<sup>nd</sup> street, and makes an alignment to the existing IMAX 3D Theater. The inclined wall follows the city planning strategy, and makes a plaza along Chestnut Street which leads people into the building, and to the riverfront. Half of the building is floating, leaving a shaded ground underneath. This public space merges with the riverfront park. The stack is embedded into the green plaza, as a sculpture. Part of building's geometry responds to the direction of scenic views. The roof and columns frame the picturesque landscape beyond. But this idea doesn't create a strong relationship between the industrial stack and the building.





FINAL PROPOSAL



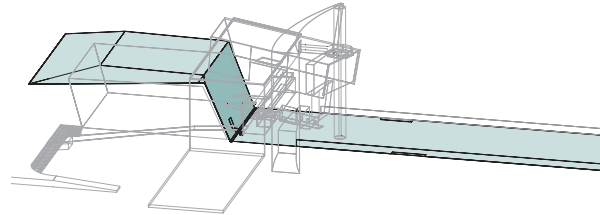


SITE PLAN

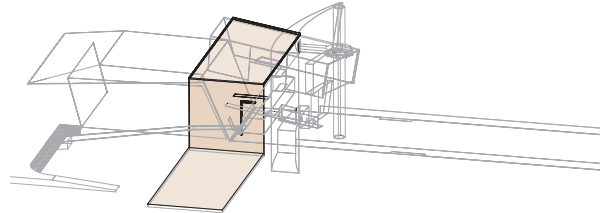


## GEOMETRY OF THE INTERSECTION SPACE

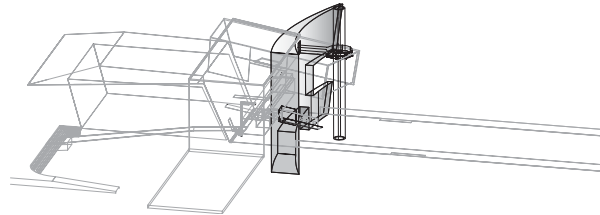
The copper band --- The Bottom and the Southern boundary.



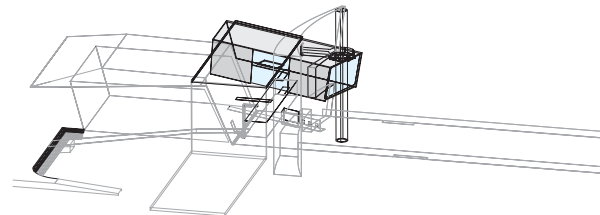
The concrete band --- The Top and the Eastern boundary.

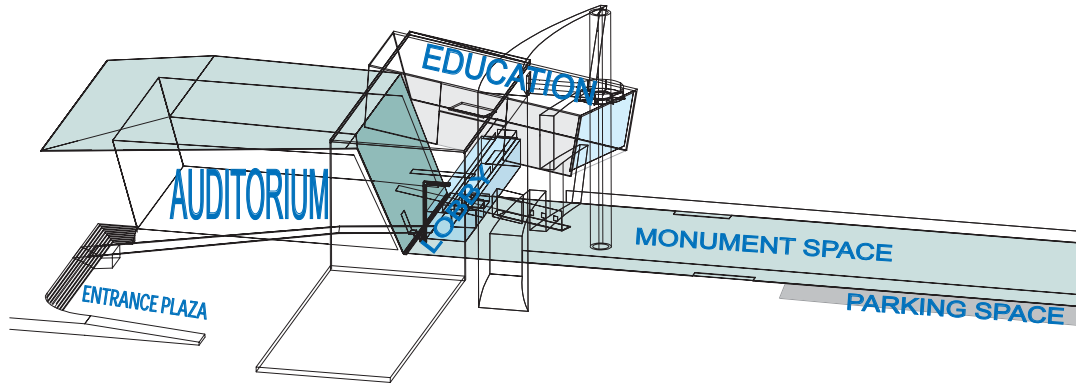


The curved wall --- The Northern boundary.

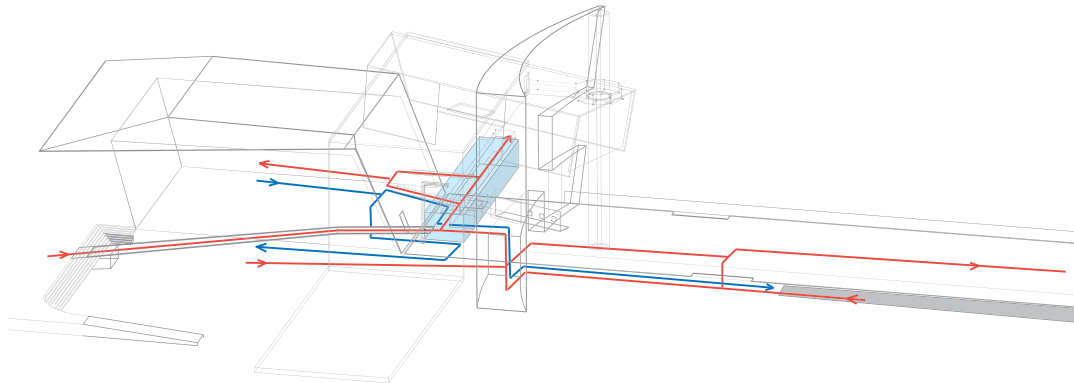


The education box --- The Western boundary.



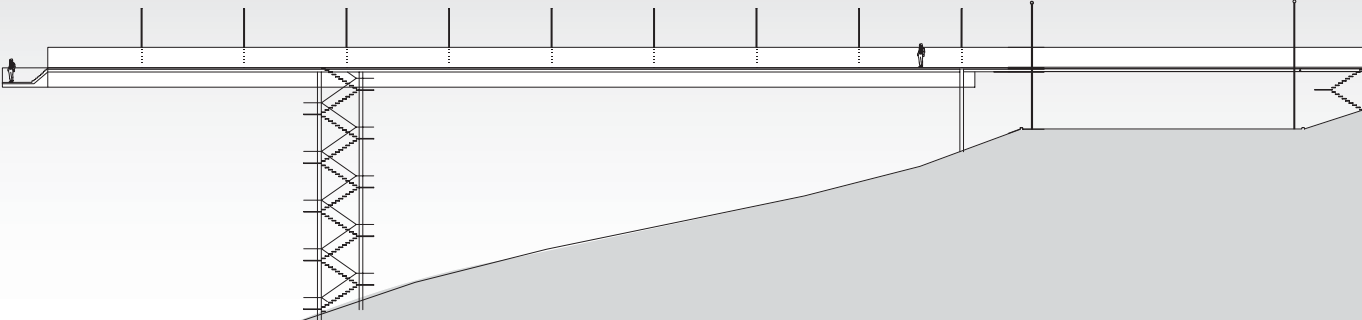
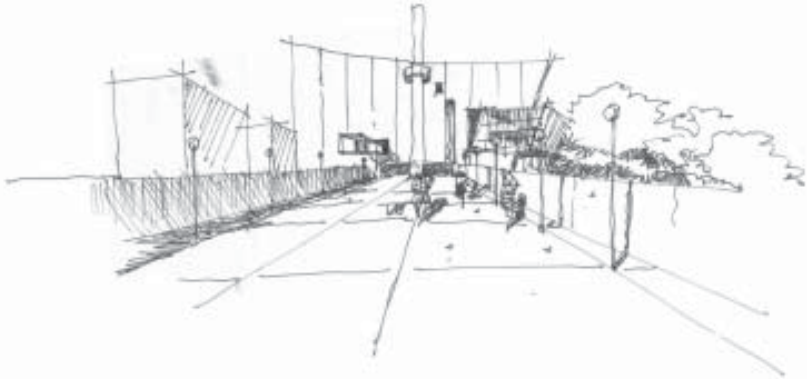


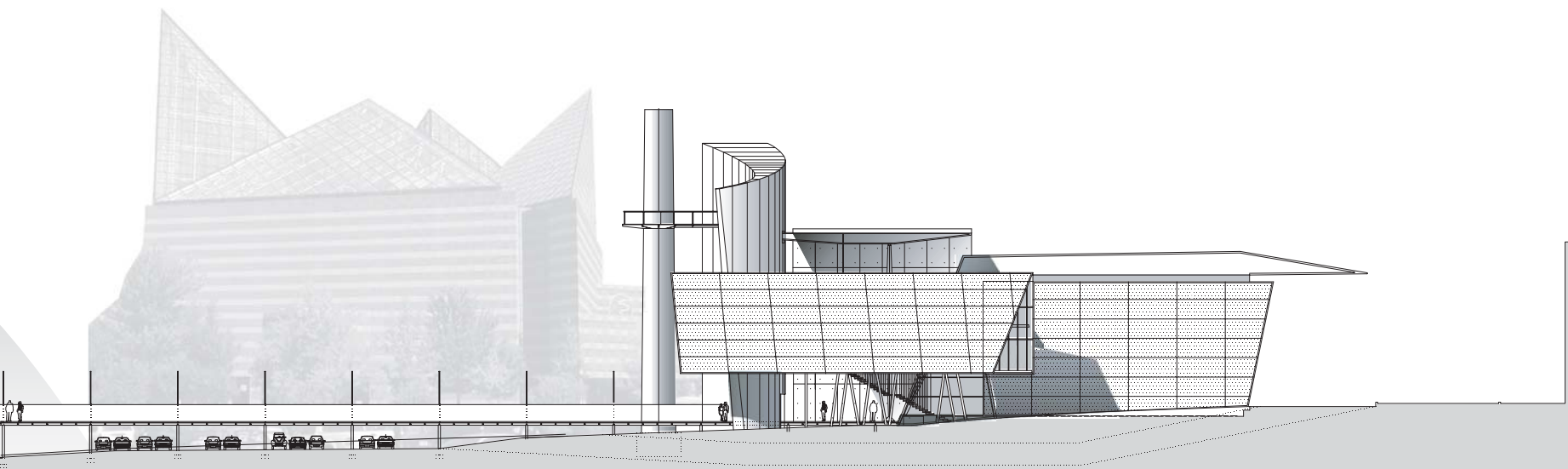
SPACE ARRANGEMENT



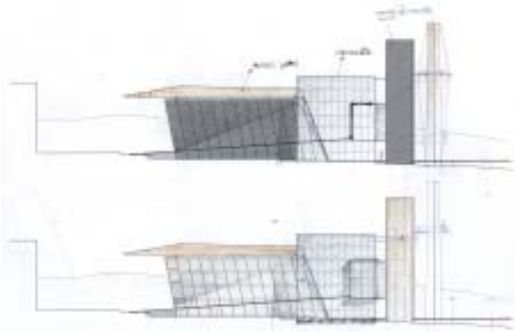
BUILDING CIRCULATION

RELATIONSHIP BETWEEN GEOMETRY AND CONTEXT

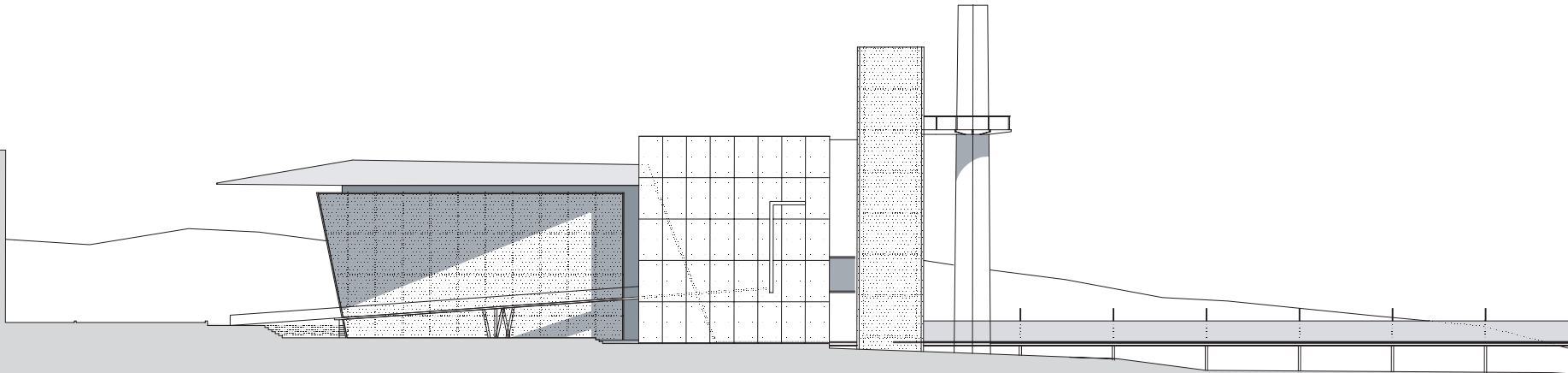




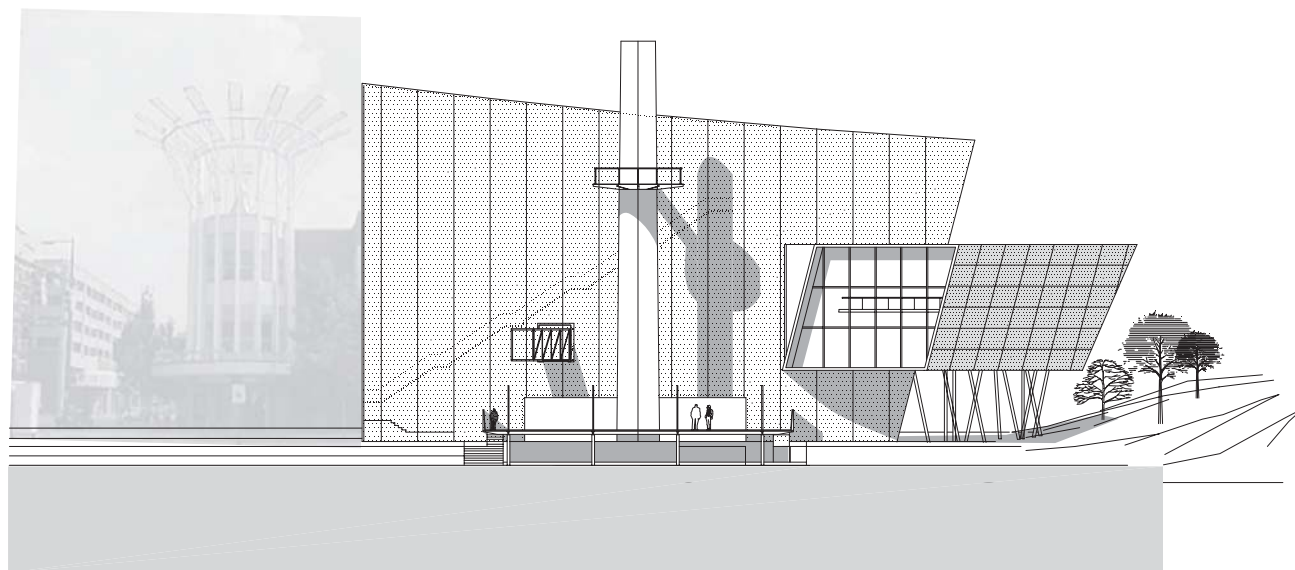
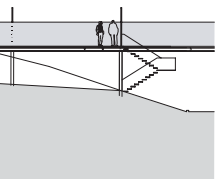
WEST ELEVATION



Along 2nd Street, the building has the same height as the existing buildings nearby as an attempt to achieve continuity along the street.



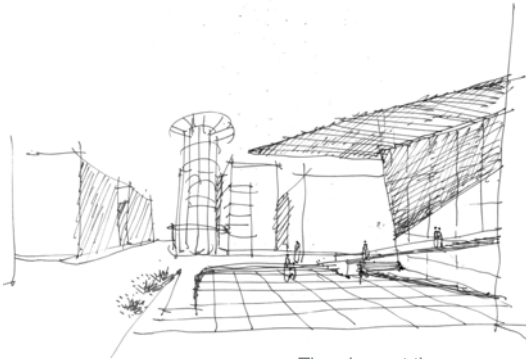
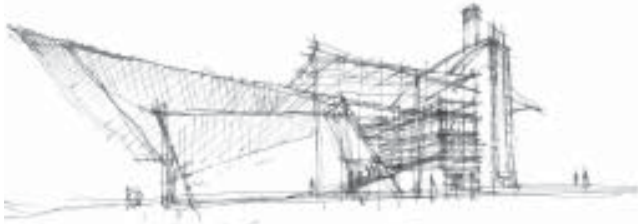
EAST ELEVATION



NORTH ELEVATION

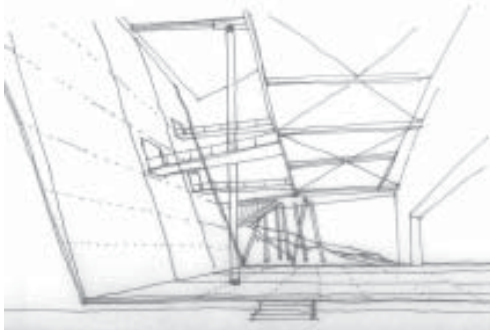


## DIALOGUE BETWEEN INTERSECTION SPACE AND CONTEXT

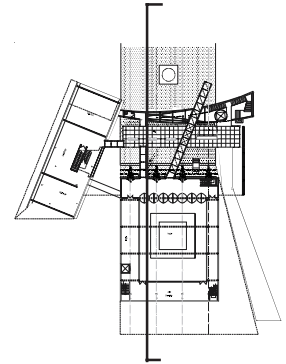


The plaza at the corner

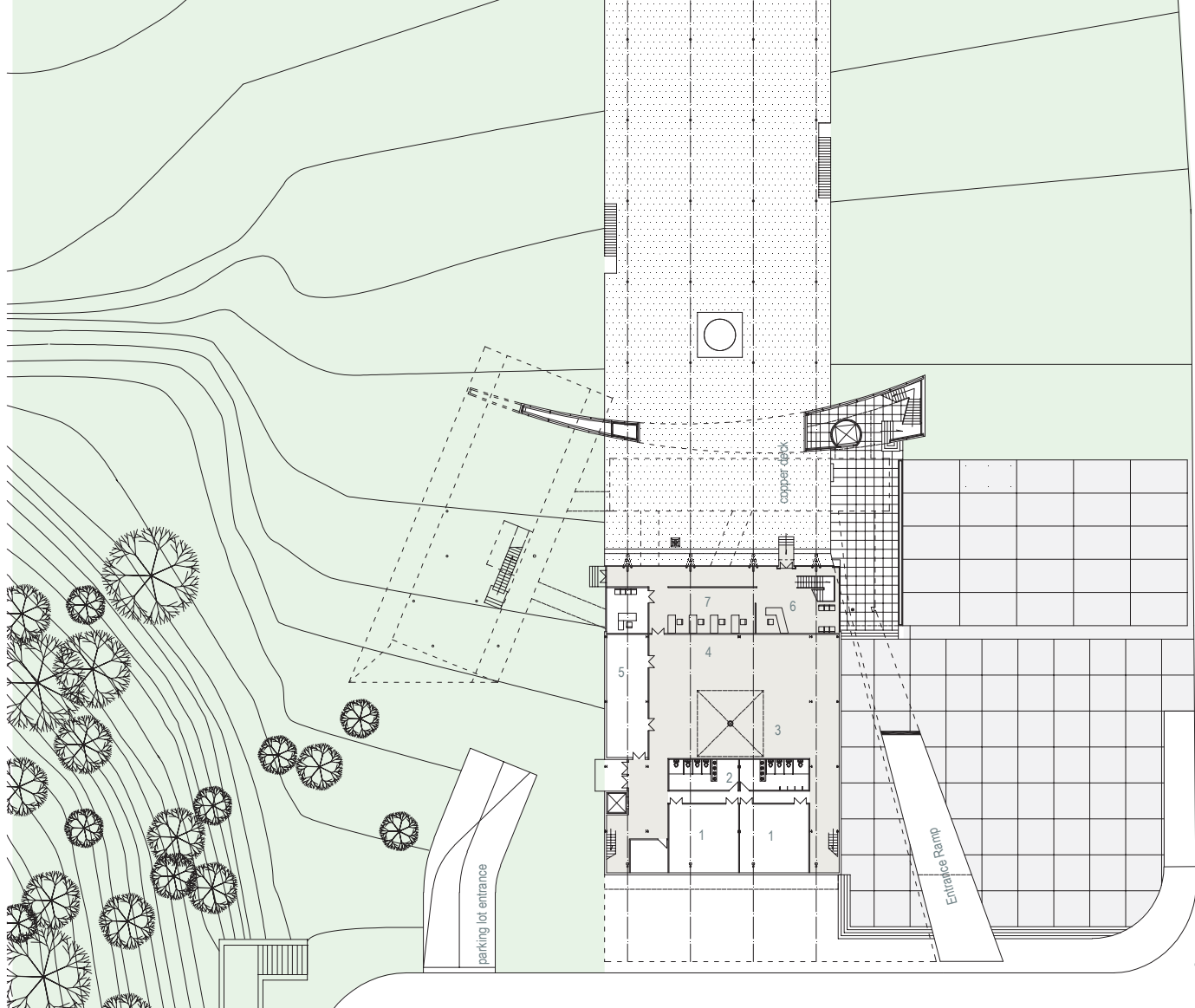
A plaza is defined with setbacks from Chestnut Street and Second Street. From this plaza a long entrance ramp leads to the lobby.



To the west of the entrance hall, the natural setting and man-made space interact. The green hill becomes a garden for the inside space.

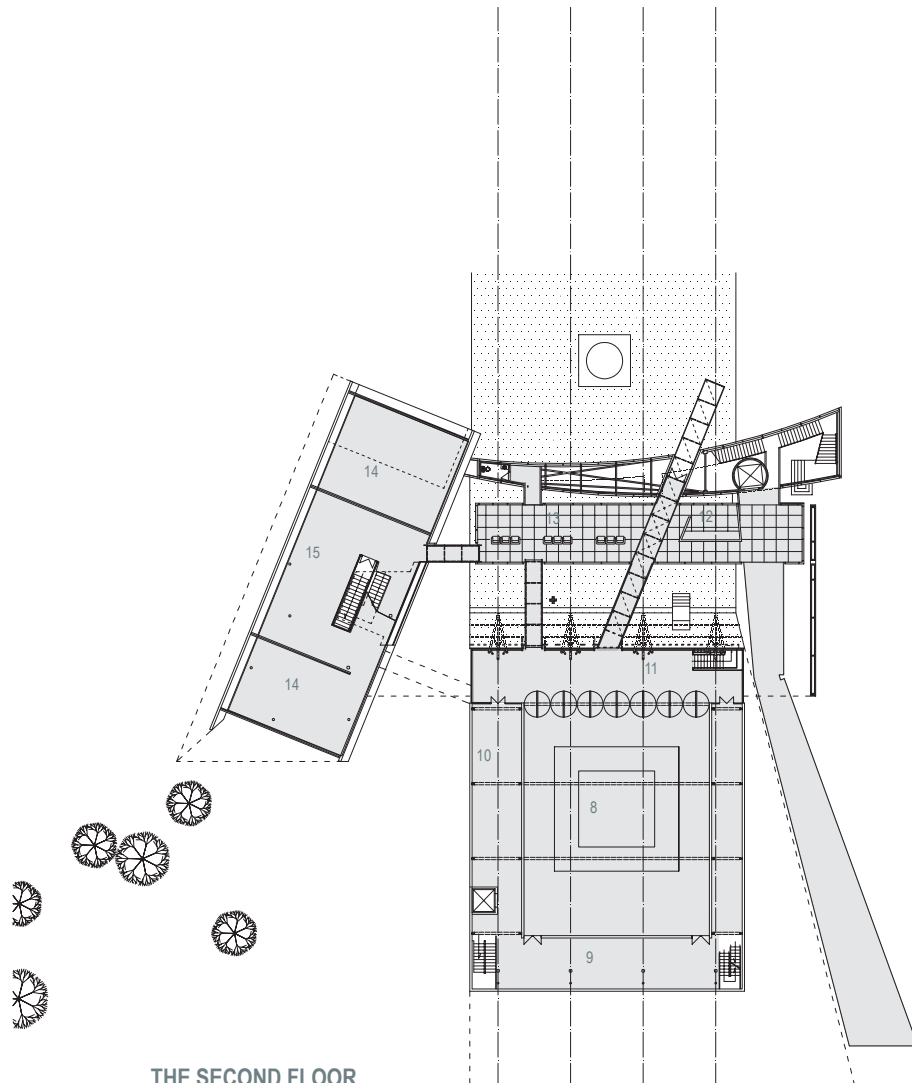


THE LONGITUDINAL SECTION

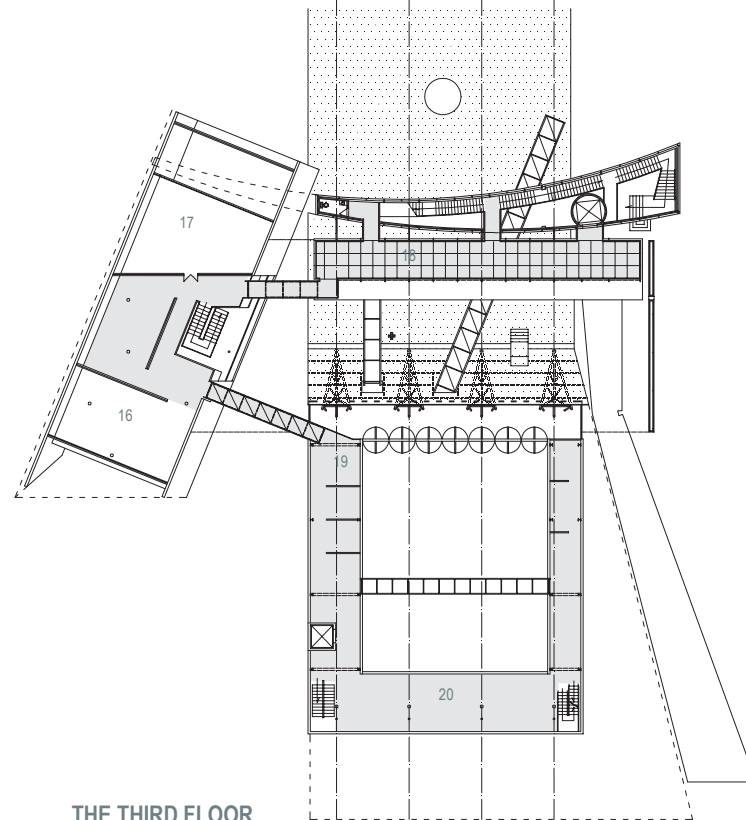


THE GROUND FLOOR

- 1. Dressing Room
- 2. Rest Room
- 3. Costume Shop
- 4. Stage Shop
- 5. Storage
- 6. Reception
- 7. Office
- 8. Auditorium
- 9. Stage(Workshop)
- 10. Storage
- 11. Foyer



THE SECOND FLOOR



THE THIRD FLOOR

- 12.Box Office    13.Lobby (Exhibition Hall)    14.Class Room    15.Design Center    16.Choral Rehearsal    17.Dance Rehearsal    18.Balcony    19.Control Booths    20.Workshop



ABSTRACT

THE SITE

CONTEXT AND BUILDING

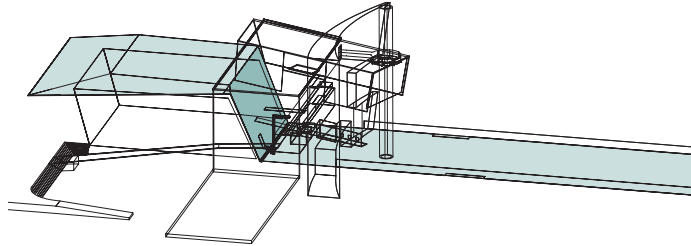
COMPONENTS

THE COPPER BAND  
THE CONCRETE BAND  
THE CURVED WALL  
THE EDUCATION BOX  
THE THEATER

CONCLUSION

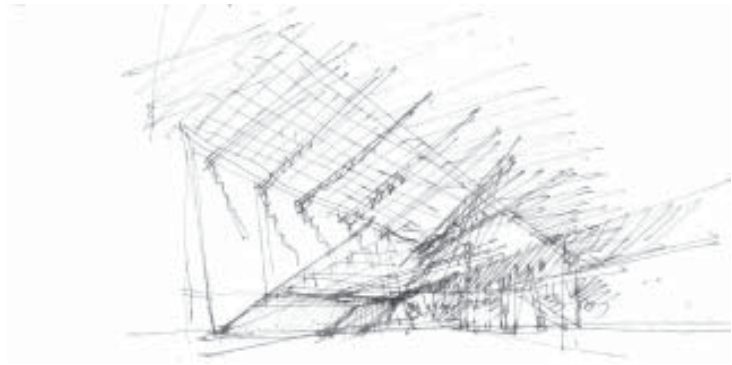


## THE COPPER BAND

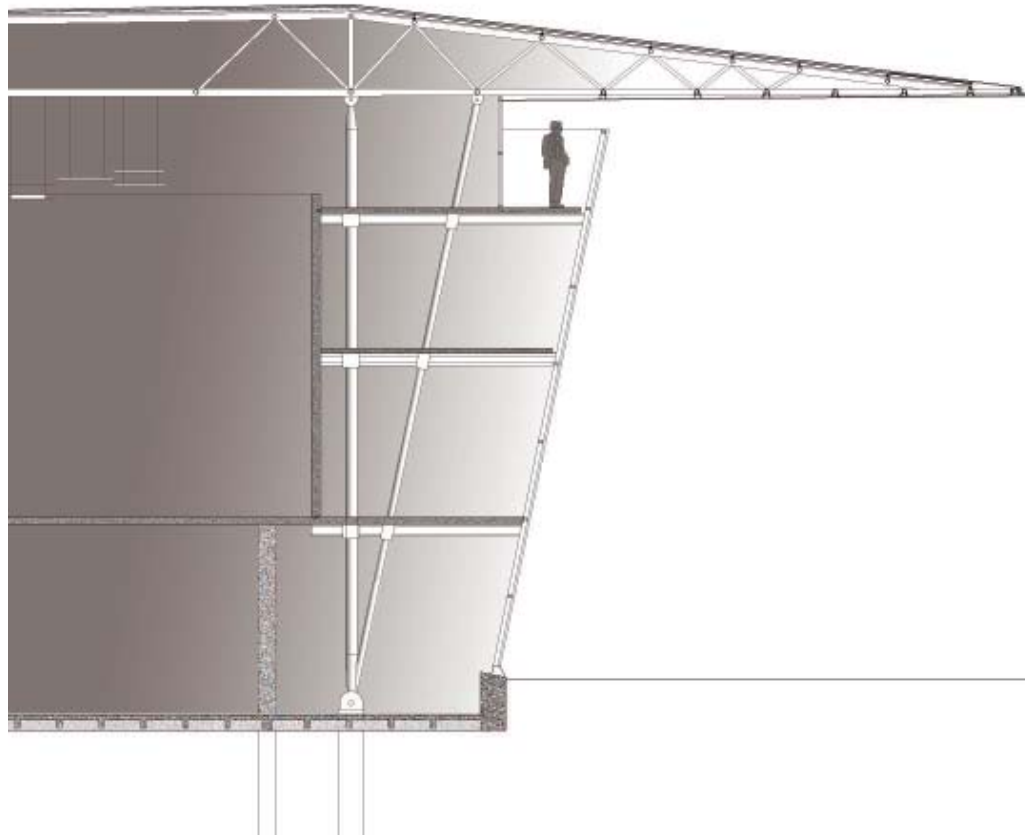


The copper band begins as the theater roof, folds and drops as an inclined wall, and folds again to level as a walkable man-made floor that reaches the edge of the river. Conceptually it connects the natural setting of Riverfront Park and the mountains beyond with the denser urban environment. Underneath this vast, horizontal copper deck, arrival and parking are joined with a grand access toward the complex marked by the existing smoke stack.

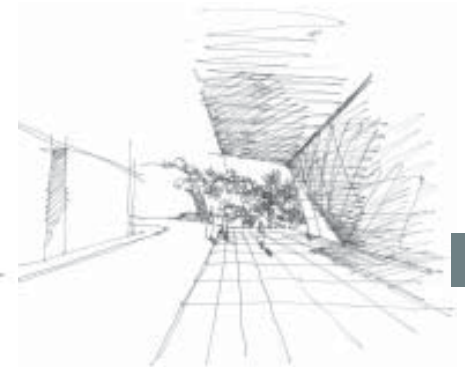


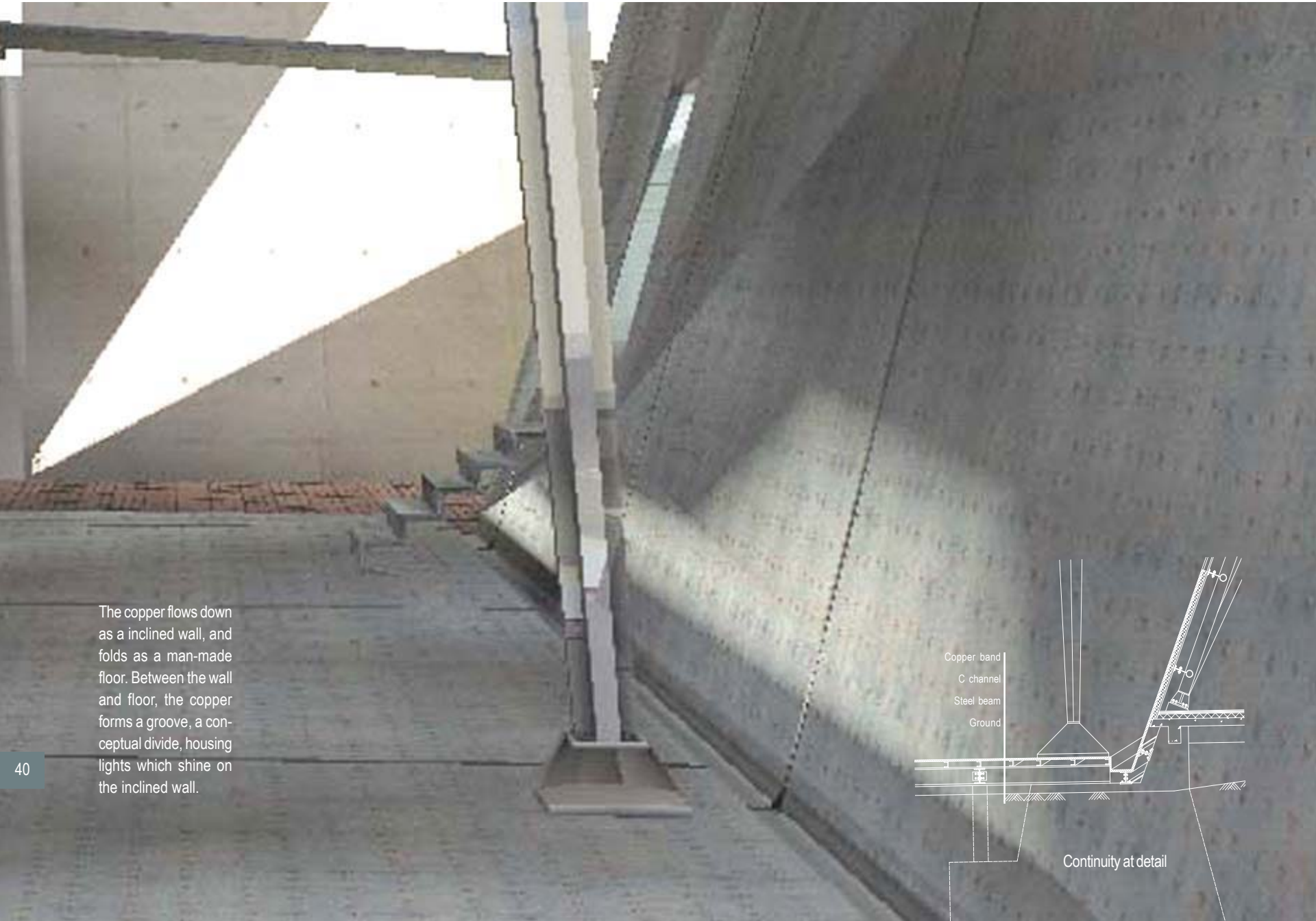


The copper band forms the inclined wall and the floor of the intersection space.

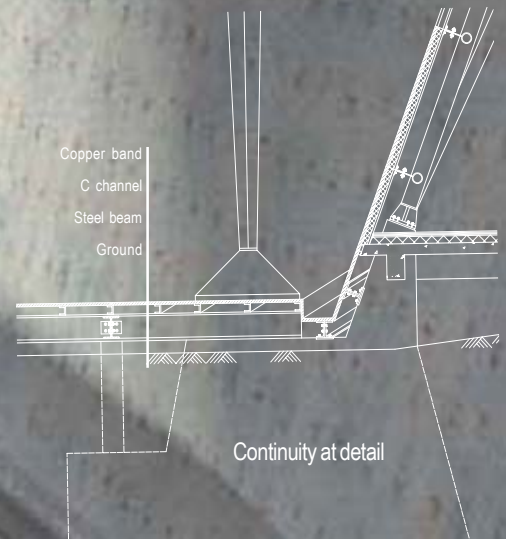


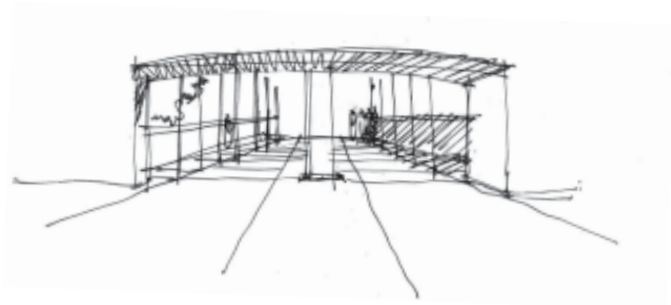
The copper roof extends its edge out past the wall above the street, creating a covered urban space.



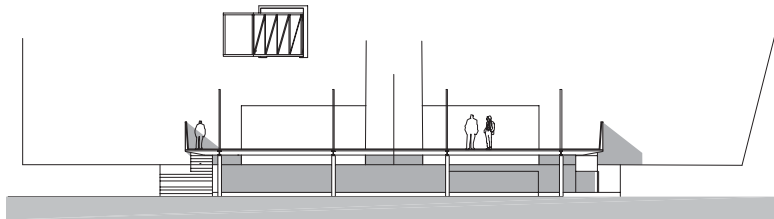


The copper flows down as a inclined wall, and folds as a man-made floor. Between the wall and floor, the copper forms a groove, a conceptual divide, housing lights which shine on the inclined wall.

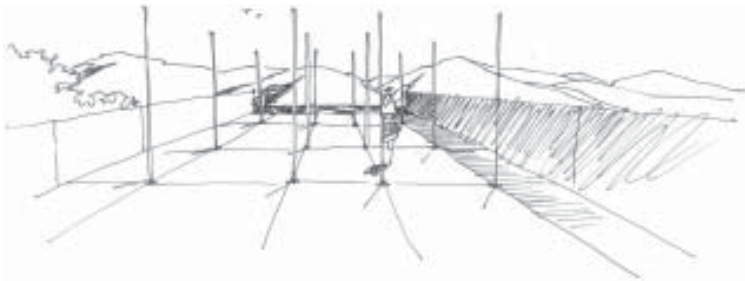




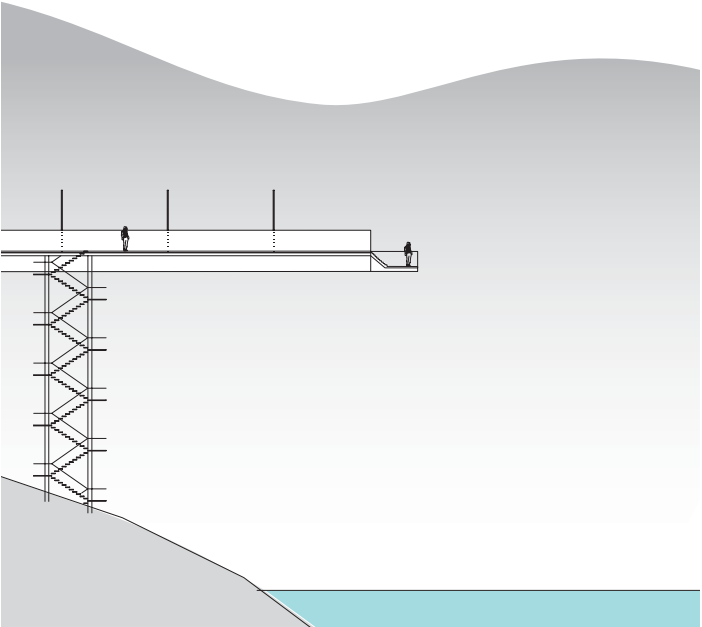
The copper band flows out as a floor passing through the gate-like opening at the bottom of the curved wall. The material continuity suggests a literal coherence between inside and outside.



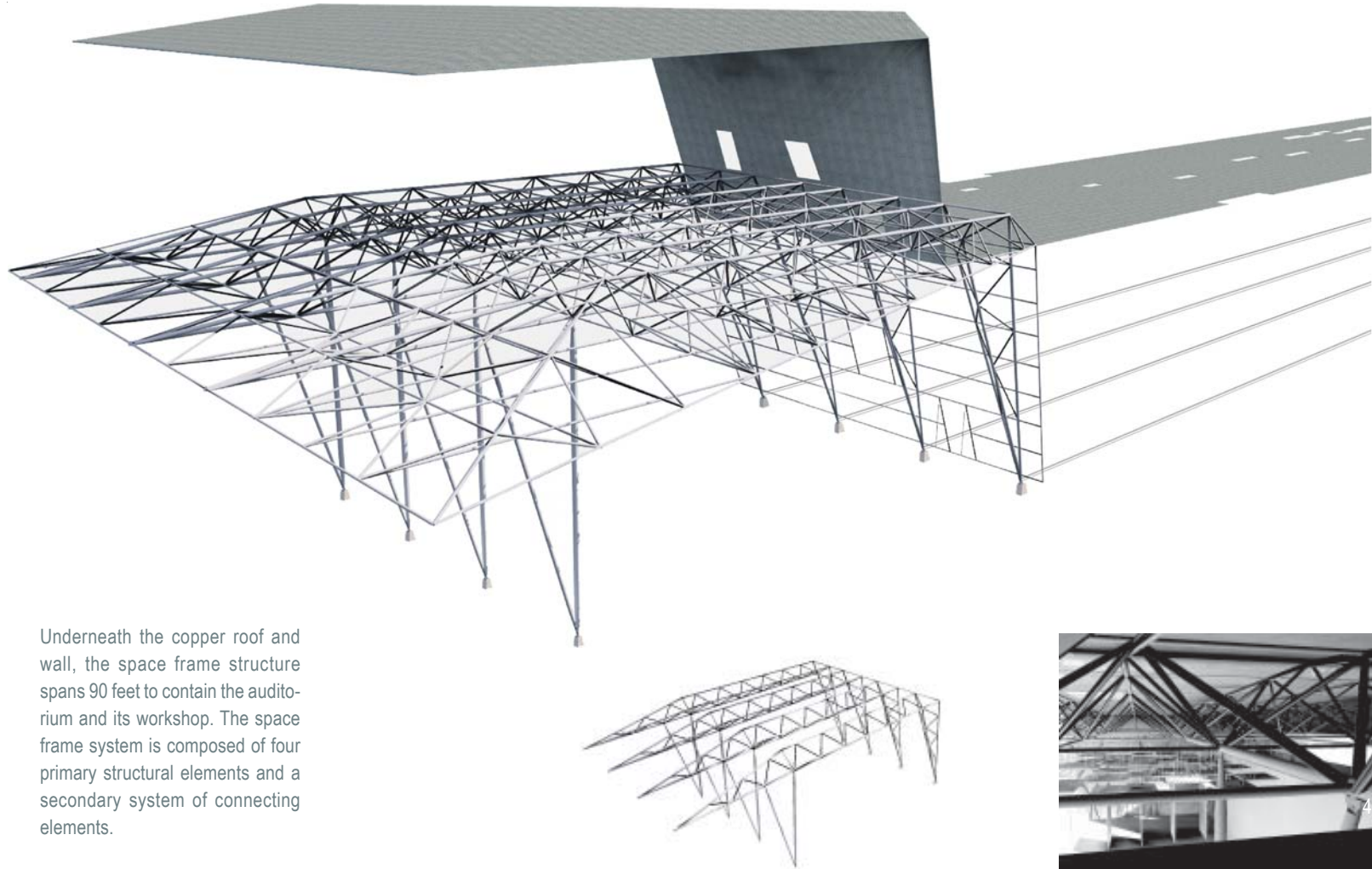
Along two sides, the copper band folds up to an eye-level boundary. The two boundaries constrict the view, and present the beautiful mountainscape. They also exhibit information about events in the city and its development on their surface.



At the end, the deck steps down into a balcony exposing the sharp horizontal deck line without boundary. Upon arrival on the balcony, one realizes the river directly below. From there, it is possible to enjoy the boating and other activity on the river.



## DEVELOPMENT OF THE COPPER BAND

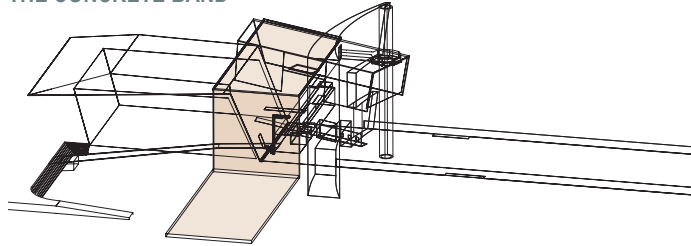


Underneath the copper roof and wall, the space frame structure spans 90 feet to contain the auditorium and its workshop. The space frame system is composed of four primary structural elements and a secondary system of connecting elements.





## THE CONCRETE BAND



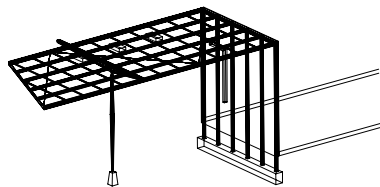
Perpendicular to the copper band, the concrete band begins as a floating roof over the entrance hall. It folds and becomes a wall and finally extends to the west as a floor toward the other institutional buildings. Along its side a plaza is defined with setbacks from Chestnut Street and Second Street. From this plaza a long entrance ramp leads to the lobby.



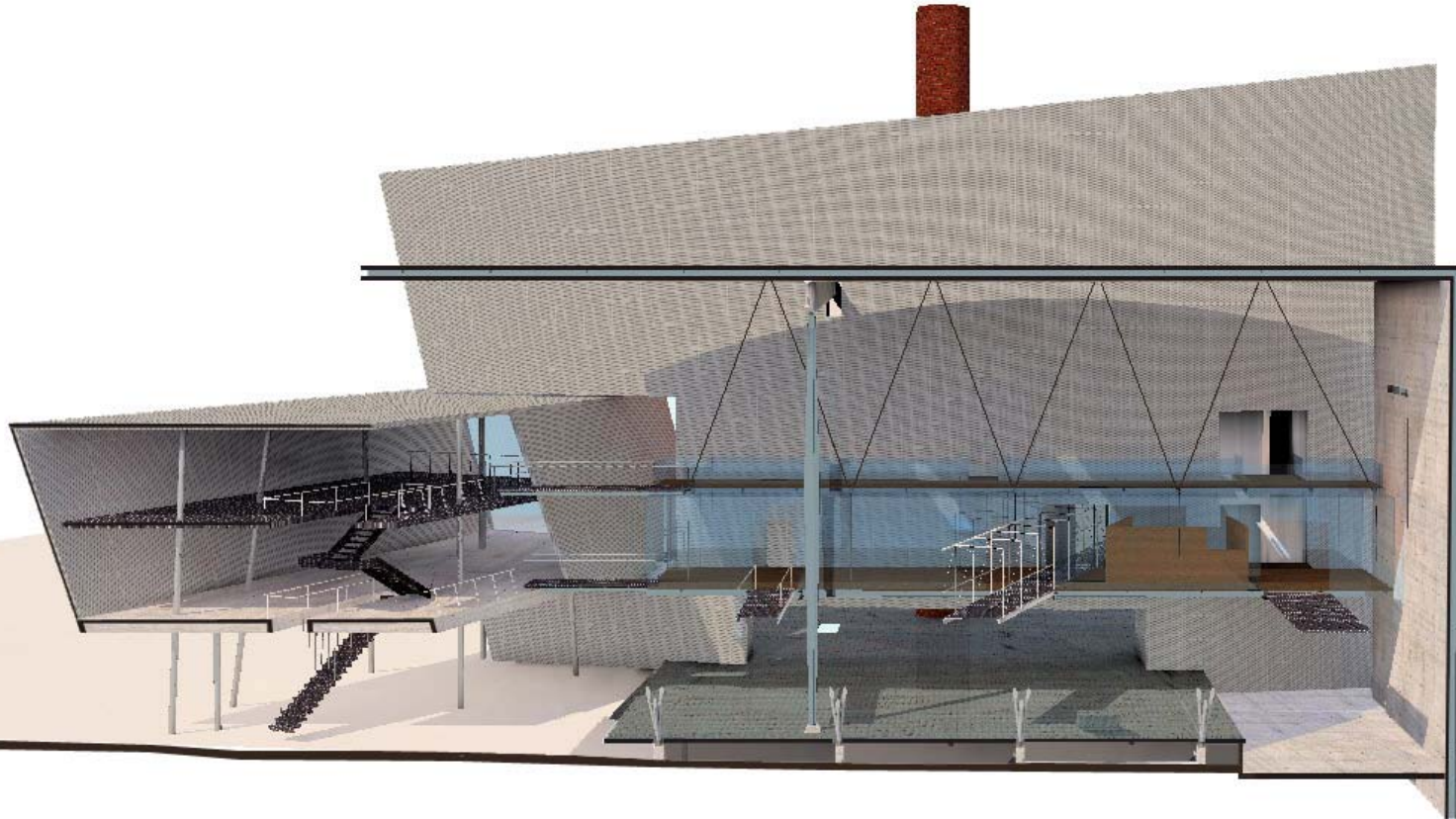
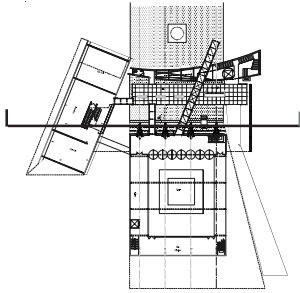


The concrete band is folded up to construct an intersection with copper band. Natural light, inserted into the intersection space through the gap between the two bands, emphasizes the two bands.

The view from the western edge of the intersection space



The structure of the concrete band



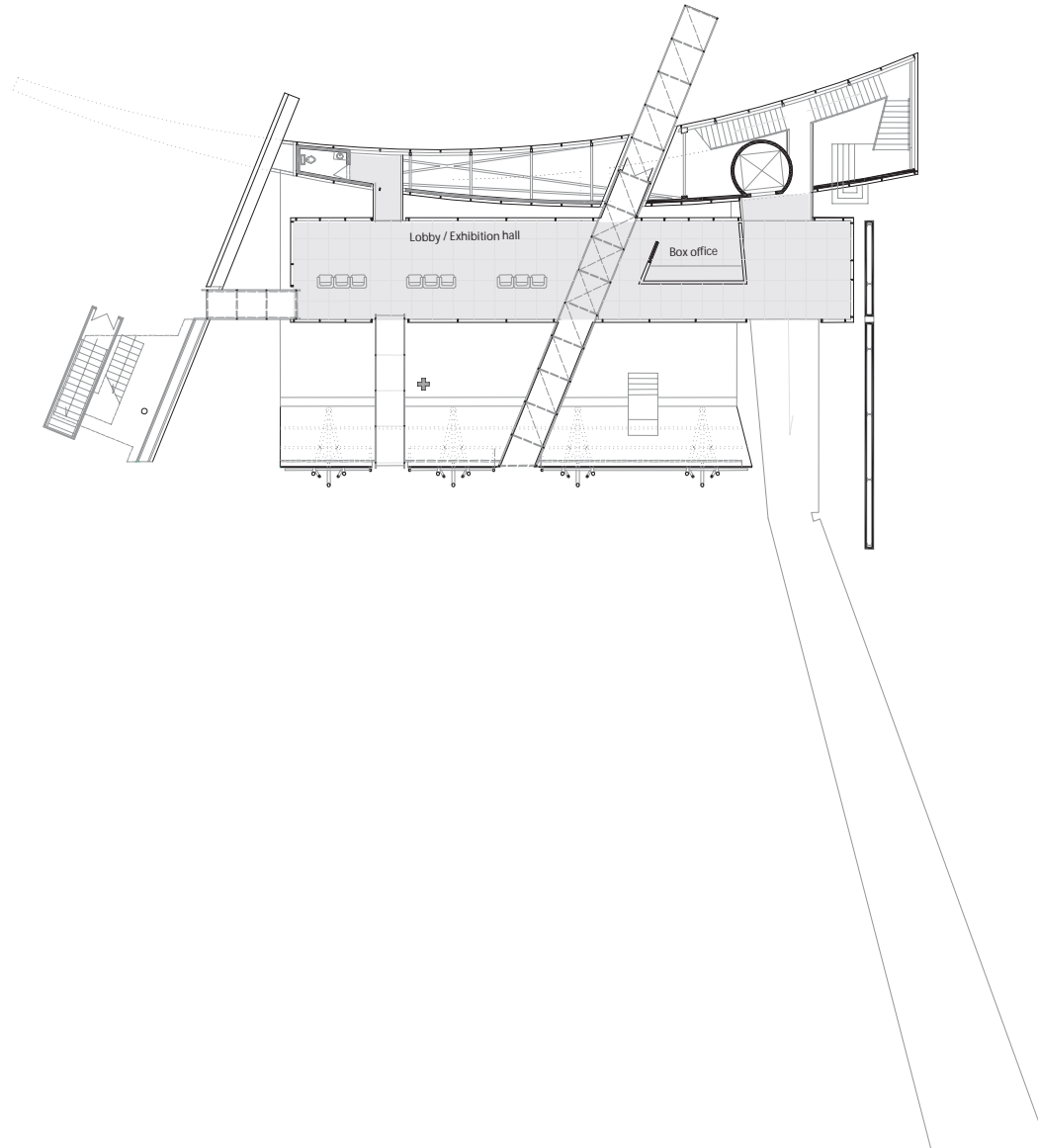
## LOBBY BOX IN THE INTERSECTION SPACE

Underneath the concrete band is a hanging glass box, in which a small box-office and the lobby are located. The primary structure of the box is steel studs accompanied by a glass structure, one end of which is hung by cables, while the other is held by the curved wall. Two bridges lead people from the lobby into the theater puncturing the inclined copper band.

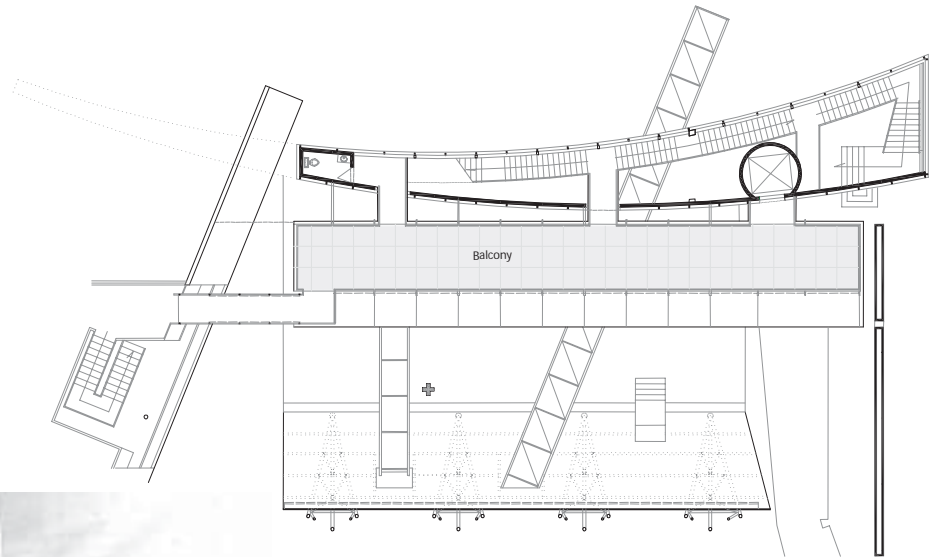




## SPACE AT THE INTERSECTION

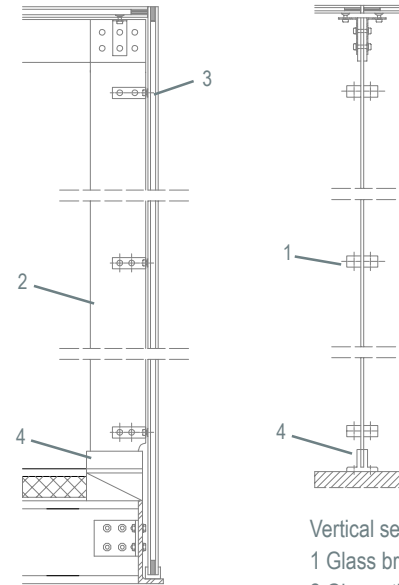
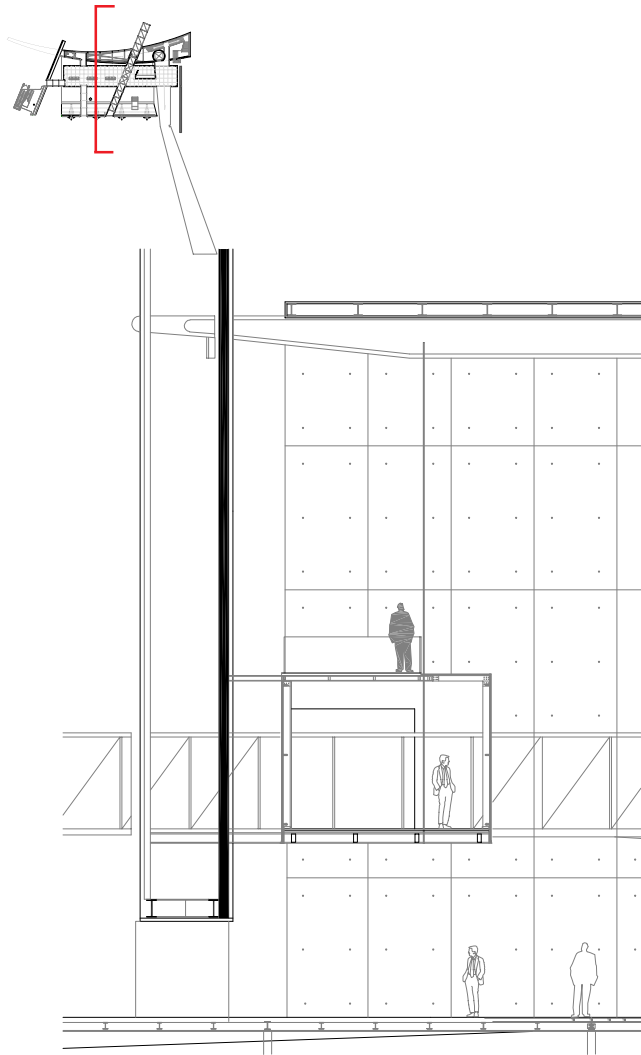


One bridge extends to the outside from the theater's foyer penetrating the metal screen curved wall, and ends as a balcony close to the chimney. It ties those components together.




The lobby is the circulation pivot and the central “stage” in the intersection space. It houses display of student scenery designs and costumes.

## MAKING THE GLASS BOX



Vertical section through main facade.

- 1 Glass bracket.
- 2 Glass stiffener, laminated safety glass 19mm.
- 3 "Planar" system laminated safety glass, 12mm.
- 4 Glass stiffener made from stainless steel.

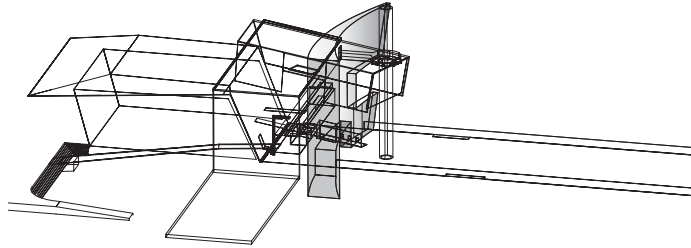


The glass structure and hanging cable create the maximum transparency. It makes the boundary of the intersection space clear.





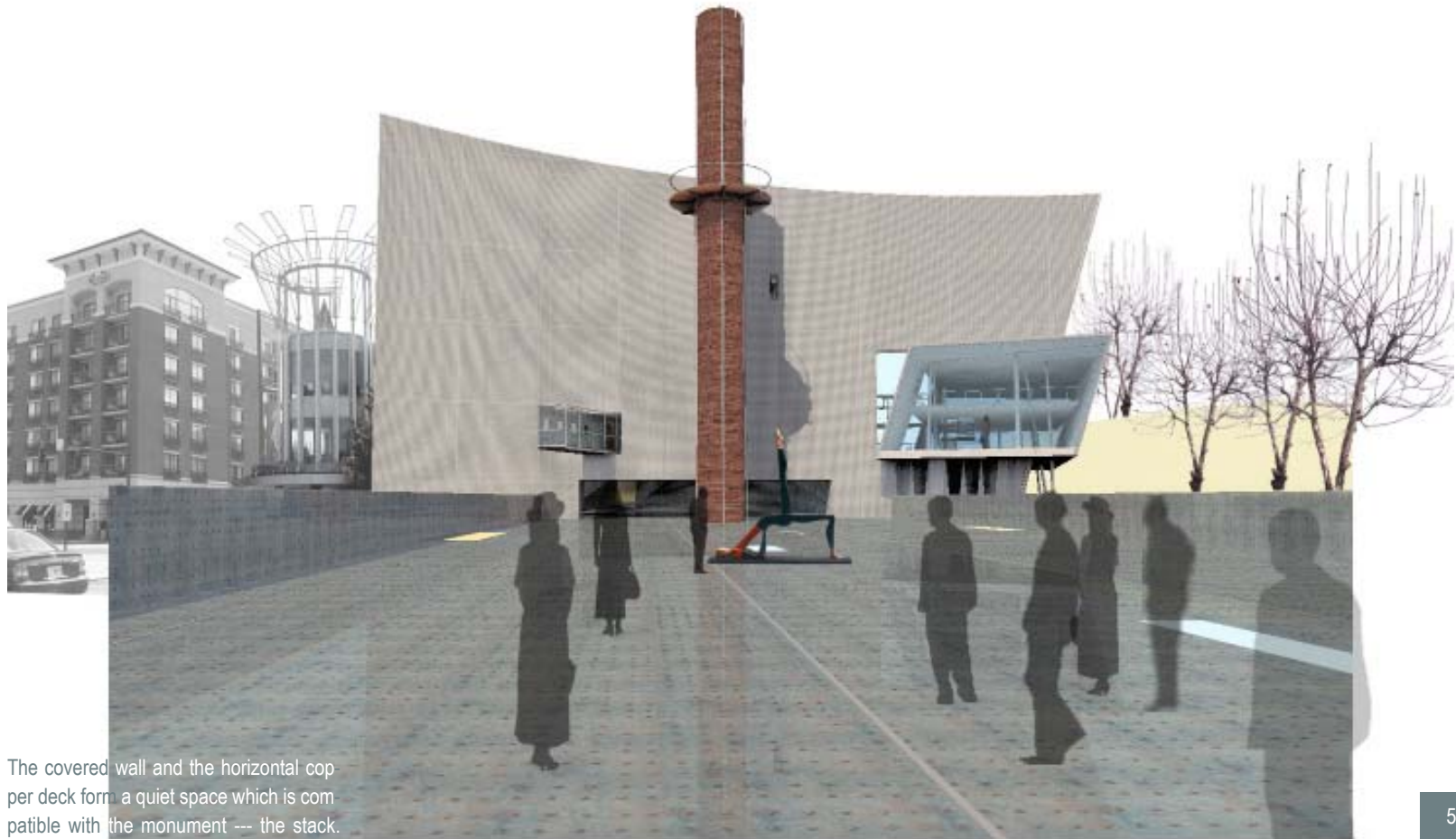
## THE CURVED CIRCULATION WALL



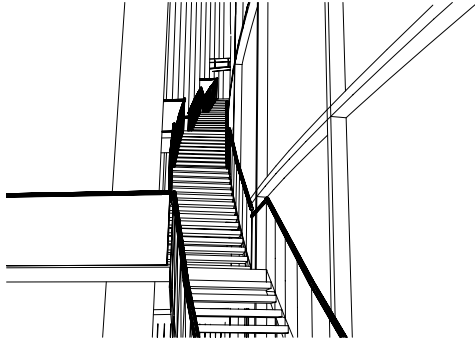
The curved circulation wall is a boundary membrane that separates the stack from the busy city to promote serenity. At the same time it provides a function as proscenium screen with its curved geometry as a response to the stack.



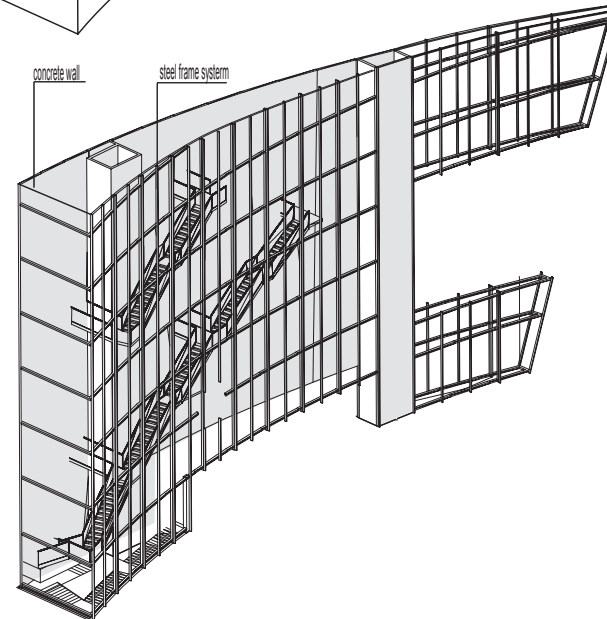
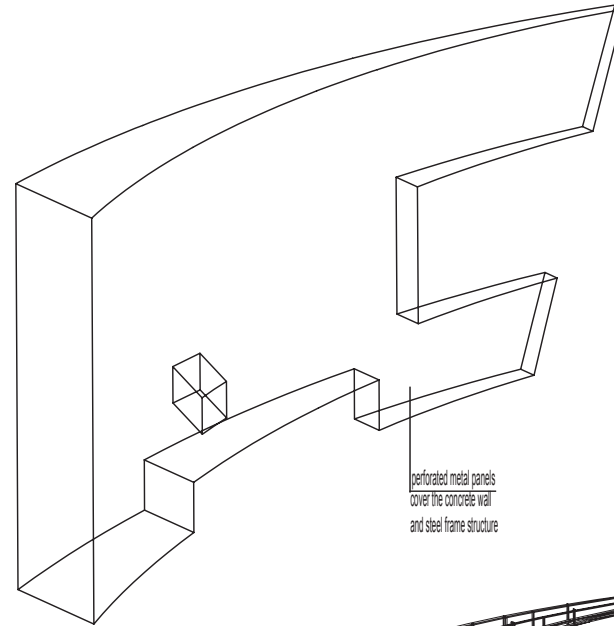
The curved metal screened wall anchors the chimney with a terrace balcony. The wall provides an opportunity to read the chimney at different height levels, from deck floor, bridge, education box and terrace balcony.



The covered wall and the horizontal cop per deck form a quiet space which is compatible with the monument --- the stack. This space also provides a place for the out-air performing activities.



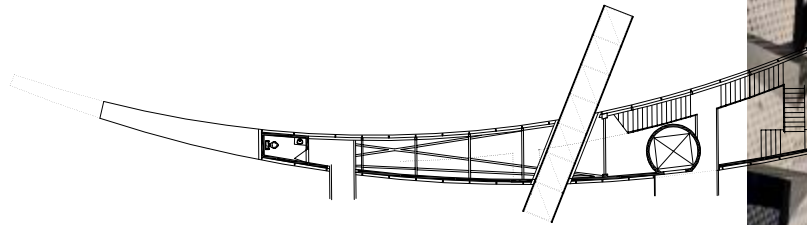
The one-directional long stair leads people from the underground parking space level and deck floor level to the lobby, inside balcony, and the high terrace. It creates a strong space inside the wall.



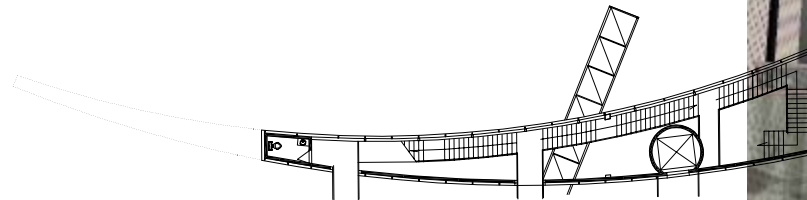
The curved wall is constructed with a concrete wall and a steel studs system covered with perforated metal panels. Stairs are located in between.



THE CURVED WALL GROUND FLOOR



THE CURVED WALL SECOND FLOOR

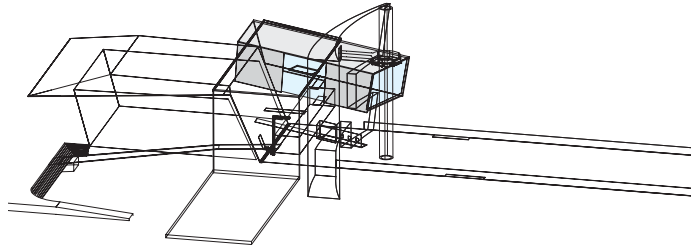


THE CURVED WALL THIRD FLOOR



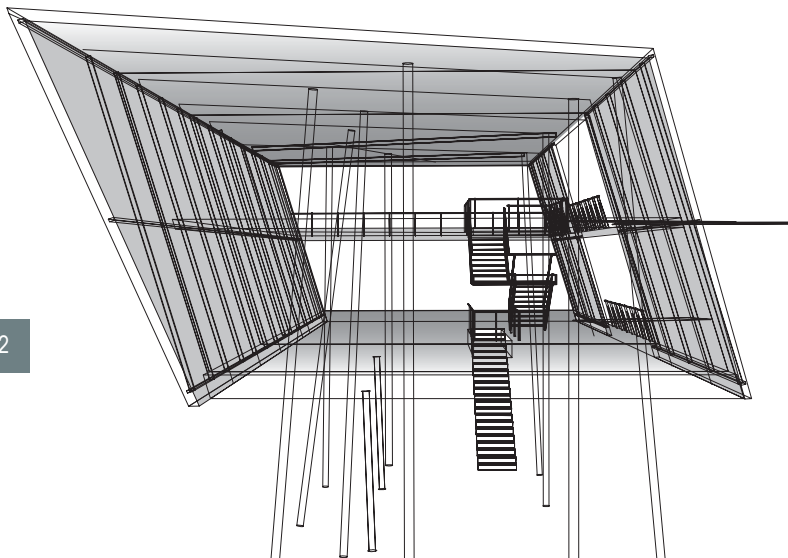


## THE EDUCATION BOX

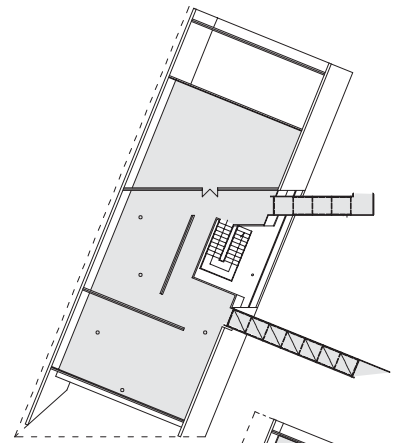


The education space is a floating hollow box opening on two ends, linking the views pointing to the river and the old steel bridge on one end, and the green hill in the city on the other. It hovers over the ground along the west side of the building, and defines the west boundary of the intersection space. The floating box makes a place underneath. The transparency of the box invites the natural environment into the public space.

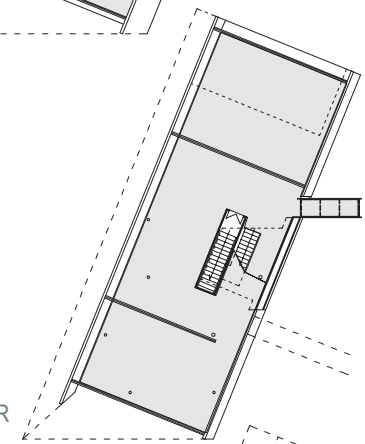




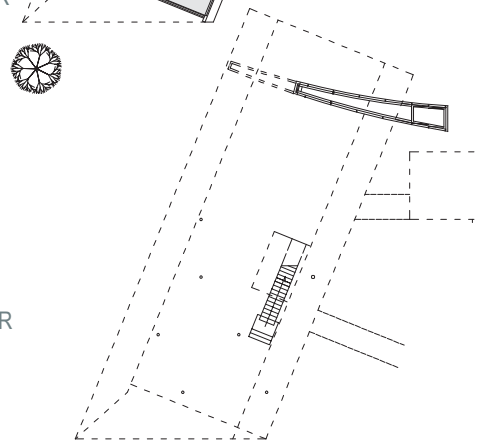
THE THIRD FLOOR

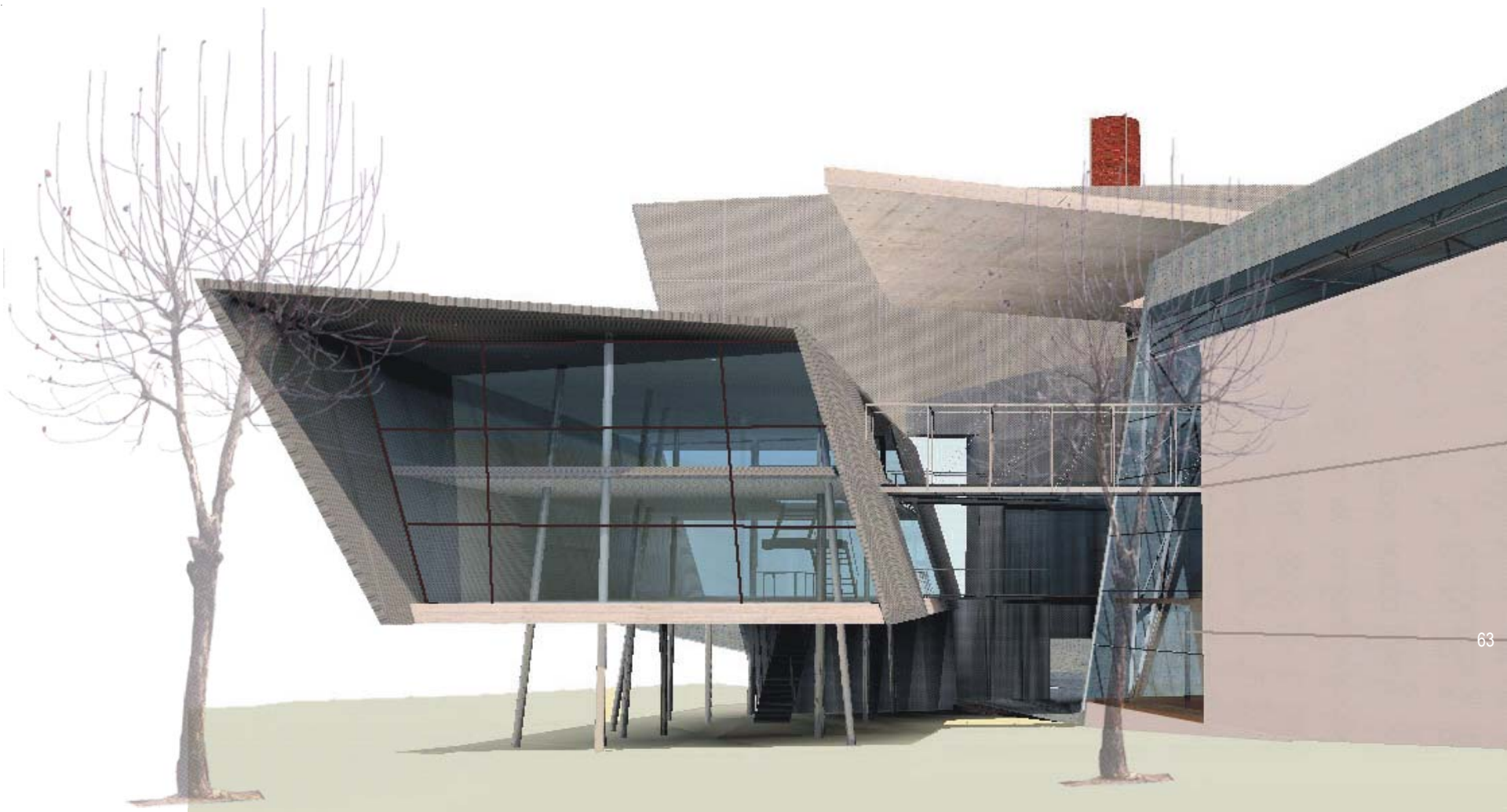


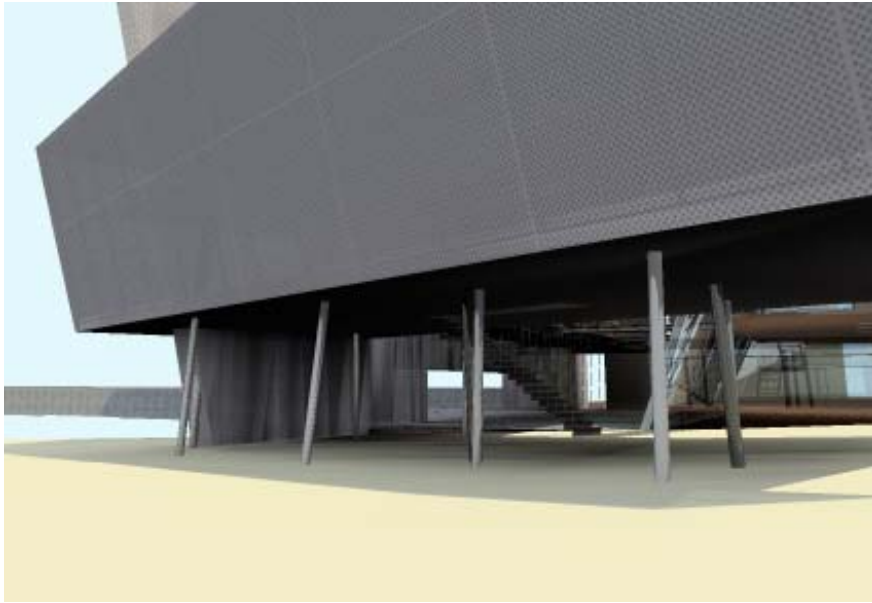
THE SECOND FLOOR



THE GROUND FLOOR

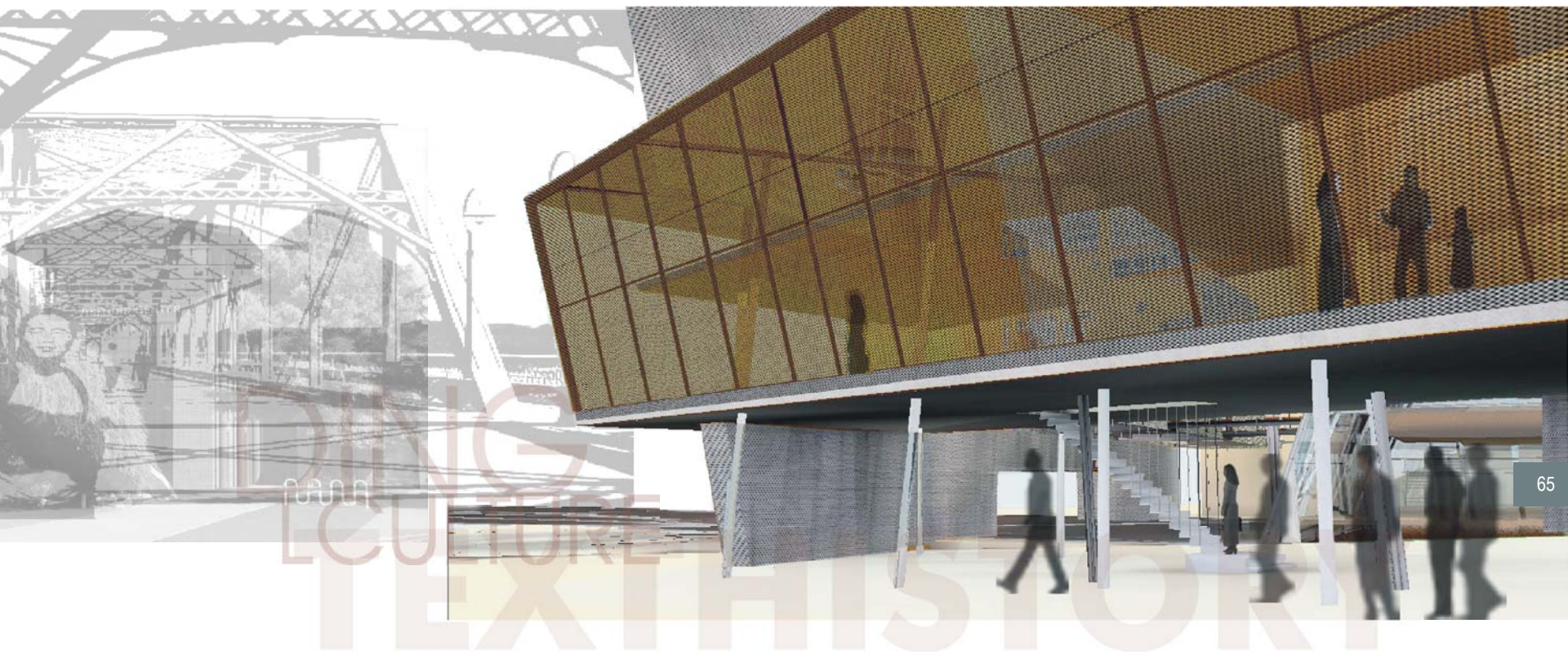






The hollow box is occupied by the dance and choral rehearsal rooms, a design center and class rooms. It is detached from others part of the building signaling its different character. This requires a relatively quiet and private place away from public spaces. Perforated metal panels cover the box from opaque to translucent.





The box opens at the middle of the wall, which faces the public space at the intersection. The opening allows people to walk from the lobby, and provides access for communication between the space in the box and the intersection space.

View from the Education Box toward the Entrance Hall

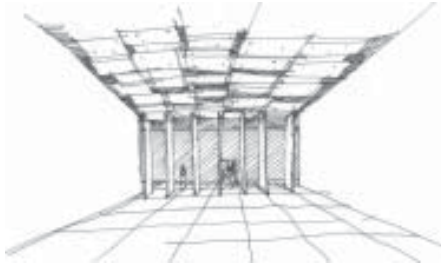


View from the Entrance hall toward the Education Box





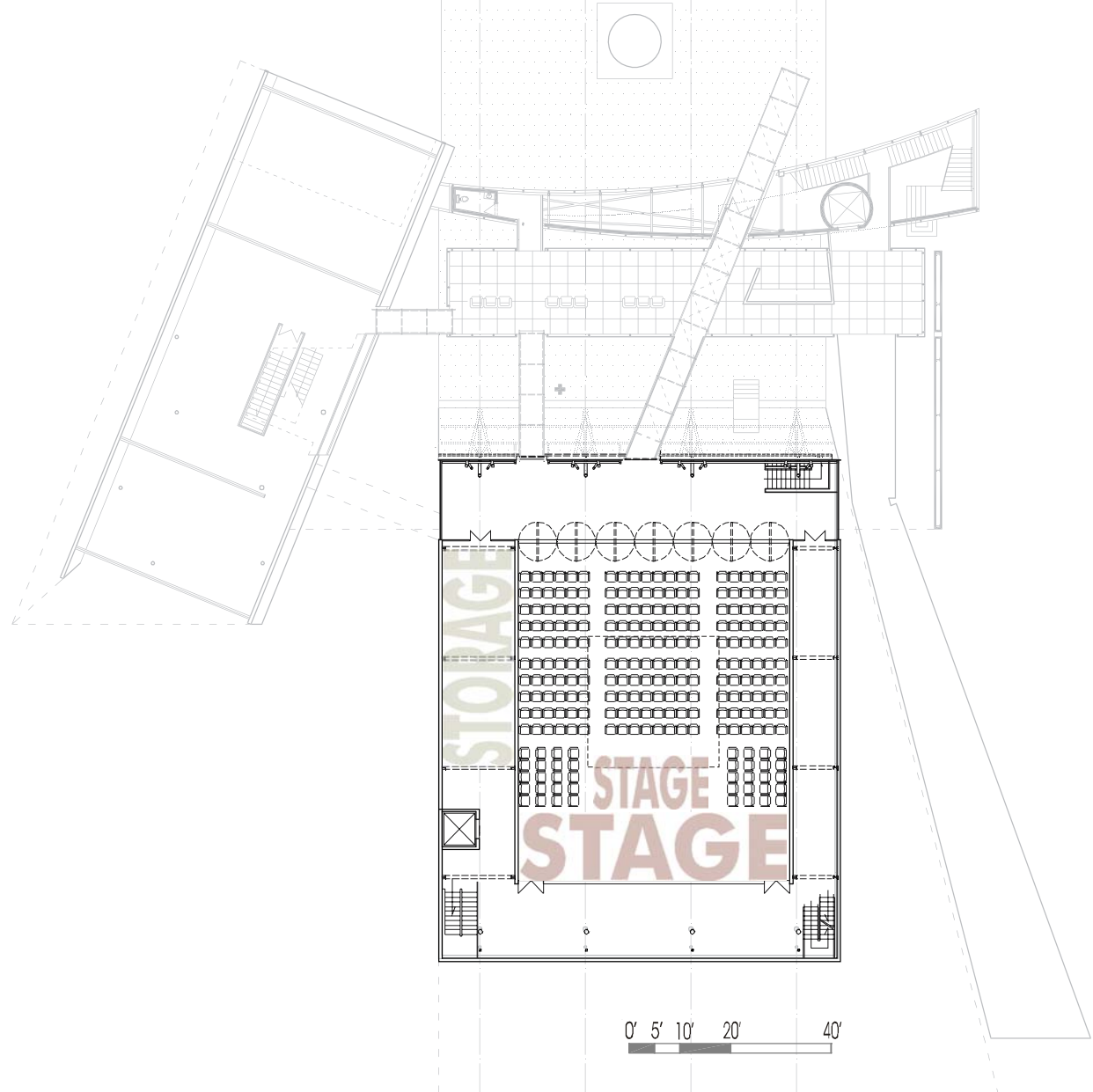
## THE THEATER



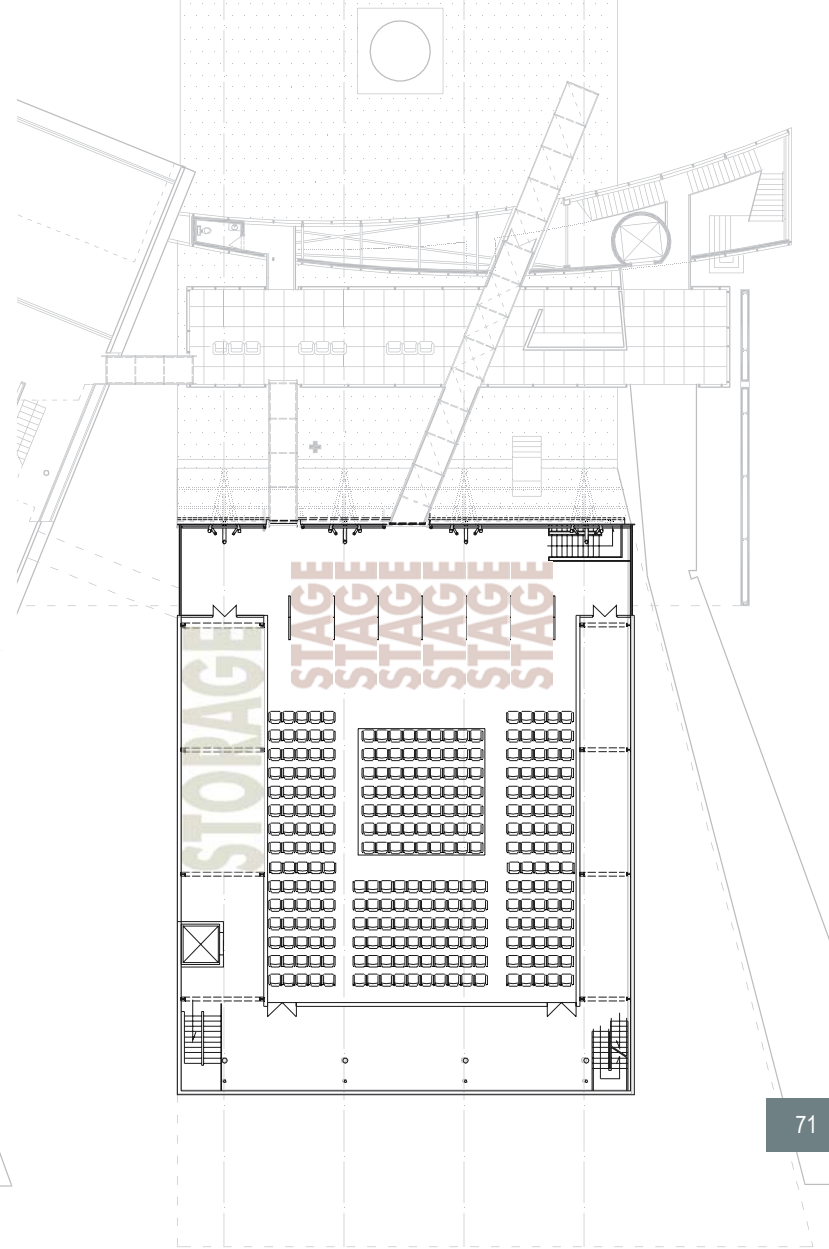
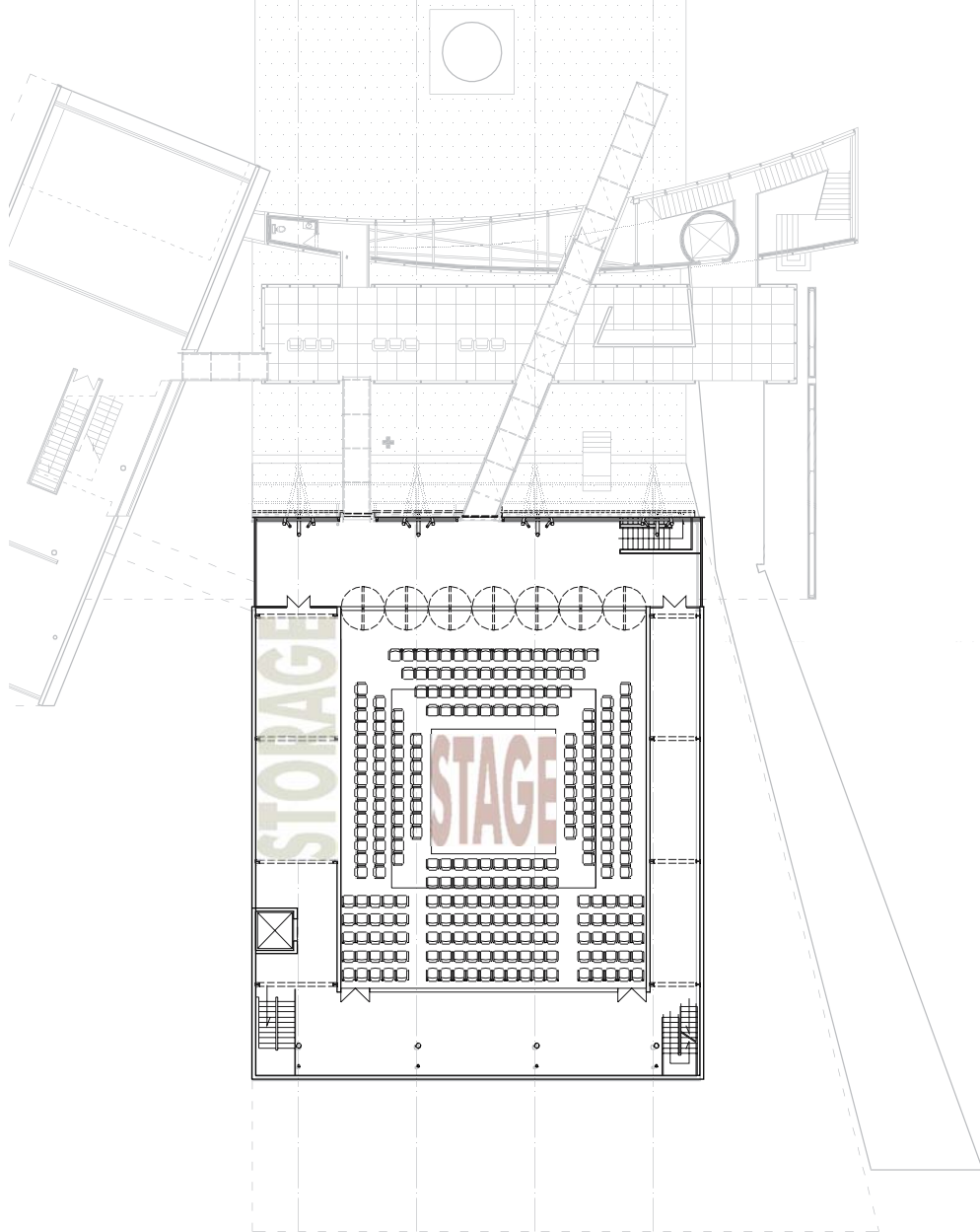
The theater space itself is accessed via the lobby bridges puncturing the inclined copper band. The copper band, supported by the space frame mega structure, shelters the stage and support rooms. A secondary ceiling suspended from the copper band, a hydraulic floor and rotating wall panels further assist the experimental character of the theater space.



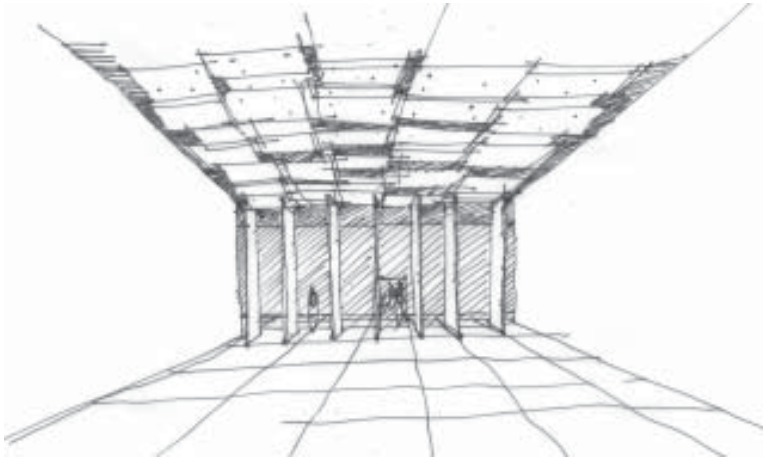
## SEATING ARRANGEMENTS



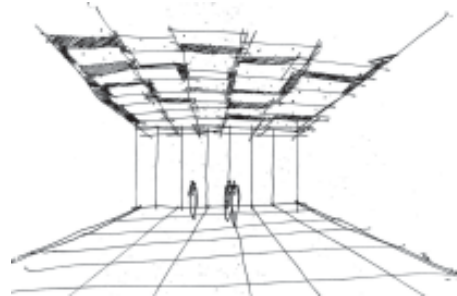
The theater provides maximum flexibility to arrange the seating. It can accommodate various arrangements of the stage such as a thrust, arena, or an innovative arrangement matching the creative drama. The movable floor, the main access to the workshop from the theater, provides convenience to install the stage.



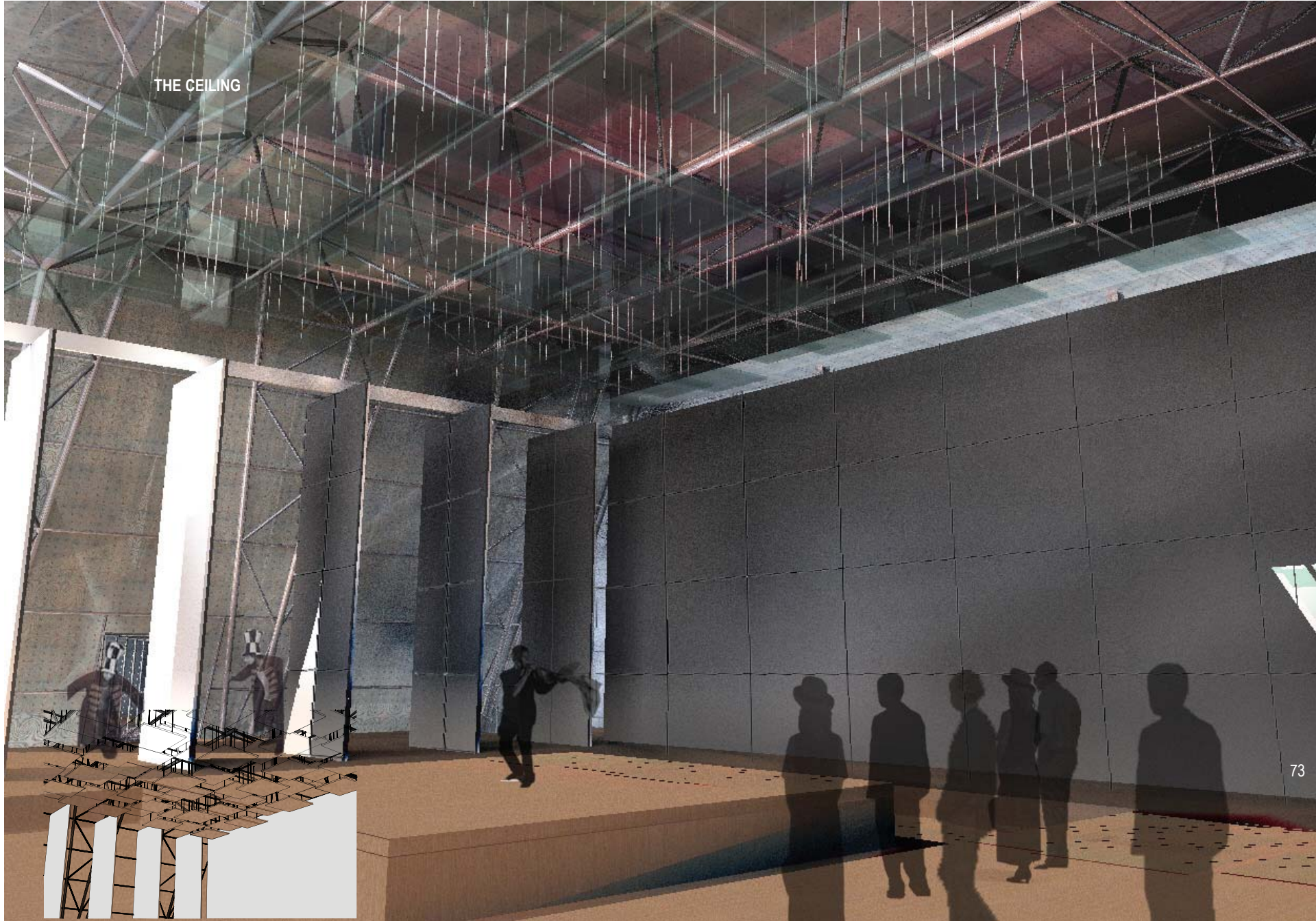
## THE ROTATING WALL



The rotating walls become both the door and the wall. When the walls are closed, they connect to the other surfaces to complete the room. When they turn open, the walls disappear, and they become separated pieces working as a boundary between two spaces. People can walk in or out between them.



THE CEILING





ABSTRACT

THE SITE

CONTEXT AND BUILDING

COMPONENTS

CONCLUSION



## Conclusion

The design is not in making the elements. Elements are realizations of the demands of the site and its context. "The design is the struggle to develop the elements into shapes compatible with each other, reaching for a wholeness," and is realizations that "the order of structure, the order of construction, the order of time, and the order of spaces come into play." -- Louis I. Kahn.



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All photographs are by the author or are in the public domain, unless otherwise noted.

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1990 - 1994 Bachelor of Eng. in Architecture Design, Hefei Univ. of Technology, Hefei, China

### EXPERIENCE

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2002 - 2003 VPI+SU: College of Architecture + Urban Studies: Graduate Teaching Assistant Blacksburg, VA  
2002 Shriver & Holland Associate, Norfolk, VA  
1999 Shangdi Architects Associate, Beijing, China  
1994 - 2000 China Electronics Engineering Design Institute, Beijing, China

### HONORS - AWARDS

- 2003 Award for Excellence in the 2003 ACSA/American Institute of Steel Construction Student Design Competition.  
Instructional Fee Scholarship, VPI+SU: College of Architecture + Urban Studies  
Tau Sigma Delta Honor Society  
Outstanding Student Honor Society
- 2002 Award for Excellence in the 2001-2002 ACSA/Wood Architecture Design International Competition.  
Instructional Fee Scholarship, VPI+SU: College of Architecture + Urban Studies  
Phi Kappa Phi Invitee
- 2000 First prize, the "Excellent Project" awarded by the Information Ministry of China.
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- 1993 First prize, the 1993 China National Design Competition of Architecture Students.
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